#259: The genetic lottery (Kathryn Paige Harden)

Julia: Welcome to Rationally Speaking, the podcast where we explore the borderlands between reason and nonsense.

I'm your host, Julia Galef, and my guest today is Kathryn Paige Harden. She goes by Paige. She's a professor of psychology and behavioral genetics at the University of Texas Austin, and the author of the recently published book, "The Genetic Lottery: Why DNA Matters for Social Equality." Which I found really interesting and well argued, especially given that it's about a pretty controversial subject: the effect of our genes on important life outcomes like educational success.

In the first part of the episode we talk about why that's a controversial thing to study and write about. Literally, to give you a sense of what a livewire topic that is, Paige has gotten emails from other professors telling her that she's no better than a Holocaust denier, for doing this research. So we talk about that reaction and where it comes from. And then we get into the science of, okay, how much of educational success is explained by genes? And what does it actually mean to say that educational success is 'explained' by genes? And why do we need to study that relationship at all - what's the benefit?

I found our conversation really fun and helpful and I hope you'll agree. So here is my conversation with Paige Harden.

Julia: Paige, thank you so much for joining me on Rationally Speaking.

Paige: Thank you for having me, Julia.

Julia: We're going to talk about your book, *The Genetic Lottery: Why DNA Matters for Social Equality*. The book is about the effect of our genes on important life outcomes, like educational performance and things like that. And it's about how we study that relationship, why that's an important thing to be studying.

So we'll talk about all of that — but first off, it's also in some ways a very controversial thing to study. And in your book you made what I thought was a very wise choice, which was to just address that controversy right off the bat, before you get into talking about the details of the science and why it's important. And so for this podcast, I wanted to do the same wise thing and address the controversy right up front.

So could you start by talking about why people are sort of on edge, or suspicious of researchers who are studying this topic of the effect of our genes on our life outcomes?

Paige: Yeah, I think there's a couple of different layers to that. One layer is about just how different disciplines have been defined in the last 100 years. So if you look at the early origin of, say the field of sociology, it's really explicitly defined from the very beginning in Durkheim's *Rules of the Sociological Method*, that this is a social analysis. It's not an analysis of biological variables.

And at the same time, I think that natural scientists are trained with certain ideas about what seems science-y to them, in terms of always having very controlled experiments and really shying away often from more observational data.

So I think even if there weren't the historical association, which I'll talk about in a second, of genetics with eugenics, I still think there would be some sort of conflict there, some tensions there. Just because, by using genetic tools to study social behavior and phenomena that are socially situated, it really, at the end of the day, I think, excavates a lot of assumptions that are very core to how disciplines define themselves and what are legitimate answers, what are legitimate questions to be asked.

Julia: Oh, interesting. And I know you're going to get to the second and also important part, but just to comment on that... Genetics does not seem to be an outlier to me at all, in terms of being fuzzy or relying on correlational data that's maybe not definitive. That is just everywhere in the social sciences and in public health. I would be kind of surprised if there was some reason to treat genetics as a unique example of that.

Paige: No, I think you're right about that. I mean, I think particularly when we're talking about human molecular genetics, it is like so many parts of epidemiology. We're talking about huge population data sets and correlational data. And you're trying to wrest causal inferences from correlations.

I think if you look at historically who've been some of the fiercest critics of using genetics to study social phenomena, what you see are people who are more on the experimental biology side of things, who really have the advantage of working with model organisms and really exquisitely controlling both the genotypes and the environments of the organisms they study.

And so I think when they look at social science genetics, a lot of their criticisms are coming from a place as if they're criticizing social science genetics, but from my perspective, it feels like a larger discomfort with the fuzziness of social science and the norms that we have, not just in using genetics to study psychological phenomena, but how psychologists and sociologists and economists work, using these kinds of more observational methods. So that's what I'm thinking about in terms of that kind of tension.

Julia: A methodological tension.

Paige: A methodological, yeah.

And then of course we have this historical association between genetics and eugenics. And eugenics is a word that can be defined in a lot of different ways. I define it in the book really in terms of an ideology that casts some people as naturally inferior or superior to other people, and that falls often along racial lines, and proposes to violate their bodily integrity or reproductive autonomy in some way, in the name of bettering the human race.

And so when we look at the history in America of eugenic sterilization laws, when we look at how that played out, obviously with the atrocities of the Nazis… those historical examples just loom so large in the public imagination that when you say “genetics and IQ” or “genetics and education,” you kind of almost automatically summon this web of associations that I think has to be dealt with first, before you can go on to have a conversation about the current state of the science today.

Julia: Right. Man, the word “eugenics,” it's so broad, and so un-useful.

Paige: I agree.

Julia: It’s so weird to me that it refers both to things like forced sterilization of adults for being the wrong race or something, and also refers to a couple doing embryo screening ahead of time to make sure their kid isn't going to be born with a fatal disease or something. Those are two extremely different things, functionally and morally. And to use one word to refer to both of them is crazy to me.

And I know there are probably rhetorical reasons that people use the same word for both things, but it's very frustrating to me.

Paige: I mean, I think it makes the conversation really hard. So much of what we'll talk about today is around how we can have words that have a very particular, specific meaning, whether that's “eugenics” or “heritability” or “determinism,” but it's so easy for there to be concept creep around that. And it contributes to people talking past one another, because you're not agreeing on the very basic definitions of words.

So in the book, I quote, or cite, political philosopher, Elizabeth Anderson, quite a bit. And part of the reason I do that is because I think that she gives a very lucid analysis of the core of what many people would find morally objectionable about eugenics. And again, it's back to this idea of a natural hierarchy that justifies inequalities in freedoms, in welfare, and in resources. And I think if we stick to that definition, then you can see, well, yes, obviously forced sterilization fits into that. Whereas other examples are really just about couples exercising

reproductive autonomy, but are not necessarily operating from this inferiority / superiority framework.

Julia: To get into a bit more of a concrete reason that people might consider this area controversial or be suspicious of a researcher doing research into this topic, you described this really striking study early on in your book, in which people read about some hypothetical scientist, Dr. Karlsson, who was studying genes' influence on, I guess, academic performance, or maybe a performance on a math test or something. And some participants were told that Dr. Karlsson found that genes were quite important, and other people were told that he found that genes weren't that important. And then they were asked to make inferences about: What do you think Dr. Karlsson's values are? Do you think he values equality and so on?

And the people who were told that Karlsson found that genes made a big difference tended to assume "Well, he probably doesn't really value equality, and he probably thinks some people are inherently superior to other people," et cetera. Please feel free to correct me if I'm misremembering this, but it was so striking —

Paige: No, you got it totally right.

Julia: — that people make inferences about what you, the researcher, must value and believe based on what your experiments find.

Paige: Yes. I mean, and I think that's a really core part of the study setup. The different conditions... the participants weren't exposed to different descriptions of the study question or the study methodology. They were just exposed to differences in what was found in the study. And even then, it still swayed their perceptions of the scientist's commitment to egalitarian values, so, "Do you think this fictional Dr. Karlsson believes that people should be treated equally in a legal or political sense?"

The other thing about this study is they're not recruiting fellow academics here. This is, "Let's recruit people off of Mechanical Turk or undergrads in a psych department." So it's really more of a lay perception of how these perceptions of political motives and moral beliefs map onto our perceptions of what scientists have found.

And when the study first came out, I remember reading it and thinking...

Julia: "I'm screwed"?

Paige: "I've totally been on both sides of this." I have been that person. Because I run a twin study. And I have given talks where I say, "Here's a battery of executive functioning tasks, and if we're looking at general executive functioning, it's nearly

perfectly heritable in children." And I have given a talk where I say, "Here is evidence for how children's math scores vary with neighborhood poverty, or this is how their pace of biological aging varies with neighborhood poverty."

And it's literally the exact same population study. The dataset, it's from the same grant. It's collecting the sample in the same way. It's the same dataset. But depending on which result you describe, the audience's response can often be markedly different in terms of just the reaction of "Well, why am I studying this? And what are my motivations?" Go ahead.

Julia: Well, I was just going to say, especially focusing on how non-academics react to this kind of research, I've had the impression for a while that a lot of their shocked reaction comes from the fact that people genuinely don't realize what mainstream consensus in the field of genetics is.

And so, if one researcher says publicly that, I don't know, "IQ is a meaningful metric that predicts various life outcomes and it's significantly heritable," or something like that, a journalist or the public might react as if that's like a fringe radical thing to say and not realize that that's just the bog standard mainstream view among respected academics. And so I just keep seeing this disconnect where people don't realize what the standard scientific view is.

Paige: I think actually it's even a layer more complicated than that, which is I think there's kind of this curious, both knowing and not knowing at the same time.

So there's one study that I talk about in the book where... this is done by Emily Willoughby at the University of Minnesota, and her colleagues. Where they just ask people, "What percentage of the variation in height or eye color or intelligence or depression do you think is due to genes?" And then they compare the average lay rating of that with the best meta analytic published heritability estimate. And they find that people aren't perfectly concordant, but they're not that off. I think the correlation between the lay estimate and the published heritability estimate is like 0.6 or 0.7.

So on the one hand, people know. Especially if they have kids, if they have siblings, they see that people differ genetically in ways that matter for their lives. The question is, then, what do they think that means? Or who do they think are the sorts of people, the sorts of scientists who study that?

And so I think you actually get these kinds of internally inconsistent perceptions of genetics in the public. Because they both see evidence of it in their lives, but there are also... Any discussion of genetics in the public sphere is inevitably accompanied by this "But what about eugenics" conversation.

Julia: Well, at least when the discussion of genetics is about emotionally or ideologically fraught traits. As opposed to eye color and height. Yeah, then the reaction is very different.

Paige: I think when it's about anything that we... I recently had to kind of do one of these summaries that university departments invariably make their faculty do, which is like “What is it that you study?” And so I was just trying to think of the theme, and it turns out that I think what I'm really interested in is things that are rewarded or punished, things that we moralize in some way. You know, we reward kids who do well in math, and we punish kids who don't in various ways.

Julia: “We,” like, “society” rewards?

Paige: Yeah, like writ large, right? How do we set up our reinforcement schedule in society?

Julia: Right. Right.

Paige: So I think there is this disconnect between the perception of what is true about heritability and what people think the role of the scientist's motivations are .But I also think there's also a disconnect between how the public's perceptions of genetics pop up when they're asked questions in different ways, or around different domains. Which makes kind of anticipating counter-arguments or assumptions and responding to them really difficult, because there's a lot of different levels going on at the same time.

Julia: Right. I think this is in your book, or maybe it was in a blog post that I read by you. You described a situation where you told someone, I think it was at... Maybe it was just someone at a party... that you worked on genetics and educational outcomes, or I don't know what your description was, and they kind of accusatorily were like, "Oh, so what did you think of the musical Hamilton?"

And you were so confused by the question — until you kind of pieced together that in their mind, “working on genetics” = “associated with the right.” And the right wing doesn't like the musical Hamilton.

And you were like “Ohhh, I see where that question came from.”

Paige: Yeah. No, it was actually in a professional setting.

Julia: Oh God.

Paige: Like a conference space. And I must've looked like a deer in the headlights. And it was one of those things... I was trained as a therapist. My PhD was in clinical psychology. And I haven't worked as a therapist in many years, but it was one of those interactions where I thought there's really no way to think about what just

happened, except kind of through my framework as like a more analytically trained therapist. Because it was so obviously a loose association that had to do with their sense of tribal identities, and really nothing to do with me.

But I think, again, it speaks to... It's not just interdisciplinary work, to connect education to genetics, but it's really kind of cross-tribal work. The way that people think of "This is what people like me study and how we study it." And I tend to sit really uncomfortably in any of those tribes.

Julia: All right. Well, let's start talking about the actual science and what we've found so far. And I guess I kind of want to start with the punchline. How would you characterize our current best guess about how much genes matter to educational success? Like, what percent of the variation in educational outcomes is explained by genes?

Paige: So I would say that the best guess depends on the method that you're using.

Julia: Okay, you can give a range.

Paige: Yeah, so I'll give a range. So I would say twin studies — which tend to give the biggest estimate of heritability — would say that about in high-income European, North American countries, that about a third of the variation in how far people go in school is due to genetic differences between them. And we'll come back to, what do we mean by "due to genetic differences between them."

So that's a twin study, and it doesn't measure anything about someone's genetics. It's just leveraging the differences between people in their phenotype, in this case, how far they go in school, in relation to the differences between different types of relatives, so identical twins versus fraternal twins, but it's not actually looking at anything in the DNA.

Julia: And just for the rest of this podcast... a "phenotype" is just any observable trait? About a person's appearance or their life outcomes, or just anything that we might care to measure, is the phenotype?

Paige: Yes. And it can be something that's obviously physiological, like height. It could be a measured IQ score. It could be something else biological. So it could be something about their epigenetics could be the phenotype. But it's their observed characteristic.

Julia: Right, right. Yeah. And so you were just saying the — yeah, go on. Go on.

Paige: Yeah. So the twin method would estimate it at about 30% for educational attainment, which is years of schooling, how far people go in school.

If you're looking at, we actually measured something about someone's DNA, and we've added up information about their genome into what we call a “polygenic index” — and this polygenic index is kind of a single number that is our best guess of what your phenotype will be, based just on your DNA sequence. Then those effect sizes are about maybe 10% to 15% of the variance in educational attainment, is correlated with this polygenic index.

And then there are other methods that are kind of somewhere in between polygenic scores and twin studies, in that they're still leveraging differences in different types of biological relatives, but they're using, “I've actually measured how genetically similar you are to people.” And those estimates are typically somewhere in between that 10% and 30% range.

So if I were a betting person, my bet would be 17%. That would be my point estimate.

But science is moving really rapidly, and so there's inevitably some kind of... We're getting better and better at measuring the genome, which tends to increase the effect sizes that are associated with genetics. But we're also getting better and better at testing the assumptions of our different methods. And those sometimes pull down the estimates. So there’s some, kind of, bouncing around in that range, I think.

Julia: So I do want to very soon get to the question of what does it mean to say that genes “cause” or “predict” educational success.

But first I want to talk about that number — your point estimate, 17%. Because I feel like a lot of people would hear that number and say, "Well, that's not very much, 17%. The conclusion, I guess, we should be drawing here is that genes don't matter that much to educational success.”

So how do you think about how big 17% is in this context?

Paige: Yeah. I think that's such an important question, because most of the public conversations around genetics tend to cluster around one of two extremes.

And one extreme is talking about genes as if they're these super causal, deterministic, inexorable influences on our lives. And so when we're thinking about something like trisomy, trisomy 21 causing Down syndrome, that is not an effect size of 17%. That is, if you have three copies of your 21st chromosome, you will have Down syndrome. And so I think sometimes people think of genes as being like that. And by comparison, 17% sounds very, very small.

At the same time, I think at the other end of the spectrum is this conversation that's like, “Well, that's so small that we can ignore it. It's worthless. It's genetic astrology. It's not enough variation to worry about.” And I also think that's an

incorrect intuition. 17% is about what we see for the best social science variables that we use when we're predicting complex human behavior.

Julia: So what might be an example?

Paige: So the example that I keep returning to in the book, because I think it's a really good one, is family income. So if we look at, "How much variation does family income — so how much money your parents made when you were growing up — how much variation does that capture in your likelihood of graduating from college?"

That's also in the 13% to 20% range, depending on the sample that you're looking at. And I think that comparison is really useful, because it goes to show that our intuitions about what a big or large effect is, when we're talking about complicated human outcomes, really need to be recalibrated. These are extraordinarily complicated phenotypes, and no one variable predicts that much variation when we're looking at it in like 0% to 100% terms.

But in the long run, like when we're thinking about how income dynamics play out over the course of a person's life, over the course of an entire population, things can be not deterministic, but still meaningful for understanding the dynamics of population inequality.

And that's where I think genetics is, is it is not useless. It's not deterministic. It is a factor that is as important, I think, as the factors that we are used to thinking of, like how wealthy your parents were, in shaping our life outcomes.

Julia: Great. No, that is really useful. That was such an illustrative comparison. I remember being really struck by it when I read it in the book.

So, you have emphasized that the education polygenic index, the collection of genes that we have found to be predictive of educational success, to some extent... that it's just a whole range of different things. It's not just like, well, "We've measured this one thing that's how smart you are, and it's this one gene, and that predicts 17% of your educational success."

And I think that's kind of a counterintuitive concept for a lot of people, that it's not a trait we've discovered. It's just the name we give to a whole collection of genes, but we don't necessarily know yet exactly by what mechanism they end up predicting educational success. And so I wanted to talk about that now.

For example... Some genes might influence educational outcomes by increasing your analytical ability, which makes you better at school. Other genes might increase your educational success by making you pretty, and maybe teachers give pretty people better grades, and that leads to better educational success. Or maybe some genes aren't even causal. They're just symptoms of some other trait

that's actually doing the causal work, like a gene appears to be correlated with educational success because it's more common in high socioeconomic status families. And they hire tutors for their children and test prep and so on. And so that's not actually having a causal impact in its own right.

So how do we even begin to start disentangling these different causal pathways and figuring out which genes are doing which things?

Paige: Yeah. I mean, I think you've explained that so well. It is very counterintuitive. I think when people first started the GWAS, the Genome-Wide Association Study enterprise, I think there was this idea that we would define our phenotypes really well, and there would be something really modular or really small — something about your reaction time, or some kind of core part of your cognitive machinery — and that then we would come up with good hypotheses about the underlying biology of that. And then we would go find the genes associated with that underlying biology.

So it was really this idea that we were going to have very narrowly-defined phenotypes; good, plausible hypotheses about biological mechanisms; and then we would find genes. And understanding what the heck we found and what they do would be kind of a relatively straightforward process.

And it did not work like that at all, at all. And instead, what we have is these really coarsely-measured phenotypes. Like, how many years of education did you get?

And so one way to think about it is to just envision the long process between conception and finishing school, at whatever age you're finishing school. And then thinking about that early cognitive development phase, but also that long process of formal education — anything, any embodied characteristic that makes it a little bit easier or a little bit harder for you to get through the way we have currently set up our formal educational system, is going to have some genetic correlate. And a GWAS is going to find it.

So that could be, yes, I have better fluid intelligence, and so I more easily grasp my math classes. That could be, I went through puberty earlier and got attention from boys and was more likely to have a teenage pregnancy and got pushed out of school. That could be, I'm a morning person versus an evening person. That could be I am someone who is capable of sitting still at a desk and following instructions from the teacher, and so I get a lot of positive reinforcement.

Any of those processes, to the extent that they're reflected in our biology at all, is going to be picked up in a GWAS. So it's this motley crew. It's this huge constellation of processes.

So instead of having really nice phenotypes, and then we can map them really neatly to genes, what we have is what I often call genotypes in search of phenotypes, which is that we have DNA sequences, and we have no idea what they do or where they go. And our task as scientists is to tease out, “Well, okay, we know that when this child was conceived, they got a DNA sequence that has correlated with them being in school for 26 years versus 16 years versus 12 years. Why?” And that to me is such an exciting and interesting scientific project.

Julia: But I mean... how would you go about answering those questions? How do you figure out which genes are associated with which phenotypes?

Paige: Which thing is causing what?

Julia: Yeah.

Paige: Yeah, so I think there's a couple of different approaches. One is what's called bioannotation, which is, we have found these genetic variants. The most common ones that people are focusing on right now are what are called SNPs, which are single nucleotide polymorphisms. There are these single differences between people in one letter of the DNA sequence.

So we know where those are, and they can be mapped to nearby genes. Those genes can be mapped to, “This gene tends to be expressed in this type of tissue.” So are we looking at something that's pituitary? Are we looking at something that's cerebellar? Are we looking at something that's skeletal, or skeletal muscle?

And so that gives us clues. About whether or not, for instance, we're picking up on a genetic signature of skin tone or height, or — which is how it's turned out, something that's expressed in brain. And almost all of the genes that are associated with educational attainment are expressed in brain.

So that's one approach. Another approach is really much more old-fashioned psychological studies. Which is thinking about, for instance, a longitudinal cohort study, where you look to see, okay, well, we know this polygenic score is associated with ultimately going further in school. Did children who are higher on this polygenic score receive different sorts of parenting than their siblings who were lower on this polygenic score? So perhaps they elicit more attention from their mother.

We have a lot of theories in developmental psychology about what sorts of parenting practices are good for encouraging children to be motivated to achieve in school. So those are all candidate mechanisms that we can look to see, “Well, perhaps these genes are associated with receiving this social experience, and does that social experience then turn around and predict our later phenotype, doing better in school?”

Ultimately, however... I mean, that is kind of the bread and butter of a lot of what I think about in my lab. Ultimately, the best way to know whether or not you've identified the right mechanism is to try to change it or break it or push on it somehow.

So if I think that, for instance, a child with a genetic liability is more likely to develop symptoms of conduct disorder because they behave in ways that elicit really harsh, inconsistent punishment from their parents, the best way to test that is to try to change the punishment strategy of the parent. Like, if we disrupt this environmental process that we think is part of the mechanism, do we change that relationship between genotype and phenotype? Can we push on it? Can we break something about this chain of events that we think is mediating the connection?

Julia: Ah, I see. Right. Well, one of my key questions I wanted to ask you about was why this kind of research is worth doing. Because I think a lot of people feel skeptical that it's worth the cost. The cost in terms of, as we were discussing earlier, it's so emotionally and politically fraught; it comes with potential risks, like people find out about small probabilistic differences in their predicted educational success, and those differences just get magnified and reified, and people treat them as fixed and a measure of people's inherent worth...

And you acknowledge all of those risks in the book. So I think a lot of people feel like, given all of that, why is it worth it?

Paige: Why do it?

Julia: Why even bother doing this research in the first place, yeah.

And that might actually play into some of the suspicions people have of researchers' motives, if they can't see a justification for doing this research other than nefarious political motives. So yeah, what is the justification, as you see it?

Paige: I mean, I think you've described it really well. I think so many of the disagreements about the value of this, are about this risk-benefit trade-off, and calculation.

And I agree with many of my more skeptical colleagues about the potential risks for stigmatization, for people thinking that certain ideologies about racial superiority are being "scientifically validated." I think they're right that those are valid fears.

I think where I differ from many of my colleagues is about the benefit that social science can get from integrating genetics. And that comes from a place of actually being quite cynical about the success of mainstream psychology, that's mostly ignored genetics thus far.

I don't think that our field has been nearly as good as it could have been at identifying effective psychological interventions, educational interventions, and social policies to help children succeed. If you look at any meta analysis of, let's say RCTs in education, randomized controlled trials, which are very expensive — the modal effect size of those is zero. Most things we try in education make no difference whatsoever in children's academic achievement skills.

There's high profile exceptions. There are definitely high-profile exceptions. But when we're thinking about the landscape, the educational interventional landscape, it's not that things don't work. It's that finding things that are at all effective is really, really hard to do.

Julia: I was going to say that I could deal with a situation where the modal effect was zero — or even where the average effect was zero — as long as the few things that do work were reliable, and actually replicated and generalized outside of the original place where they were tested. And I feel like we don't even have that. And so I'm also cynical.

Paige: Yeah, yeah, I agree. And then I think even for the things that do appear promising, we have very little information about, are those things helping people who are most at risk for poor educational outcomes? Or are they doing what many, many interventions in psychology do, which is a Matthew effect, the rich get richer, they're helping kids who are already doing well? It's the Sesame Street effect. In which it does improve vocabularies. It improves vocabularies for middle to rich kids more. And so it doesn't actually do its original purpose, which was to be inequality-narrowing.

Julia: But so how would genetics help with this problem?

Paige: So I think it's important to say that I don't think genetics is a silver bullet here. I think there's a lot of problems that we've seen with, say, the replicability crisis around the rigor of methods in psychology.

But one thing that much research in education and sociology have in common is that they know, researchers know on some level, that they can't just observe a correlation between an aspect of the child's environment and an aspect of the child's outcomes, and conclude that that relationship is causal... But they do it anyways.

So I write about this in this book. If you pick up an issue of Child Development or Developmental Psychology or many sociology journals, and you just look at how many studies are correlating aspects of the children's environment that are provided by their genetic relatives, and the children's own functioning, and then declaring this to be a causal relationship, and suggesting that we intervene on

this, on the basis of this correlational evidence... And if you think about the inefficiency of that —

Julia: Like for example, parents reading to their children?

Paige: Yeah. I saw actually someone who was on my dissertation committee tweeted yesterday that "Children who eat dinner before 6:00 PM have better reading skills, and so everyone should be eating dinner earlier."

Julia: Aw man...

Paige: And I thought, aw man, really? You are a full professor in the the sociology department at a major research university. You know better than this.

So there are many problems with being fast and loose with your causal inference. And again, genetics isn't going to solve all of them. But particularly when we're doing research on child development, almost all of the environments that we are potentially interested in are correlated in some way to their genetic differences. Because those environments are shaped by their parents, who don't just make their environments, but also give them their genes.

And I think that criticism is sometimes mischaracterized as me alleging that parents don't matter at all or don't make a difference, or that the lesson of behavior genetics is that nothing parents do make a difference. I don't think that's true. I think the —

Julia: Have you read Bryan Caplan's book making that claim?

Paige: No, I haven't, actually.

Julia: Oh. It's called *Selfish Reasons to Have More Kids*. And the punchline is that parenting doesn't matter and everything is explained by genetics, to slightly oversimplify it.

He uses twin studies, and...

Paige: Yeah... I think if you're looking, even if you just limit yourself to twin studies, twin studies I think actually offer some of our best evidence that the family environment in which you were born matters for how far you go in school. For educational attainment much more than, say, personality. I don't think that your parents' rearing style will make you more extroverted, but I think it will get you into college, or at least increase the probability of you getting into college.

So, my reading of the evidence is that parents do make a difference for key sociological outcomes, like educational attainment. But figuring out which aspects of the environment are going to be our most powerful levers for change,

for intervention, is much harder than it might first appear. Because basically everything's correlated with everything else.

Julia: Mm-hmm.

Paige: So my sense of what many of my colleagues suggest, which is to continue with business as usual — "Yes, genetics might matter, but let's not talk about it too much, let's continue as if it doesn't" — continues this, I think really decades old, tradition of squandering opportunity. Squandering our ability to use a really powerful research tool to more rapidly narrow in on, what is actually causal in this family system? What is actually causal about this school environment?

And we end up with a situation in which we're often building our interventions — which are very expensive, and there's real opportunity cost there — off of a very shaky basic research evidence base.

Julia: I'm totally on board with your diagnosis of the problem. But it's still not totally clear to me why we couldn't address the problem by just doing more randomized control trials. Like, doing more things where we're actually intervening to see the results, instead of just looking at correlations. Basically, just relying on measuring the phenotypes we care about, instead of looking at the potential genetic root causes of those phenotypes.

Like, if what we care about is which types of schools are best at helping children who are genetically predisposed to have a harder time in school, it seems to me that we don't necessarily need to look at those kids' education polygenic index. We could just give them tests, and measure how many of them have ADHD or things like that. And use those as the independent variables. And ask which schools are best at helping kids with these traits that we already know are correlated with bad educational outcomes?

So yeah — why are the genes necessary?

Paige: Yeah, I think that's a really great question. I would say that I would agree that part of the solution here I think is to just do more micro RCTs. To just be testing a greater variety of things and seeing if there's promising evidence there, that this particular intervention makes a difference.

I have a colleague here at UT who does a lot of intervention research. It's been interesting for me to talk to him because this is also his strategy, which is basically how can we build better platforms for many more micro RCTs, to get initial evidence of promising levers for change? And even then, when they're trying to design those, a core strategy is for them to look at what they call bright spots. Who are the schools and who are the teachers that are seeming to do the

best job? Who are the parents that seem to be having the kids that are thriving? Can we reverse engineer the secrets of their success in some way?

When I hear that, I think, “But then why wouldn't you use every tool you have in your toolbox to actually think about who are the bright spots?” For instance, if we're looking at a rank ordering of schools in terms of proportion of kids who are doing really well in math, it would make obvious sense for us to be like, “Well, that's comparing apples and oranges. Because some schools have more advantaged affluent kids than others. What we want to see is, what are the features of the schools that have really high achieving kids raised in poverty?”

Why not add another level of information about that?

Julia: Ah, I see...

Paige: So that's one thing, which is that I don't think that genetics are “the” tool, but I think they are a tool, to identify features — basically feature selection. What are features or bright spots that seem to be serving people who are otherwise predicted to really struggle in school?

The second is, I think we have to think about what's special about genetic data that is not easily replicated with measures of phenotype. And I think there's two things that make genetic measures different from other social science variables.

One is that conditional on parent genotypes, children's genetics are randomly assigned. So If I know your mom's DNA, which variants you got relative to other members of your family is nature's random assignment. There are so few variables that we can measure about a person that work like that. That are, “For every child, if we measure something about the parental genotypes, we have this reasonably exogenous variation.” This “as if random” variation on something. So that's one.

The second is that while the effects of your DNA can and will change over your life... so, think about your genes relative to your height. Your height will change. The extent to which the genes relevant for adult height will become more important as you go through puberty, and they were less important when you were a baby for body size. But the actual DNA sequence itself doesn't change.

Which means that we could measure, not just people who are participating in new intervention studies — we could measure anyone who's ever participated in any intervention study that's ever been conducted, and know something about their individual differences. They could be 50 now, and they were four when they got a pre-school intervention — but their DNA sequence is exactly the same. There's no other variable that has that quality.

That's why I get excited about polygenic scores. Because it is a tool that has these two qualities that we never get in social science, which is: Invariance across time, and this random assignment contingent on parental genotypes.

Julia: That is such a good point, right. I didn't think of that.

Do you think that it's possible to only collect and use data on people's education polygenic indices at the group level? “Group,” as in kids in a school. And not make salient an individual's education polygenic score?

Because it seems like a lot of the downsides could be avoided if we were just using the data at aggregated levels, and not saying, like, “You, you're 25% below the median education polygenic index.”

But I don't know if that's a realistic plan, to just keep it aggregated.

Paige: I think the most useful applications are in that aggregation. I write about this in the last chapter of the book where I recommend that polygenic indexes really be used... not thinking of them as a way to diagnose people. Because when you diagnose someone, you're saying, “Okay, I am confident about this information about you as a person, and I'm going to give it back to you in some sort of diagnosis information.”

I don't think it's for that. I think it's for telling us something about environments, actually. Like which interventions are working the best? What are the features of the social structures for which people who are at risk are faring the best? It's telling us information at that aggregate level, where the person's genotype is in space and is in place, what is going on with the structure.

In my own work, I run a twin study. We test people in all sorts of ways, including cognitive tests. And we don't deliver those results back to them. We say, “It’s not because we're trying to hide something from you. It's because these are not trained psychometricians, these are research assistants. Your information is useful for us to understand population trends, but we're not equipped to make a diagnosis about your child's learning disability. We will refer you to a neuropsychologist who can do that for you.”

So from my perspective, genetics fits into that framework very readily, at least from the research perspective. We're not delivering genetic predictions back to individual students.

Julia: Right, that makes sense. Before I forget, I wanted to tell you when you were talking about how common it is in a lot of social science research to just ignore the alternate hypothesis that genes are causing the correlation, as opposed to the parenting causing the outcomes... It reminded me very much of my experience

reading through a lot of the research on — as I was researching for my book — the research on how self perception affects your success.

Paige: Oh, interesting.

Julia: Because there's all these studies looking at how people's self image affects their success at various things. And the conclusion is always: “You should have a positive self image, because people with positive self images tend to be more successful.”

And either it's just not acknowledged that a possible alternate explanation is that people with positive self images are more likely to actually have positive traits that help them succeed… Either that's not acknowledged, or occasionally it is acknowledged, and just dismissed out of hand as, “Well, of course not.”

I remember this one paper where they were reporting these results, and then there was a footnote where it said “Some people might object that people with positive self image have greater inherent talent than people without. But we can dismiss that, as it is obviously abhorrent.”

Paige: Oh, really?

Julia: That was it, yeah.

Paige: I would love to see that footnote, absolutely. Please send that to me. It's so shocking…

Julia: I will try to find that, it's somewhere… I saved it somewhere in my “God, I hate social science” folder in my computer. But yeah, I thought of that when reading that part of your book.

Paige: Yeah. There was a very controversial book by Susan Mayer that my colleagues Dalton Conley and Jason Fletcher talked about in their book. Her book was *What Money Can't Buy*. It was talking about how you see these correlations between parental income and child outcomes. But then if you just give parents money — which you might argue is the morally right thing to do, but it doesn't recapitulate the magnitude of the observed correlations.

So what you see when you're observing the world, that parents who make $40,000 more a year have kids that score X number of points higher on a standardized test… if you just give parents $40,000, the resulting bump in their kids' outcomes is not commensurate.

It's a very obvious point, which is that affluent parents differ from not affluent parents in any number of things. And you're not changing all of those things. Which include tons of non-genetic factors too, in terms of the children's exposure

to lead, and violence in the neighborhood, and the stability of the parents' employment situation in terms of establishing household routines, or anything like that. You're not changing all of that —

Julia: Right. Or just the parents' knowledge of all the things that help you get into college, which rich parents are more likely to know, yeah.

Paige: Yeah exactly. Their social capital, in convincing their kid to get into the gifted and talented program. You're manipulating one thing, but not everything. So given that, what should we expect from our interventions that are coming from our observational data?

Mayer gave more recently an interview where she repeated a really fundamental point in her book, which I think captures a lot of my frustration with social science sometimes, which is: It's not enough to want to help people, you have to actually know what works in order to help people.

Julia: It sounds so obvious. Who could possibly disagree with it?

Paige: It sounds obvious. But if we say to ourselves, "Oh, it's abhorrent to consider that there's genetic confounds here," we get in our own way to actually identify what really works to help children succeed.

Julia: Paige, I wanted to make sure I got a chance to ask you about an interesting disagreement you seem to have with a colleague of yours -- actually also PhD mentor of yours -- Eric Turkheimer.

Paige: Okay.

Julia: So, Turkheimer alludes to this disagreement he has with you and doesn't fully explain it. But basically, it seems like the two of you disagree about whether it's even meaningful to posit that there could be differences between racial groups, in some complex trait. Like intelligence. And your disagreement is over whether that's even a meaningful question to ask.

Here's the way Turkheimer put in a Vox article you both contributed to, about the question of whether the racial gap in IQ scores is partly genetic — he said, "I am convinced that the question is irredeemably unscientific, while Harden questions the quality of the existing evidence but thinks more determinative data may be found in future genetic knowledge."

So basically Turkheimer sounds like he thinks it's meaningless; you think it's not meaningless, we just don't know the answer. And... I guess I'm not sure I understand why he thinks this question is unscientific. Do you understand why you disagree about this?

Paige: Yeah... I think the core of Eric's and my disagreement actually doesn't have anything to do with race. It has to do more with: How meaningful is it to say that something has genetic causes, if those genetic causes don't operate through strictly what we would intuitively think of as biological mechanisms?

So I think, and I describe this in my book, that ultimately to be a "cause" is to be a difference maker, and that genetic causes can have social mechanisms. These are the sorts of things that we've talked about already. So, "I have a fearless and disinhibited temperament, and I elicit harsh punishment from my mother, and that makes me more likely to hang out with friends who are delinquent, and that leads to involvement in the criminal justice system..."

... I would say that that's an environmentally mediated genetic effect. Whereas Eric I think would be hesitant to call that "genetic," because it's mediated via the social. And he is pessimistic about the prospect of really being able to make a strong differentiation about the types of mechanisms that link genetic differences between people, and their ultimate phenotypic outcomes.

I think what you were seeing in that article is how that more fundamental theoretical disagreement plays out when we move away from individual differences to population differences. So in my mind, I think it would require different methods and different data, but you could... and again, I don't think that "population" in the genetic sense maps to socially defined "race" nearly as neatly as often assumed. But I think population geneticists do this all the time, where they're looking at, How have traits differed across populations due to genetic mechanisms... Or, drift or something like that.

And when I read that work, I think, "Well, you could have, with better data and better methods, a population genetics of behavioral traits, that's pointing to genetic differences. But those genetic differences still might be mediated via social causes."

Whereas I think Eric's greater nihilism about our ability to ever say that something is genetic in the absence of strong biological knowledge, that just gets turned up to 11 as soon as we're moving away from individual differences to population differences. It seems just hopelessly intractable in his mind.

That's my understanding of the difference between us.

Julia: Yeah... But it still sort of seems to me if that were the cause of the disagreement, then couldn't it be resolved just by using different language? Like, instead of talking about whether the complex behavioral thing, like "educational success" or something, is partly genetic, you instead just focus on the earlier steps in the chain of causality. Like working memory, or something. Or whatever the building

blocks are that we think have an ultimate impact on predicting the big important complex thing, like educational success.

Couldn't you just drill down to the smaller building blocks, like working memory, or energy levels or whatever the things are, and talk about whether those are genetically determined, or genetically different between populations?

Paige: Yeah. I think that that's at least one potentially plausible way forward. I think if you want me to put on my Turkheimer hat for a second...

Julia: Yeah, please.

Paige: I think that even just our intuitions about what are more basic building blocks... to what extent they can be satisfactorily described without reference to early social environmental processes — I think there's probably also going to be a difference there. Even with working memory...

Julia: But wouldn't that even be true of something like height? Isn't height affected by early childhood nutrition and stuff?

Paige: I agree with you on that! I often use height as an intuition pump. Height's a really interesting one, because no one ... we can keep all sorts of things in our minds at the same time when it comes to height. We can keep in our minds that if society changes, or if the environment is drastically deprived, that that's going to have an effect on height. And that in a world in which nutritional resources are ample, most of the differences in people's heights are due to their genetics. We keep that in our minds very easily.

Height is massively polygenic. Height is potentially omnigenic, in the sense that there's not a biology of height. But we don't think of massive polygenicity — as necessarily many, many genes contributing to height — as making it that we would never understand the genetics of height.

Julia: Right, or that it's meaningless to talk about a genetic cause of height.

Paige: Yeah. Yeah. So height is an example... Often I come back to two touchstones, which is: If I replaced polygenic score with family income, would what this other person is proposing make sense? Or: If I replace educational attainment with height, would what this person is saying make sense?

I think having those two counter examples in your mind is a really good screen for whether or not we're thinking sensibly about the relationship between genes and phenotypes.

Julia: Those are great. I'm going to print out that quote from the transcript and mail it to everyone who needs to read it!

Well, I'll wrap up here, Paige, thank you so much for coming on the show, this was really enlightening and enjoyable.

Paige: Oh, thank you. Thank you so much for having me. These were fantastic questions and I appreciate the opportunity to talk through them.

[musical interlude]

Julia: That was Kathryn Paige Harden, author of "The Genetic Lottery: Why DNA Matters for Social Equality."

I'll link to her book, of course, and also to the article in which her colleague and mentor Eric Turkheimer talks about his disagreement with Paige, which we discussed at the end of the episode. And I'll also link to a recent New Yorker profile of Paige that you might find interesting, titled "Can Progressives Be Convinced That Genetics Matters?"

That's all for this episode of Rationally Speaking. I hope you'll join me next time for more explorations on the borderlands between reason and nonsense.