



## BRAIN

## High Anxiety: How Worrying About Math Hurts Your Brain

By Olivia B. Waxman | Nov. 08, 2012 | 2 Comments

Does math make you anxious? The latest research shows that even the thought of arithmetic can trigger a physical reaction that looks a lot like pain in the brain.

If you consider yourself mathematically challenged — meaning you break a sweat every time you have to solve a math problem or calculate the tip at dinner — then what you are feeling may be more than just embarrassment.

According to a study conducted by Ian M. Lyons and Sian L. Beilock, psychology professors at the University of Chicago, math anxiety may be much more than a psychological aversion to numbers. Many math-phobics go out of their way to avoid math-related tasks or thinking about math problems, and this reaction led the scientists to wonder whether something more than dislike was involved. And math phobia made a useful study target since people who find math challenging have no shame in talking about their fears. “You often don’t hear people walking around bragging about how they can’t read,” says Beilock.

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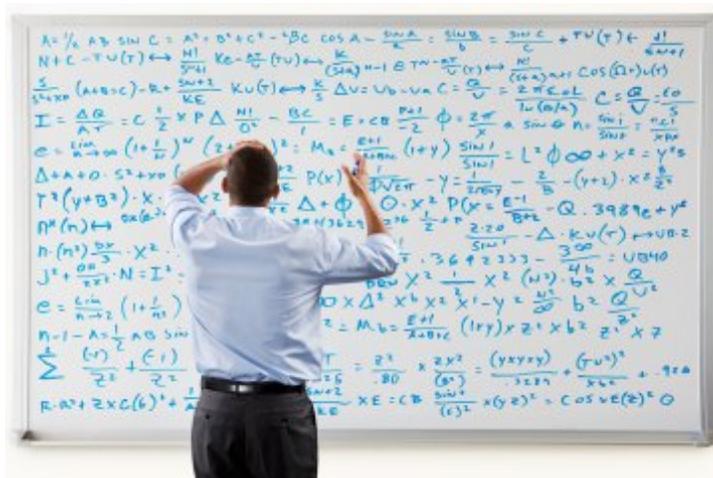
Beilock and Lyons tracked 14 people with high math anxiety and 14 people with low math anxiety and asked them to rate how anxious they get in math-related situations such as “walking to math class” or “opening a math or statistics book and seeing a page full of problems.” Then the researchers used an fMRI to peek inside their brains when they alerted the volunteers, with a yellow-circle cue card, that they would have to solve a math problem. (For comparison, the participants also performed word tasks, which were preceded by blue-square cue cards.)

That’s when they noticed increased activity in the dorso-posterior insula (INSp), the fold of tissue in the brain that is activated when a person experiences physical pain like burning his hand, but only in the math-anxious subjects, and not in those who did not have math anxiety. It’s also the area that lights up in response to severe social rejection such as a bad romantic breakup, which can result in symptoms of physical pain as well.

Interestingly, these pain areas were more intensely activated when the math-phobics were anticipating an upcoming math-related task, and not while they were actually trying to solve a math problem. Which suggests that it’s not math itself that gets people wound up. “There’s something about the anxiety itself that may rob people of the brainpower that they could otherwise use to do math well,” Beilock said. “There may not be this distinction between the mind and body that we always talk about, especially since some of the ways our brain registers physical pain, social pain, and pain about doing math is all very much the same.”

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But why the intense connection between math and physical pain? Most circumstances that trigger pain centers in the brain are deeply rooted in evolutionary survival strategies — which is why being rejected by a close friend or loved one is painful, since that threatens our ability to survive by thwarting our ability to reproduce and take advantage of community resources for gathering food and shelter. But math? That’s a cultural



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phenomenon that, while certainly useful, isn't a matter of life and death.

Beilock and Lyons say the data suggest that even non-threatening, physically benign circumstances can tap into the anxiety and pain response — if we let them. Regardless of how a math aversion starts — a scary arithmetic teacher or tedious pages of math homework in school — even something as seemingly innocuous as math can take on anxiety-inducing and pain-triggering reactions that may be out of sync with their actual threat to our lives. And that has to do with how we respond to stress.

Fortunately, the anxiety related to math can be dialed down, and just as the brain adapts to viewing numbers as a threat, it can also adapt to seeing them as not so harmful. In her book exploring the science of how people handle high-stress situations, *Choke: What the Secrets of the Brain Reveal About Getting It Right When You Have To*, Beilock recommends that math anxious people write down their worries before performing a quantitative task or facing a math test and to focus on the positive — like the fact that they did the homework or are well-prepared for the test .

That may be useful for helping educators and students to cope with math stress, and encourage youngsters to overcome any fears they may have about the subject, rather than allowing those fears to grow into anxiety and something more. “We have to deal with not just the content of what’s going on in classes, but also making sure kids feel motivated and are enjoying the subject,” says Beilock. Especially since jobs in STEM fields (Science, Technology, Engineering, and Mathematics) are growing at three times the rate of non-STEM jobs.

Beilock and Lyons’s study, which was supported by the National Science Foundation, was published online in *PLOS ONE*.

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