

Intergenerational transmission of education and ADHD

Effects of parental genotypes

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Background

It is challenging to study whether children resemble their parents due to nature, nurture, or a mixture of both.

Method

Parents transmit 50% of their alleles to their offspring. The combined trait-specific effect of these alleles are summarized in a polygenic score (PGS). Likewise, we can calculate a PGS for alleles that were not transmitted. They can only affect offspring through the environment, via genetically influenced behaviours in the parents, called *genetic nurturing*. For genotyped mother-father-offspring trios (1,120-2,518 per analysis) we calculated transmitted and non-transmitted PGSs for adult educational attainment (EA) and childhood ADHD, and tested if these predicted and school success and ADHD in offspring.

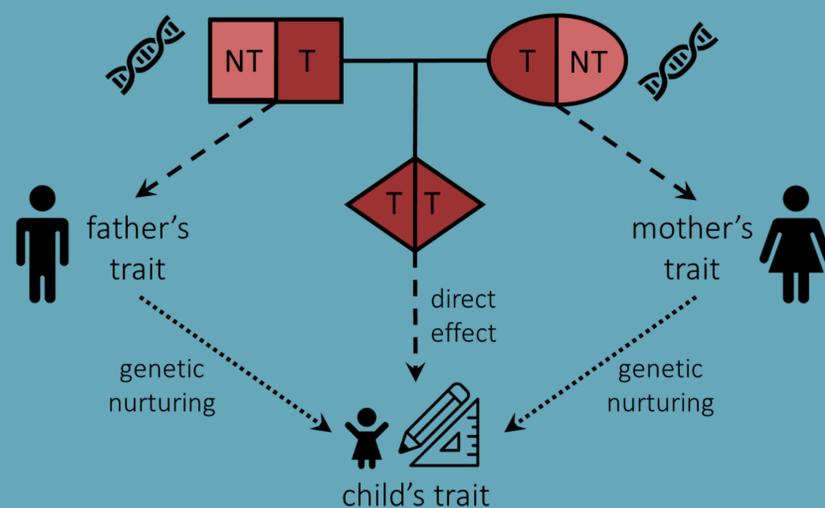
Results

In adults, both transmitted ($R^2 = 7.6\%$) and non-transmitted ($R^2 = 1.7\%$) EA-PGSs predicted offspring EA, evidencing genetic nurturing. In 12-year olds, academic achievement was predicted only by transmitted EA-PGSs ($R^2 = 5.7\%$), but we did not find genetic nurturing ($R^2 \sim 0.1\%$). The ADHD-PGSs did not predict academic achievement ($R^2 \sim 0.6\%$). ADHD symptoms in children were predicted by transmitted EA-PGSs and ADHD-PGSs ($R^2 = 1-2\%$).

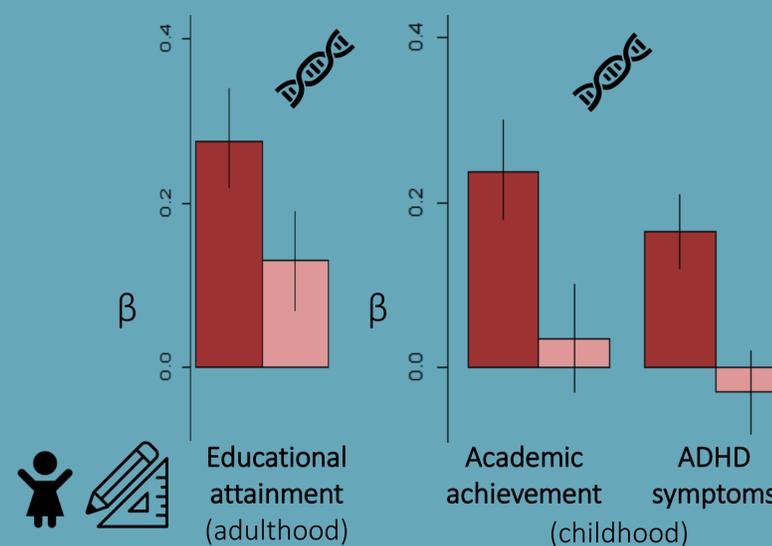
Conclusion

Previously reported associations between parent characteristics and offspring outcomes seem to be mainly a marker of genetic effects shared by parents and children. S

Genes of parents shape children's environment, impacting school success in adulthood, but not yet in childhood.



T = transmitted
NT = not transmitted



Effects (with 95% CI) of:

- EA-PGSs on educational attainment in adults
- EA-PGSs on academic achievement in children
- ADHD-PGSs on ADHD symptoms in children



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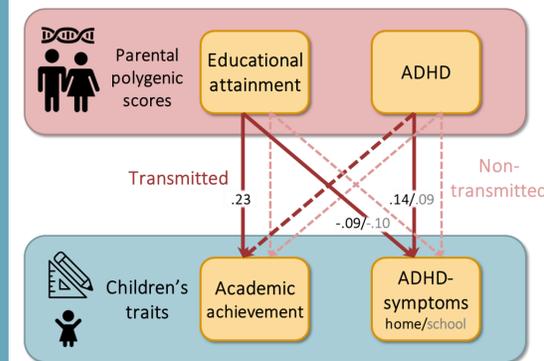
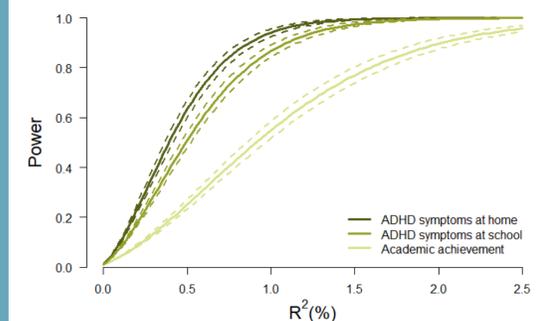


Table 1 The estimated effects (with 95% CI) of the transmitted (T) and non-transmitted (NT) polygenic scores for educational attainment (EA) and ADHD on offspring's academic achievement, ADHD symptoms at home and ADHD symptoms at school

	Model 1			Model 2		
	Beta	R ² (%)	p	Beta	R ² (%)	p
Academic achievement (N = 1,120)						
EA _T	.238 (.18;.30)	5.7	7x10 ⁻¹⁵			
EA _{NT}	.034 (-.03;.10)	0.1	.284			
ADHD _T				-.077 (-.14;-.01)	0.6	.022
ADHD _{NT}				-.017 (-.08;.05)	0.0	.610
ADHD symptoms at home (N = 2,518)						
EA _T	-.125 (-.17;-.08)	1.6	4x10 ⁻⁶			
EA _{NT}	-.010 (-.05;.03)	0.0	.669			
ADHD _T				.165 (.12;.21)	2.7	1x10 ⁻¹⁵
ADHD _{NT}				-.030 (-.08;.02)	0.1	.190
ADHD symptoms at school (N = 1,969)						
EA _T	-.131 (-.18;-.08)	1.7	1x10 ⁻⁷			
EA _{NT}	-.012 (-.06;.04)	0.0	.637			
ADHD _T				.126 (.08;.18)	1.6	3x10 ⁻⁷
ADHD _{NT}				.029 (-.02;.08)	0.1	.243



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