Teacher-rated educational achievement in primary school

GxE interaction or rater bias?

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INTRODUCTION

Teacher ratings of educational achievement (EA) are important as they provide an addition to results obtained with standardized achievement tests. The opinion of a teacher is taken into account in the recommendation for level of secondary education.

Correlations for EA between twins rated by the same teacher tend to be higher than between twins rated by different teachers. Are the higher twin correlations due to rater bias or due to the presence of gene-environment (GxE) interaction?

- **Rater bias**

The perception of the teacher may bias ratings[1].

- **GxE interaction**

The influence of genes depends on the environment[2].

Exposure to teachers can affect the heritability of EA in primary school. For example, teacher quality has been shown to moderate genetic effects on early reading[3]. We assess the etiology of teacher-rated EA in 7, 9 and 12-yr old twins in primary school.

METHODS

The Netherlands Twin Register (NTR) has collected over 30.000 surveys of primary school teachers of 7, 9 and 12 yr-old twins and their siblings. Teachers graded the proficiency of their students in the school subjects arithmetic, language and reading on a five-point scale from 1 (insufficient) to 5 (very) good)

EA was coded in 3 categories and treated as a trait with an underlying continuous liability. The contribution of genetic (A), common environmental (C), and unique environmental (E) influences on the liability of EA was estimated in OpenMx[4].

RESULTS

7-yr olds: 4839 complete and 972 incomplete twin pairs
9-yr olds: 4340 complete and 1121 incomplete twin pairs
12-yr olds: 3189 complete and 928 incomplete twin pairs

	Insufficient	Sufficient	Good
7 yr-olds			
Arithmetic	10.1	60.7	29.2
Language	10.5	65.4	24.1
Reading	19.0	54.2	26.8
9 yr-olds			
Arithmetic	13.0	53.7	33.3
Language	8.2	64.8	27.0
Reading	15.0	52.4	32.6
12 yr-olds			
Arithmetic	12.7	50.3	37.0
Language	8.8	59.7	31.5
Reading	10.4	53.8	35.8

Table 1 Prevalence of teacher ratings (insufficient, sufficient, and good) for the school subjects arithmetic, language, and reading

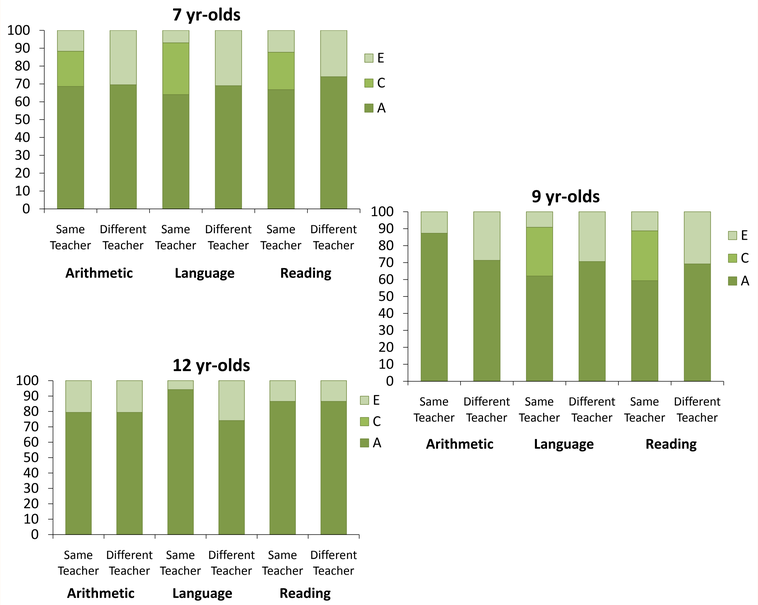

Figure 1 Proportions of variance explained by additive genetic (A), shared environmental (C), and unique environmental factors (E) of the most parsimonious and best-fitting models for the three age groups

CONCLUSIONS

- No qualitative or quantitative sex differences.
- Heritability increased with age.
- Influence of common environment decreased with age for twins sharing a teacher.
- No influence of common environment on twins in different classrooms.
- No rater bias in teachers who rated both twins of a pair.

- For most school subjects, heritability is the same for twins regardless whether they were rated by the same or different teachers.
- For arithmetic in 9 yr-olds and language in 12 yr-olds, there is evidence for GxE interaction.
- Higher correlations between twins rated by the same teacher at 7 and 9 are caused by their shared classroom environment.

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