The effect of transcranial direct current stimulation on judgement tasks

Daniel R. Edgcumbe¹, Volker Thoma¹, Davide Rivolta¹, Michael Nitsche², Cynthia H.Y. Fu¹,³

¹School of Psychology, University of East London. ²Department of Psychology and Neurosciences, Dortmund. ³Institute of Psychiatry, King’s College London.

Abstract

Transcranial direct current stimulation (tDCS) was used to investigate whether stimulating the right-dorsolateral prefrontal cortex (DLPFC) modulated performance on judgement and thinking tasks. Performance was improved by right-DLPFC offline stimulation in the 20-item Cognitive Reflection Test whilst controlling for cognitive ability (National Adult Reading Test; NART). The CRT scores were higher in open-minded thinking (AOT) individuals. These results are the first to show improvement in JDM tasks after tDCS stimulation, and support theoretical approaches proposing analytic thinking dispositions in overcoming intuitive responses.

Methods

- n = 54, between design (mean age = 24.63 ± 4.46 years; 29 females).
- tDCS montage and parameters:
  - 2 mA anodal or cathodal current (a 25 cm² area of stimulation).
  - Electrode current intensity 1.5 mA & current density of 0.06 mA/cm².
  - Electrode gel.

Results

- A multivariate analysis of variance (MANOVA) to examine effects of stimulation (right-DLPFC, left-DLPFC or sham) and Actively Open-minded Thinking (AOT; high or low) and cognitive ability (National Adult Reading Test; NART) on the Enhanced Cognitive Reflection Test (CRT), representativeness, logic index, and belief index scores. Follow-up ANOVAs used where indicated.
- Enhanced Cognitive Reflection Test (CRT):
  - No main effect of AOT on accuracy F(2,47) = 0.01, partial η² = .00. (see Table 2A)
  - No main effect of AOT on accuracy F(2,47) = 1.83, partial η² = .06. (see Tables 2A & 2B)
  - No main effect of AOT on accuracy F(2,47) = 8.32, partial η² = .24. (see Table 2B)
  - No main effect of AOT on accuracy F(2,47) = 0.93, partial η² = .02. (see Table 2B)

Conclusions

- The main effect of anodal tDCS on accuracy was positively associated with performance. The results are the first to show an improvement in JDM tasks after tDCS stimulation, and support theoretical approaches proposing analytic thinking dispositions in overcoming intuitive responses.

References