

A population-wide gene-environment interaction study on how genes, schools, and residential areas shape achievement

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A new study reveals that if you have a child with a high genetic risk of learning difficulties, you should send them to a school that scores high

on national tests.

"Schools where average performance is lower on the same tests, on the other hand, may have a negative effect on the child's performance," says postdoctoral fellow Rosa Cheesman at the University of Oslo (UiO) Department of Psychology and the PROMENTA Research Centre.

"School quality was twice as important for a child with less genetic predisposition to learning than a child with an average background. The greater the genetic predisposition of the child, the less it mattered which school they attended," she says.

Cheesman has led a major study, published in *npj Science of Learning*, which linked genes—which scientists know have an impact on school performance—with the results of national tests of 23,000 Norwegian [children](#) and adolescents between the ages of 10 and 14 in schools throughout Norway.

The study also shows that the school you attend is less important for your academic development if you are born with a greater predisposition for attaining education. It questions the benefits of sending resourceful children to private schools in the hope that they will become even better.

"Social development is another issue and equally important. The results might be different for mental health outcomes than for [academic development](#), but that is something we don't know because we haven't investigated it in this study," she says.

A genetic lottery

"There are substantial [genetic differences](#) between children in how likely they are to do well in school," according to Cheesman.

She calls it a genetic lottery, which is about how many genes have an impact on school performance that each of us inherits from our parents.

In the study, she reveals that children with the lowest genetic starting point in terms of school performance performed the most differently from school to school. The finding suggests major differences in quality between state schools in Norway.

Children who inherited fewer education-linked genes performed much better in schools that scored higher on national tests, while children with similar genetic starting points performed significantly weaker in schools that performed poorly on national tests.

"Going to schools that do well on national tests is therefore most important for children with higher genetic risk of developing learning difficulties," Cheesman says. "In these schools, the children were able to perform at a similar level to the other students, while those attending schools with poorer results fared worse than the other students in their school. Schools that achieve good national test results boost the performance of all children, especially those children with a disadvantaged genetic starting point."

"Unfortunately, we cannot yet explain why this is so. Perhaps the good schools have better academic opportunities and more teachers per pupil. We want to take a closer look at this in further studies," says Cheesman.

In Norway, state comprehensive schools have been called one of the pillars of the welfare state and democracy. The education system is based on the principle of equality and that all children should have equal opportunities to attend a good school. School should be free, inclusive and provide the same education to children of all walks of life, regardless of who they are, where they live or what school they attend, but according to the postdoctoral fellow, there are differences in quality

between the schools.

"Some are better than others, and these are significantly better for children with a more disadvantaged genetic starting point when it comes to schooling," she says.

Same pattern in children with ADHD

In a similar study published by Cheesman in the [*Journal of Child Psychology and Psychiatry*](#) last summer, she shows that the same principle applies to children with elevated symptoms of ADHD. These children also performed much better in schools that scored high on national tests compared to children with medium or low ADHD symptoms.

"The results correspond with and strengthen each other's findings. Good schools raise the performance level of all children, and compensate for those who have a genetic risk of learning difficulties. Norwegian [school](#) authorities may want to address this disparity between schools and work to ensure that all schools can give all children a good start in life," says the researcher.

More information: Rosa Cheesman et al, A population-wide gene-environment interaction study on how genes, schools, and residential areas shape achievement, *npj Science of Learning* (2022). [DOI: 10.1038/s41539-022-00145-8](https://doi.org/10.1038/s41539-022-00145-8)

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