Cognitive aging and neuroplasticity: prefrontal compensatory mechanisms during working-memory performance

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Ethical review	Approved WMO
Status	Recruiting
Health condition type	Other condition
Study type	Interventional

Summary

ID

NL-OMON37260

Source
ToetsingOnline

Brief title
fNIRS during working-memory performance in elderly

Condition

- Other condition

Synonym
mild cognitive impairment, mild memory loss

Health condition

cognitieve veroudering

Research involving
Human

Sponsors and support

Primary sponsor: Universitair Medisch Centrum Sint Radboud
Source(s) of monetary or material Support: Ministerie van OC&W,TopTalent grant (NWO) toegewezen aan A. Vermeij ,subsidie Alzheimer Nederland

Intervention

Keyword: aging, cerebral oxygenation, cognitive training, working memory

Outcome measures

Primary outcome

Changes in functional prefrontal activation as determined by oxygenated

hemoglobin changes (*mol/L) induced by working-memory training.

Secondary outcome

Changes in functional prefrontal activation as determined by deoxygenated

hemoglobin changes (*mol/L) induced by working-memory training.

Study description

Background summary

This project aims to unravel the working-memory-related neurocognitive changes that take place in healthy aging and in the prodromal stages of dementia. Our pilot study showed that older adults recruit bilateral prefrontal areas already at low levels of working-memory load in an attempt to compensate for the observed aging-related decline in performance. Our next goal is to establish whether prefrontal activation and behavioral performance may be influenced by working-memory training. Because we are interested in the underlying mechanisms of prefrontal compensation, we will include both individuals who show successful compensation, healthy elderly, as well as individuals who fail to show successful compensation, Mild Cognitive Impairment patients.

Study objective

The primary objective is to establish whether prefrontal compensatory mechanisms during working-memory performance may be enhanced by working-memory training, both in healthy older adults and MCI patients. The secondary

objective is to establish age- and disease-related neural and vascular changes which may influence compensatory brain activation in healthy older adults and MCI patients, and hence may influence the results of the cognitive training.

Study design

This is an intervention study with a crossover design.

Intervention

Healthy older adults and MCI patients will receive the computerized working-memory training Cogmed QM, which runs on the participant*s PC at home. The training consists of 25 sessions of approximately 30-40 minutes and will be completed within 5 weeks. Cogmed QM is an evidence based training programme with proven effects on working-memory performance and concentration.

Study burden and risks

Given the established safety of the noninvasive techniques fNIRS, TCD, Finapres, and EEG, and the nature of the intervention, i.e. a computerized working-memory training at home, there are no foreseeable risks associated with participation in this study.The investigators have ample previous experience with healthy young, healthy elderly and MCI/Alzheimer patients undergoing non-invasive measurements (fNIRS/TCD/Finapres). These investigations were very well tolerated by the participants.
For the young adults the burden consists of one experimental session of 3 hours. They will not directly benefit from participation, but this study will enhance our knowledge about the feasibility of combined fNIRS-EEG studies and will provide us more insight into aging-related changes in neurovascular coupling.
A considerable burden will be placed on the participating healthy elderly and MCI patients because the three lab visits and computerized working-memory training at home are time-consuming. Nevertheless, both groups may considerably benefit from Cogmed working-memory training. The Cogmed training program is designed to improve working-memory capacity, attention and concentration. Previous studies (Brehmer et al., 2011;2012) indeed showed training-related improvement of performance on working-memory tasks in healthy elderly. Also, transfer effects were found on other cognitive domains and a self-rating scale on cognitive functioning in daily life. Cogmed QM training, which is offered by several commercial clinical practices for 400 euro per participant, is for obvious reasons offered for free to the participants in the present study. During the 5 weeks of Cogmed training, we will contact the participant to provide structure, motivation and feedback on the progress.
Because we are interested in the underlying mechanisms of prefrontal compensation, we chose to include both individuals who show successful compensation, the healthy elderly, as well as individuals who fail to show

successful compensation, the MCI patients.

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

- Males and females aged 20-35 (young adults group) or 60-85 (older adults group and MCI group)
- MCI group: Diagnosis of amnestic Mild Cognitive Impairment according to International Working Group criteria.
- Right-handed
- Dutch speaking
- Informed consent
- Normal or corrected-to-normal vision
- Access to a PC with internet connection at home (older adults group and MCI group)

Exclusion criteria

- Estimated IQ < 85 (based on Nederlandse Leestest voor Volwassenen (NLV) -score)
- Mini-Mental State Examination (MMSE) score of < 27 (for healthy older adults group)
- Clinical Dementia Rating (CDR) * 1 (i.e. fulfilling the criteria for diagnosis of dementia)
- Current psychiatric disorder, such as psychosis or major depression
- Current or past neurological disorder, such as severe cerebral vascular disease (e.g. cortical stroke, subarachnoid hemorrhage), Parkinson*s disease, epilepsy, traumatic brain injury, central nervous system infection, brain tumor, and alcoholic encephalopathy. N.B. Transient Ischaemic Attack, lacunar infarction and white matter lesions are no exclusion criteria.
- Current severe systemic disease such as coronary artery disease, myocardial infarction < 6 months, heart failure (unstable), chronic obstructive pulmonary disease (unstable)
- General medical conditions, such as repetitive strain injury (RSI), which may confound the results of the study, as judged by the investigator
- Blood pressure > 160/90 mmHg (use of antihypertensives are allowed)
- Use of psychopharmacological drugs (anxiolytics, antidepressants, antipsychotic drugs, long-acting benzodiazepines etc.)
- Current abuse of drugs or alcohol
- Current participation in another study, or a specific cognitive training study within the past six months

Study design

Design

Study type: Interventional

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

Recruitment

NL

Recruitment status:	Recruiting
Start date (anticipated):	01-12-2013
Enrollment:	66
Type:	Actual

Ethics review

Approved WMO Date:	15-11-2012
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	ID
CCMO	NL40968.091.12