Is movement or muscle coded in the motor cortex? Implications for motor rehabilitation

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Ethical review	Approved WMO
Status	Recruiting
Health condition type	Movement disorders (incl parkinsonism)
Study type	Interventional

Summary

ID

NL-OMON36246

Source
ToetsingOnline

Brief title
Motor imagery and hand position

Condition

- Movement disorders (incl parkinsonism)

Synonym
stroke

Research involving
Human

Sponsors and support

Primary sponsor: Universitair Medisch Centrum Groningen
Source(s) of monetary or material Support: Ministerie van OC&W

Intervention

Keyword: corticospinal excitability, Motor imaginary, Motor learning, transcortical magnetic stimulation

Outcome measures

Primary outcome

The amplitude of the transcranial magnetic evoked potential serves as an

indication of the excitability of the motor cortex and is our main outcome

parameter. The amplitude is expressed as a percentage of the electrically

evoked muscle potential (M-wave).

Secondary outcome

geen

Study description

Background summary

Motor Imagery (MI) is a cognitive process, in which an individual performs a goal directed movement without any actual (overt) movement (Decety, 1996). It is known that MI results in similar brain activation patterns as overt movement, and it is therefore thought to be a potential tool for relearning difficult movements (Decety, 1996). Previous research has proven MI training to have a beneficial effect in increasing skilled motor performances in healthy subjects as well as in diseased patients, for example in stroke patients (Braun et al, 2006; Sharma et al., 2006; Simmons et al., 2008). Thus, MI is a relevant tool as part of motor rehabilitation, further it is easy to perform and the training can be carried out at home.
Nonetheless, no attention has been paid to the position of the patient during imagery so far. From experiments in which subjects actually perform muscle movements, it is known that the motor cortex codes the activity of the movement direction rather than the active muscle ensemble (Post et al., 2009). If this also holds for MI, this would imply that patients have to sit in a position that encourages movement performance.
The objective of this project is to investigate whether the posture of the patient is important for the efficacy of motor imagery. We assume that a

stronger corticospinal activity would result in a better motor imagery.

Study objective

The corticospinal spinal tract is an important descending pathway for control of hand muscles (Lemon, 2008). About 50 years ago, direct connections between the primary motor cortex and the motoneurons were discovered, but it is still a matter of debate what is actually coded in the motor cortex: the active muscle ensemble needed to perform the task, or rather the movement direction? And are the muscles specified at a *lower* organizational level (e.g. spinal cord)?
If the motor cortex codes for movement direction, this would have direct effects on the requirements of an efficient motor rehabilitation program. In the present proposal, we want to address this question by investigating differences in the corticospinal excitability during motor imagery with the target ("active") hand in different positions.

The corticospinal excitability during hand tasks can easily be assessed by TMS of the motor cortex . If the muscle is the primary parameter to be coded, we don*t expect changes in corticospinal excitability by altering the resting hand position. However, if movement direction is the important parameter we would expect to observe differences for different hand positions
In addition, it is known that during overt movement not only the excitability of the target motor cortex (the *classical*contralateral motor cortex) is modulated but also that of the non-target motor cortex. Thus, when you change the position of the non-target hand, we expect that it will also modulate the excitability of the target motor cortex. Therefore we want to change the position of both target and non-target hand during the experiment.

Ojective: Is the excitability of the corticospinal tract during motor imagery modulated by the position of the target and the non-target hand?

Study design

The study is an intervention study in which we evaluate the effect of a change in hand position on the excitability of the motor pathway (corticospinal tract) during motor imagery.

Subjects are asked to complete two questionnaires at home before the experiment.

Intervention

change of hand position

Study burden and risks

no risks known of single pulse trancranila magnetic stimulation or electrical nerve stimulation

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

Right handed subjects, age 18-55

Exclusion criteria

neurological diseases, muscle diseases, migraine, epileptic activity

Study design

Design

Study type: Interventional

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

Recruitment

NL

Recruitment status:	Recruiting
Start date (anticipated):	02-04-2011
Enrollment:	20
Type:	Actual

Ethics review

Approved WMO

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	NL35055.042.10