Investigating inhibitory processes within the motor cortex during conflict resolution using transcranial magnetic stimulation

Published: 23-06-2014
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We aim to test how inhibitory processes within the primary motor cortex change over time during the resolution of response conflict.

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

Summary

ID

NL-OMON41872

Source
ToetsingOnline

Brief title
Inhibition of M1 during conflict

Condition

- Other condition

Synonym
na

Health condition

neuroscientific research

Research involving
Human

Sponsors and support

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

Intervention

Keyword: inhibition, Transcranial magnetic stimulation

Outcome measures

Primary outcome

Changes in the amplitude of the MEP in response to single- and paired-pulse TMS

(sICI) as a function of task condition (left or right hand response, conflict

or no conflict trial).

Secondary outcome

behavioral outcome of choice RT task.

Study description

Background summary

In daily life, we often need to deal with situations in which a number of actions are potentially possible and are in conflict with each other, situations of so-called *response conflict*. Our brain needs to select the best of these competing responses and suppress unwanted actions. There is a substantial literature regarding which higher-level areas of the human brain assist in this process of response selection. However, it remains unknown how and by which physiological mechanism these areas affect the *output station* of the brain, the primary motor cortex. A potential mechanism is the involvement of inhibitory interneurons, which can be directly tested using transcranial magnetic stimulation (TMS).

Study objective

We aim to test how inhibitory processes within the primary motor cortex change over time during the resolution of response conflict.

Study design

In order to probe inhibitory processes within the primary motor cortex, this study will employ single- and paired-pulse TMS. A TMS coil will be positioned over the primary motor cortex of the left hemisphere. The dependent measure in the task is the change across single- and paired-pulse trials in the amplitude of the motor-evoked potential (MEP). This change in amplitude is termed short intra-cortical inhibition* or sICI. The MEP is elicited by the TMS in the muscle of one of the response hands. The TMS will be applied while participants are performing a simple choice reaction time task. The stimuli are arranged such that they elicit only one response (no conflict) or two competing responses of which only one is correct (conflict). Four different time points will be used for stimulation with one time point per trial. In this way the individual time specific physiological pattern of inhibitory processes can be identified for either conflict or no conflict situation

Intervention

Participants will receive a total of 864 trials. On half of the trials a single pulse of TMS will be applied, on the other half of trials two TMS pulses will be applied in quick succession.

Study burden and risks

Participants will not directly benefit from their participation in the study. Transcranial magnetic stimulation (TMS) is a widely used non-invasive brain stimulation technique, based on the principle of electromagnetic induction. During stimulation the participant will likely hear the clicks of the TMS pulses and experience a slight stimulation of nerves and muscles of the head. The most common side effect is a light transient headache (2-4% occurrence). A severe headache is uncommon (0.3-0.5% occurrence). In TMS studies using certain patient populations (e.g. epilepsy) or that exceeded the standard protocols (e.g. in intensity or frequency) epileptic seizures have been reported in rare cases. In the current study healthy participants will be stimulated with a protocol that falls within the safety guidelines. All subjects are screened for their relevant medical history and other TMS safety aspects (e.g. presence of metal parts in the head). In summary, because the risk and burden associated with participation can be considered negligible-to-minimal, we do not expect serious adverse events during the project.

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

Only healthy, competent, right-handed participants, 18-45 years old, with normal vision or corrected-to normal
vision by means of contact lenses.

Exclusion criteria

Serious head trauma or brain surgery
- Large or ferromagnetic metal parts in the head (except for a dental wire)
- Implanted cardiac pacemaker or neurostimulator
- Pregnancy
- Large of ferromagnetic metal parts in the body
- Claustrophobia
- Skin diseases at intended electrode sites
- Disorders of vision (i.e., deviation from *normal or corrected-to-normal vision*)
- History or current presence of any neurologic or psychiatric disease
- Any prescribed medication that can alter cortical excitability (e.g. antiepileptics, tricyclic anti-depressives or benzodiazepines) or can have an influence on the participant*s vigilance or cognitive performance within two weeks prior to participation.

Study design

Design

Study type: Interventional

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

Recruitment

NL

Recruitment status:	Recruiting
Start date (anticipated):	08-07-2015
Enrollment:	24
Type:	Actual

Ethics review

Approved WMO Date:	23-06-2014
Application type:	First submission
Review commission:	CMO regio Arnhem-Nijmegen (Nijmegen)
Approved WMO Date:	05-03-2015
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	NL48749.091.14