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Proof math can be a real pain

Report shows similarities between brain's response to math anxiety and physical pain

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November 14, 2012

Sian Beilock is the author of "Choke: What the Secrets Of the Brain Reveal About Getting It Right When You Have To."

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She recently co-authored a report that suggests that when a person is anxious about math, his or her brain responds in the same way it would if the person was experiencing pain.

Beilock, a professor of psychology at the University of Chicago, helps people learn how not to choke in important, stressful situations, such as taking a math test.

She has her own story of choking: Years ago she was playing in the U.S. Youth Soccer Olympic Development Program, and a national coach was on the field, standing behind her. She was the goalie and allowed two goals to fly past her.

"It was a horrible game and affected my interest and willingness to pursue soccer," she told me. "I knew I could play as a top athlete, but when the pressure was on, I didn't pull out my best performance."

She said there's a lot of research that has examined how we learn, but she wanted to know what happens when we sometimes fail to show what we know. We talked about her math study, and here's an edited transcript of our conversation:

Q: For the report, you and your former doctoral student, Ian Lyons, studied people who said they were anxious about math and others who weren't.

A: We asked everyone to do a series of tests while we scanned their brains using magnetic resonance imaging. We are able to look at what's going on in the brain when they're anticipating doing math and while they're doing it. One of the parts of the brain that was more active for people who are math-anxious was the back part of the insula. It's an interesting region because we know it's active when people have visceral stress or feel physical pain. We showed that the more anxious people were about math, the more that region of the brain was

activated. For people who weren't anxious about math, we didn't show that relationship.

Q: Why choose math as a subject?

A: We'd been interested in how anticipation and anxiety about something you don't like to do or aren't confident about affect the brain and how you perform. We know math is a common issue for a lot of people. You don't hear people bragging that they can't read. But it's totally acceptable to admit you're not a numbers person. We wanted to know: Is there something about anxiety regarding doing math (that we can see during magnetic resonance imaging) that affects how math-anxious people perform and whether they want to pursue math?

Q: If math is painful, people will stay away from it?

A: It's like what I did on the soccer field. People will be reluctant to learn math, and that's problematic because math is such a part of our world. In our study we had participants looking at algebraic equations or solving for "x." But research has shown that people who are highly anxious about math don't perform rudimentary problems well.

Q: Your testing showed that these weren't people who were just naturally high-strung and anxious about many different things, right?

A: That's right.

Q: And, their anxiety about math wasn't only about taking tests?

A: One of the interesting things about math anxiety is that you don't have to be under the microscope of being tested. People get anxious when they get a receipt or get a math textbook or even when they're told their math requirements for graduation.

Q: I've tried to be a math cheerleader for my daughter because of the stereotypes that suggest girls aren't good at math. There's a fascinating gender component to this research.

A: We know from other work that women tend to be more anxious about math than men. In previous work that we've done, we've followed up on a finding that one group of people that tend to be most anxious about math are teachers who are going into elementary school education. In the U.S., 90 percent of them are women. We found that for first- and second-grade teachers, the more anxious they were about their math skills, this affected the girl students more than the boys.

Q: The teachers made the girls more anxious?

A: The girls were more likely to endorse the thinking that boys are better in math than girls. The consequence is that teachers send messages to girls, and they develop their own anxiety. People who have math anxiety talk about having negative experiences with math early on. Most people think those experiences don't happen until middle school. But we have another paper that shows first- and second-graders have math anxiety.

Q: The messages are so important.

A: Last year I blogged about a T-shirt that was on the shelf at a department store. It said, "I'm too pretty to do math so my brother does it for me." It was aimed at tween girls.

Q: Well, that sucks. I've noticed that people tend to think that either you write well or you do math well. But the two aren't mutually exclusive.

A: People pigeonhole themselves. It doesn't have to be that way. You may have a natural proclivity to do one thing, but that doesn't have to come at the expense of the other. There are many obstacles.

Q: What can a person do if he or she is anxious about math?

A: There are psychological tools, and journaling is one. We haven't published that journaling works on math anxiety, but we have shown that it works on other testing. Journaling before a test allows you to download those worries so that they're less likely to pop up and distract you later.

Q: Writing about numbers. I like that — pure poetry.

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