Cognitive development in young adulthood: neuropsychology & functional neuroimaging

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

Summary

ID

NL-OMON34261

Source
ToetsingOnline

Brief title
Young adulthood

Condition

- Other condition

Synonym
niet van toepassing

Health condition

niet van toepassing

Research involving
Human

Sponsors and support

Primary sponsor: Vrije Universiteit
Source(s) of monetary or material Support: NWO

Intervention

Keyword: development, fMRI, neuropsychology, young adulthood

Outcome measures

Primary outcome

The primary study parameters are mean scores on the neuropsychological tasks

and brain activation during the neuroimaging tasks for the different groups.

Secondary outcome

The secondary study parameters are the grades and number of ECTS for each

group.

Study description

Background summary

The brain continues to develop into the early 20s (Giedd, 2004; Giedd et al., 1999). Maturation of the cortex is characterized by a linear increase in white matter volume and an inverted U-shaped pattern of changes in grey matter volume (Giedd, et al., 1999). These trajectories are thought to result from myelination, improving processing speed, and synaptic pruning, which increases neural efficiency. Peak volume occurs earlier in females while total volume is larger for males (Giedd, 2004). The frontal cortex, important for cognitive control and social cognition, matures relatively late (Gogtay et al., 2004). Recently, studies have compared the neural basis of cognitive control in children, adolescents and adults. Differences in brain activation have been found on several tasks, measuring processes such as working memory (Kwon, Reiss, & Menon, 2002), inhibition (Rubia et al., 2006) and error processing (Velanova, Wheeler, & Luna, 2008). A general reported pattern is an increase in activation for task-relevant regions and attenuation of other areas with development (Durston et al., 2006).
In the domain of social cognition, developmental changes have been observed in fMRI experiments investigating emotion regulation (Monk et al., 2003), thinking

about intentions (Blakemore, den Ouden, Choudhury, & Frith, 2007) and self-reflection (Pfeifer et al., 2009). These studies have shown involvement of distinct brain regions, indicative of altered processing of social stimuli during adolescence.
In contrast to the considerable amount of research on these specific life periods, little is known about maturation in young adults. Between the ages of 18 and 25, several demographic and identity changes occur, including possible entrance into higher education. This is therefore sometimes referred to as a separate developmental period, named emerging adulthood (Arnett, 2000). Consistent with changes in the environment and the protracted development of the frontal cortex, continuing improvement of higher order functions can be expected in young adults.
In addition, there are large individual differences in timing and efficiency of maturational processes during childhood and adolescence, which plausibly extend into young adulthood. A crucial determinant of individual differences is sex. Brain development during adolescence starts at an earlier age in girls compared to boys (De Bellis et al., 2001). Males and females engage different brain areas when performing cognitive (Bell, Willson, Wilman, Dave, & Silverstone, 2006), emotional (Koch et al., 2007) and social (Krach et al., 2009) tasks, which may also interact with age (Christakou et al., 2009).
Individual differences in development and concurrent neuropsychological functioning might have consequences for education. Processes such as inhibition and self-reflection are important for learning. Poor academic performance could be the result of a not yet fully mature brain. Therefore, performance on cognitive tasks and neural activation are possibly correlated with success in university.
The aim of the current study is to investigate development in male and female Medical students aged 18/19 years and 23/24 years. Differences between age groups and sex on neuropsychological and neuroimaging tasks will be assessed. In addition, grades and number of ECTS will be collected to relate cognitive development to academic performance.

Study objective

The primary objective of the current study is to investigate cognitive development in young adults by comparing 18/19 year old and 23/24 year old male and female students on a variety of neuropsychological and neuroimaging tasks.
The secondary objective of the current study is to explore the correlation between neuropsychological functioning and brain activation patterns with academic performance.

Study design

The current study employs a cross-sectional design with four groups: 20 males aged 18/19, 20 females aged 18/19, 20 males aged 23/24 and 20 females aged 23/24. First year and last year students from the Medical Department at VU

University will be recruited. Grades and number of ECTS will be collected at the end of the academic year, for which students are asked written permission. The study consists of two sessions. The first session of two hours is the behavioral part during which questionnaires, IQ tests and a neuropsychological testbattery are administered. In addition, the experimental task for the second session wil be practiced. In the second session of 1 hour a cognitive, emotional and social task are performed in the fMRI scanner.

Study burden and risks

There are minimal risks associated with participation in this study. Slight discomfort might be experienced by the participants during the fMRI session because of the noisy environment and the requirement to move as little as possible. Scanning time is limited to an hour to minimize burden for the participants.

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

healthy, right-handed first year students (aged 18/19) and last year students (aged 23/24) from the Medical Department at VU University

Exclusion criteria

uncorrected vision or hearing problems, (a history of) neuropsychological or psychiatric problems, claustrophobia or other contra-indications for fMRI (e.g. metal parts in body)

Study design

Design

Study type: Observational non invasive

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

Recruitment

NL

Recruitment status:	Recruitment stopped
Start date (anticipated):	09-11-2010
Enrollment:	80
Type:	Actual

Ethics review

Approved WMO

Date:	09-09-2010
Application type:	First submission
Review commission:	METC Amsterdam UMC

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	NL32047.029.10