

# The Math Gender Gap: Nurture Trumps Nature

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**(Updated)** Rural India might not seem a likely place to study the roots of gender differences in math performance. But a new study of two tribes living in the northeast of the country offers intriguing evidence that biology alone does not determine women's math aptitude (or lack thereof, as former Harvard President Lawrence Summers once infamously suggested) and that culture has a lot to do with the differences between the genders.

Prior research has found that fewer than 10% of tenured math professors are women at Ph.D.-granting institutions (only 7% are full professors at top 100 universities), so understanding the reasons for the disparity could help address it. The new study of members of the Khasi and Karbi tribes of India suggests that the influence of culture can virtually eliminate at least some of the gender differences.

Researchers led by Moshe Hoffman, a postdoctoral fellow at the University of California, San Diego, studied villagers from both tribes. Genetically, the Khasi and Karbi are highly similar: the groups only became separate a few hundred years ago and some intermarriage continues. Both groups are also subsistence farmers, living mainly on rice in a hilly region that gets world-record levels of rainfall.

Culturally, however, they are quite distinct. The Karbi are patrilineal. Women are only rarely allowed to own land and the eldest son in each family inherits the property. Political and religious leadership is male-dominated and girls leave school nearly four years earlier than boys.

Among the Khasi, though, women are the landowners, with no exceptions. Inheritance goes to the youngest daughter and men are not supposed to handle money. Even cash earned by men working outside the family farm is typically given to their wives. Both genders are equally educated.

The Khasi are not completely matriarchal, however. Men do make up the political and religious leadership. (These variant land practices are permitted in India, as the tribal regions are semi-autonomous, similar to American Indian reservations.)

Hoffman and his colleagues studied 1,279 people, from four Khasi and four Karbi villages, paying them for their time to test their ability to solve block puzzles. Each block was divided into four parts and tests were scored by how fast people could accurately assemble the pictures painted on them. The puzzles were designed to test participants' spatial abilities, which are linked to math and science aptitude.

Among the male-dominated Karbi, men were 36% faster at solving the block puzzles than women. But about a third of the overall difference was attributable to the greater education received by the boys among the Karbi, and the rest seemed to be linked to other cultural differences.

Among the Khasi, the difference between men and women was so small that it was not statistically significant. “This study tells us that culture does matter,” says Hoffman. “What makes [it] unique is that we can control for biology.”

Hoffman describes conversations he had with villagers that typify the differences. Among the Karbi, he spoke with an 18-year-old girl who had recently married. She had left school at age 8. “I asked her, ‘Why didn’t you keep going?’” She replied, “That would be a complete waste. Women are not smart enough to understand and would I never use it anyway.”

Among the Khasi, however, it is male abilities that are the subject of negative stereotypes. Speaking to a Khasi woman, Hoffman confirmed that she handled the finances in her marriage. When asked why, she replied, “If you give a man money, he’s just going to waste it on booze.”

While the Karbi seemed typical on levels of trust and hospitality, the Khasi were exceptional in both, according to Hoffman. “They are some of the nicest people I’ve ever met,” he says, describing how people welcomed and trusted him, even when he first arrived. For example, he once needed to buy almost all of the food in the town’s lone store. When he didn’t have appropriate change, the storekeeper gave Hoffman the food anyway, even though the two had never met before, saying to pay the next day.

The current study is not without its limitations, namely that the puzzle used to test villagers’ spatial skills did not include the rotation of figures — similar to that seen in the computer game Tetris — which is used in traditional spatial-ability tests. Such tests were not used in this case, however, because the abstract objects would have been too unfamiliar to the Indian tribes.

Critics of the findings are bound to point to the lack of spatial-rotation testing, says Rebecca Goldin, director of research at science-media watchdog Stats.org and associate professor of mathematics at George Mason University. She was not connected with the study. (Full disclosure: Goldin and I are colleagues at Stats.org.)

“I think that is valid concern,” she says. “But I do think the study certainly does suggest that some spatial abilities have a cultural influence. This fits into the large amount of literature that suggests that culture differences have a large impact on performance.”

Indeed, culture is not limited simply to encouragement of young girls in grade-school math. Studies that have looked at gender gaps in math performance have found that the more equitably a country treats its people, the smaller that gap is. In Scandinavian

countries, for example, where men and women share paid family leave and high quality day care is affordable, the gap is much narrower.

Girls in those countries see in their mothers' lives that child-rearing and math careers are not incompatible; the mothers also don't have to give up high powered jobs to have kids so they reach higher levels of equality with men at work. Even in the U.S., the ranks of female math and science professors—including those in tenure-track positions— are growing appreciably.

"These questions of biology could be possibly relevant if we had solved all of the social problems," says Goldin. "It could be that there's a difference, but it doesn't matter when you have such gaping cultural differences."

Goldin has a family history that provides unique insight on the issue. Her father is a physicist, her sister is also a math professor and all three were educated at Harvard. "In my opinion, it has a lot to do with self-definition," Goldin says. "For boys, math is validated and opportunities abound to identify yourself as being mathematically strong and liking math — at least for white and Asian boys. It's really not there as much for girls."

Goldin notes that a huge proportion of her female math professor colleagues also had fathers who were scientists or mathematicians. "That could be genetic, who knows?" she says. "In my own personal life, my father intervened in many subtle and explicit ways." For instance, when principals or teachers tried to steer her away from math, her father objected and stopped them.

"It would be wrong [to conclude from the new study] that nature doesn't play a role. [But] nurture plays a substantial role, large enough that we can even see a gender difference wiped out," Hoffman says.

The study was published in the *Proceedings of the National Academy of Sciences*.

<http://healthland.time.com/2011/08/30/the-math-gender-gap-nurture-can-trump-nature/>