

Transmissions of the efference copy signal and re-efference signal during active and passive hand movements: a Somatosensory Evoked Potential study

Published: 05-04-2013

Last updated: 26-04-2024

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Ethical review	Approved WMO
Status	Will not start
Health condition type	Other condition
Study type	Observational non invasive

Summary

ID

NL-OMON39495

Source

ToetsingOnline

Brief title

active,passive,SEP

Condition

- Other condition

Synonym

healthy subjects

Health condition

healthy subjects

Research involving

Human

Sponsors and support

Primary sponsor: Universitair Medisch Centrum Groningen

Source(s) of monetary or material Support: VENI grant to Valeria Gazzola

Intervention

Keyword: active, efference copy, movement, passive, SEP

Outcome measures

Primary outcome

The main study parameter is the difference in the latency and amplitude of the components of the somatosensory evoked potentials during action planning and action in different conditions.

The comparison we are most interested in is the SEP induced by the electrical stimulation before the action starts (during the action planning stage) in active and passive conditions.

Secondary outcome

The second comparison we are interested in is the SEP induced by the electrical stimulation during the action (during the action execution) in active and passive conditions.

Study description

Background summary

Contemporary theories of motor control suggest intensive crosstalk between motor and somatosensory regions. Each motor command is assumed to go not only to the body but also to other brain regions, the somatosensory cortices such as BA2 in particular. The motor signal sent from the central nervous system to the peripheral system is called efference signal. A copy of this signal sent to

somatosensory area is called efference copy. In one fMRI study (Study Title: Measuring the Mirror Neuron System: A Combined EEG/fMRI Study, METC number: 2009/056, ABR number: 29796 / NL29796.042.09) we did last year we found that the enhancement of activation in somatosensory area BA2 during active action compared to passive action may be due to an efference copy sent from SMA to BA2 using Dynamic causal modeling (DCM) analysis. But the methods constrained us from precisely quantifying the timing and strength of this influence. In the present study we want to confirm the finding and quantify the contribution of the efference copy in the difference between active action and passive action using somatosensory evoked potentials (SEP).

Study objective

In this study we want to quantify the contribution of the efference copy in the difference between active action and passive action using somatosensory evoked potentials (SEP).

Our first hypothesis is that during the motor planning stage, the difference in SEP between active and passive task is caused only by efference copy sending from SMA to BA2. According to the nature of SEPs, the early components reflect subcortical activation and later components are believed to be associated with higher levels of cortical processing. We suppose that the SEPs during the motor planning state will be only differentiating in later (after 45ms) components.

Our second hypothesis is that during the squeezing action stage, the difference in SEP between active and passive is caused by the combination of efference copy and re-efference signal sending from the sensory system back to the somatosensory area in the cortical system. So the SEP differences may show on both earlier and later components.

Study design

The participants will wear a thin latex glove on their right hand which attached to an identical glove worn by experimenter. There are three tasks in this study: Active; Passive and Relax.

During the active task, participants will be instructed to squeeze gently with their right hand for 2 seconds in each trial.

During the passive task, participants will keep their hands relaxed and the experimenter will squeeze the participant's hand.

During the relax task, participants will keep their hands relax through the session.

We will apply electrical stimuli on the median nerve on the participants' wrist during their performing of the task and record the SEP signal on their scalp.

The electrical stimuli will be applied twice in each trial. One is during the motor planning stage the other one is during the squeezing action stage.

Study burden and risks

A small electrical current is sent through a probe to the skin near a nerve on participant's wrist. This may be done several times. This makes a twitching or pulsating feeling in the wrist. Participant's thumb may twitch during the test. While the sensation may be unusual or slightly uncomfortable, this test is not harmful and most people don't consider this test painful.

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. 18-40 years old
3. Normal vision and Hearing
4. Right-handed

5. Good proficiency in the English language in listening, speaking, reading, and writing

Exclusion criteria

1. Neurological disorders (including epilepsy)
2. Psychiatric disorders which could affect / have affected cognitive function

Study design

Design

Study type: Observational non invasive

Masking: Open (masking not used)

Control: Uncontrolled

Primary purpose: Other

Recruitment

NL

Recruitment status: Will not start

Enrollment: 20

Type: Anticipated

Ethics review

Approved WMO

Date: 05-04-2013

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

CCMO

ID

NL39507.042.12