

A change in perspective could be all it takes to succeed in school

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Knowing the right way to handle stress in the classroom and on the sports field can make the difference between success and failure for the millions of students going back to school this fall, new University of Chicago research shows.

"We found that cortisol, a hormone released in response to stress, can either be tied to a student's poor performance on a [math](#) test or contribute to success, depending on the frame of mind of the student going into the test," said Sian Beilock, associate professor in psychology at UChicago and one of the nation's leading experts on poor performance by otherwise talented people.

She is the author of "Choke: What the Secrets of the Brain Reveal About Getting it Right When You Have To," released this month in paperback.

In a new paper published in the current issue of the journal "*Emotion*," Beilock and her colleagues explore the topic of performance failure in math and show, for the first time, that there is a critical connection between [working memory](#), math anxiety and salivary cortisol.

Working memory is the mental reserve that people use to process information and figure out solutions during tests. Math anxiety is fear or [apprehension](#) when just thinking about taking a math test. Cortisol is a hormone produced by the [adrenal gland](#) and associated with stress-related changes in the body; it is often referred to as the "stress hormone."

Tracking math anxiety in students

Beilock and her team tested 73 undergraduate students to determine their working memory capacities and their level of math anxiety. They also measured cortisol levels (via a [saliva](#) sample) before and after a stressful math test. They published the results in a paper titled "Choke or Thrive? The Relation between Salivary Cortisol

and Math Performance Depends on Individual Differences in Working Memory and Math Anxiety."

Among students with low working memories, there was little difference in performance related to either cortisol production or math anxiety, the study found. Students with lower working memory exert relatively less mental effort to begin with, researchers found, so taking a stressful test didn't drastically compromise their performance.

Among people with large working memories, those who were typically the most talented, rising cortisol either led to a performance boost or a performance flop - depending on whether they were already anxious about math. For students without a fear of math, the more their cortisol increased during the test, the better they performed - for these confident students, the body's response to stress actually pushed them to greater heights. In contrast, for students with more anxiety about math, surging cortisol was tied to poor performance.

"Under stress, we have a variety of bodily reactions; how we interpret these reactions predicts whether we will choke or thrive under pressure," Beilock said. "If a student interprets their physiological response as a sign they are about to fail, they will. And, when taking a [math test](#), students anxious about math are likely to do this. But the same physiological response can also be linked to success if a student's outlook is positive," she further explained.

In other words, a student's perspective can determine success or failure. Students can change their outlooks by writing about their anxieties before a test and "off-loading" their fears, or simply thinking about a time in the past when they have succeeded, her research has shown.

Taking an exam brings on a different kind of pressure than when a student recites a memorized speech before classmates or an athlete plays

before a packed stadium, other research by Beilock and her team demonstrates.

Why people choke under pressure

In another paper published this month in the "Journal of Experimental Psychology," Beilock and her colleagues identify, for the first time, different ways in which people can fumble under pressure. They also suggest remedies. The work, which was based on a series of experiments with several hundred [undergraduate students](#) in varying stressful situations, is reported in the paper "Choking Under Pressure: Multiple Routes to Skill Failure."

The experiments explored two theories of why people choke: One holds that people are distracted by worries, and as a result, fail to access their talents; another conversely proposes that stress causes people to pay too much attention to their performance and become self-conscious.

"What we showed in these experiments is that the situation determines what kind of choking develops. Knowing this can help people choose the right strategy to overcome the problem," Beilock said.

In the case of test-taking, good test preparation and a writing exercise can boost performance by reducing anxiety and freeing up working memory. The kind of choking prompted by performing before others calls for a different remedy.

"When you're worried about doing well in a game, or giving a memorized speech in front of others, the best thing to do is to distract yourself with a little tune before you start so you don't become focused on all the details of what you've done so many times before," she said. "On the playing field, thinking too much can be a bad thing," she further explained.

Provided by University of Chicago

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