

NAME OF PRESENTING AUTHOR: Kirsty Wilding

EMAIL ADDRESS OF PRESENTING AUTHOR: kirsty.wilding@york.ac.uk

Genomic prediction of education outcomes: A systematic review

Kirsty Wilding¹, Allie Nancarrow¹, Sophie von Stumm¹

¹Department of Education, University of York, York, UK

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ABSTRACT:

Genome-wide polygenic scores (GPS) aggregate DNA variants identified in genome-wide association (GWA) studies to index an individual's genetic propensity for a trait. Here, we present a systematic review of studies that tested associations between GPS, derived from the summary statistics of the largest GWA study for education attainment (Lee et al., 2018, *Nat Genet*) and phenotypic measures of education outcomes (preregistered: OSF <https://osf.io/xcm43/>; PROPSERO https://www.crd.york.ac.uk/prospero/display_record.php?ID=CRD42021237620). To address (a) the strength of association between GPS and education outcomes across studies and (b) the role of moderators on the association (e.g., type of education outcome, participant characteristics, and GPS computation methods), Google Scholar and Web of Science searched for papers that cited Lee et al.'s GWA. 1100 hits were returned; after removing duplicates and excluding ineligible papers, 36 studies met the eligibility criteria, reporting an association between GPS and a phenotypic measure of education in independent populations. GPS predicted education with small to medium effect sizes (R^2 from .04 to .16) for a range of outcomes, from school performance to highest education qualification level obtained. The age of phenotypic education assessment ranged from 7 to 50, and differences in strength of association varied minimally by age at or type of phenotypic assessment, or by population origin, or GPS estimation methods. Of these studies, 93% tested exclusively samples of European Ancestry. Our review summarizes that individuals with higher genetic propensities for education attainment perform better throughout compulsory schooling and are more likely to continue onto further education (e.g., university).

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