Nutrition and the neural development of spatial cognition using fMRI

Published: 24-08-2017
Last updated: 13-04-2024

To assess whether nutrition status can predict the outcome of spatial cognition training, how this is represented in the brain and whether this is mediated by inflammation.

Ethical review	Not approved
Status	Will not start
Health condition type	Other condition
Study type	Interventional

Summary

ID

NL-OMON45717

Source
ToetsingOnline

Brief title
Nutrition & Spatial cognition

Condition

- Other condition

Synonym
not applicable

Health condition

geen van bovenstaande (gezonde proefpersonen)

Research involving
Human

Sponsors and support

Primary sponsor: Radboud Universiteit Nijmegen
Source(s) of monetary or material Support: Europees Fonds voor Regionale

Ontwikkeling (EFRO),Mead Johnson Nutrition

Intervention

Keyword: fMRI, Neural development, Nutrition, Spatial cognition

Outcome measures

Primary outcome

Brain activation patterns (fMRI) pre and post training are the main outcome measures for this study. These will be related to nutrition and performance. In addition, we will assess the degree to which the aforementioned relationship is mediated by inflammation.

Secondary outcome

The mediating effect of DNA methylation on the relation between nutrition and the brain activation patterns will also be assessed.

Study description

Background summary

Childhood obesity is one of the most serious public health challenges of the 21st century. Childhood obesity has moved to the center of attention since overweight children are likely to stay obese into adulthood. Obesity is highly associated with dietary quality, and poor dietary quality is associated with cognitive decline. Recent evidence suggests that chronic low-grade systemic inflammation and subsequent neuroinflammation may underlie this association. In adults, poor dietary quality has indeed been linked to reduced performance in a spatial cognition task. One brain structure particularly prone to neuroinflammation is the hippocampus, which is also the core brain hub for spatial cognition. In line with these findings, a recent rodent study demonstrated high fat diet-induced detriments in spatial cognition, which were mediated by enhanced inflammation of the hippocampus. Importantly, these findings were particularly strong in juvenile rats, i.e. during development, rather than in adult rats. The relationship between nutrition and the neurodevelopment of spatial cognition, including the mediating effects of inflammation have not yet been investigated in children. Here, we propose to

examine the effects of diet and inflammation on the neural development of spatial cognition in primary school children. We adopt a spatial cognition paradigm that allows investigation of training induced neural plasticity changes.

Study objective

To assess whether nutrition status can predict the outcome of spatial cognition training, how this is represented in the brain and whether this is mediated by inflammation.

Study design

The proposed study uses an intervention consisting of a spatial cognition training, to assess the relationship between nutrition and the neural development of spatial cognition. The assessment of nutrition is observational.

Intervention

All participants will use a computer game to train spatial cognition for 7 days.

Study burden and risks

The children are not exposed to any risks when participating in this study. Participants will come to the Donders Institute three times: (1) for the intake session (max 80 minutes, including 5 minutes anatomical MRI scan), (2) for the pre-scan session (65-80 minutes in total, of which 30 minutes in the MRI scanner) and after seven days (3) for the post-scan session (50 minutes in total, of which 30 minutes in the MRI scanner). Saliva samples will be collected twice, after the pre and after the post scan session. In between the pre- and the post-scan session, subjects will perform the spatial cognition training from a computer at home, for 30 minutes a day, 7 days in a row.

Contacts

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Trial sites

Listed location countries

Netherlands

Eligibility criteria

Age
Children (2-11 years)

Inclusion criteria

Age: 8-10
Healthy
fMRI compatible
Proficient use of Dutch in both child and parent

Exclusion criteria

- Deafness, blindness, or sensori-motor handicaps
- Neuropsychiatric disorders
- Diabetes
- Chronic inflammatory diseases
- Daily use of ibuprofen, aspirin or glucocorticoids
- Any recent tooth extraction one month prior to the experiment
- History of oral candidiasis
- Acute illness with fever, vomiting, or diarrhea within 5 days of the study
- Recent use of antibiotics (within 3 months prior to the experiment);Exclusion criteria for MRI:
- Non-removable metal in the upper body
- Active implant, pacemaker, neurostimulator, insulin pump and/or auditory prosthetic
- Epilepsy
- Claustrophobia
- Brain surgery in the anamnesis

Study design

Design

Study type: Interventional

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

Recruitment

NL

Recruitment status:	Will not start
Enrollment:	55
Type:	Anticipated

Ethics review

Not approved

Date:	24-08-2017
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.

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

No registrations found.

In other registers

Register	ID
CCMO	NL60917.000.17