Explaining IQ: Nature, Nurture, or Both?

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You may have noticed that people who are closely related are often of similar intelligence. Does this mean that intelligence is inherited and purely down to a person's genes?

The genetic basis for intelligence

When researchers talk about heritability, they are referring to the degree to which a particular characteristic's variation is explainable by variation in genes. Early experiments to determine whether intelligence is passed down genetically relied on studies done with identical twins who were raised in separate homes.

Subsequent experiments designed to identify some genetic basis for intelligence have shown that the heritability coefficient for intelligence is between 0.4 and 0.8.

The heritability coefficient is calculated as a relationship between the variance in genotype (the genes) and the phenotype (the manifest expression of those genes) and can range from 0.00 to 1.00, where a higher number shows that a trait's variation is highly determined by genes and less by the environment.

As geneticists gain a richer understanding of the way that our DNA is translated into our physiology and behavior (our phenotype), they can appreciate that a gene is less like a computer program that is always obeyed to the letter, and more like a recipe that can be

adjusted depending on the ingredients at hand.

Thus, even though an individual may be born with a genetic predisposition for high intelligence, the expression of that intelligence also depends on the input of the environment. Gene expression, i.e. how genes can be “switched on or off”, is a factor that tells us how the instructions in the genetic code are actually carried out. This is why the heritability coefficient is a range and not a fixed number.

Importantly, a heritability of for example 80% (coefficient of 0.8) is a measure of *population* variance, and is a statement about variance that isn’t applicable to individuals. So, it’s not the same as claiming that 80% of an individual’s IQ score comes from genes with the rest down to the environment.

When talking about the genetic contribution of intelligence, it’s important to remember that there is nothing deterministic or mechanical about how DNA emerges as complex and adaptive behavior in the real world. Nevertheless, countless studies from several disciplines have confirmed that there is some significant portion of intelligence that can be explained by heritable factors.

So, is intelligence due to our “nature”? The answer is yes.

But the environment plays a role too

Of course, those who are interested in studying the human experience from a behavioral, social or cultural perspective understand that the genetic contribution is not all there is. Research in various directions has convincingly shown that intelligence can be negatively influenced by many elements:

- Malnutrition at any stage of life but particularly in early development can lead to lower IQ
- Exposure to toxins, trauma or illness during critical developmental periods can interfere with intellectual development
- Stress and trauma or insufficient early education have also been shown to hinder cognitive performance
- Other influences have also been explored: low socio-economic status, lack of breastfeeding, and even a too-early school starting age.

Likewise, several factors have been shown to increase intelligence, most notably all kinds of education, training or developmental support. Much like any variable human skill, the intellect appears to be something that can be exercised and developed: learning languages or an instrument, puzzles or strategy games and regular reading have all been shown to boost IQ.

So, is intelligence due to our “nurture”? The answer is also yes.

From a geneticist’s perspective intelligence can be understood as *multifactorial*, meaning that the final outcome is a complex interplay between genetic variables. From a behaviorist’s perspective, intelligence is flexible and adaptive depending on the ever-changing environment.

Understanding cognitive ability (nature) is a little like understanding the biomechanics of the hand – it doesn’t tell you much about the millions of ways an individual might choose to use those hands and to what end (nurture).