

Genetic modelling of cognitive brain maturation in pre-adolescence: a longitudinal study in healthy twins.

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Background

Puberty is a critical period in human development. Large amounts of gonadal hormones are secreted, physical growth accelerates, and children show changes in behaviour and cognition, like the onset of abstract thinking. Until now it is not entirely clear how these cognitive changes should be understood and even less is known about what starts these cognitive changes. This study will relate cognitive development to hormonal changes and changes in brain structure and in addition will explore their genetic interrelations.

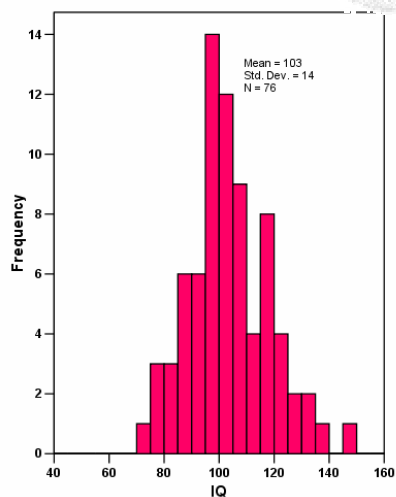
Research questions

- 1) What cognitive changes take place when children enter puberty?
- 2) To what extent is variation in cognitive development genetically determined? And what is the (genetic) relation between these cognitive changes and hormonal levels and brain development?
- 3) In what way are brain development, hormone levels and changes in cognition causally related?

Data acquisition VU

Cognition will be assessed using the WISC-III, Stroop, Tower of Hanoi, Verbal Fluency Task, 15-words task, Reading the Mind in the Eyes- task, Pi-inspection Task, Flanker, N-back task, Corsi block tapping task, and Raven's matrices (the Raven will also be taken by the parents).

To assess the stage of pubertal development, gonadal hormone levels (testosterone, FSH, LH and oestradiol) will be determined in saliva and urine samples aside from a physical examination. Cortisol levels are also assessed. DNA is collected using buccal swabs to determine zygosity and for future linkage and association studies. These data will be related to data collected at the UMC on brain structure.



Subjects

Nine-year-old healthy identical and fraternal twin pairs and their full siblings (aged 9 -14 years) from the Netherlands Twin Registry will participate in the study. In total 300 subjects will be included coming from 100 families.

A follow-up measurement takes place two years later when the twins are 11 years old to investigate developmental changes.

Up till now families have been selected from the 1995 birth cohort if twins were born in August or later having an older sibling aged 14 or younger. 140 Families fulfilled these criteria, 94 were approached and 44 agreed to participate. Most important reasons for refusal were: no time or too much effort, problems with children, children did not want to participate or were scared.

VU update and planning

- Test re-test data have been collected in 82 subjects of the Reading the Mind in the Eyes, Flanker, N-back task, Pi-inspection Task and Tower of Hanoi.
- Up till now, 30 families have been assessed using the cognitive test battery. First data on individual variation in intelligence in these families is shown in Figure 1; as one can see our sample is representative for the Dutch population.
- Planning of the measurements:
 - January 2005 - June 2005: finishing of first test wave
 - June 2005 - September 2006: data processing and analysis
 - September 2006 - June 2007: follow-up test wave and data analysis

