# Working memory and MCI.

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Objectives: The aim of this study is to investigate the feasibility of a computer-based cognitive training (working memory training) in a relative old and cognitive impaired population of MCI patients. We will examine the effect of this cognitive...

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# Samenvatting

### ID

NL-OMON27255

#### Bron

Nationaal Trial Register

#### Aandoening

Dementia refers to an acquired and persistent syndrome of intellectual impairment. The Diagnostic and Statistical Manual of Mental Disorders IV-R (DSM; American Psychiatric Association, 2000) defines the two essential diagnostic features of dementia as (1) memory and other cognitive deficits and (2) impairment in social and occupational functioning. Dementia is characterized by the permanent loss of basic cognitive functions: (a) memory impairment, including impaired ability to learn new information or to recall previously learned information, (b) aphasia (language disturbance), (c) apraxia (inability to carry out motor activities despite intact motor function), (d) agnosia (failure to recognize or identify objects despite intact sensory functioning), (e) disturbance in executive functioning (such as planning, organizing, sequencing, and abstracting information).

Dementia is caused by microscopic damage to the brain tissue that leads to atrophy. It can be caused by various disorders, most commonly it is caused by Alzheimer's disease (AD). Dementias are an increasing problem for society, owing to changing demographics. Mild cognitive impairment (MCI) is a condition in which a person experience reduced cognitive functioning at a faster rate than is expected from normal aging. Because the problems do not interfere with daily activities, the person does not meet criteria for being diagnosed with dementia (Petersen et al., 1999). Research has shown that individuals with MCI have an increased risk (approximately 10% to 15% per year; Grundman et al., 2004) of developing AD over the next few years. It is often found to be a transitional stage between normal aging and dementia. Due to the association between MCI and severe cognitive disorders like AD, it is important that suitable interventions come available to curb the reduction in cognitive functioning.

### Ondersteuning

**Primaire sponsor:** Maastricht University MUMC **Overige ondersteuning:** Not applicable

### **Onderzoeksproduct en/of interventie**

### Uitkomstmaten

#### Primaire uitkomstmaten

Feasibility:<br>

Feasibility will be evaluated on the basis of (a) age, (b) patient's abilities/capacity (daily investment, duration and difficulty level of the tasks and questionnaires), and (c) weakly (or daily) telephonic conservations between the researchers and the patient or his/her partner/caregiver. In addition, the (possible) lack of computer skills and the necessity of an involved partner/caregiver are also important factors to consider in regard to the feasibility. <br/>
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WM capacity:<br>

WM capacity will be measured with using the same tasks that will be used during the WMT. However, the assessment versions of the three tasks will end when participants are unable to reproduce a sequence of two consecutive trials. The outcome measure for each task will be the length of the longest sequences that participants correctly reproduce on two consecutive trials. See section 3 for detailed information about the WM tasks.

#### <br><br>

WM (equal, but not trained task):<br>

The Backward letter span will be used to function as a control WM task. This means that this task is equal to the other WM tasks, but that it not will be trained. During this backward letter spa task, a sequence of letters will be presented on the computer screen. Participants have to reproduce this sequence in reversed order, using either the computer mouse or the letter keys on the keyboard. This task is added to the present study to see whether the participants show an improved WM performance on only the trained WM tasks or on all WM tasks (including the not trained task). By this way, we can chart the (generalization) effect of WMT. <br/> <br/> <br/> <br/> <br/>

Consequences of WM deficits in everyday life: <br>

The Working Memory Questionnaire (WMQ) is a self-administered scale, addressing three dimensions of WM: short-term storage, attention, and executive control. The WMQ assess the consequences of WM deficits in everyday life (Vallat-Azouvi, Pradat-Diehl & Azvouvi, 2012). The WMQ consist of 30 items and each question will be rated on a five-point Likert-type scale, ranging from 0 ("no problem at all") to 4 ("very severe problem in everyday life"). Examples of items are: "Do you find it difficult to remember the name of a person who has just been introduced to you?" and Do you feel that fatigue excessively reduces your concentration?".

This questionnaire is added in the present study to monitor the everyday WM problems of our participants.

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Executive functioning (non-equal task):<br>

A computerized version of the Stroop task (Stroop, 1935) will be used to measure information processing speed and susceptibility to interfere. Participants have to respond in the first block as fast as possible to four coloured (blue, red, green and yellow) words (''Blue'', ''Red'', ''Green'' and ''Yellow'') by using the number keys on the keyboard. During the second block, participants have to respond to the colour (blue, red, green and yellow) of the words (distracters) by using the number keys on the keyboard. This task is included in the present study to chart the executive functioning performance of the participants at pre-test, post-test and follow-up and primarily to see whether executive functioning will improve after WMT. <br/> <br/> <br/>

Cognitive failures: < br>

The Cognitive Failure Questionnaire (CFQ; Broadbent et al., 1982; Ponds et al., 2006) is a selfreport questionnaire which consists of 25 items measuring the frequency of everyday cognitive failures. Each item is rated for frequency in the past 6 months on a four point scale, ranging from '0' (never) to '4' (very often). The maximum score is 100. Examples of items are: '' Forgetting appointments'' and '' Forgetting people's names''. This questionnaire is included in the present study to monitor the cognitive failures of our participants at pre-test, post-test and follow-up.

# **Toelichting onderzoek**

### Achtergrond van het onderzoek

#### Rationale:

Mild cognitive impairment (MCI) is a condition in which a person and their environment experience reduced cognitive functioning at a faster rate than is expected from normal aging. Because the problems do not interfere with daily activities, the person does not meet criteria for dementia. Research has shown that individuals with MCI have an increased risk of developing Alzheimer's disease (AD) over the next few years. MCI is often found to be a transitional stage between normal aging and dementia. For this reason, the present study will investigate whether working memory training can strengthen working memory and executive control in MCI patients, which may prevent them from further cognitive decline leading to dementia.

#### Objective:

The aim of this study is to investigate the feasibility of a computer-based cognitive training (working memory training) in a relative old and cognitive impaired population of MCI patients.

We will examine the effect of this cognitive training on working memory performance and executive functioning in a small clinical sample of MCI patients. We are especially interested whether this improvement of working memory performance is related to an improvement of other (non-trained) cognitive/executive functions and cognitive functioning in daily living.

Study design:

A non-blind observational intervention study (pilot study).

Study population:

A minimal total of 6 MCI patients who receive treatment for their memory and/or cognitive problems at the memory clinic of the Maastricht Universitair Medisch Centrum (MUMC).

Intervention:

The participants will receive working memory training for 25 consecutive days.

Main study parameters/endpoints:

The feasibility of the cognitive training, and the difference in working memory performance (on trained and non-trained tasks), executive functioning and daily cognitive functioning before and after working memory training.

Nature and extent of the burden and risks associated with participation, benefit and group relatedness:

Working memory training is an intervention that is used to strengthen executive functions. It is found that working memory training is highly relevant for reducing clinical symptoms and to improve working memory capacity and other cognitive abilities in a variety of clinical samples. It is unknown if these benefits are also present for the MCI patients. The study holds no direct and indirect risks for the participants.

#### Doel van het onderzoek

Objectives:

The aim of this study is to investigate the feasibility of a computer-based cognitive training (working memory training) in a relative old and cognitive impaired population of MCI patients. We will examine the effect of this cognitive training on working memory performance and executive functioning in a small clinical sample of MCI patients. We are especially interested whether this improvement of working memory performance is related to an improvement of other (non-trained) cognitive/executive functions and cognitive functioning in daily living.

Expected effects of the WM training in this MCI sample are:

- 1. WM performance will be improved after WMT;
- 2. Cognitive/executive functions will be improved after WMT;
- 3. Cognitive functioning in daily living will be improved after WMT.

The present study will function as a pilot study. This study is mainly conducted to investigate the feasibility of a computerized cognitive training (like WMT) in a relative old and cognitive impaired population. In addition, the intensive daily investment, the (possible) lack of computer skills and the necessity of an involved partner/caregiver are also important factors to consider in regard to the feasibility. In the future, a similar study (as regard to population, e.g. mild dementia/MCI patients) will be conducted on a larger scale including multiple control groups. The present study will only focus on one small MCI group.

### Onderzoeksopzet

- 1. Pre-test;
- 2. Training for 25 consecutive days;
- 3. Post-test;
- 4. Follow-up.

#### **Onderzoeksproduct en/of interventie**

WMT is an intervention that is used to strengthen executive functions (Klingberg, 2010). It is found that WMT is highly relevant for reducing clinical symptoms and to improve WM capacity and other cognitive abilities in a variety of clinical samples (Beck et al., 2010; Borella et al., 2010; Klingberg et al., 2005; Houben, Wiers & Jansen, 2011). Participants will be trained during the WMT on three kinds of WM tests: the visuospatial WM span task, the backwards digit span task, and the letter span task (based on Klingberg, Forssberg & Westerberg, 2002).

1. Visuospatial WM task: During this task, a certain number of squares in a 4x4 grid changed in colour on the computer screen. Participants have to reproduce this sequence by clicking on the squares that have changed colour in the correct order using the computer mouse;

2. Backward digit span: During this task, a sequence of numbers will be presented on the computer screen. Participants have to reproduce this sequence in reversed order, using either the computer mouse or the number keys on the keyboard;

3. Letter span task: During this task, a sequence of letters will be presented on the computer screen in a circle. One of the positions in this circle is to be indicated and participants have to reproduce the corresponding letter using the keyboard.

Participants must follow 30 trials of each of the three WM tasks. This means that they have to solve on a daily basis 90 WM exercises for 25 consecutive days. The difficulty level of all three WM tasks will be automatically adjusted on a trial-by-trial basis. Initially, each task involved sequences of three items. The length of the sequences will increase and decrease according to participants' performance. When participants correctly reproduce the sequences on two consecutive trials, one item will be added to the sequence on the next trial. When participants are not able to correctly reproduce the sequences on two consecutive trials, the sequence in the next trial will contain one item fewer. In sum, the training is adaptive; WM load was increased according to each individual's performance levels. This automatic adjustment makes the training easier or more difficult. Every participant trains on his optimal WM capacity.

# Contactpersonen

## **Publiek**

Faculty of Psychology and Neuroscience<br> Maastricht University Kay Deckers Maastricht The Netherlands

## Wetenschappelijk

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# **Deelname eisen**

### Belangrijkste voorwaarden om deel te mogen nemen (Inclusiecriteria)

1. MCI: Diagnosed according to the criteria of the DSM IV-R (American Psychiatric Association, 2000);

- 2. Age over 18 years;
- 3. A minimum of 4 years of formal schooling and no history of mental retardation;
- 4. Native Dutch speaker;

5. Mental competency to give informed consent. Mental competency as defined by the Dutch law (WGBO: Wet of Geneeskundige Behandel Overeenkomst) is determined by the medical specialist (psychiatrist, neurologist);

6. Participants must have access (preferable at their own home) to a computer with an internet connection;

7. Participants must have some experience with computers (preferable with Windows and Internet Explorer);

8. A partner/caregiver who is willing to help/assist the participant with the daily computerized training.

### Belangrijkste redenen om niet deel te kunnen nemen (Exclusiecriteria)

1. History of acquired brain injury (e.g. cerebral contusion, cerebrovascular accident);

2. Participants who show signs of poor compliance (e.g. not completing a session in time and session loss) and/or poor response on the questionnaires will be excluded from the

# Onderzoeksopzet

### Opzet

Туре:	Interventie onderzoek
Onderzoeksmodel:	Parallel
Toewijzing:	N.v.t. / één studie arm
Blindering:	Open / niet geblindeerd
Controle:	N.v.t. / onbekend

### Deelname

Nederland	
Status:	Werving nog niet gestart
(Verwachte) startdatum:	01-07-2012
Aantal proefpersonen:	6
Туре:	Verwachte startdatum

# **Ethische beoordeling**

Niet van toepassing Soort:

Niet van toepassing

# Registraties

### Opgevolgd door onderstaande (mogelijk meer actuele) registratie

Geen registraties gevonden.

### Andere (mogelijk minder actuele) registraties in dit register

Geen registraties gevonden.

# In overige registers

Register	ID
NTR-new	NL3344
NTR-old	NTR3476
Ander register	:
ISRCTN	ISRCTN wordt niet meer aangevraagd.

# Resultaten

Samenvatting resultaten

N/A