Van Leeuwen et al (2008)

Previous twin studies have estimated the contribution of genetic effects to the variability in intelligence at 25% to 50%. This article builds on previous research. It uses an extended twin design which includes MZ and DZ twins, their siblings and their parents, to study to what extent assortative mating, cultural inheritance and GE (genotype-environment) interaction and correlation are present for general intelligence (IQ). Data on general IQ were collected in both generations with the Raven Progressive Matrices test.

The study investigates whether biological factors and/or environmental factors might affect intelligence. Van Leeuwen et al (2008) expected additive genetic effects would explain a large part of any individual differences in intelligence.

Twins were recruited from the Netherlands Twin Registry (NTR), established by the Department of Biological Psychology at the Vrije Universiteit (VU) in Amsterdam. Twin families with an extra sibling between 9 and 14 years were selected from two birth cohorts (1995–1996). A total of 214 families were invited by letter, which was sent out one to two months before the ninth birthday of the twins. Two weeks after receiving the letter, the families were contacted by phone. Of these families 52% (112) agreed to participate. Parents signed informed consent forms for their children and themselves. Children also signed their own consent forms.

Of the 112 families, 103 had full siblings who wanted to participate. Mean age of the twins at time of cognitive assessment was 9.1 years, ranging from 8.9 to 9.5 years.

There were 23 MZ male, 23 DZ male, 25 MZ female, 21 DZ female and 20 DZ pairs of opposite sex. Zygosity was based on DNA polymorphisms and questionnaire items.

The study collected cognitive, behavioural and hormonal data, pubertal status and structural Magnetic Resonance Imaging (MRI) brain data. Cheek swabs, for DNA isolation, were collected at home by parents and children.

For cognitive testing, families arrived between nine and eleven o'clock in the morning. Children were tested in separate rooms with a cognitive test battery including the Raven's Standard Progressive Matrices (SPM; Raven, 1960). Parents completed the Raven Advanced Progressive Matrices (APM; Raven et al., 1998). The whole protocol took approximately 5 h, including two short breaks and one longer lunch break.

Children were individually tested with the SPM, which they completed at their own pace after verbal instruction.

Parents were given the APM (Raven et al., 1998), since the SPM is too easy for most adults. They received written instructions and made the test at their own pace.

Descriptives for all subjects of the sum IQ score on the RAP

	N	Minimum	Maximum	Mean	SD
Fathers	94	4	36	27.0	6.5
Mothers	95	9	36	25.9	6.0
Male siblings	44	24	56	43.8	7.8
Female siblings	57	30	49	46.4	6.5
Male twins	114	13	50	36.7	8.6
Female twins	110	19	50	36.6	7.1

Parents received the APM (maximum achievable score = 36), offspring received the SPM (maximum achievable score = 60)

This showed that correlations were higher in MZ twins than in first-degree relatives (siblings, DZ twins and parent-offspring pairs). The mean IQ score was higher in the older siblings than the younger and there was more variance in siblings than in twins, even though the same test was used. Findings in relation to GE interaction suggested that the environment is relatively more important in explaining individual differences for low IQ groups than for high IQ groups.

Van Leeuwen et al (2008) concluded that Individual differences in intelligence are largely accounted for by genetic differences. Parental influence on their children's IQ can be explained by the transmission of genes. Cultural transmission from parents does not influence their children's IQ. Environmental factors are significantly more important in children with a genetic predisposition for low IQ than in children with a genetic predisposition for high IQ. This provides support for the biological basis of intelligence.

Reference:

Van Leeuwen, M., Van den Berg, S. M. & Boomsma, D. (2008) A twin-family study of general IQ Learning and Individual Differences, 18, 76–88.