Heritability of working memory in preschoolers

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Aim: To study the influence of genes in variation in performance parameters in a working memory task. Heritability (h^2) was assessed by testing a large group of monozygotic (MZ; 100% genetically identical) and dizygotic (DZ; 50% genetically identical) twins. The *difference* in concordance between the groups indexes the influence of genes in individual differences.

Method: A computerized child friendly version of the Sternberg memory search task, with two memory loads.

Task: To detect the presence of one animal (Load 1) or two animals (Load 2) in a display of 4 items (Figure 1).

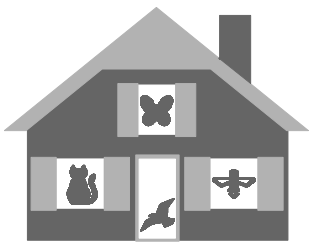

Figure 1. Subjects see 4 animals, and they have to press a key when they see a mouse (Load1), or –in another block of trials – a bird and a cat (Load2)

Subjects: 231 twin pairs (50 MZ Males, 35 DZ Males, 71 MZ Females, 36 DZ Females, 39 Dizygotic Opposite Sex pairs). All twins were 5.8 years old.

Results:

a) A high memory load slows down performance (Figure 2).

b) Memory search rate (RT[Load2] *minus* RT[Load1]) is heritable (h^2 = .29), as are speed (h^2 = .54) and accuracy (h^2 = .35); see Table 1.

c) Girls were somewhat faster than boys, but there were no sex differences in variance components.

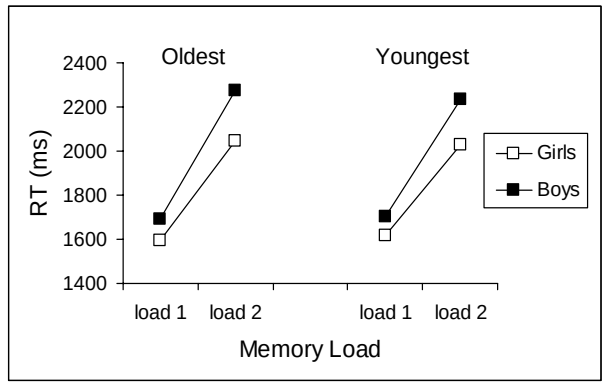

Figure 2. Mean RTs as a function of Memory Load, sex, and birth order

Zygosity (N)	RT	Accuracy	Search Rate
MZM (50)	0.64	0.54	0.40
DZM (35)	0.02	0.44	0.15
MZF (71)	0.52	0.26	0.33
DZF (36)	0.20	0.11	-0.15
DOS (39)	0.39	0.15	0.01

Table 1. Twin correlations for the performance parameters. Heritability can be derived from the twin correlations by doubling the difference between r[MZ] and r[DZ].

Conclusion: The heritability of Memory Search Rate makes this variable a potentially good genetic predictor of developmental frontal abnormalities, such as ADHD.

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