

# Citizens in 34 countries show implicit bias linking males more than females with science

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thoughts that people may be unwilling to express or may not even know that they have - may have a powerful effect on gender equity in science and mathematics engagement and performance, according to a new study published this week in the *Proceedings of the National Academy of Sciences*.

The international study involving more than half a million participants in 34 countries revealed that 70 percent harbor implicit stereotypes associating [science](#) with males more than with females. Moreover, in countries whose citizens stereotyped most strongly, boys achieved at a higher level in eighth-grade science and math.

Implicit stereotypes may contribute to continuing underachievement and under-participation among girls and [women in science](#) compared to their male peers.

"We found a general tendency, across every country that we investigated, that people on average have an easier time associating science concepts with male, rather than with female," said lead investigator Brian Nosek, an associate professor of psychology at the University of Virginia.

"We correlated our data with a measure of actual science achievement among eighth-graders in those 34 countries and found that in the countries with the largest sex gap - where the boys were performing much better than girls in math and science - there also was the strongest implicit stereotyping of science as a male endeavor."

The science and [math](#) achievement scores across nations came from the Trends in International Mathematics and Science Study and were compared with the implicit stereotype data collected through Project Implicit, led by the study's authors.

Surprisingly, there was no gender gap in the tendency to implicitly stereotype science as male. Male and female study participants showed equally strong associations of science with males.

Among nations represented in the study, the United States falls roughly in the middle of the pack in stereotyping science as male, and in the actual achievement of boys compared to girls at the eighth-grade level.

The study is part of Project Implicit, a publicly accessible research and education Web site at which visitors can complete the Implicit Association Test to measure their own implicit associations. The test is available for a variety of topics involving gender, race, religion and politics.

Participants in the gender and science study were asked to quickly categorize words representing male, such as "he," "son" and "father"; or female, such as "she," "daughter" and "mother," with science; such as "physics," "biology" and "chemistry"; or liberal arts, such as "arts," "history" or "literature." Most participants were able to more quickly categorize male words with science items than female words with the same science words.

In Project Implicit's more than 10 years of existence, more than 10 million tests at the Web site have been completed by visitors around the world. A dozen years of research and hundreds of published studies suggest that people have implicit belief systems that may differ from their declared beliefs.

These implicit beliefs are related to behavior, such as interracial behavior, voting and even drug use. A recent meta-analysis led by Anthony Greenwald, one of the researchers on the current study, provides evidence of the relationship between the Implicit Association Test and a variety of behaviors from more than 100 studies.

"Participants are often surprised to learn that they may have unconscious biases involving gender or race or religion that are quite different from their stated beliefs," said Fred Smyth, a co-investigator on the study and research assistant professor at the University of Virginia.

This divergence between implicit and explicit beliefs, and the relation of both to behavior, suggests that behavior is influenced both by deliberate, explicit beliefs and by automatic, implicit reactions.

"We believe that implicit stereotypes and sex gaps in science achievement are mutually reinforcing mechanisms," Nosek said. "When people see patterns, such as men more often working in scientific fields and women more often in non-scientific fields, then a bias may develop in their minds that men may be better equipped to succeed in those fields, and women less so. Simultaneously, possessing a gender stereotype about science might affect one's own behavior toward others or considerations of one's own potential or career options."

"Culture is a powerful force for shaping the beliefs and behavior of its members," Nosek said. "Even if one's explicit beliefs change, the cultural residue may persist in memory and continue to influence behavior."

This presents a challenge for addressing gender gaps in scientific engagement.

Nosek noted that even as women and girls achieve more success in the

sciences, and enter these fields in ever greater numbers, underlying stereotypes that more often link men with science may persist.

"If countries want to increase their competitiveness in science and engineering, they might want to look at their social environments, the social factors like implicit stereotypes that exist at a cultural level, and how this might inhibit women - who comprise more than half their intellectual pool - from contributing to scientific and engineering advancement," Nosek said.

Over the past decade, Nosek, Mahzarin Banaji of Harvard University, and test creator Anthony Greenwald of the University of Washington have led the development of the Implicit Association Test to assess mental associations that may be different than what people know or say about themselves. For the gender and science study, they worked with colleagues at universities and institutes across the globe.

Source: University of Virginia ([news](#) : [web](#))

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