The effects of transcranial current stimulation on visual oscillations

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We aim to provide causal evidence for the following:Study arm one: That the oscillatory brain response produced by a visual stimulus can be modulated by tonically altering cortical excitability using tDCS.Study arm two: That functionally relevant...

Ethical review	Approved WMO
Status	Recruiting
Health condition type	Other condition
Study type	Interventional

Summary

ID

NL-OMON40881

Source
ToetsingOnline

Brief title
tCS and visual oscillations

Condition

- Other condition

Synonym
Not applicable

Health condition

Not applicable

Research involving
Human

Sponsors and support

Primary sponsor: Radboud Universiteit Nijmegen
Source(s) of monetary or material Support: Ministerie van OC&W,VICI grant

Intervention

Keyword: Neuronal Oscillations, Transcranial Current Stimulation (tCS), Visual processing

Outcome measures

Primary outcome

Changes in the oscillatory brain activity produced by visual stimuli (which are

known to produce robust oscillatory modulations in visual cortex) will be

assessed as a function of stimulation condition, and - in the case of study arm

three - stimulated hemisphere.

Secondary outcome

n/a

Study description

Background summary

Neuronal oscillations in the visual cortex subserve different roles in processing of relevant input and inhibition of irrelevant input. Normal human subjects are able to endogenously modulate these oscillations; however subjects with disorders of attention exhibit disrupted oscillatory dynamics which have consequences for behaviour. Transcranial current stimulation (tCS) is a technique that may eventually have applications for exogenously modulating neuronal oscillatory responses in a manner similar to directed attention. However until recently it has not been possible to concurrently stimulate the brain using tCS and record oscillatory activity, meaning this relationship could not be studied directly. Recent developments have enabled this via concurrent tCS and MEG. Therefore it is now for the first time possible to change these oscillatory dynamics by increasing or decreasing cortical excitability, to attempt to subject these oscillations to external modulation (*entrainment*), and to assess the relationship between these oscillatory dynamics between the two hemispheres of visual cortex by selectively altering

the excitability of one hemisphere.

Study objective

We aim to provide causal evidence for the following:

Study arm one: That the oscillatory brain response produced by a visual stimulus can be modulated by tonically altering cortical excitability using tDCS.

Study arm two: That functionally relevant brain oscillations can be entrained using tACS, and that this oscillatory entrainment mimics the effect of endogenously modulations (ie, that transcranial modulation of alpha oscillations will produce phasic modulation of stimulus-induced gamma oscillations).

Study arm three: That the human visual cortex exhibits *interhemispheric inhibition*, and that increase of cortical excitability in one hemisphere using tDCS results in both an increase in stimulus-induced gamma responses in that hemisphere, plus a concomitant reduction of stimulus-induced gamma responses in the opposite hemisphere.

Study design

Experimental within-subject (cross-over) design with healthy volunteers.

Intervention

Short blocks of either tDCS or tACS (2mA; 2 min blocks; cumulative duration of max. 32 min per session) will be applied to the visual cortex. In both cases, commonly used, well-documented stimulation protocols will be applied (for references, see section *study design*). Either tDCS or tACS will be applied whilst participants perform a visual attentional task, concurrently with recording of whole-brain activity using magnetoencephalography (MEG).

Study burden and risks

For the assessment of risks and burden associated with transcranial brain stimulation in this study please refer to paragraph 5.2 of the approved Standard Operating Procedure for Non-Invasive Brain Stimulation (v. 2.1., CMO No. 2013/245) at the Donders Institute for Brain, Cognition and Behaviour.

Contacts

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Trial sites

Listed location countries

Netherlands

Eligibility criteria

Age
Adults (18-64 years)
Elderly (65 years and older)

Inclusion criteria

Please refer to 'Donders Institute Standard Operating Procedure for Non-Invasive Brain Stimulation' - Document number SOP 2013/245 - Section 6.2, 'Screening' and Section 6.3, 'Exclusion Criteria'.

Exclusion criteria

Please refer to 'Donders Institute Standard Operating Procedure for Non-Invasive Brain Stimulation' - Document number SOP 2013/245 - Section 6.2, 'Screening' and Section 6.3, 'Exclusion Criteria'.

Study design

Design

Study type:	Interventional
Intervention model:	Crossover
Masking:	Open (masking not used)
Control:	Uncontrolled
Primary purpose:	Other

Recruitment

NL

Recruitment status:	Recruiting
Start date (anticipated):	16-05-2014
Enrollment:	60
Type:	Actual

Ethics review

Approved WMO Date:	05-05-2014
Application type:	First submission
Review commission:	CMO regio Arnhem-Nijmegen (Nijmegen)
Approved WMO Date:	20-08-2014
Application type:	Amendment
Review commission:	CMO regio Arnhem-Nijmegen (Nijmegen)

Study registrations

Followed up by the following (possibly more current) registration

No registrations found.

Other (possibly less up-to-date) registrations in this register

No registrations found.

In other registers

Register	ID
CCMO	NL48225.091.14