The Genetic Relation between Working Memory Speed and Working Memory Capacity in Children

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Introduction

Working Memory (WM) is an important aspect of cognition. WM is not a unitary system; it can be divided into subsystems.

We examined the heritabilities of two WM subsystems, WM Speed (WMS) and WM Capacity (WMC), and tested the hypothesis that these systems are genetically different.

In addition we tested the hypothesis that the genetic relation between WMS and WMC is explained by general IQ.

Method

WMS was assessed with a reaction time (RT) task with three increasing memory load conditions. Indices were basic speed (Load 1) and Slope.

WMC was measured with two subtests of the WISC-R: Arithmetic and Digit Span.

General IQ (*g*) was assessed with the shortened version of the WISC-R.

We tested models in which WMS and WMC were correlated 0, or 1, or were freely correlated.

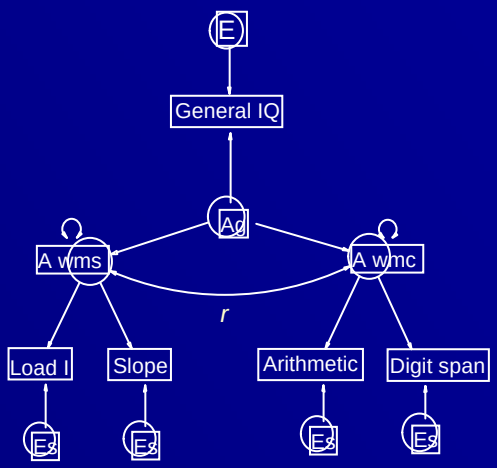

Figure 1: the hierarchical model with three latent factors for genetic influences (A-WMS, A-WMC and A*g*), the correlation is represented by *r*

Subjects

97 monozygotic twin pairs

80 dizygotic twin pairs

53 siblings

twin pairs age 12

siblings age 8-14

Results

The phenotypic correlations among the WMS and WMC indices were around -0.30. Heritabilities for all variables ranged from 43% to 56%.

A model with two genetic factors, representing WMS and WMC, which were correlated (-0.54) fitted the data best, indicating that WMS and WMC are genetically not unitary.

When general IQ was simultaneously analysed with the data the correlation between the genetic factors for WMS and WMC decreased to -0.25, but was still significant.

The model is presented in Figure 1.

Conclusion

There is a significant genetic correlation between WMS and WMC. This means that WMS and WMC are partly mediated by the same genes and partly by different genes About 50% of this genetic correlation is explained by general IQ.

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