Improved spelling performance during left temporal transcranial direct current stimulation

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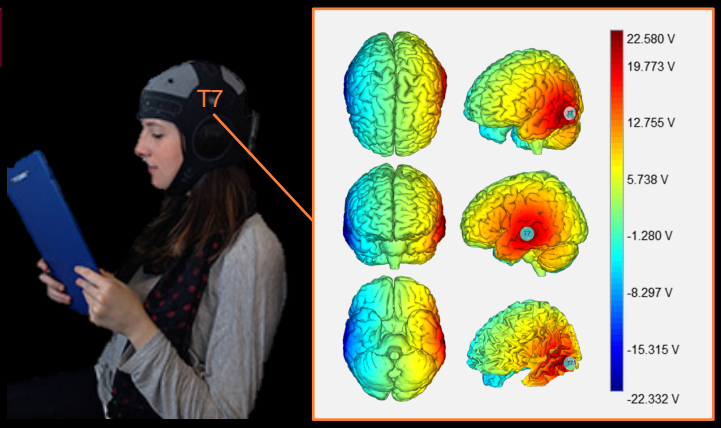
BACKGROUND

The left temporal cortex involves neural substrates such as the inferior frontal gyrus that have been associated with orthographic processing (Cao et al., 2008, *Brain & Lang*; Landi et al., 2010, *Ann. of Dyslexia*; Welcome & Joanisse, 2012, *Brain & Lang*; Tsapkini et al., 2000, *NeuroImage*)

There is evidence for reduced involvement of temporal brain regions in individuals with dyslexia during tasks that involve orthographic processing (e.g., Temple, et al., 2000, *Brain Imaging*)

Reading interventions have been found to result in improved reading performance and increased involvement of brain regions associated with orthographic processing (Aylward, 2003, *Neurology*)



AIMS

To investigate whether non-invasive brain stimulation over the left temporal cortex is associated with improved orthographic knowledge in healthy adults

To inform evidence-based decisions about tDCS use

METHOD

We assessed reading and spelling performance on standardised assessments over two sessions in 16 healthy adults

Participants: n=16 , M_{age} = 33.5, SD = 9.6, 9 females

tDCS protocol: 1.5 mA of anodal stimulation over the left temporal cortex (T7) for 15 minutes (cathode positioned over T8)

	Session 1	Session 2
n=7	**tDCS** ⚡	Sham 💊
n=8	Sham 💊	**tDCS** ⚡

Reading: TOWRE Sight Words (2 alternate forms)
Spelling: WRAT Spelling (2 alternate forms)

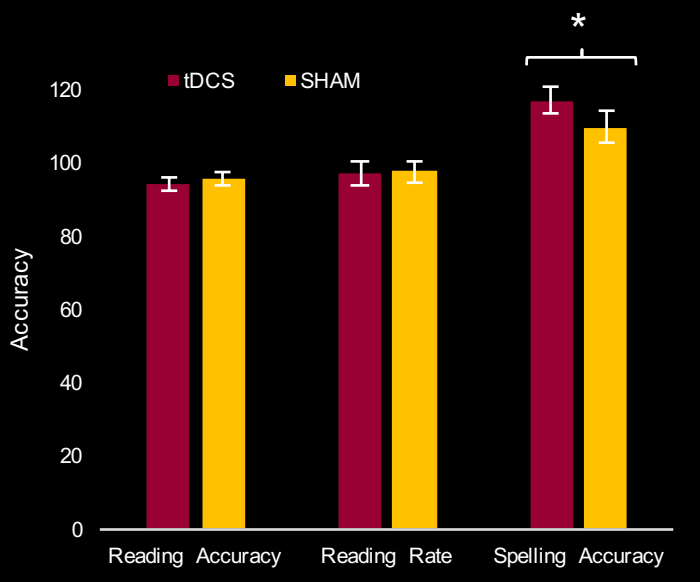
We counterbalanced test form and order across participants

RESULTS

Participants spelled significantly more words correctly when they received tDCS stimulation than sham

However, we found no effect of tDCS on reading accuracy or rate (all *p*s > .05)

t = 2.41, p = .029, d = 2.52

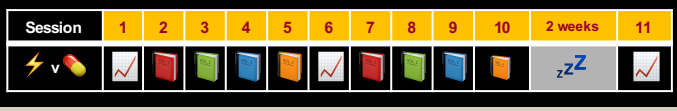


NEXT STEPS

tDCS may have the greatest potential to enhance cognitive function during the learning, training and practice of new cognitive abilities (Kadosh et al., 2010, *Curr Biol*)

We plan to investigate whether tDCS enhances spelling performnace gains achieved during a spelling training program

We will also use functional transcranial Doppler ultrasound to assess whether langauge lateralisation changes as a function of learning and tDCS stimulation



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