

Study relies on twins and their parents to understand height-IQ connection

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The fact that taller people also tend to be slightly smarter is due in roughly equal parts to two phenomena—the same genes affect both traits and taller people are more likely than average to mate with smarter people and vice versa—according to a study led by the University of Colorado Boulder.

The study did not find that environmental factors contributed to the connection between being taller and being smarter, both traits that people tend to find attractive.

The modest [correlation](#) between height and IQ has been documented in multiple studies stretching back to the 1970s. But the reasons for the relationship between the two traits has not been well understood.

The technique developed by the researchers at CU-Boulder to tease out those reasons may open the door for scientists to better understand why other sexually selected traits—characteristics that individuals find desirable in mates—tend to be linked. People who are attractive because of one trait tend to have other attractive traits as well.

"Not just in humans but also in animals, you see that traits that are sexually attractive tend to be correlated," said Matthew Keller, assistant professor of psychology and [neuroscience](#) at CU-Boulder and lead author of the study appearing in the journal *PLOS Genetics*. "So if you have animals that are high on one sexually selected trait they are often high on other ones, too. And the question has always been, 'What's the

cause of that?' And it has always been very difficult to tease apart the two potential genetic reasons that those could be related."

The key to the technique developed by Keller, also a fellow at CU-Boulder's Institute for Behavioral Genetics, and his colleagues is using data collected about fraternal twins, [identical twins](#) and, importantly, their parents.

It has been common in the past to use information about identical twins and fraternal twins to determine whether a particular trait is inherited, caused by environmental factors or affected by some combination of both. This kind of twin study assumes that each twin grows up with the same environmental factors as his or her sibling.

If a trait that's present in one twin is just as often present in the other—regardless of whether the twins are fraternal or identical—then the trait is likely caused by environmental conditions. On the other hand, if a trait is generally found in both identical twins but only in one of a set of fraternal twins, it's likely that the trait is inherited, since identical twins have the same genetic material but fraternal twins do not.

Similar studies also can be done for linked traits, such as height and IQ. But while scientists could determine that a pair of traits is passed down genetically, they could not further resolve whether inherited traits were linked due to the same genes influencing both traits, called "pleiotropy," or because people who have those traits are more likely to mate with each other, known as "assortative mating."

The new CU-Boulder study solves this problem by including the parents of twins in its analysis. While this has occasionally been done in the past for single traits, information on parents has not previously been used to shed light on why two traits are genetically correlated. In part, that's because existing twin registries, where information for heritability

studies is drawn, don't often contain information on the parents.

Additionally, creating the computer programs that are necessary to crunch the data for multiple traits from twins and their parents in order to understand environmental effects and both types of genetic effects is difficult.

"These designs have never taken off because they're very difficult to code," Keller said. "It's a challenge. They're very complicated models."

For this study, the research team used data collected from 7,905 individuals—including twins and their parents—by the Colorado Twin Registry at CU-Boulder and the Queensland Twin Registry at the Queensland Institute of Medical Research in Australia.

Keller and his colleagues found that for the twins in their study, the correlation between height and IQ was not impacted by environmental conditions. Though Keller cautions that in societies where there is more nutritional variation among families, [environmental factors](#) could come into play.

The research team found that pleiotropy and assortative mating were about equally responsible for the genetic connection between height and IQ.

"It does look like there are genes that influence both height and IQ," Keller said. "At the same time, it also looks like people who are taller are slightly more likely to choose mates who are smarter and vice versa. Such mate choice causes 'IQ genes' and 'tall [genes](#)' to become statistically associated with one another. There are a lot of exceptions, but there's a statistical relationship that does happen more than would be expected by chance."

Now that the CU-Boulder team has built a computer model that is capable of disentangling the causes for linked traits, Keller said he hopes twin registries will begin to collect more data from parents and that other people in the field take advantage of the model.

Provided by University of Colorado at Boulder

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