Modulation of motor overflow and surround inhibition during sequential finger movements - an explorative study

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Ethical review	Approved WMO
Status	Pending
Health condition type	Movement disorders (incl parkinsonism)
Study type	Observational non invasive

Summary

ID

NL-OMON42522

Source ToetsingOnline

Brief title Motor overflow and surround inhibition

Condition

• Movement disorders (incl parkinsonism)

Synonym neurologische aansturing spieren

Research involving Human

Sponsors and support

Primary sponsor: Universitair Medisch Centrum Sint Radboud Source(s) of monetary or material Support: Europese unie (Marie Curie fonds)

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Intervention

Keyword: finger independence, motor overflow, neural control, surround inhibition

Outcome measures

Primary outcome

- We expect an effect of time on the motor overflow in intrinsic muscles

generated during sequential movements.

- The effect of the training and the overflow on surround inhibition will be

assessed with single pulse TMS.

- Relationship between the amount of motor overflow and the decrease in

surround inhibition.

Secondary outcome

- We expect that the amount of motor overflow during the sequential movement

will be related to the amount of surround inhibition before the start of the

training.

- We expect to also find motor overflow in the extrinsic muscles.

Study description

Background summary

Fine motor control of the hand influences daily activities as grasping and writing. While most human hand movement involves grasping, some require single finger movement. Two neural mechanisms are associated with the execution of single finger movements: motor overflow, and surround inhibition (SI). Motor overflow describes the involuntary muscle activation of nearby muscles, while SI focuses the movement on a single muscle by inhibiting surrounding muscles. To understand how fine hand movements are controlled, we introduce a sequential task, to simulate skilled performances as typing. During this task, motor overflow is monitored. The effect of the task on SI is tested by comparing SI before and after the task.

The results of this study might teach us, among others, about the mechanisms of dystonia . This neurological condition typically features task-and context-specific abnormal posturing due to sustained muscle contractions interfering with the performance of motor tasks. Focal hand dystonia (FHD) can be characterised by a pattern of cocontraction of the agonist and antagonist muscles in the forearm and hand. People with FHD have been shown to lack SI, and are known to generate motor overflow. Currently, it is not clear if there is a relation, let alone a causal link between these characteristics.

Study objective

Our objective is to investigate how individual finger movements are controlled within a sequential task. To study the presence and changes over time of motor overflow, multi-channel EMG on both intrinsic and extrinsic hand muscles are used. Changes in muscle excitability due to the training are determined with TMS. We will study if these two modulations - motor overflow and excitability - are related to each other.

Study design

Subjects will be approached in person, via telephone, or social media to inform them in short about the experiment and to hear if they might be interested to participate. After signing the informed consent, participants are given two questionnaires: one in order to determine the handedness, and one to check if the participant can undergo TMS. Surround inhibition is determined by TMS before the sequential task as a normative value. After this, the participant is asked to performed a predefined finger sequence for 30 minutes. During this, muscle activity is monitored with EMG. After performing the task, surround inhibition is determined again at 4 time points: 0 - 10 - 20 - 30 minutes after the end of the task.

Study burden and risks

The risk assessment teaches us that the risk associated with this study are negligible. The experiment takes 3 hours, with the longest task (only performed once) taking 30 minutes. Most comon side effect of TMS is a light transient headache (2 - 4% occurrence). A severe transient headache is uncommon (0.3 - 0.5% occurrence).

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 18-30 years old, must be right-handed.

Exclusion criteria

Presence of wrist pain, previous hand or wrist trauma.
Experience with extensively playing a musical instrument.
Being pregnant.
Ever had brain surgery.
Presence of cardiac pacemaker or intracardiac lines.
Presence of implanted neurostimulator.
Presence of cochlear implants.
Presence of medication infusion device.
History of epilepsy or seizures in participants or close relatives.

Study design

Design

Study type: Observational non invasive		
Masking:	Open (masking not used)	
Control:	Uncontrolled	
Primary purpose:	Other	

Recruitment

NL	
Recruitment status:	Pending
Start date (anticipated):	01-06-2015
Enrollment:	15
Туре:	Anticipated

Ethics review

Approved WMO	
Date:	28-07-2015
Application type:	First submission
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

ССМО

ID NL53124.091.15