The Heritability of Working Memory Speed and Working Memory Capacity in children

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Introduction

Working Memory (WM) is an important aspect of cognition, and is often impaired in cognitive disorders. In the current study we investigated to what extent genetic or environmental factors explain individual differences in WM.

Subjects

* 97 identical twin pairs (monozygotic: MZ)
* 80 fraternal twin pairs (dizygotic: DZ)

(twin pairs age 12)

* 53 siblings (age 8-14)

MZ twins share all their genes, DZ twins and siblings share half of their genes.

Method

WM Speed (WMS) was assessed with a reaction time (RT) task with three increasing memory load conditions. RTs were highest in load 3 and lowest in load 1.

WM Capacity (WMC) was measured with two subtests of the WISC-R: Arithmetic and Digit Span (Forward and Backward).

	MZ	DZ	Twin-Sib
Load 1	0.50	0.40	0.13
Load 2	0.67	0.41	0.24
Load 3	0.70	0.49	0.22
Slope	0.46	0.32	0.18
Arithmetic	0.60	0.15	0.12
Digit Span	0.50	0.32	0.17

Table 1: Phenotypic twin and twin-sib correlations for each variable

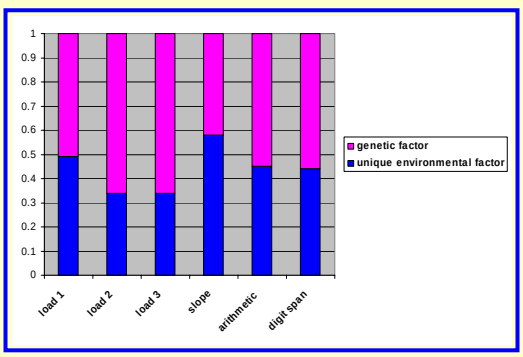

Figure 1: % of variance due to genetic and unique environmental factors for each variable

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Twin method

The total variation in a trait can be divided into:
* genetic variance
* environmental variance shared by family members
* unique environmental variance (not shared by family members)

Because of the different degree of genetic similarity between MZ and DZ twins, twin correlations give a first indication of underlying sources of variation.

Results

For each variable the MZ correlations were higher than DZ and twin-sib correlations, which indicates genetic influences (Table 1).

Genetic modeling showed that a model with genetic and unique environmental factors fitted best to the data, with genes explaining around 60% of the variation (Figure 1).

Conclusion

Genetic factors explain most of the variation in Working Memory in children.