

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

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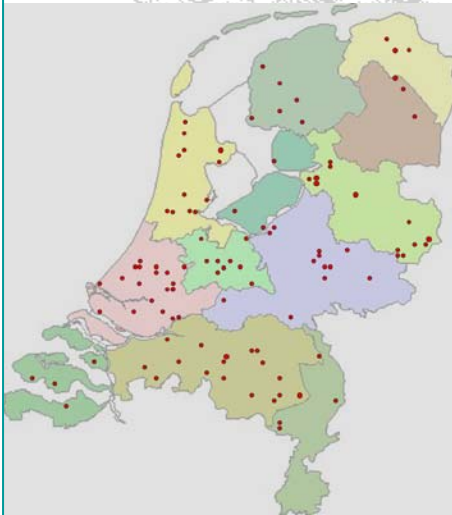
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112 families were recruited from the Netherlands Twin Registry, consisting of 48 identical twin pairs, 64 fraternal twin pairs and one of their older siblings. All twins were 9 years old, their siblings between 10 and 14.

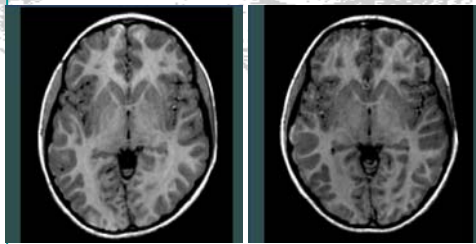


Twin families were recruited from all over the Netherlands



At the Utrecht Medical Center, the children's brains were scanned using a 1.5 Tesla Philips Achieva MR Scanner. Here we report results on total brain volume of the twins.

Twin 1      Twin 2

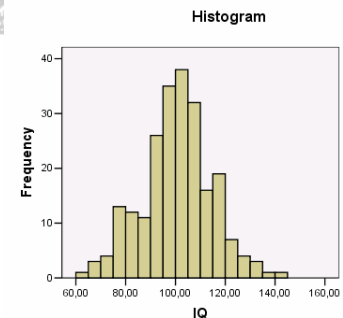


Brains of an identical twin pair



At the Vrije Universiteit in Amsterdam, cognitive ability was measured using the WISC, Raven's Progressive Matrices and a cognitive test battery. Here we report data on WISC full-scale IQ.

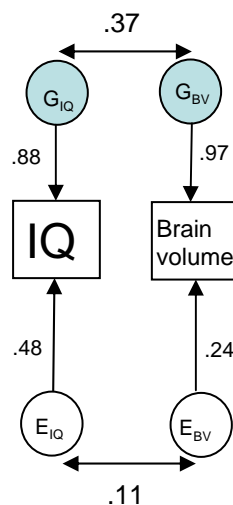
Through quantitative genetic modelling we studied the association between brain volume and cognitive ability. By using twins it can be assessed to what extent genetic factors mediate the association.



## Preliminary Results

Brain volume is highly heritable: genetic factors explain 94% of its variance. IQ is also heritable: 77%. Boys show larger brain volumes (1424 ml) than girls (1288 ml). The correlation between total brain volume and IQ is .33 in both boys and girls. This correlation can for 96% be attributed to a common genetic background.

The genetic correlation between genetic factors influencing brain volume in boys and girls is estimated at .002.



The association between IQ and brain volume: G= genetic variance, E=environmental variance. BV=brain volume

## Conclusion

In pre-adolescence, there is a moderate association between brain volume and IQ. This association is almost entirely mediated by a common genetic background (comparable with adult studies). The low genetic correlation between genetic factors for boys and girls might either reflect a difference in genetic expression between boys and girls, or a difference in pubertal stage (girls more advanced than boys). In the near future, we will focus on interactions with pubertal measures such as Testosterone, Estrogen and secondary sexual characteristics.

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