

NAME OF PRESENTING AUTHOR: Perline Demange

EMAIL ADDRESS OF PRESENTING AUTHOR: p.a.d.demange@vu.nl

## Comparing designs for estimating parental indirect genetic effects

Perline A Demange<sup>1</sup>, Michel Nivard<sup>1</sup>, Espen M Eilertsen<sup>2</sup>, Rosa Cheesman<sup>2</sup>

<sup>1</sup>Vrije Universiteit Amsterdam,

<sup>2</sup>PROMENTA Research Center, Department of Psychology, University of Oslo

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### ABSTRACT:

There has been a recent interest in separating direct genetic effects (influence of the individual's genome on their own outcomes) from parental indirect genetic effects (influence of parental genetics on individuals' outcomes). Three key designs have been developed to estimate direct and indirect genetic effects using polygenic scores, which respectively use adoption, sibling, and parent-offspring trio data. To complement our empirical use of three designs to estimate indirect genetic effects of non-cognitive skills (Demange et al. 2020), we use data simulation to compare these designs in presence of different biases and indirect effect components. We simulate data with or without presence of parental indirect effects, indirect effects of siblings, pre- and postnatal indirect effects, and assortative mating. We show that designs are not equal in their estimation of indirect genetic effects. Adoption data are necessary to separate pre- and postnatal indirect effects. Assortative mating biases sibling and trio-based estimates with or without a parental indirect genetic effect, but only affects the adoption design in the presence of parental indirect effects. Designs using siblings are very sensitive to the choice of estimates to represent the population genetic effect, and to the presence of sibling effects. Our results call for a specific attention to the design used when interpreting estimates of indirect genetic effects.

Demange, P.A., et al. (2020). *Parental influences on offspring education: indirect genetic effects of non-cognitive skills*. BioRxiv. 1–39. <https://doi.org/10.1101/2020.09.15.296236>

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