

Last summer, Google employee James Damore caused uproar with a memo asserting that underrepresentation of women in technology and leadership may be due to basic biological differences between men and women. This was reminiscent of former Harvard president Larry Summers' 2005 suggestion that women have less "aptitude at the high end" of STEM-related abilities. The “male exceptionalism” hypothesis - that men are overrepresented in the highest and lowest ends cognitive abilities – has been around for over 100 years. Why does this belief exist? Is there actual evidence to support it?

The Google Memo and Public Perception

“Differences in distributions of traits between men and women may in part explain why we don't have 50% representation of women in tech and leadership.”¹

“I'm simply stating that the distribution of preferences and abilities of men and women differ in part due to biological causes and that these differences may explain why we don't see equal representation of women in tech and leadership.”¹

- Is there a reason many people are quick to attribute differences in male and female performance to biological rather than societal factors?
- Damore's argument for biological rather than social causes include: that differences are “universal across human cultures,” that “underlying traits are highly heritable,” and that they are “exactly what we would predict from an evolutionary psychology perspective” (no citations given). How relevant are these claims to his argument?

On ways to increase female representation: *“Women on average show a higher interest in people and men in things. We can make software engineering more people-oriented with pair programming and more collaboration. Unfortunately, there may be limits to how people-oriented certain roles at Google can be and we shouldn't deceive ourselves or students into thinking otherwise (some of our programs to get female students into coding might be doing this).”¹*

- Damore seems to suggest that it is easier to change jobs to fit women's perceived interests than to teach new skills. (Is he saying that female students learning coding are being deceived that it will be a people-oriented job? Or being deceived that it will hold their interest?) Does purported “average interest” of a population have any relevance to employment?
- Have you encountered assertions such as those expressed by Damore in your day-to-day life?

History of Research into “Male Variability”

In 1995, *Science* published an article entitled “Sex Differences in Mental Test Scores, Variability, and Numbers of High-Scoring Individuals” (Hedges and Nowell, 1995). They report that male test score variance is greater than female score variance in most categories.

“Such differences are relevant to people who are interested in achieving fair representation of women in scientific and technical fields where excellence requires a high degree of ability.”²

¹ James Damore (2017). “Google's Ideological Echo Chamber.”

² Hedges and Nowell (1995). *Science*. “Sex differences in mental test scores, variability, and numbers of high-scoring individuals.”

- The context implies that this “degree of ability” is inherent rather than learned. (The authors frequently use the term “talent” as well.) Do scientific and technical fields actually require specific inherent abilities?
- Are differences in test score variance a good metric from which to predict who has a “high degree of ability”?

“These occupations have been male-dominated, and attempts to promote fairness in representation may be thwarted by a shortage of females with a basic amount of aptitude relevant to these occupations.”²

“Differences in the representation of the sexes in the tails of ability distributions are likely to figure increasingly in policy discussions about salary equity.”²

- Is there a way to responsibly address misuse of scientific results of this nature in policy discussions? (Many scientists posted responses and breakdowns of the misrepresentation of science in the Google memo.)

Recent Research and the Future

Penner (2008). “Gender differences in extreme mathematical achievement: an international perspective on biological and social factors.” Reported that the distribution differences between male and female math scores were different across different countries, implying social rather than biological factors.

“Ultimately, the work of identifying the role of biology and genetics in creating gender differences in mathematics achievement falls to biologists and geneticists.”³

- Is this a question that biologists can answer?
- What is the purpose of doing research into the biology of sex differences in achievement?
- Are categories of “male” and “female” useful ways to demarcate people when trying to understand the role of genetics in intellectual ability?
- Is there a way to approach this kind of research appropriately?

Makel et al. (2016). “Sex differences in the right tail of cognitive abilities: An update and cross cultural extension.” Report that for SAT-Math scores from 1985 to 2015, the male to female ratio of scores in the top 0.01% (score ≥ 700) has decreased from 13.5:1 to 2.5:1 – thus female representation in the upper end of the distribution has been increasing over time.

“In the U.S., the changing nature of the male-female ratios on two independent measures suggests that mathematical performance differences among males and females in the extreme right tail, although still present, may be less of a factor in potentially explaining male-female STEM occupational differences in the future than they have been in the past.”⁴

- Makel et al. do not attribute male-female test differences to biology, but do bring up test performance differences as a potential explanation for underrepresentation of women in STEM fields. Is it likely that reducing the gap between male-female math scores is a harbinger of a further reduced gap in STEM employment?

³ Penner (2008). *American Journal of Sociology*. “Gender differences in extreme mathematical achievement: an international perspective on biological and social factors.”

⁴ Makel et al. (2016). *Intelligence*. “Sex differences in the right tail of cognitive abilities: An update and cross cultural extension.”

Some history of the “Male Variability” hypothesis

- Darwin’s cousin, Francis Galton (1869 *Hereditary Genius*, who coined the term “eugenics”), concluded that “genius” is hereditary by tracing families of known geniuses (almost all male).
- Havelock Ellis (1894) specifically proposed greater male variability in general intelligence, as evidenced that there were more male geniuses as well as more males in care for mental deficiency.
- Leta Stetter Hollingworth (1914) pointed out that for variation to make a difference in range of abilities, there must be an assumption of normal distribution for intelligence. She also pointed out the flaws in assuming Ellis’ observations were due to biology rather than society.

In 1995, *Science* published an article entitled “Sex Differences in Mental Test Scores, Variability, and Numbers of High-Scoring Individuals” (Hedges and Nowell, 1995).

- They summarized six US studies between 1960-1992 using different “conventional mental tests” for reading comprehension, vocabulary, math, nonverbal reasoning, spatial ability, etc.
- Average differences between boys and girls were “small,” with the exception of writing, in which girls performed better.
- Reported that male score variance is greater than female score variance in almost all cases, by 5-20%.
- The authors use the term “talent” frequently (e.g. “Most work on sex differences and talent...”).
- They also suggest intervention for boys with low scores in reading comprehension and writing but make no such suggestion for girls in math.

More recent attempts to quantify intelligence between sexes have not observed differences in mean, but do frequently report a greater variance in scores among men than women, with more men than women in the tails of the distributions. This is often raised as justification for the higher preponderance of men than women in top technological and scientific positions.

Johnson et al. 2008 – Looked at Scottish Mental Surveys of 1932 and 1946 (of ages 11-12). Observed that scores were not normally distributed. Males showed greater variance than females, but there is evidence that the lower end contributed more to the variance than the higher end.

Hyde et al. 2008 – Used state cognitive assessments to conclude that there is no difference between boys and girls in average math performance, but that there is greater variance in scores for boys. Variance ratio (ratio of male variance to female variance) from 1.11 to 1.21.

Both Johnson and Hyde argue, however, that the difference in variance is much less than would account for observed differences in actual occupations (such as tenure-track physics faculty, etc.).

However, the difference in distribution has been changing over time.

Makel et al. 2016 “Sex differences in the right tail of cognitive abilities: An update and cross cultural extension.”

- For the SAT-Math scores⁵ in the 1980s, the male to female ratio of scores in the top 0.01% (score \geq 700) was 13.5:1. In 2015, the male to female ratio was 2.5:1.
- For the SAT-Verbal in the 1980s, the male to female ratio of scores in the top 0.01% (score \geq 700) was 1:1. In 2015, the male to female ratio was 0.67:1.

Differences in distributions also change depending on the country surveyed, suggesting societal factors

⁵ These were SAT scores from 12 year olds “talent searched” to take the SAT early

Penner 2008 “Gender differences in extreme mathematical achievement: an international perspective on biological and social factors.”

- Looked at international data in math achievement from 40 countries in 1995 to try to divorce social factors from inherent biology. Observed that gender differences in mathematics scores vary between countries. Ex. France has gender differences that stay stable along the tails of the distribution, but in the Czech Republic gender differences become more extreme as tails go out
- Used labor force equality and representation to judge “gender inequality” of countries and found them related to mathematical achievement gender differences.

Articles:

<https://heterodoxacademy.org/the-greater-male-variability-hypothesis/>

<http://www.sciencemag.org/news/2014/03/both-genders-think-women-are-bad-basic-math>

<https://hbr.org/2017/08/what-the-science-actually-says-about-gender-gaps-in-the-workplace>

<https://www.forbes.com/sites/quora/2017/08/10/a-scientists-take-on-the-biological-claims-from-the-infamous-google-anti-diversity-manifesto/#5767685f3364>

References:

1. James Damore (2017). “Google’s Ideological Echo Chamber.”

2. Hedges and Nowell (1995). *Science*. “Sex difference in mental test scores, variability, and numbers of high-scoring individuals.”

Comment in “Women, Math, and Test Scores.” Kegel-Flow and Didion (1995). *Science*.

3. Penner (2008). *American Journal of Sociology*. “Gender differences in extreme mathematical achievement: an international perspective on biological and social factors.”

4. Makel et al. (2016). *Intelligence*. “Sex differences in the right tail of cognitive abilities: An update and cross cultural extension.”

5. Hyde et al. (2008). *Science*. “Gender Similarities Characterize Math Performance.”

6. Johnson et al. (2008). *Perspectives on Psychological Science*. “Sex differences in variability in general intelligence: a new look at the old question.”