

Fear of math makes your brain hurt, study confirms

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To the math-minded among us, tackling something like the Pythagorean theorem is easy, even fun. To others, anything with numbers and letter causes sweating, teeth gnashing, broken pencils, and a general feeling of dread. Now, a new study shows when number-phobic people anticipate math, their brains believe they are feeling physical pain.

“People often walk around talking about how awful math is,” says Sian Beilock, psychology professor at the University of Chicago and author of the book, “Choke: What The Secrets Of The Brain Reveal About Getting It Right When You Have To.”

“In our society it is common to hate math,” Beilock says. “You don’t hear people walking around bragging about how they can’t read.”

Beilock and doctoral student Ian Lyons asked 14 adults with math anxiety to verify the results of an equation such as $(a*b) c = d$ or work on word puzzles -- where subjects discerned whether a string of letters makes an English word if the spelling is reversed --while in a fMRI. Beilock and Lyons found when people with high levels of math anxiety anticipated equations, their brain reacted much like they would if they were in physical pain. The higher the person's anxiety, the more the posterior insula flashed with activity. (The posterior insula is what springs into action when one burns her hand or stubs her toe.) The researchers also found activation in the cingulate cortex, which also serves in the brain’s pain center.

“We have this evolutionary ancient, pain system that responds when we burn our hands on the stove and are in physical pain ... when people are anxious and anticipating the math test, (our brains) activate the same system,” Beilock explains.

Beilock, who views math positively as a challenge and puzzle, was surprised to learn that people reacted as if they were in pain only when they anticipated math, not while working on the equations.

“We weren’t necessarily expecting to see the activation in the anticipation and thought that was interesting,” Beilock says. She believes that when people actually started the math problems, the pain and anxiety subsided because they focused on the task at hand.

While people don’t actually feel pain—there aren’t any mysterious burning or pricking sensations while thinking about numbers—the brain reacts as if the hand is being burned.

“The brain isn’t making a clear distinction (between physical and mental pain),” she says. “People talk about math as if it is actually painful.” And it is. Because of this, people anticipating math might also feel the same physiological symptoms that a person who stubbed her toe, such as sweaty palms and increased heart rates.

Some of these unpleasant math side effects can be reduced. Beilock has evidence that if math anxious people spend 10 minutes writing about their fears, they purge their anxiety and perform better—and reduce any physical reactions.

The paper appears in the online journal PLOS ONE.

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