

# Differences in educational achievement owe more to genetics than environment

11 December 2013

The degree to which students' exam scores differ owes more to their genes than to their teachers, schools or family environments, according to new research from King's College London published today in *PLOS ONE*.

The study, which took place in the UK, looked at students' scores for their GCSE's (General Certificate of Secondary Education), a UK-wide examination at the end of compulsory education at 16 years old.

The authors explain that the findings do not imply that educational achievement is genetically pre-determined, or that environmental interventions are not important, but rather that recognising the importance of children's natural predispositions may help improve learning.

Researchers compared the GCSE exam scores of over 11,000 identical and non-identical 16 year old twins from the Medical Research Council (MRC) funded Twins Early Development Study (TEDS). Identical twins share 100% of their genes, whereas fraternal (non-identical) twins share on average only half of the genes that vary between people. Therefore, if [identical twins](#)' exam scores are more alike than those of non-identical twins, the difference in exam scores between the two sets of twins is due to genetics, rather than environment.

The researchers found that for compulsory core subjects (English, Mathematics and Science), genetic differences between students explain on average 58% of the differences between GCSE scores. In contrast, 29% of the differences in core subject grades are due to shared environment - such as schools, neighbourhoods or families which twins share. The remaining differences in GCSE scores were explained by non-shared environment, unique to each individual.

Overall, science grades (such as Biology, Chemistry, Physics) were found to be more

heritable than Humanities grades (such as Media Studies, Art, Music) – 58% vs 42%, respectively.

Nicholas Shakeshaft, PhD student at the Institute of Psychiatry at King's College London and lead author of the paper says: "Children differ in how easily they learn at school. Our research shows that differences in students' educational achievement owe more to nature than nurture. Since we are studying whole populations, this does not mean that genetics explains 60% of an individual's performance, but rather that genetics explains 60% of the differences between individuals, in the population as it exists at the moment. This means that heritability is not fixed – if environmental influences change, then the influence of genetics on educational achievement may change too."

Professor Robert Plomin, senior author at the Institute of Psychiatry at King's College London and Director of the TEDS study, says: "Whilst these findings have no necessary or specific implications for educational policies, it's important to recognise the major role that genetics plays in children's educational achievement. It means that educational systems which are sensitive to children's individual abilities and needs, which are derived in part from their genetic predispositions, might improve [educational achievement](#)."

Professor Michael O'Donovan, from the Neurosciences and Mental Health board at the Medical Research Council (MRC), said "The findings from this substantial cohort add to a convincing body of evidence that genes influence characteristics that are ultimately reflected in educational performance. But it is equally important to stress that the researchers found that environments for students are also important and that the study does not imply that improvements in education will not have important benefits. For individuals living in the best and worst environments, this exposure is likely to make more

of a difference to their educational prospects than their genes. Further research is needed to assess the implications of the findings for educational strategies. The MRC-funded TEDS cohort highlights the importance of long-term investment and how this can help improve our understanding of how genes and environment interact over the course of our lives."

**More information:** Shakeshaft, N.G et al. 'Strong genetic influence on a UK nationwide test of educational achievement at the end of compulsory education at age 16' *PLOS ONE*.

[dx.plos.org/10.1371/journal.pone.0080341](https://doi.org/10.1371/journal.pone.0080341)

Provided by King's College London

APA citation: Differences in educational achievement owe more to genetics than environment (2013, December 11) retrieved 15 September 2022 from <https://medicalxpress.com/news/2013-12-differences-genetics-environment.html>

*This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.*