Motor cortical control of antagonist muscle function in aging

Published: 05-10-2015
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To examine the motor cortical control of antagonist muscle function in younger and older adults

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

Summary

ID

NL-OMON41777

Source
ToetsingOnline

Brief title
Cortical antagonist muscle function in aging

Condition

- Other condition

Synonym
aging senescence

Health condition

Veroudering

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: aging, antagonist muscle, motor cortical excitability, transcranial magnetic stimulation (TMS)

Outcome measures

Primary outcome

The primary study parameter is the co-activation of antagonist muscle function

in younger and older adults during a rapid flexion of the wrist after hearing

an auditory tone.

Secondary outcome

The secondary study parameter is the amount of motor cortical excitability

before and during the flexion of the hand in younger and older adults.

Study description

Background summary

There is overwhelming evidence that for some reason increasing age affects a key aspect of how humans produce voluntary force. During finger, wrist, elbow, knee, and ankle joint movements old compared with young adults execute weak and strong contractions so that the muscle that is antagonist (opposing) to the muscle that produces the movement (the agonist), becomes more strongly activated. The neural mechanism of this age-related increase in coactivation is unknown. One example for the functional significance of this age-driven altered movement strategy is the strong association between the 20% greater metabolic cost of transport and heightened antagonist leg muscle activation during gait in old compared with young adults. The hypothesis is that motor cortical control of antagonist muscle function alters with age.

Study objective

To examine the motor cortical control of antagonist muscle function in younger and older adults

Study design

In this study, a rapid flexion of the wrist will be used as a voluntary movement to examine the amount of coactivation in the lower arm muscles. The cortical excitability before and during the movement will be measured with transcranial magnetic stimulation (TMS).

Participants respond to a tone by rapidly flexing their right-dominant wrist. A single TMS is given with 20 ms increments between 80 to 380 ms after the tone. Pilot experiments showed that old individuals were able to reliably execute the reaction time task if administered in 3 blocks of 68 trials, a total of 204 trials with 3-5 minutes of rest between the blocks. In 1 of the 17 conditions, only the tone is presented and in the 16 other time-interval conditions a single TMS pulse is delivered, targeting the right wrist muscles. There are 12 trials in each of the 17 conditions, with the condition administered in a random order. The data are then sorted in to 10 ms bins. The participants will visit the Center for human movement sciences once during an approximately 2 hour lasting session.

Intervention

Non-invasive flexion of the right hand after hearing an auditory tone. Measuring the cortical excitability indexed by the size of the motor evoked potentials (MEPs) produced by transcranial magnetic stimulation (TMS).

Study burden and risks

Participants will visit the Center for Human Movements Sciences once. The duration of the session is approximately 2 hours. TMS may cause slight discomfort lasting less than a second on the scalp near the coil. It may also cause twitching of the muscles, the face and jaw, which may be unpleasant and surprising but not painful. There are no known long-term risks of magnetic brain stimulation. For participating in the study, participants receive 10 euros in form of VVV gift cards.

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

Age 18-30 years or 65>, female or male gender, right-handed

Exclusion criteria

Fracture in the upper extremity over the past year, having neurological disorders, being pregnant, muscle or joint disorders, cardiovasculair diseases, medicine known to affect nerve conduction, a history of epilepsy, use of a pacemaker, and metal in the brain/skull

Study design

Design

Study type:	Observational non invasive
Intervention model:	Parallel
Allocation:	Randomized controlled trial
Masking:	Single blinded (masking used)
Control:	Active

Primary purpose:	Diagnostic

Recruitment

NL

Recruitment status:	Will not start
Enrollment:	28
Type:	Anticipated

Ethics review

Approved WMO

Date:	05-10-2015
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

ID: 23489
Source: NTR
Title:

In other registers

Register	ID
CCMO	NL52432.042.15
OMON	NL-OMON23489