Investigating the neural basis of auditory false perceptions in a signal detection paradigm using transcranial direct current stimulation

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Ethical review	Approved WMO
Status	Recruitment stopped
Health condition type	Other condition
Study type	Observational non invasive

Summary

ID

NL-OMON46726

Source
ToetsingOnline

Brief title
The role of specific brain regions in false auditory perceptions using tDCS

Condition

- Other condition

Synonym
auditory perception, false signal detection

Health condition

auditory perception

Research involving

Human

Sponsors and support

Primary sponsor: Durham University
Source(s) of monetary or material Support: Welcome Trust;grant no: WT108720

Intervention

Keyword: audtitory perception, false detection, tDCS

Outcome measures

Primary outcome

The dependent variable which will serve as the primary outcome measure will be response bias (*) on the signal detection task, corresponding to the *externalising bias*. This will be calculated according to the following formula, as recommended by Stanislaw and Todorov (1999): *=e{(*Z(FA)*^2- *Z(H)*^2)/2}. Z(FA) refers to the standardized false alarm rate (that is, the proportion of trials on which a participant incorrectly responds *yes* when no voice or tone is actually present), whilst Z(H) refers to the standardized hit rate (that is, the proportion of trials on which a participant correctly responds *yes* when a voice or tone is presented). Lower * values refer to a more *liberal* response bias.

-3x2x2 way ANOVA [stimulus condition x stimulus type x time point] with a Bayes factor as an evidence

Secondary outcome

we will repeat the analysis with:

- task sensitivity (d') on the signal detection task as the dependent

variable, which will be calculated as d' = Z(H) * Z(FA).

- raw false alarm rate on the signal detection task as a dependent variable.

False alarm rate will be defined as the percentage of trials on which no

stimulus is presented on which the participant responds *yes*.

- planned contrast between superior temporal condition and mean of the two

other conditions for voice auditory stimuli.

- the interaction between stimulus condition (superior temporal, sham or non

auditory cortex) and stimulus type (voice or non-voice).

Study description

Background summary

Transcranial direct current stimulation (tDCS) is a non invasive brain stimulation technique, used to increase or decrease cortical excitability via a weak electrical current, applied through electrodes placed on the scalp. Many studies report effects on neurophysiological or cognitive measures following stimulation to specific cortical regions; however, tDCS studies have often used small sample sizes, and concerns have been raised about the replicability of these effects. For example, the reported findings surrounding effects on auditory and language-based tasks have been variable, and larger scale studies are needed. Considering that tDCS applied to cortical regions associated with language has been tested as a treatment option for some psychiatric disorders (for example, left superior temporal stimulation for auditory hallucinations in schizophrenia), it is crucial to fully test and replicate effects on processing of auditory stimuli. The present study will replicate and extend a previous study into the effect of tDCS applied to the left superior temporal gyrus on basic auditory signal detection, as well as testing whether any effect is specific to speech-based stimuli.

Study objective

The study will investigate auditory signal detection for voices or tones during and after anodal tDCS to the left STG, compared to stimulation of the left mPFC and sham stimulation. The experimental hypotheses are as follows:
1) There will be a main effect of stimulation condition; specifically, that anodal stimulation to the left STG will lead to a reduced response bias on

the signal detection task, compared to the other conditions.
2) We will also test for an interaction between stimulation condition and stimulus type; that is, to test for a difference in the effect of stimulation on response bias (*) to voice and tone stimuli. If any effect of stimulation is specific to voice stimuli, this would imply the effects are due to stimulation of language specific areas of cortex. In contrast, if there is an effect of stimulation on all types of auditory signal detection, this would imply a more general effect of stimulation on auditory stimuli.

Study design

This is a cross-over study. Stimulation condition (anodal stimulation to superior temporal/medial prefrontal/sham) will be a within subjects variable. All participants will complete all three stimulation conditions in separate experimental sessions. The order in which participants complete the three stimulation conditions will be counterbalanced so that all six possible orders are equally represented in the sample. The sham condition acts as a control condition, assessing task performance when no stimulation is applied, despite electrodes being placed on the scalp. The unrelated area condition acts as an *active* control condition, assessing task performance when an area other than STG is stimulated, to exclude general effects on performance from receiving tDCS, regardless of the region stimulated.

Study burden and risks

Participants will come in 3 sessions, each lasting aprr. 50 minutes. They receive tDCS during the task. Before they will be screened if it is safe for them to participate.

If tDCS is applied in compliance of the valid safety protocols it is considered as a safe method of brainstimulation, without short or long term damage. It is possible that during the stimulation the person experiences an itching feeling on the head, and possible afterwards a light headache.

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

1) participants are aged between 18-35
2) participants are right-handed
3) speak fluent English;
4) do not report any known hearing impairments (to be tested before the first tDCS-session)
5) signed informed consent

Exclusion criteria

1) (suspected) pregnancy
2) not signing the informed consent
3) family history of epilepsy
4) non-removable metallic objects on the head or arms,
5) a history of skin conditions (e.g., eczema).

Study design

Design

Study type: Observational non invasive

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

Recruitment

NL

Recruitment status:	Recruitment stopped
Start date (anticipated):	20-04-2018
Enrollment:	54
Type:	Actual

Ethics review

Approved WMO

Date:	04-04-2018
Application type:	First submission
Review commission:	METC Universitair Medisch Centrum Groningen (Groningen)

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	NL64248.042.17