Brain development between ages 8 and 25:
Intentional inhibition & reward-based learning

Published: 17-12-2010
Last updated: 03-05-2024

Research GoalsUsing cross-sectional data we will test whether control and affective brain regions follow different developmental time courses. The first study will focus on the development of inhibitory control (stimulus-driven and intentional),...

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

Summary

ID

NL-OMON34028

Source
ToetsingOnline

Brief title
IIRBL

Condition

- Other condition

Synonym
n.a.

Health condition

GEEN AANDOENING! gezonde hersontwikkeling: hersenfunctie, hersenstructuur en gedrag

Research involving

Human

Sponsors and support

Primary sponsor: Universiteit Leiden
Source(s) of monetary or material Support: NWO: VIDI & Aspasia beurs; ESF

Intervention

Keyword: Functional MRI, Healthy brain development, Intentional inhibition, Reward-based learning

Outcome measures

Primary outcome

The primary objective of these studies is to understand how the developmental changes in different regions of the brain are important for cognitive and emotional decision-making at different stages of development. To this end, we will acquire fMRI, sMRI and DTI data and behavioral responses of participants aged 8-25 years. Furthermore, these studies will be complemented with heart rate and skin conductance measures and with performance outside of the scanner on a battery of tests.

Secondary outcome

The goals of the current set of studies are to use functional Magnetic Resonance Imaging (fMRI) to:

1. Identify brain regions that are associated with developmental changes in functions that may contribute to developmental changes in cognitive and emotional decision-making using three cross-sectional studies

2. Identify the relationship between striatal responsiveness and prefrontal regulatory processing

Study description

Background summary

Adolescence is a highly important transition phase between childhood and adulthood, marked by significant physical, cognitive, and social-emotional changes (Dahl and Gunnar, 2009; Steinberg et al., 2008). The onset of adolescence is characterized by the start of pubertal maturation around the age of 10 years, during which children undergo rapid physical growth and experience the onset of sexual maturation (Shirtcliff et al., 2009). One of the most salient characterizations of adolescence is a steady increase in executive functioning, or the ability to control our thoughts and actions to make them consistent with internal goals. Executive functions are thought to be central to human cognition (Miller and Cohen, 2001), and therefore adolescence can be seen as a period of significant advancements. A fundamental question in the current research proposal concerns how these changes in cognitive and social-emotional behavior are related to functional brain development. The current proposal has the objective to understand how these functions and neural underpinnings develop relative to each others within individuals.

Study objective

Research Goals
Using cross-sectional data we will test whether control and affective brain regions follow different developmental time courses. The first study will focus on the development of inhibitory control (stimulus-driven and intentional), which is thought to be the main component of our monitoring system and relies strongly on prefrontal cortex. The second study will focus on reward anticipation, which is thought to be important for affective processes and relies strongly on the limbic system, especially the striatum and prefrontal cortex. The third study will combine these studies and will focus on the interaction between inhibitory control and reward processing.

Study design

The proposed research will be double blind. All subjects will be coded; these codes will be applied for all research measures (MRI-scans, test-battery performance etc.).
The subjects will perform standard test-batteries of cognition and emotional decisionmaking. Furthermore, to get an estimate of IQ, a shortened version of the WISC/WAIS will be applied to the subjects.

The MRI-scans:
1. Structural MRI, to gain information on gray and white matter properties (volume, density and cortical thickness)

2. DTI, to gain specific information on white matter microstructure and fibertracking
3. Functional MRI, to gain information on task-related brain activity during cognitive and emotional decisionmaking.-emotionele taken.

Study burden and risks

There are no risks concerning this research project.
See also pages 24-27

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

See also page 17 in the protocol
1. Healthy children, adolescents and young adults without a history of neurological disorders
2. Right-handed
3. No counter-indications for MRI
4. Native Dutch speakers

Exclusion criteria

1. Lefthanded
2. A history of psychiatric and/or neurological disorders
3. Counter-indications for MRI (such as metal implants, heart arrhythmia, claustrophobia, and possible pregnancy

Study design

Design

Study type: Observational non invasive

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

Recruitment

NL

Recruitment status:	Recruiting
Start date (anticipated):	01-02-2011
Enrollment:	220
Type:	Actual

Ethics review

Approved WMO

Date:	17-12-2010
Application type:	First submission

Review commission:	METC Leids Universitair Medisch Centrum (Leiden)
Approved WMO Date:	31-01-2013
Application type:	Amendment
Review commission:	METC Leids Universitair Medisch Centrum (Leiden)

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	NL34206.058.10