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May 30, 2013 by Paul Voosen

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There Is No Gene for Finishing College

A couple of years ago, Daniel J. Benjamin, a behavioral economist and associate professor at Cornell University, noticed a disturbing trend in genoeconomics, the nascent discipline that seeks to tie human genetics to traits relevant to the social sciences, like risk aversion, happiness, or even self-employment.

Most of the work was statistically weak, he found, conducted on small samples of a few hundred people. Benjamin calculated that scientists could legitimately conclude almost nothing from those studies. It was a black mark on a charged discipline, one that invariably brings up the hoary nature-nurture debate and past associations with eugenics.

Benjamin wanted to do more, however, than just criticize the field—though he did that well, especially in a joint review paper [published](http://www.annualreviews.org/doi/abs/10.1146/annurev-economics-080511-110939) (<http://www.annualreviews.org/doi/abs/10.1146/annurev-economics-080511-110939>) last year. That's why he and several other researchers began, two years ago, the [Social Science Genetic Association Consortium](http://www.ssgac.org/Home.php), (<http://www.ssgac.org/Home.php>) a group dedicated to pooling data in search of genoeconomic insight. To find any legitimate links, they decided, they had to increase their study size to at least 100,000 people.

Building such a sample is difficult, at least for now; given the amount of genetic sequencing under way, that could change in a couple of years. Across 42 data sets, however, the group did find one variable that was consistently collected in genetic-sampling studies around the world. It was a variable that had existing methods for translating national differences. And it was one likely to have at least some small link to your genes.

It was how far you had made it in school.

The consortium—also led by David Cesarini, an assistant professor at New York University’s Center for Experimental Social Science, and Philipp Koellinger, an associate professor at Erasmus University Rotterdam—has now released the first major paper from its work, published (<http://www.sciencemag.org/content/early/2013/05/29/science.1235488.full>) on Thursday by Science. The researchers screened 126,559 people for the study, finding three robust regions in the human genome that connected, in a microscopic way, to educational attainment.

How small? For perspective, the largest link they found could account for only 0.022 percent of the variation in the subjects’ educational advancement, drastically smaller than the largest genetic influences found for, say, height, where one gene might explain up to 0.4 percent of the variation. Over all, the genome variants the researchers surveyed could explain, combined, 2 percent of their subjects’ educational success.

The group’s work is both a negative and a positive finding, in a way. It supports the researchers’ assertion that work finding large genetic ties to human behavior is likely to be flawed, while still compiling the hard statistics needed to justify their field’s existence. In effect, it argues that genoeconomists are ready to play at a higher level, and everyone should start listening.

There’s much to take from the group’s work, and I encourage you to read the study and, more important, a series of questions and answers (<http://ssgac.org/documents/FAQsRietveldetal2013Science.pdf>) written by Benjamin and his colleagues. But perhaps the most important lesson for the public is this: There will never be a “gene for educational success” or a “gene for entrepreneurship,” just as there will never be a “gene for intelligence” or a “gene for personality.”

“You just shouldn’t believe anything that says it’s the ‘gene for education,’” Benjamin says. That’s true for pretty much any human trait, down to height and weight, but it applies doubly so for socioeconomic outcomes. “The effect for any gene is going to be vanishingly small.”

This is old news for genetics researchers, who have been wrestling with that reality for the better part of a decade. Genes are great at predicting what proteins the body will make, but they are far, far removed from human behavior, and every step along the way, their influence is weakened by a host of environmental factors. There is no linear chain that runs from, say, genes to personality to educational success; when such connections exist, they form, at best, a dense web.

Even the parts of educational success that can be tied to genetics—given a larger sample of one million people, Benjamin expects the number could rise from 2 percent to 12 percent or so—can still be deeply influenced by the environment. Take the example of phenylketonuria, a metabolic disorder, caused by a single mutation, that makes it impossible for the body to use an amino acid, leading to mental retardation. It's a disease mediated by the environment; early detection and strict dietary guidelines ultimately allow its victims to lead healthy, normal lives.

What would be a somewhat analogous scenario for educational success? This is purely hypothetical, Benjamin stresses, but say there's a gene variant that increases the likelihood to read books, and it is the reading, in turn, that helps determine scholastic futures. (I said it was hypothetical.) We could still encourage kids who don't have the variant to read, raising their chances of educational success. Nothing would be predetermined.

Benjamin hopes the new study will also help with a sort of reverse engineering, pointing back to areas in the genome connected with traits closer to biology than whether you graduated from high school. Indeed, the researchers found the same genetic regions, in a pool of Swedish soldiers, explained 3 percent of the variation in their skill on intelligence tests—more than it did to explain their educational path. That finding seems to support the notion that cognitive abilities are one strand in the long web between genes and graduation. That distance could also help explain why the individual effect sizes for educational success are so tiny; each step away from genes reduces their influence. But that's far from proved.

So what use is the work? It would be incredibly helpful in designing studies of social interventions, like providing universal preschool or offering prenatal care to poor women. Those social experiments are so expensive that studies of them are often small in number, but if you could remove the genetic effects, that could provide a huge boost to their statistical power. That's what gets Benjamin truly excited about the work.

Beyond that, members of the group are quite explicit about what lessons public-policy experts should take from their work: none at all. Given the limited genetic influence, even if Benjamin and company do tick it up to 12 percent, it's unlikely you'll ever be able to predict people's educational future with their genome sequence. Don't expect to see such a genetic test appearing on college-admission exams. (Sorry, Gattaca fans.)

There's another hypothetical Benjamin uses as our phone call wraps up, about how the environment can influence genetic connections. Imagine if you ran a genetics study of college-completion rates 100 years ago.

“You’d find a very strong effect,” he says, “of the number of X chromosomes you have on whether you’ve completed college.”

18 comments



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[pnwangwu](#) · 6 months ago

Actually, there is a pair of dominant "genes" for educational success, and for entrepreneurship called persistence and delayed gratification! They overcome a host of environmental factors. They may form a dense web, but they are surely connected.

Peter U. Nwangwu, Pharm.D., Ph.D.

11 ^ | v · Reply · Share >



[falzf](#) · 6 months ago

I think scientists should study why it is that scientists so desperately yearn to find scientific explanations for everything.

6 ^ | v · Reply · Share >



[philosophile](#) → [falzf](#) · 6 months ago

One could equally ask, "Why is that that artists so desperately yearn to find an artistic solution for everything?"

Well, it is a disconnect between the sciences and the humanities.

Your posts on Brainstorm when it was alive addressed the problem in a creative (artistic), knowledgeable (scientific), and amusing (human) way. Too bad Brainstorm was replaced by the innocuous "The Conversations."

3 ^ | v · Reply · Share >



[ruthenium66](#) · 6 months ago

These days, the genes for finishing college may be any genes linked to the creation and dispersal of family trust funds to put kids through school and carry them while they figure out the career possibilities for their too-general BA or too-specific graduate degree.

11 ^ | v · Reply · Share >

[Avatar](#) [wepstein](#) • 6 months ago

The real trick in genetic studies of behavior, including evolutionary psychology and its extensions, is to find the gene for bigotry and study the motives of researchers. None of the research is amenable to experimental testing; few if any, handle environmental influences accurately or well. The interplay of genetics and environmental factors is very poorly understood. However, the use of poorly derived findings has been frightening for more than one century. More to the point, social decisions based on genetic predisposition for a variety of behaviors are customarily immoral, unethical, and politically worrisome.

9 ^ | v • Reply • Share ›

[Avatar](#) [mkt42](#) • 6 months ago

Nice article, but I don't understand this passage:

"social experiments are so expensive that studies of them are often small in number, but if you could remove the genetic effects, that could provide a huge boost to their statistical power."

If the effects are as small as described (2% of the variation) then how would accounting for them provide a huge boost to the statistical power of social experiments?

3 ^ | v • Reply • Share ›

[Avatar](#) [williakz](#) • 6 months ago

Nice take on genetics, economics, and social science for an English major. You guys got it nailed!

^ | v • Reply • Share ›

[Avatar](#) [eajmtp2](#) • 6 months ago

Since it is widely known in the social and behavioral sciences that such phenomena as school completion are the result of complex multi-variable processes, why do "genoeconomists" think that they have the skill to reduce them to single variable explanations?

It's the same sort of boneheaded thinking that led their counterparts in the banking business and finance world used to create the pseudo-scientific theories of infinite growth that caused the banking crisis. There is a big difference between science and something that vaguely looks like science, as Richard Feynman noted when he spoke about "cargo-cult science". It seems like these economists are bringing out the "con" in their discipline to the fore in both the legal and political senses of the word, just as their confrères did in the banking crisis.

Still I breathlessly await the day when chemoeconomists will prove that there is a fundamental molecular basis for intellectual achievement that shows a .99999 correlation between the ability to utilize oxygen and the ability to complete school.


3 ^ | v • Reply • Share ›

[Avatar](#) [wepstein](#) → [eajmtp2](#) • 6 months ago


 [wepetom](#) • 6 months ago
"bulk-cargo" empiricism

The is a huge correlation between being in bed and dying. If you want a long life, sleep on the sofa.


1 ^ | v • Reply • Share ›

 [amy trumble](#) • 6 months ago
um yes there is, it's called the money gene.


2 ^ | v • Reply • Share ›

 [raymond_j_ritchie](#) • 6 months ago
This is deterministic nonsense. Just like astrology. The same as the way IQ tests are abused. When I was a post-doc in the US at Cornell I openly joked about my official IQ. It is 70. The poor yanks were horrified and even more horrified that I joked about it. They told me I would have not got into a good university on america because of it. Glad I am Australian.
I deliberately drew aeroplanes and submarines on my IQ tests. First time because I did not like the idea of being sent away to a strange school, later because I knew what IQ tests were and chose not to co-operate. I pointed out to people in the lab at Cornell that I had a BSc (Hons) and PhD and a substantial publication record. Should my degrees be withdrawn and my papers retracted? What are you going to do if someone does not have the 'right' genes? Deny them access to higher education or take their degrees from them? Even worse stream them in highschool, like what the Sir Cyril Burt inspired policies did to thousands of kids in the UK? Seen the movie GATACA?

3 ^ | v • Reply • Share ›

 [big guy](#) • 6 months ago
there is too a Gene for finishing college, UCLA Chancellor Gene Block
<http://www.chancellor.ucla.edu.....> here he made the case beautifully
<http://chancellor.ucla.edu/upd...>

2 ^ | v • Reply • Share ›

 [dank48](#) • 6 months ago
Some commentors seem to have missed the last two paragraphs, which imo save the entire article.

Incidentally, am I the only person wondering why it's assumed, in a study of a large human population, that "years in school" is a *positive* characteristic? Does having a higher number than Bill Gates make me a "more successful" person than he is? Or might there be some genetic factor for, say, "making practical use in the real world of what one has learned in the artificially sheltered environment of school" that might be considerably harder to study?

3 ^ | v • Reply • Share ›

Avatar

Bernard Malin · 6 months ago

Genoeconomics should be renamed gee-o--I-can-study-anything-I-want-without-any-background. The fake scholars are like sociobiologists in the 1970s...a rush to judgement based on faulty data on topics that had serious implications. Poor understanding of statistics, poor understanding of genetics. These slackers have changed their title to evolutionary biology, committing the same sins. Be forewarned genoeconomists are doing the same.

3 ^ | v · Reply · Share ›

Avatar

snwashburn · 6 months ago

Whether genes exist or not, the environment will change the outcome for someone attending college.

^ | v · Reply · Share ›

**raymond_j_ritchie** → snwashburn · 6 months ago

You are right. Remember 16th and 17th century predestination? To most people today the idea that there is an elect who are going to heaven and the rest are doomed to eternal damnation seems a theologically ludicrous and unattractive idea but at the time it was not to many people. Why? The crucial step was that they convinced themselves that they were the elect and told their children they were too.

Today IQ tests and gene profiles are used by people to decide who is told that they are the elect without any really tangible evidence that they are. And some damn fools believe it.

3 ^ | v · Reply · Share ›

Avatar

klymkowsky · 6 months ago

I would be interested to know just how much money this rather dubious project cost. Is this another example of Science publishing "arsenic bacteria" to get attention?

^ | v · Reply · Share ›

Avatar

Sean Robert Parks · 4 months ago

I found this article particularly interesting because in my undergrad this subject would come up a lot in my educational courses, is intelligence genetic or learned. From what I got from the blog was that intelligence is 98% nurture and 2% nature, that your educational success is based on your upbringing and factors in your life. This makes sense to me and I always assumed that educational success was a combo of the two, that would explain how even in extremely poor and down trodden regions, like the northend of Hartford, there are a lot of struggle students, but there are still students that are very smart and are doing well. However in areas with fewer major stressors like the suburbs you see students that statistically doing better. This article really does

see students that statistically doing better. This article really does show that the home life of a student is more important to the child's educational success than their inborn genetic intelligence. In our educational system that says everyone can succeed and go to college, we sometimes forget to address the stressors of the students outside of the school.

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