

EFFECTS OF REPEATED TRANSCRANIAL DIRECT CURRENT STIMULATION (TDCS) ON ADDICTION-RELATED BEHAVIORS IN MICE: A PRELIMINARY STUDY

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This study was part of a wider translational project on the efficacy of tDCS in the treatment of major depression and in attempts to facilitate alcohol and smoking cessation. tDCS is a non-invasive, painless and safe brain stimulation procedure capable of modulating cortical excitability. Preliminary clinical studies have indicated that tDCS applied over the dorsal prefrontal cortex of chronically dependent smokers and alcohol users reduces their desire for smoking and drinking, respectively. The neurobiological mechanisms underlying these effects remain unknown. We have developed a model of tDCS in mice that mimics the experimental paradigms used in our clinical research. Anodal tDCS is applied transcranially over the frontal cortex (2 x 20 min/day current for 5 consecutive days, intensity = 0.2 mA). The control group undergoes the same procedure but no current is applied. We evaluated the effects of tDCS on nicotine and alcohol consumption as well as on the rewarding effects of these two drugs of abuse. We assessed the impact of tDCS on stress-related, anxiety-related and depression-related behaviors. We tested the effects of tDCS on mice that had been chronically exposed to nicotine during adolescence. Chronic exposure to nicotine induced depression-like behavior in adult mice. It is thought that this depression-like state may be a symptom of withdrawal that facilitates relapse after abstinence. Our data indicate that tDCS reversed behavioral anomalies. In conclusion, our animal model has potential value as a means for exploring the neurobiological changes that underlie the beneficial effects of tDCS on addiction-related behaviors.