Practice makes the brain work better: A developmental training study

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The main objective of this study is to investigate whether under-recruitment of the prefrontal cortex and poorer performance during manipulation of working memory in children is a result of immature neural circuitry or of limited practice.

Ethical review	Approved WMO
Status	Pending
Health condition type	Other condition
Study type	Observational invasive

Summary

ID

NL-OMON32384

Source ToetsingOnline

Brief title

Practice makes the brain work better: A developmental training study

Condition

• Other condition

Synonym not applicable

Health condition

er wordt geen aandoening bestudeerd

Research involving

Human

Sponsors and support

Primary sponsor: Leids Universitair Medisch Centrum Source(s) of monetary or material Support: Ministerie van OC&W

Intervention

Keyword: development, fMRI, Memory, Practice (Psychology), Short-Term

Outcome measures

Primary outcome

Age-specific changes in performance and prefrontal activity/connectivity after

training of working memory and transfer of these effects to other cognitive

abilities

Secondary outcome

not applicable

Study description

Background summary

Despite the importance of keeping information in an active state when learning new information (such as in school), it is not yet known how the maturation of this function is related to changes in brain function over the course of child development. Neuroimaging research has shown that 8-12-year-old children fail to recruit prefrontal cortex and perform worse than adults when manipulating information in working memory. In the current project, we will train working memory functions in different age groups to test whether this under-recruitment is the result of maturational constraints (i.e., this region is not yet accessible) or limited practice (i.e., children do not know how to use this region).

Study objective

The main objective of this study is to investigate whether under-recruitment of the prefrontal cortex and poorer performance during manipulation of working memory in children is a result of immature neural circuitry or of limited practice.

Study design

Experimental design; Repeated measures with between-subjects comparisons.

Study burden and risks

Participants will receive a working memory training program, in which they are trained three times a week, for a period of 6 weeks. In the first and last week of the training period, participants will be scanned using functional Magnetic Resonance Imaging (fMRI) while they are performing an object working memory task that is used in the training program and a spatial working memory task that will not be trained. On both occasions, resting state activity will also be assessed and a structural high-resolution anatomical scan will be made. A diffusion tensor imaging (DTI) scan will made only in the first week. In addition, participants will complete a demographic questionnaire and a battery of cognitive tests before and after the training phase. There will be a follow-up 6 months later in which participants will be (behaviorally) tested on the working memory tasks/ cognitive tests.

There are no risks associated with behavioral testing and training. There is an occasional possibility of some frustration with poor performance or fatigue, testing will stop if a subject displays frustration or appears tired. There are no known risks associated with participating in an fMRI study. Subjects with intracranial or intraocular metal, a pacemaker, possible pregnancy and claustrophobia will be excluded because of potential contraindications of MRI in such subjects. The Nederlands Vereniging voor Kindergeneeskunde (NVK) code of conduct; Gedragscode verzet bij minderjarigen die deelnemen aan medisch-wetenschappelijk onderzoek will be applied to this study.

Considering the minimal risks involved in this research, the importance of the benefits gained from this research far outweighs the costs. This study aims to acquire knowledge about the normal development of working memory in relation to maturation of neural circuitry on the one hand and practice on the other hand. This knowledge about normal development is critical to aid in the understanding of cases of abnormal cognitive development, as seen in children with learning disorders, Attention Deficit Hyperactivity Disorder, autism spectrum disorder, or traumatic brain injury. The results will also be of great importance to educational service. Working memory is the driving force behind many cognitive capabilities, such as those involved in reading and arithmetic. By understanding the potential of children*s brain systems in the context of the developing brain, we will be able to demonstrate what can and cannot be expected of children across school-aged development.

Contacts

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Trial sites

Listed location countries

Netherlands

Eligibility criteria

Age

Adolescents (12-15 years) Adolescents (16-17 years) Adults (18-64 years) Children (2-11 years) Elderly (65 years and older)

Inclusion criteria

Children and adults aged 8-25 with no history of neurological/psychiatric disorder/disease and no contraindications to MRI will be included in this study. All participants will be right-handed native Dutch speakers with normal or corrected-to normal vision.

Exclusion criteria

Potential participants will be prescreened for contraindications for MRI, which include metal implants, a pacemaker, claustrophobia, and possible pregnancy (in adult females). They will

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additionally be prescreened for head trauma, premature birth, learning disabilities, and history of neurological or psychiatric illness and/or use of psychotropic medications. Because of the difficulties in interpreting cognitive studies in subjects with Dutch as a second language, only native-Dutch speakers will be asked to participate in the study. Finally, lefthanded individuals will be excluded from the study because some left-handers have substantially different brain organization relative to right-handers.

Study design

Design

Study type: Observational invasive	
Masking:	Open (masking not used)
Control:	Uncontrolled
Primary purpose:	Other

Recruitment

NL	
Recruitment status:	Pending
Start date (anticipated):	01-01-2008
Enrollment:	60
Туре:	Anticipated

Ethics review

Approved WMO	
Application type:	First submission
Review commission:	CCMO: Centrale Commissie Mensgebonden Onderzoek (Den Haag)

Study registrations

Followed up by the following (possibly more current) registration

No registrations found.

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Other (possibly less up-to-date) registrations in this register

No registrations found.

In other registers

Register

ССМО

ID NL19971.058.07