Scientists predict reading ability from DNA alone

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Researchers from King's College London have used a genetic scoring technique to predict reading performance throughout school years from DNA alone.

The study, published today in *Scientific Studies of Reading*, shows that a genetic score comprising around 20,000 of DNA variants explains five per cent of the differences between children's reading performance. Students with the highest and lowest genetic scores differed by a whole two years in their reading performance.

These findings highlight the potential of using genetic scores to predict strengths and weaknesses in children's learning abilities. According to the study authors, these scores could one day be used to identify and tackle reading difficulties early, rather than waiting until children develop these problems at school.

The researchers calculated genetic scores (also called polygenic scores*) for educational achievement in 5,825 individuals from the Twins Early Development Study (TEDS) based on genetic variants identified to be important for educational attainment. They then mapped these scores against reading ability between the ages of seven and 14.

Genetic scores were found to explain up to five per cent of the differences between children in their reading ability. This association remained significant even after accounting for cognitive ability and family socio-economic status.

The study authors note that although five per cent may seem a relatively small amount, this is substantial compared to other results related to reading. For example, gender differences have been found to explain less than one per cent of the differences between children in reading ability.

Saskia Selzam, first author of the study from the Institute of Psychiatry, Psychology & Neuroscience (IoPPN) at King's College London, said: 'The value of polygenic scores is that they make it possible to predict genetic risk and resilience at the level of the individual. This is different to twin studies, which tell us about the overall genetic influence within a large population of people.'

'We think this study provides an important starting point for exploring genetic differences in reading ability, using polygenic scoring. For instance, these scores could enable research on resilience to developing reading difficulties and how children respond individually to different interventions.'

Professor Robert Plomin, senior author from the IoPPN at King's College London, said: 'We hope these findings will contribute to better policy decisions that recognise and respect genetically driven differences between children in their reading ability.'

*Calculating an individual's polygenic score requires information from a genome-wide association study (GWAS) that finds specific genetic variants linked to particular traits, in this

case educational attainment. Some of these genetic variants, known as single nucleotide polymorphisms (SNPs), are more strongly associated with the trait, and some are less strongly associated. In a polygenic score, the effects of these SNPs are weighed by the strength of association and then summed to a score, so that people with many SNPs related to academic achievement will have a higher polygenic score and higher academic achievement, whereas people with fewer associated SNPs will have a lower score and lower levels of academic achievement.

More information: Saskia Selzam et al, Genome-Wide Polygenic Scores Predict Reading Performance Throughout the School Years, *Scientific Studies of Reading* (2017). DOI: 10.1080/10888438.2017.1299152

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