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The influence of specialist genes in mathematical, language and reading ability

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ABSTRACT: Although a general factor of cognitive ability (g) is well-established within the literature, both phenotypically and genetically, more than half of the variance of specific cognitive abilities is independent of g. We hypothesized that we could identify specific genetic effects on mathematical, language and reading ability independent of g. We used a sample of 5,434 12-year-old twin pairs (1,945 MZ, 1760 same-sex DZ and 1729 opposite-sex DZ) from the Twins Early Development Study. The twins were assessed on verbal and nonverbal abilities (g) and mathematical, reading and language abilities using a battery of 14 tests. Using univariate twin analyses, we explored the genetic and environmental components of the three specific cognitive abilities phenotypically corrected for g. These results were complemented by bivariate Cholesky decomposition analyses between each of the specific cognitive abilities and g to estimate specific genetic effects independent of g. Finally, we conducted comparable analyses using genome-wide polygenetic scores (GPS), beginning with the most recent IQ GPS (2018 'IQ3'). First, we correlated each GPS with each of the three g-corrected specific cognitive abilities. We then conducted 'GPS-by-subtraction' analyses that corrected IQ3 for g and correlated the corrected GPS with each specific cognitive ability.

Savage JE, Jansen PR, Stringer S, Watanabe K, Bryois J, de Leeuw CA et al. Genome-wide association meta-analysis in 269,867 individuals identifies new genetic and functional links to intelligence. *Nature genetics* 2018; 50(7): 912–919.

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