

Transcranial Direct Current Stimulation: A possible intervention for obesity?

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What is tDCS?

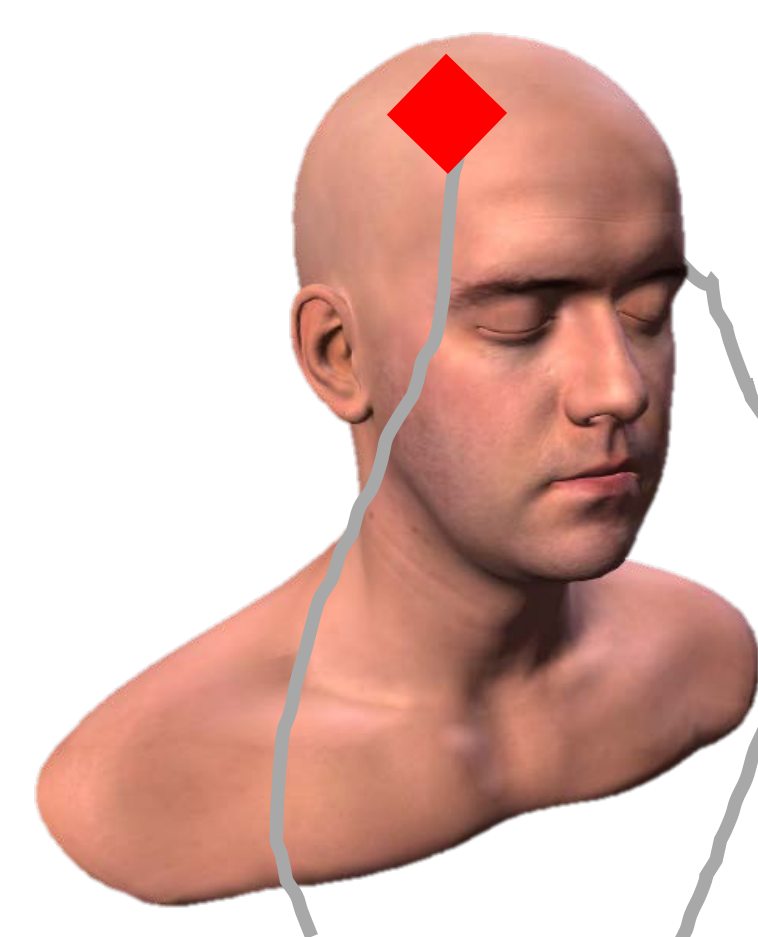
Transcranial direct current stimulation (tDCS) is a non-invasive method of brain stimulation, which applies a continual weak electric current to the brain via electrodes placed on the scalp^{1,2}.

This elicits changes in neuronal excitability, and is growing in popularity as it is relatively simple, scalable and cost-effective^{1,2,3}.



tDCS and Obesity

The majority of tDCS research has been conducted in a young, healthy and physically active population. However, this work suggests eating and exercise behaviour can be improved following tDCS³.



In an overweight/obese population, tDCS over the dorsolateral prefrontal cortex (DLPFC) has significantly reduced^{7,8,9,10,11};

General, sweet and carbohydrate **food craving**

Desire to eat (greater when combined with exercise)

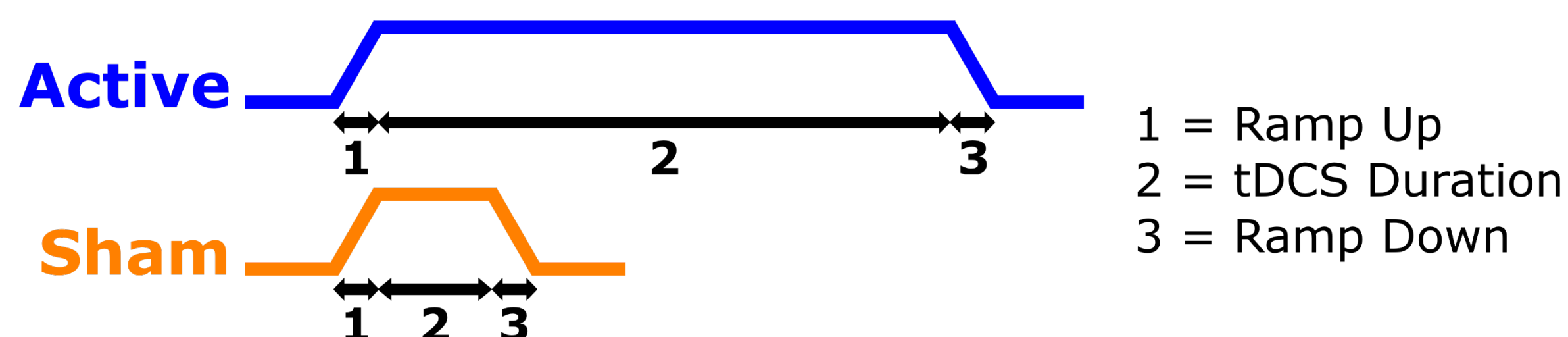
Total daily **calorie intake** (specifically for fat and soda)

Feelings of **hunger** and **inability to resist food**

Common parameters:
2 mA
20 minutes
Anodal vs. sham
Healthy/Overweight

Standard Protocol

Current intensity: 1 - 2 mA
Duration: up to 20 minutes
Ramp current up/down (~30sec)
Sham as blinding technique



Effects

Anodal tDCS increases neuron excitability*
Cathodal tDCS diminishes neuron excitability*
*When measuring motor evoked potential (MEPs)¹

Effects may outlast stimulation duration (e.g. 13 mins anodal tDCS over the motor cortex increased MEPs for ~150 mins post-stimulation²)

Safety

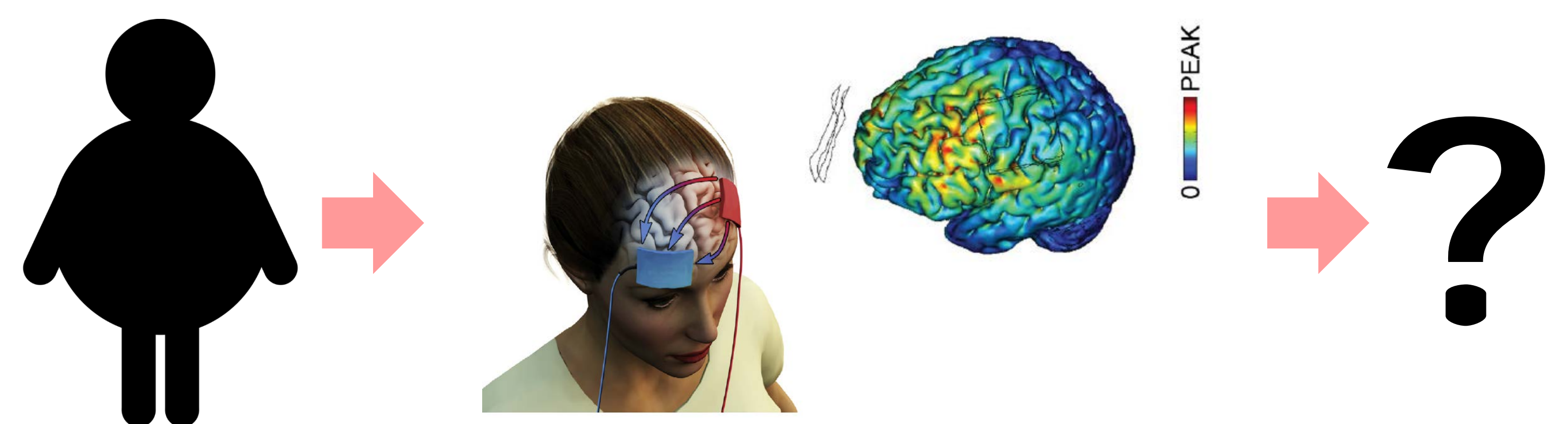
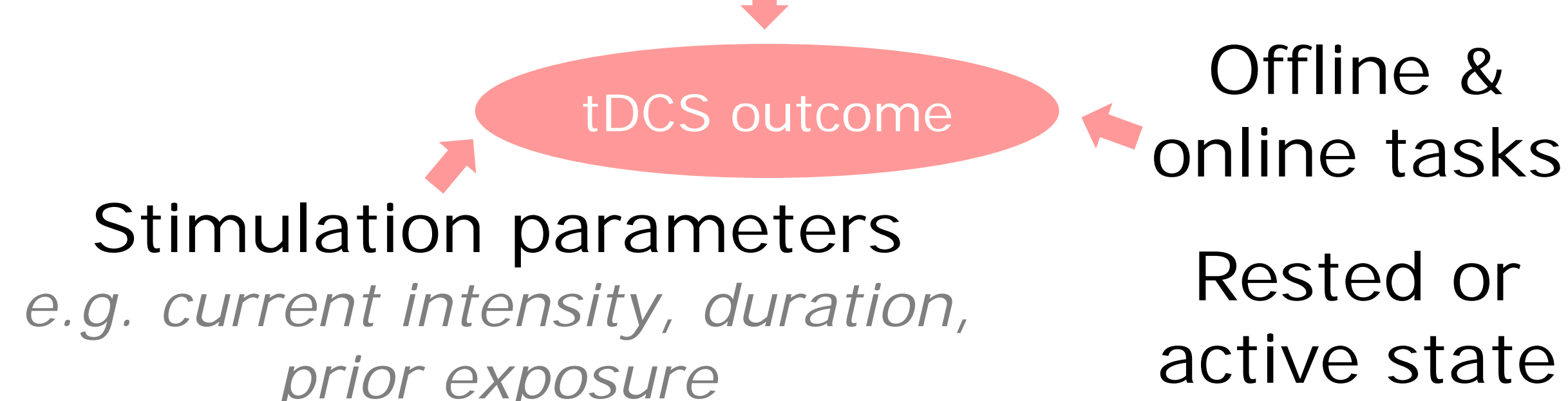
Standard protocols are safe for adults and children, healthy individuals and patients⁴.

A risk of mild adverse events (AEs) (e.g. itching, tingling, redness under electrode)⁴.

A meta-analysis found no evidence of serious AEs in >33,200 sessions⁵.

Reliability

Inconsistency between- and within-groups⁶;
Inter- and intra-individual differences
e.g. anatomy, baseline state, gender, medication



Filmer, H.L., Dux, P.E., and Mattingley, J.B. (2014). *Trends in Neurosciences*, 37, 742-753.
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tDCS at Leeds Trinity University

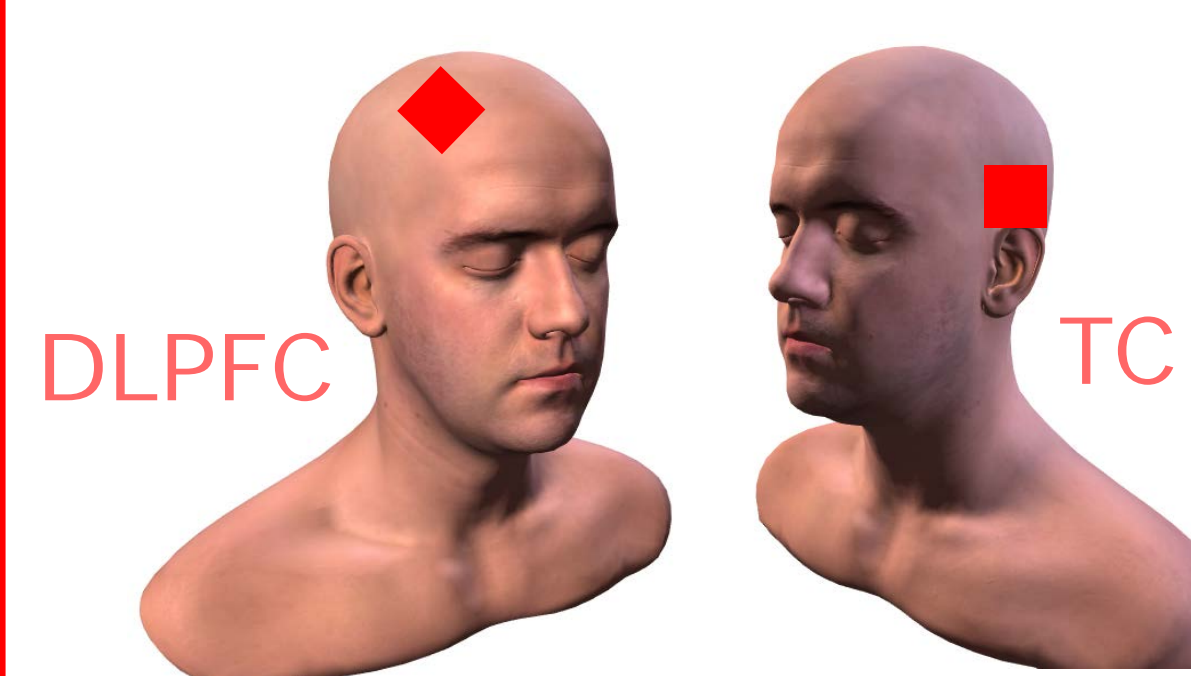
Can tDCS improve diet & exercise behaviour?

In answering this question, we aim to;

- Develop understanding of behaviour in overweight individuals
- Assess the efficacy of tDCS on behaviour change
- Determine the effects of tDCS on diet and physical activity in an overweight population
- Develop protocols for eating/exercise behaviours

Study One

"The effects of tDCS over the dorsolateral prefrontal cortex (DLPFC) and/or temporal cortex (TC) on eating and exercise behaviours in an overweight population."



2 mA / 20 minutes
Anodal vs. sham

Food Craving & Energy Intake

Exercise Capacity & Physical Activity

References

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