# The role alpha (10Hz) oscillations in spatial updating: a transcranial alternating current stimulation study

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Ethical review	Approved WMO
Status	Recruitment stopped
Health condition type	Other condition
Study type	Interventional

## Summary

### ID

NL-OMON40808

**Source** ToetsingOnline

**Brief title** Alternating current and spatial updating

### Condition

• Other condition

**Synonym** niet van toepassing

#### **Health condition**

nvt - onderzoek bij gezonde vrijwilligers

#### **Research involving**

Human

1 - The role alpha (10Hz) oscillations in spatial updating: a transcranial alternati ... 13-05-2025

### **Sponsors and support**

Primary sponsor: Radboud Universiteit Nijmegen Source(s) of monetary or material Support: European Research Council (EU-ERC 283567)

### Intervention

Keyword: alpha oscillations, Alternating current stimulation, spatial updating

### **Outcome measures**

#### **Primary outcome**

We expect to see a modulation of spatial updating performance, as measured

psychophysical testing due to tACS stimulation. This modulation is expected to

be lateralized, as the tACS montage is restricted to one hemisphere.

#### Secondary outcome

n/a

# **Study description**

#### **Background summary**

We perceive the world as a stable reality, despite the ubiquitous changes in visual input due to our own movements. When the body is brought in motion, like when driving a car, vestibular feedback informs the brain about the motion, but if and how these signals contribute to visual stability has not been revealed. In a recent study, using a moving vestibular sled, we showed that internal representations of remembered visual objects are stored as a spatial-selective alpha power (10Hz) reduction in the posterior brain and remapped trans-hemispherically due to the translation, when objects cross the midline relative to the fixation point. The activity seen in occipito-parietal areas may be an implementation of an \*attentional pointer\* to the remembered location in gaze coordinates. Importantly, in posterior parietal cortex, the strength of these remapping alpha power modulations correlated significantly with the quality of the visuospatial updating. It may thus be that the posterior parietal cortex integrates signals related to whole-body translation, and applies this information to update spatial representations in parieto-occipital

areas. However, causal evidence for this hypothesis is still missing.

### Study objective

The primary objective of this study is to establish a causal role of the alpha band oscillations in lateralized parieto-occipital areas during spatial updating with whole-body translation using online transcranial alternating current stimulation (tACS) in the alpha frequency range (10Hz). We expect that updating of remembered targets is affected when information about self-motion needs to be applied in order to remap the location of a remembered target, during stimulation of occipito-parietal areas.

### Study design

Placebo-controlled double-blind within-subjects design with healthy volunteers.

#### Intervention

The experiment consists of two sessions: an experimental session and a control (\*sham\*) stimulation session. During the experimental session 25 minutes of tACS will be administered over parieto-occipital areas of the left or right hemisphere during performance of a spatial updating task. In the control stimulation session, the current will be ramped up and down at the beginning and end of the session, without any stimulation during the experiment. Online transcranial alternating current stimulation (tACS) will be delivered by a battery-driven electric current stimulator (Eldith DC Stimulator (CE 0118), Ilmenau) using a pair of electrodes over the occipital parietal area and over the brain midline.

#### Study burden and risks

Participants will not directly benefit from their participation in the study, except for a compensatory (financial) incentive. Transcranial current stimulation (tCS) is a widely used non-invasive brain stimulation technique, applying weak direct/alternating currents (tDCS/tACS) via conductive rubber/sponge electrodes to the scalp. These weak currents can slightly shift the neurons\* membrane potential and thereby increase or decrease spontaneous neuronal activity in the stimulated cortex, but (unlike TMS) they do not evoke action potentials. During the stimulation, participants may transiently experience light tingling, itching or burning sensations on the skin underlying the electrodes, which can be unpleasant. The most common side effects are a light transient headache and a feeling of fatigue. In the current study, healthy participants will be stimulated with a protocol that is considered safe with respect to the latest published safety guidelines. All subjects are screened for their relevant medical history and other tCS safety aspects (e.g. metal parts in the head, skin allergies). In summary, because the risk is negligible and the burden associated with participation can be considered minimal, we do not expect serious adverse events during the project.

# Contacts

#### Public

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# **Trial sites**

### **Listed location countries**

Netherlands

# **Eligibility criteria**

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

### **Inclusion criteria**

Between 18-35 years of age years; Right-handed; Non-smoking; Normal or corrected-tonormal vision; Willingness and ability to give written informed consent and willingness and ability to understand the nature and content, to participate and to comply with the study requirements.

### **Exclusion criteria**

(1) Average use of more than 3 alcoholic beverages daily; (2) Use of psychotropic medication or recreational drugs; (3) Skin disease; (4) Pregnancy; (5) Serious head trauma or brain surgery; (6) Neurological or psychiatric disorders; (7) Large or ferromagnetic metal parts in the head (except for a dental wire); (8) Implanted cardiac pacemaker or neurostimulator; (9) Participation in a NBS study in the past 28 days; (10) Previous participation in 10 or more NBS studies.

### Study design

### Design

Study type:	Interventional
Intervention model:	Parallel
Allocation:	Randomized controlled trial
Masking:	Double blinded (masking used)
Control:	Placebo
Primary purpose:	Other
Recruitment	
NL Recruitment status:	Becruitment stopped
Start date (anticipated):	26-08-2015
Start date (anticipated): Enrollment:	26-08-2015 24
Start date (anticipated): Enrollment: Type:	26-08-2015 24 Actual
Start date (anticipated): Enrollment: Type:	26-08-2015 24 Actual

# **Ethics review**

Approved WMO	
Date:	02-12-2014
Application type:	First submission
Review commission:	CMO regio Arnhem-Nijmegen (Nijmegen)

5 - The role alpha (10Hz) oscillations in spatial updating: a transcranial alternati ... 13-05-2025

# **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 CCMO **ID** NL50173.091.14