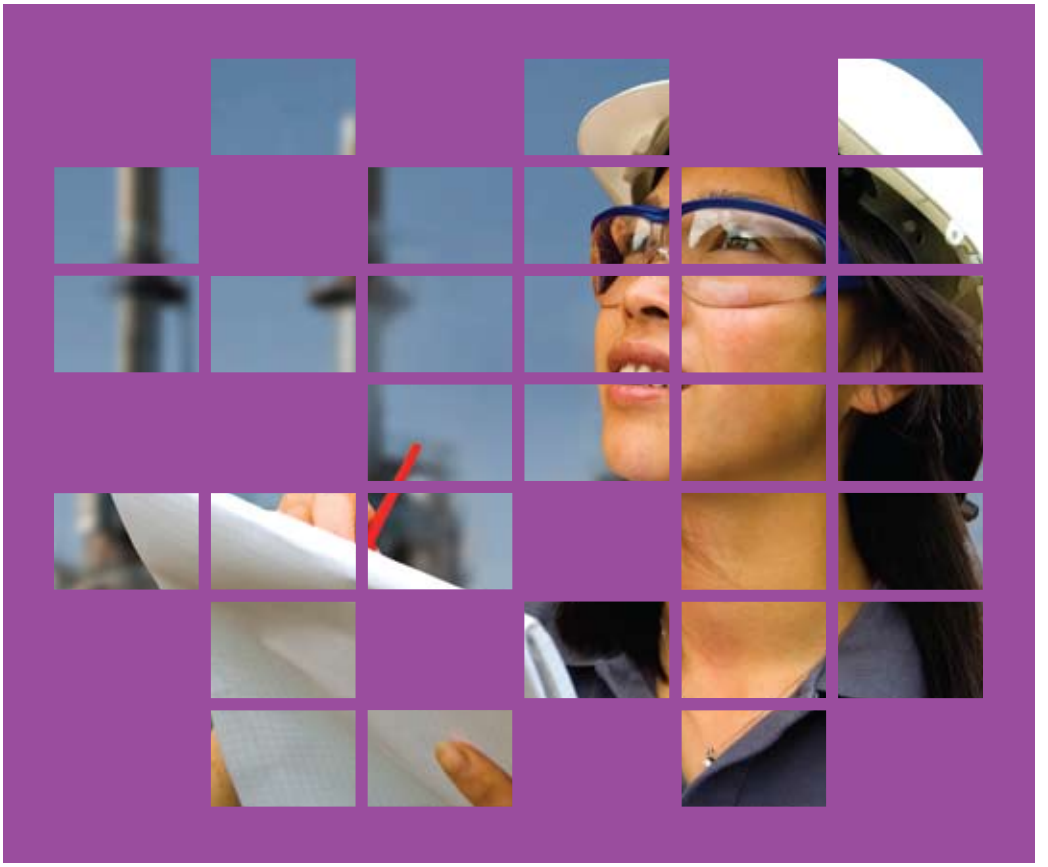


Chapter 8.
Implicit Bias

> A widespread belief in American culture suggests that group membership should not constrain the choices and preferences of group members. Being a girl need not prevent one from becoming a police officer, senator, or mathematician. Being a boy need not prevent one from becoming a nurse, kindergarten teacher, or primary caregiver. In fact, all programs promoting equal opportunity seek the removal of external constraints for individual pursuits. Yet until the internal, mental constraints that link group identity with preference are removed, the patterns for self-imposed segregation may not change.
>
> — Brian Nosek, Mahzarin R. Banaji,[10] and Anthony Greenwald

Many people say they do not believe the stereotype that girls and women are not as good as boys and men in math and science. The research of Mahzarin Banaji, however, shows that even individuals who consciously refute gender and science stereotypes can still hold that belief at an unconscious level. These unconscious beliefs or implicit biases may be more powerful than explicitly held beliefs and values simply because we are not aware of them. Even if overt gender bias is waning, as some argue, research shows that less-conscious beliefs underlying negative stereotypes continue to influence assumptions about people and behavior.

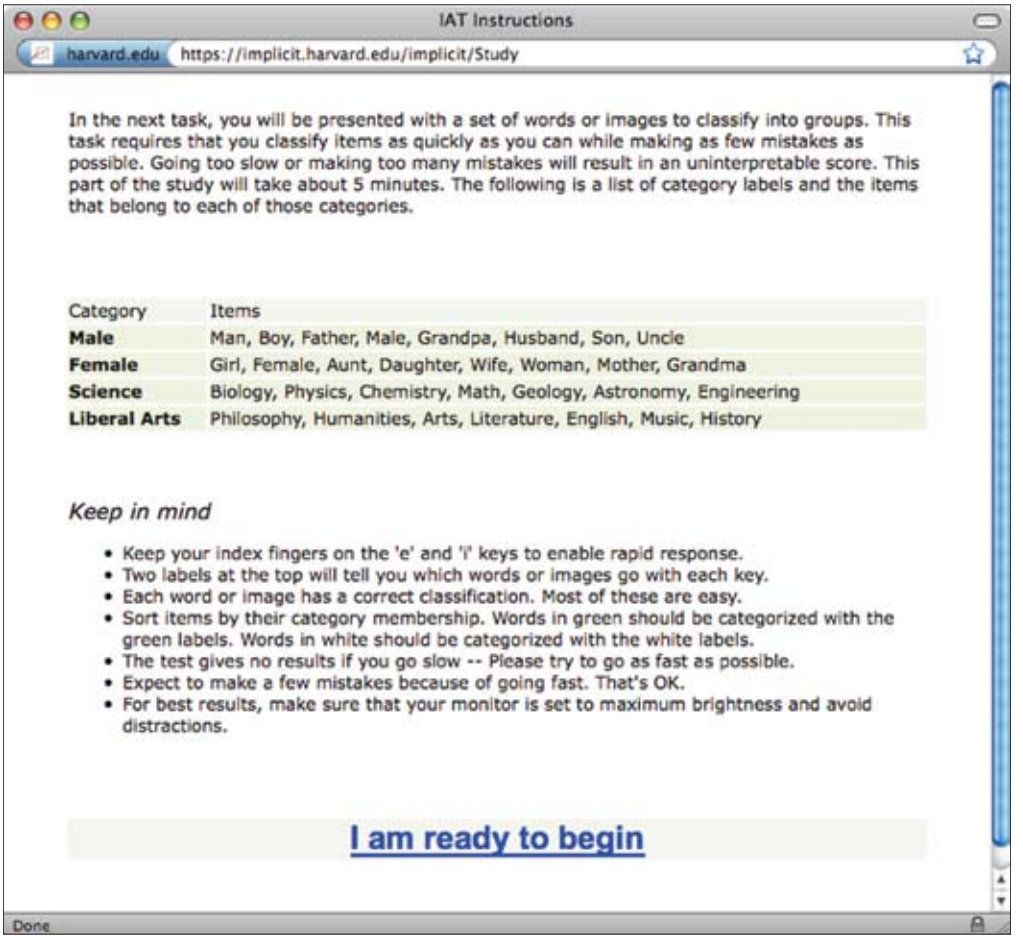
Banaji is a professor of social ethics at Harvard University and a co-developer of the implicit association test (IAT) with Anthony Greenwald, professor of psychology at the University of Washington, and Brian Nosek, professor of psychology at the University of Virginia. Together they created and operate the Project Implicit website (https://implicit.harvard.edu), a virtual laboratory housing implicit association tests that measure the association between two concepts to determine attitudes about different social groups. For example, the gender-science IAT, which is the focus of this discussion, measures the association between math-arts and male-female (see figure 20).

For the gender-science IAT, participants (who take the test anonymously) complete two rounds of categorization. In each round, participants are asked to categorize 16 randomly ordered words, eight representing either "male" (for example, boy, son) or "female" (for example, daughter, girl) and eight representing either "science" (for example, physics, engineering) or "arts" (for example, English, history). In one round, participants use one key to indicate words representing male or science and another key to indicate words representing female or arts. In the second round the pairings are switched, and participants hit one response key to

[10]Mahzarin Banaji is the Richard Clarke Cabot Professor of Social Ethics and head tutor in the Department of Psychology at Harvard University. Her research focuses primarily on mental systems that operate in implicit or unconscious mode. With Brian Nosek and Anthony Greenwald, she maintains the educational website at https://implicit.harvard.edu, which was designed to create awareness about unconscious biases in self-professed egalitarians.

indicate if a word represents male or arts and another key if a word represents female or science.[11] The participants' response time for both rounds is measured, and the average response time when science is paired with male is compared with the average response time when science is paired with female.

Figure 20. Instructions for an Implicit Association Test on Gender and Science



Source: Retrieved November 2009 from https://implicit.harvard.edu/implicit.

[11] The sequence of whether male is paired with science or arts first and female with the other is decided randomly for each test taker.

Since the gender-science test was established in 1998, more than a half million people from around the world have taken it, and more than 70 percent of test takers more readily associated "male" with science and "female" with arts than the reverse. This tendency is apparent in tests on the website and in the lab (Nosek et al., 2002a). These findings indicate a strong implicit association of male with science and female with arts and a high level of gender stereotyping at the unconscious level among both women and men of all races and ethnicities. The findings also challenge the notion that bias against women in math and science is a thing of the past.

Banaji did not begin her career in social psychology with an interest in gender bias. As a graduate student (supported by an AAUW fellowship) at Ohio State University, she studied social cognition, a broad field that looks at how people make decisions about other people and themselves. "I don't think that the word gender appeared even once in conversations in my five years in graduate school," Banaji remembers. In her first faculty position at Yale University, however, the results of a particular experiment caught her attention.

Jacoby et al. (1989) found that when individuals were shown random names, such as Sebastian Weisdorf, from a phone book, a few days later they were likely to identify that name as the name of a famous person from a list of both famous and unknown persons. Banaji explains: "Memory works in odd ways. Something that we have seen before lingers in our mind, and sometimes we use that information to incorrectly make decisions." She wondered if the same thing would happen with female names and replicated the experiment using the name Sally Weisdorf alongside Sebastian Weisdorf. Surprisingly, Banaji found that people were less likely to identify Sally as famous, even though both Sally and Sebastian were unknown. Women, it seemed, did not falsely "become famous" overnight like men. Based on this finding, Banaji concluded that people must unconsciously associate "male" and "fame" more readily than "female" and "fame." When asked if gender had anything to do with their choices, study participants said no, indicating that they were not conscious of their bias. This finding led Banaji to try to understand unconscious forms of bias. She told AAUW that these unconscious beliefs can help explain "how good people end up unintentionally making decisions that violate even their own sense of what's correct, what's good."

IMPLICIT BIASES AND GROUP IDENTIFICATION

In their first series of lab experiments to measure the strength of implicit attitudes between gender and math and science, Banaji and her colleagues worked with a sample of undergraduate students (40 women and 39 men) at Yale University. In one study, the researchers found that although both female and male participants had negative implicit attitudes toward

math-science compared with language-arts, women showed a more negative evaluation of math-science (Nosek et al., 2002b). Additionally, women identified more strongly with arts than with math, but men showed no preference for either math or arts. Insofar as this result is representative of the population of the United States as a whole, Banaji says:

> The first effect is that our culture does not support the idea that studying math and science is a cool thing to do. That alone is something to worry about. However, girls and boys seem to know that if one or the other group is better at it, it's boys. When we look at how quickly men associate self with math, it's a lot more easily than do women. Often we hear from girls that it's not that they can't do math; it's that they don't identify with it. And that's critical—when you don't see yourself connected to a particular path, whether it is math-science or motherhood, the likelihood is that you will steer clear of it.

In the second study of another group of Yale undergraduates, Banaji and her colleagues measured the implicit math-gender stereotype and degree of gender identity. They found that both women and men held equally strong implicit stereotypes linking math to male. They also found that the degree to which female and male students identified with their gender group was related to their attitude toward math, math identity, and the endorsement of math-gender stereotypes (ibid.). For example, women who more closely identified with female identity showed more negative math attitudes and weaker math identity. According to Banaji, "The sad but clear implication of that result is that the more you associate with your group (female), the less you are likely to associate with math. Something has to give, so to speak, and it's not going to be the connection to your gender; math is psychologically more dispensable."

IMPLICIT GENDER-SCIENCE BIASES AND GENDER GAPS IN PERFORMANCE

Implicit gender-science biases may go beyond influencing individual behavior. The overall level of the implicit association of science with male in a country may be related to gender disparities in math and science performance. A recent study conducted by several researchers from several countries, including Banaji, examined whether national differences in implicit gender-science stereotypes could predict gender differences in performance in math and science.

The researchers hypothesized that a two-way relationship may exist between the level of gender-science stereotyping and gender differences in science performance. Stereotypes linking science with male may create gender differences in performance among students, and those gender differences in performance may reinforce the stereotypes linking science with male (Nosek et al., 2009). To test this idea the researchers examined whether a country's mean level of the implicit gender-science stereotype could predict gender difference in eighth

grade performance in science on the Trends in International Mathematics and Science Study (TIMSS). Using data from almost 300,000 gender-science IATs completed by citizens of countries that participate in TIMSS, the researchers first determined the level of the implicit gender-science stereotype for each country by calculating the mean of all valid IAT scores for citizens from each country. Second, the researchers calculated the gender gap in performance by subtracting the average female performance from the average male performance for each of the 34 countries that took part in the 2003 TIMSS.

The results of the study showed a positive relationship between the implicit gender-science stereotype of the country and the gender difference in eighth grade science TIMSS performance. Specifically, the stronger the association between male and science in a country, the larger the male advantage in science performance. In this study, implicit biases predicted TIMSS performance better than self-reported stereotypes did. Because this study was correlational, the researchers could not determine whether the weaker performance of girls in science created the implicit gender-science stereotype or whether the stronger gender stereotype led to poorer female performance. Banaji believes, however, that it is the latter:

> The degree to which the idea that girls aren't good at science is in the air we breathe, the more likely it is to show up in patterns of attitudes, beliefs, and performance. If you look around you and only a fraction of those doing science come from group A, what are members of group A and B to think? It doesn't take too many neurons to figure out that perhaps group A isn't so good at science.

IMPLICIT BIAS AND WOMEN IN STEM

Overall, the implications of this research for women in science and engineering are significant. Implicit biases against women in science may prevent girls and women from pursuing science from the beginning, play a role in evaluations of girls' and women's course work in STEM subjects, influence parents' decisions to encourage or discourage their daughters from pursuing science and engineering careers, and influence employers' hiring decisions and evaluations of female employees.

Banaji points out that unconscious beliefs, once they are brought to the fore, can be changed if the holder of the belief so desires: "Implicit biases come from the culture. I think of them as the thumbprint of the culture on our minds. Human beings have the ability to learn to associate two things together very quickly—that is innate. What we teach ourselves, what we choose to associate is up to us."

RECOMMENDATION

- **Raise awareness of implicit bias.**

  A main purpose of the IAT is to help educate individuals about their implicit biases. Although implicit biases operate at an unconscious level and are influenced by our cultural environment, individuals can resolve to become more aware of how they make decisions and if and when their implicit biases may be at work in that process. Anyone can take the IAT at https://implicit.harvard.edu to gain a better understanding of their biases. Educators can look at the effect their biases have on their teaching, advising, and evaluation of students and can work to create an environment in the classroom that counters gender-science stereotypes. Parents can resolve to be more aware of messages they send their sons and daughters about their suitability for math and science.