Predicting motor learning with neurophysiological measurements

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Assess the correlation between multiple neurophysiological measurements and complex motor learning in healthy subjects.

| Ethical review | Approved WMO |
|-----------------------|---|
| Status | Pending |
| Health condition type | Central nervous system vascular disorders |
| Study type | Observational invasive |

Summary

ID

NL-OMON46030

Source ToetsingOnline

Brief title Predicting motor learning

Condition

· Central nervous system vascular disorders

Synonym CVA, Stroke

Research involving Human

Sponsors and support

Primary sponsor: Erasmus MC, Universitair Medisch Centrum Rotterdam **Source(s) of monetary or material Support:** Ministerie van OC&W

Intervention

Keyword: Motor learning, TMS

Outcome measures

Primary outcome

Motor Learning: The accuracy on a sequential visual isometric force pinch task (SVIPT), will be used to measure motor skill. Motor learning is defined as the difference between the first day and the last day. //

Local excitation: Local excitation will be measured with a single pulse motor map procedure. A motor map is the area on the skull from which a TMS pulse can stimulate the target muscle. The volume is the sum of the MEP aplitudes in this area//

Local inhibition: Local inhibition is mediated by GABAa-ergic and GABAb-ergic interneurons. GABAa-ergic local inhibition will be measured with a paired pulse procedure called short interval intracortical inhibition (SICI). The first pulse is a subthreshold pulse that depolarizes the GABAa-ergic interneurons, which reduces the MEP amplitude of the second suprathreshold pulse. The outcome measure is the amplitude ratio between paired pulses and single pulses. GABAb-ergic local inhibition will be measured with a single pulse procedure called the cortical silent period (cSP). The subject is contracting the target muscle while the magnetic pulse is applied. This produces a short depression of the EMG signal. The outcome measure is the duration of this silent period.//

Transcallosal inhibition: Transcallosal inhibition will be measured with a

single pulse protocol called the ipsilateral silent period (iSP). The subject is contracting the homologous muscle, ipsilateral of the stimulated motor cortex. The magnetic pulse excites a GABAb mediated transcallosal network that inhibits the contralateral motor cortex, which produces a short depression in the EMG signal of the ipsilateral muscle. The outcome measure is the duration of this silent period.//

Secondary outcome

Assess how the neurophysiological measurements change and interact during multiple sessions of motor training.

Study description

Background summary

Stroke is a leading cause of long-term adult disability. The ability of stroke patients to independently undertake activities of daily living is highly dependent on motor function of the upper limbs. Current prognostic algorithms for the upper limb use the ability to make basic movements 3 days post stroke as a predictor for functional recovery. However, approximately 30% of stroke patients show substantially less improvement than predicted by early post-stroke ability. Functional recovery after stroke is mediated by both natural repair and motor learning. It has been proposed that lagging stroke patients have a deficit in brain plasticity which impairs motor learning and thus prevents them from reaching their full potential for functional recovery. If these patients are detected at an early stage they could benefit from novel noninvasive brain stimulation therapies in the rehabilitation clinic. The goal of this experiment is to assess the correlation between complex motor learning and multiple brain plasticity measurements in healthy subjects. Local excitation, local inhibition and transcallosal inhibition will be assessed. In this study these measurements will be conducted with Transcranial Magnetic Stimulation (TMS). With this technique, magnetic pulses are applied to the brain with a small coil placed over the head. When the coil of the TMS apparatus is held over the primary motor cortex, a pulse can excite or inhibit motorneurons that target a specific muscle, depending on the background contraction. These Motor Evoked Potentials (MEPs) or silent periods are measured with an electromyography (EMG) apparatus. In this study, multiple TMS measurements will be conducted in healthy subjects before and after multiple motor training sessions.

Study objective

Assess the correlation between multiple neurophysiological measurements and complex motor learning in healthy subjects.

Study design

Prospective cohort study

Study burden and risks

Participants will visit the Erasmus MC on 3 days for a total of 11 hours. In this study safety measures are applied according to Rossi et al (2012). Therefore, there is no elevated risk of seizures or other serious events. This study will not use repetitive TMS. Only single pulse and paired pulse protocols will be used. The risks associated with this study are small. The discharging of the coil at higher intensity levels can produce loud sounds. Therefore, both subjects and the experimenter will wear ear plugs. Furthermore, discharging the coil could cause temporary discomfort on the head.

There is no direct therapeutic benefit, because there are no interventions and the subjects are healthy volunteers. Subjects will receive a financial compensation for expenses made due to participation.

Contacts

Public Erasmus MC, Universitair Medisch Centrum Rotterdam

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Trial sites

Listed location countries

Netherlands

Eligibility criteria

Age Adults (18-64 years) Elderly (65 years and older)

Inclusion criteria

Healthy// Aged 18-35// Right handed

Exclusion criteria

History of neurological or psychiatric disorders Implants or metal parts in the head Use of psychoactive drugs in the last month Neuromodulatory stimulation in the last month Pregnant

Study design

Design

Study type: Observational invasiveMasking:Open (masking not used)Control:UncontrolledPrimary purpose:Diagnostic

Recruitment

| NL | |
|---------------------------|-------------|
| Recruitment status: | Pending |
| Start date (anticipated): | 01-06-2017 |
| Enrollment: | 60 |
| Туре: | Anticipated |

Ethics review

| Approved WMO | |
|--------------------|---|
| Date: | 22-06-2017 |
| Application type: | First submission |
| Review commission: | METC Erasmus MC, Universitair Medisch Centrum Rotterdam (Rotterdam) |

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** NL58087.078.16