The perception of weight and the primary somatosensory cortex

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Investigate how S1 and the premotor cortex modulate the cortico-spinal excitability as measures by single pulse TMS stimulation of M1.

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

Summary

ID

NL-OMON34097

Source
ToetsingOnline

Brief title
The perception of weight within the brain

Condition

- Other condition

Synonym
This study is not aimed at a certain disorder. It is a study with healthy subjects.

Health condition

gezonde proefpersonen

Research involving
Human

Sponsors and support

Primary sponsor: Universitair Medisch Centrum Groningen
Source(s) of monetary or material Support: NWO 451-09-006

Intervention

Keyword: somatosensory cortex, tms, weight

Outcome measures

Primary outcome

In this study we aim at measuring Motor Evoked Potentials during the

observation of objects being lifted after continue theta burst

stimulation on SI, M1 or sham.

Secondary outcome

n.a.

Study description

Background summary

The present project aims at finalizing and extending the findings from a study conducted by Nikola Valchev and Alessio Avenanti (Valchev et.al., in prep)in the Center for Cognitive Neurosciences at Cesena, University of Bologna during the month of March 2009.
In that experiment we explored the role of somatosensory cortex (brain area S1) on the perception of weight. Subjects were presented with videos of a hand lifting a box and were asked to judge the weight of the box either after a TMS (transcranic magnetic stimulation) perturbation of SI, primary motor cortex (M1) or sham (i.e. no stimulation). Results show that a TMS disruption of SI but not of M1 weakened the precision with which subjects could estimate the weight of the lifted box. These results therefore show that the primary somatosensory cortex plays a role in our perception of weight of an object we see lifted by somebody else. In addition, Pobric et al (2006) found that a disruption of the premotor cortex leads to a similar degree of impairment of the above mentioned task. Alaerts et al (2010) found that the amplitude of the motor evoked potential (MEP), elicited by single pulse TMS on M1, is modulated by the observation of an object being lifted. With the present study we therefore wish to investigate whether the modulation found by Alaerts et al is caused by the flow of information running from SI to M1 and/or from the premotor cortex. To investigate this question we will record motor evoked potential while subjects watch objects being lifted, after a cTBS (continue theta burst stimulation) perturbation of SI, of the premotor cortex or sham.

The results of the study will shed light on the relationship between SI, premotor cortex and M1 during the observation and perception of the weight of objects being lifted.

Study objective

Investigate how S1 and the premotor cortex modulate the cortico-spinal excitability as measures by single pulse TMS stimulation of M1.

Study design

The magnitude of the MEPs, elicited by single pulse TMS while subjects watch different types of video clip showing objects being lifted, will be compared after cTBS stimulation over the SI, premotor cortex or sham. The study will be composed of four sessions, collected in four separate days, for a total duration of max.6,5 hours. Between the different sessions there will be at least one day.
The detailed schedule for a single subject is the following:

FIRST session - day 1:
To optimize the localization of the cTBS stimulation through the use of a neuronavigation system, an fMRI session is needed. During this scanning is required:
a) An anatomical scan (~8 minutes) to localize the putative mirror neuron system.
b) An action execution task, to localize S1 and the premotor cortex of the sectoins involved in a hand-hand-object interactions, which are supposed to be more involved in conveying information relative to the objects to M1.
c) An action observation task, to localize the regions in SI and the premotor cortex which are involved in perceiving the weight of a box seen to be lifted by others. Participants will observe actors lift objects of different weight (~8min). The total length of the MRI session will be about 30 minutes including preparation.

SECOND session - day 2
The total duration of the second session will be approximately 2 hours and it will be composed of:
1) a preparation phase of about 45 minutes (skin preparation, electrode placements, optimal scalp position, resting motor threshold and registration of 12 MEPs at rest)
2) ~15 min of relaxation for the subjects before the beginning of the cTBS stimulation.
3) a stimulation phase of about 40 min which will include
i) 40 seconds of cTBS stimulation on areas A
ii) 5 minutes of rest
iii) ~20-25 minutes of MEPs registration during the presentation of video clips

showing objects being lifted
iv) 12 new MEPs registration at rest
4)debriefing

THIRD session - day 3
The same as day 2, but with cTBS on area B.

FOURTH session - day 4:
The same as day 2 and 3, but with cTBS on area C.

Study burden and risks

fMRI and rTMS are both non-invasive techniques, so there is no need of special preparation of the subject.
fMRI:
There are no risks that have been associated with the fMRI acquisition. Subjects will be exposed to a magnetic field of 3 Tesla and rapidly alternating gradients and radio frequency fields. This field is used on a routinely basis in fMRI and MRI research. No harmful side effects have been reported. On rare occasions, a peripheral nerve (abdomen) is stimulated by the changing magnet gradients. This might cause an etching feeling but it is not harmful. The data collected during the fMRI and MRI scans will be used for research purposes only. However, if severe abnormalities are noticed a specialist (radiologist or psychiatrist) will be asked for advice, upon decision of the research team. If it is confirmed by the specialist that medical treatment is needed, then the General Practitioner indicated by the subject will be notified.

TMS:
The safety of the rTMS has been demonstrated extensively (Gates, 1992; Pascual-Leone et al., 1993; Wassermann et al., 1996; Wassermann, 1998). No harmful side effects have been reported when the international safety guidelines are followed (Wassermann, 1998). The strong magnetic fields used by both fMRI and rTMS can dislocate ferromagnetic particles inside the brain and the eyes. In order to exclude subjects with metal particles inside their brain, subjects will be required to complete a questionnaire and only if none of the exclusion criteria is met the subject will be allowed to participate in our experiment.
The effect of TMS stimulation lasts for around an hour is easily canceled at the moment that the subject moves freely and receives enough stimulation from the outer world.

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. Healthy males and females
2. 18 years old or older
3. Normal vision and hearing
4. Right-handedness (through questionnaire: Edinburgh Handedness Inventory,

Exclusion criteria

1.left-handedness or ambidexterity
2.drug or alcohol abuse
3.(history of) significant medical, psychiatric or neurological conditions
4.history of head injury with loss of consciousness
5.metal in cranium
6.epilepsy or family history of epilepsy
7.cardiac pacemaker
8.infarcations

9.implanted medical pump
10.intracardiac lines
11.history of psychiatric illness (Axis 1, DSM-IV)
12.(suspected) pregnancy
13. Claustrophobia
14.High individual resting threshold (rMT). (If a subject presents a resting state motor threshold that is higher than 69% of the intensity of the machine, then the cTBS stimulation needed for this subject would be higher than 55% of the intensitiy of the machine. In that case there are two problems. The stimulation will be unpleasant for the subject and probalby painful. On the other side it is impossible at the rate of 50Hz (TBS stimulation) to recharge the capacitors up to intensities that are higher than 55%. In this way stimulation will be slower than needed and unpleasant. Therefore we will to exclude these subjects.)

Study design

Design

Study type: Observational invasive

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

Recruitment

NL

Recruitment status:	Recruitment stopped
Start date (anticipated):	10-11-2010
Enrollment:	21
Type:	Actual

Ethics review

Approved WMO

Date:	09-09-2010
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	NL32027.042.10