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DNA variants that are bad for health may also make you stupid

Higher IQ seems more related to less bad mutations for health in general than to more 'good' mutations. Still an open question: we would expect that gene variants that boost IQ should spread by natural selection and become more common.



Producing high-flyers
Sasha Gulish/Image source/plainpicture

By Michael Le Page

WHAT makes some people smarter than others? A genetic analysis hints that brainier people have fewer DNA mutations that impair intelligence, rather than having more genetic variants that make them smarter.

"This is one of the most exciting studies on the genetics of intelligence I've seen for a while," says Steve Stewart-Williams of the University of Nottingham Malaysia Campus, who was not involved in the work.

There is no doubt that intelligence depends partly on our childhood environment. Well-nourished children brought up in safe, unpolluted and stimulating environments on average score better in IQ tests than deprived children, for instance.

But our genes also play a role. Studies of twins suggest that 50 to 80 per cent of the variation in general intelligence could be down to genes. However, finding the gene variants responsible has proven tricky.

So far, studies of the DNA of hundreds of thousands of unrelated people suggest that only around 30 per cent of the variation in intelligence is inherited. This big discrepancy between twin studies and genome studies is known as the mystery of the missing heritability.

Now a team including David Hill of the University of Edinburgh, UK, has analysed data from 20,000 people taking part in a study looking at the health and genomes of families. They used a statistical method to quantify the effect on intelligence of rare genetic variants shared by most members of a family.

Because these variants are so rare in the general population, other studies have missed their effect. The team found that such rare genetic variants explain the discrepancy between twin studies and previous studies of unrelated people (*bioRxiv*, doi.org/b8sw).

The findings help us understand how our genomes determine our intelligence. In theory, smart people may be that way thanks to beneficial gene variants that boost IQ. But we would expect these to spread by natural selection and become more common.

"This strengthens the moral case for using genome editing. It would be killing two birds with one stone"

Hill's findings suggest an important role for very rare gene variants. These are more likely to be slightly harmful mutations that also impair health. Evolution isn't very good at getting rid of such mutations, so they build up, creating a "mutational load" that varies from person to person. The findings suggest people's intelligence depends on their mutational load, says Rosalind Arden of the London School of Economics, who studies intelligence and genetics.

This may mean that using gene editing to fix these mutations could boost health and intelligence at the same time. "I think this strengthens the moral case for pursuing genome-editing technologies," says ethicist Christopher Gyngell of the University of Oxford. "It would be killing two birds with one stone."

We are still some way from using techniques like CRISPR to edit the genomes of embryos, but some believe it's inevitable we will one day take this step.

If Hill's findings hold up, CRISPR may be used to raise the lower levels of intelligence in societies. "We're not talking about making people way, way smarter than the smartest people today – it's just bringing the average up," says Gyngell.

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