

Genes are not destiny: Environment and education still matter when it comes to intelligence

August 22 2016, by Kate Lynch



Credit: Andrea Piacquadio from Pexels

Recent research has suggested that [academic performance](#), [reading ability](#) and [IQ](#) have a genetic basis. This reinforces the popular notion

that intelligence and related cognitive capacities are somehow "in our genes".

This has led some people to [reject the importance of educational interventions](#) on the grounds that spending money on nurture isn't going to significantly affect the abilities nature has given us.

However, [genes](#) are not destiny. There is good evidence to show how effective [environmental interventions](#) can be for educational outcomes.

Genetics and intelligence

The way in which genes actually contribute to intelligent individuals is often overlooked.

Genes can act in a variety of ways to produce their effects. Some genes may alter brain chemistry so that a person is better able to learn. Other genes could cause behavioural [differences](#), causing some people to self-select more stimulating environments.

And it is likely that the genetics of [intelligence](#) works at least in part by a genetic influence on the environment. This means that a genetic basis for intelligence is as much about one's *nurture* as about one's *nature*.

Intelligence is the most widely studied trait in behavioural genetics. It is correlated with a suite of other characteristics ranging from [income](#), to [lifespan](#), to [happiness](#).

Researchers have found a significant [genetic contribution](#) to intelligence differences using the method of heritability estimates.

These studies compare populations of identical (monozygotic) and fraternal (dizygotic) twins. Identical twins are genetically identical –

they're nature's clones. Fraternal twins, like siblings, share an average of 50% of their genes.

If there is a heritable basis for intelligence, then [identical twins](#) should be more similar than fraternal twin pairs. This method gives researchers an idea of how heritable intelligence is, but tells us nothing about the actual genes involved.

Since the advent of gene sequencing, new techniques have allowed scientists to identify specific candidate [genes](#) that are correlated with intellectual outcomes.

More recently, researchers have investigated the relative effects of many specific genes working together. Earlier this year researchers at Kings College London used this method to explain a substantial proportion of exam score differences.

The standard interpretation of these kinds of results is that intelligence genes work through innate biological processes, causing individual differences. But this may not always be the case.

A thought experiment

Imagine two groups of children who have different versions of a candidate intelligence gene: *Gene X*.

Children with one version of this gene have an insatiable love for the musty smell of [books](#). The other group of children feel the opposite way and detest the smell.

You can imagine the first group actively seeking out and surrounding themselves with books, while the second group actively avoids them. As a result, the first group of children will likely attain better reading scores

than the second group, simply because of their increased exposure to books.

A genetic analysis of these results could easily lead researchers to declare that *Gene X* is the gene for reading ability. But it makes more sense to think of *Gene X* as a gene for smell preferences.

These smell preferences then cause environmental differences between the two groups, and it is the *environment* that plays the final part in generating differences in reading scores.

Nature via nurture

Genes can cause differences in brain development. But they can also predispose individuals to experience different kinds of environments. In behaviour genetics this is termed "gene-environment correlation".

There are many ways in which people behave that could influence their environment. Personality differences will influence whether or not a child has the confidence to attend an extracurricular class. Differences in temperament will affect the kinds of resources children will seek out for themselves.

More social children might spend less time constructing an academically rich environment than those spending more time alone. If personality differences of this kind are correlated with [academic performance](#), then it is likely that associated genetic effects are thought of as due to "intelligence genes".

A danger with the genetic research of human abilities is the way in which findings are understood. If results are interpreted prematurely or incorrectly, then ineffective and potentially disastrous policy decisions could follow.

This was illustrated in the 1960s when prominent geneticist Arthur Jensen [criticised](#) the Head Start education program, which offers compensatory education to children from disadvantaged backgrounds.

One reason for its instigation was to bridge the divide in school performance between black and white American students. Jensen claimed that interventions of this type would be of no use because of the [genetic basis](#) of intelligence.

This sparked debate about the causes of intelligence differences between racial groups, fuelling racism at a cultural and political level. Genetic accounts of intelligence differences between racial groups have since been [debunked](#). We now know that these differences are due to associated environmental differences, including the prejudices some groups face within society today.

Unfortunately, racism still persists, as does prejudice in many other forms. Because of this, scientists and media professionals should be extra careful when they present findings about genetic causes.

There is more work to be done to uncover the environmental factors associated with genes. But we should pay close attention, as this information can be used to create a fairer education system for all.

This article was originally published on [The Conversation](#). Read the [original article](#).

Source: The Conversation

Citation: Genes are not destiny: Environment and education still matter when it comes to intelligence (2016, August 22) retrieved 10 April 2024 from <https://medicalxpress.com/news/2016-08-genes-destiny-environment-intelligence.html>

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