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Transcranial direct current stimulation of the motor cortex in the treatment of chronic non-specific low back pain. A randomised, double-blind exploratory study

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## **Abstract**

### **Purpose**

This exploratory study aimed to test the proof of principle that active anodal transcranial direct current stimulation (tDCS) applied to the motor cortex reduces pain significantly more than sham stimulation in a group of participants with chronic non-specific low back pain.

### **Relevance**

Evidence points to alterations in brain structure and function and abnormalities in sensory processing in people with chronic low back pain [1]. A number of clinical studies have indicated that tDCS may be an effective treatment for chronic pain [2-6]. A recent Cochrane review found

insufficient evidence from which to draw strong conclusions but some evidence that tDCS applied to the motor cortex may have analgesic effects [7].

### **Participants**

A sample of 8 participants with chronic non-specific low back pain was recruited. The mean age was 45 years (SD 10), 7 of the 8 participants were female.

### **Methods**

The study utilised a within-subjects sham-controlled, interrupted time series design with randomised multiple baselines. Following 3 days of baseline measures participants entered a 15 day experimental period (Mondays to Fridays) for 3 consecutive weeks. During this period each participant received sham stimulation daily until a randomly allocated day when active stimulation was commenced. Active stimulation was then given daily for the remaining days of the experimental period. The primary outcomes were average pain intensity and unpleasantness in the last 24 hours measured using a visual analogue scale (VAS). Secondary outcomes included self reported disability, depression and anxiety, a battery of cognitive tests to monitor for unwanted effects of stimulation and participants perception of whether they received active or sham.

### **Analysis**

Data were analysed using generalised estimating equations modelling.

### **Results**

All participants completed the study. No significant effect was seen in the primary outcomes between active and sham stimulation (average pain intensity  $p=0.821$ , unpleasantness  $p=0.937$ ) or across any other clinical variables. There was some evidence that some participants may have been able to distinguish between the active and sham conditions ( $p=0.035$ ).

### **Conclusions**

The results of this exploratory do not suggest that tDCS is effective in reducing chronic low back pain. There is some preliminary evidence that the sham controls regularly employed in clinical trials of tDCS may not be optimal in terms of participant blinding.

### **Implications**

This is the first study to investigate this treatment modality on CLBP and the results are not consistent with existing studies of tDCS in chronic pain conditions. Rigorous examination of the viability of sham controls commonly used in tDCS research is necessary.

### **Keywords**

transcranial direct current stimulation (tDCS); chronic non specific low back pain; sham.

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### **Ethics Approval**

This study had full approval from the Kings College Hospital NHS Research Ethics Service, London, UK

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