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Whatever you do, please don't choke

Study says worrying saps brain's processing power

By Jeremy Manier
Tribune staff reporter
Published May 24, 2007

Psychologists have long known that stereotypes about intelligence can be self-fulfilling, leading women, minorities and even white male students to perform poorly if others expect it of them.

Exactly why that happens is a mystery that [Sian Beilock](#) of the University of Chicago may have helped crack in a new study that suggests worrying about a stereotype leaves less brainpower for the task at hand.

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Beilock and two colleagues gave female students a set of math problems after telling them that men consistently do better than women at standardized math tests. As expected, those women did worse than others who were not reminded about math stereotypes.

Stranger yet, the women also did worse at a non-mathematical chore requiring them to remember which letters were shown on a screen.

The reason may be that the stereotype didn't simply scale down the students' expectations for themselves. Beilock believes that worrying about the stereotype actually took up processing resources in the brain that otherwise would be used to solve the math problems and other tasks that rely on so-called "working memory."

"This can have important implications for high-stakes testing, which is what we're all about in education these days," said Mark Ashcraft, an expert on math-testing anxiety and chair of psychology at the University of Nevada, Las Vegas. "Even if you're really good at a subject, when someone arouses the stereotype, you'll do more poorly than you're able. You spend half of your consciousness worrying about it."

Knowing how stereotypes can affect test results may help students overcome such distractions. Previous studies have suggested that students trained to think of their intellect as something they can improve, rather than a fixed trait, are less vulnerable to the effects of stereotypes.

In Beilock's study, the people who did best were allowed to practice the problems beforehand and had less need to do computations in real time. That reduced the overall strain on working memory, offsetting the strain that the stereotype reminder apparently caused.

Even reading about why stereotypes make people perform below their abilities appears to help some students ease their test anxiety, said Joshua Aronson, an associate professor of psychology at New York University.

"You can teach students how to take a less negative attitude about their difficulties," Aronson said. "If they remind themselves that this is just something people go through, and it can go away if they relax, they can do beautifully well."

Studying how students and athletes "choke" under pressure has grown into a specialty for Beilock, whose new study is slated for Thursday's issue of the Journal of Experimental Psychology. A former lacrosse player, she has analyzed the finer points of choking among golfers and hockey players as well as math test-takers.

The reasons for choking are different in sports and academics, Beilock has found. For expert golfers, choking can happen when they have more time to think about a putt, rather than simply executing the skill they've

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perfected.

For math calculations, working memory is key -- it's what allows someone to keep track of the borrowing and carrying of numbers in a complex problem. When a good student feels too much pressure, that reduces the store of working memory and increases the risk of choking.

That's exactly what happened to the female students in Beilock's study, which she co-authored with colleagues from Miami University in Ohio and the University of California, Santa Barbara. The students were reminded of the gender gap on math tests and told their performance would be compared to that of students across the country.

"We asked the women afterward what they were thinking about during the test, and they were worrying," Beilock said. "If women are worrying about screwing up, that uses their working memory resources."

The women also did worse at a test of non-mathematical working memory, suggesting that the strain on working memory caused by math stereotypes can spill over into unrelated subjects.

"This is lovely science," said Jeremy Gray, a psychology professor at Yale University.

Men are just as vulnerable to such effects in the right situation, studies have found. Aronson of NYU published a study in which white men who normally excelled on math tests were told they were part of an effort to uncover the secret behind Asian superiority in math. The men subjected to that stereotype slid dramatically in their performance, missing an average of three more questions out of an 18-question test than men who were not reminded of the stereotype.

"These are guys who had a 750 SAT score [out of a possible 800] at a minimum," Aronson said. "But when you walk them in the shoes of a typical minority or woman math student, they choke. It really is something anyone can experience."

The gender gap on math tests is small but persistent, experts say. In 2006 women scored an average of 34 points lower than men on the math portion of the SAT.

Explaining such differences has stirred deep controversy among researchers. Former Harvard President Lawrence Summers left his post last year in part because of an uproar over his suggestion that innate genetic differences account for some of the achievement gap between the sexes in math and science.

It would be wrong to conclude that such differences are set in stone, Aronson said. In one study, Aronson found that simply reminding women that they were students at a selective liberal arts college wiped out the performance difference between genders.



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"Summers was right that there can be sex-linked effects, but how they unfold in the real world is a function of sex and the situation you're in," Aronson said. "If you can make that gap go away, there's hope for nurturing the intelligence of people who are assumed not to have it."

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