At one time or another, most students feel anxious going into a big test. But how students interpret those sweaty palms and racing pulse can make or break their performance. A new study in the Proceedings of the National Academy of Sciences suggests **two ways teachers can help students thrive in spite of stress.**

Researchers led by Stanford University psychologist Christopher Rozeck found that low-income students who expressed their anxiety or reinterpreted it as positive through pre-test writing assignments significantly improved their performance on two end-of-semester biology tests. Moreover, those students were half as likely to fail the critical 9th grade gateway course as similar students who had not participated in the writing exercises.

"What students show on a test is not just what they know, and our anxieties do play in to what we're able to show," said co-author Sian Beilock, the president of Barnard College at Columbia University and an expert in the effects of anxiety on learning and performance.

In the large, economically diverse Midwestern high school the researchers studied, low-income students were significantly more likely to fail the 9th grade biology course than their wealthier peers.

"Anecdotally, teachers who taught these courses do tend to find that students who do really poorly—and especially who fail their first-semester tests—are likely to become demotivated during the second semester," Rozeck said. "They are less interested in the material and less engaged after having kind of this negative first-semester experience with the course."

This can become a self-fulfilling prophesy, Beilock said. In STEM courses, students in poverty, women, and students of color can face added stress from stereotype threat, the added pressure to perform on students from groups that are traditionally viewed as lower-performing in a subject. The more students dwell on their worries, the less "mental bandwidth" they have to focus on the test at hand, and the less likely they are to perform well, which feeds their anxiety, Beilock said.

"There's a big disparity in terms of how lower- and higher-income students think about stress," Rozeck said. "We've found that higher-income students were more likely to hold the belief that a little bit of stress before a test can actually be helpful for their performance, whereas lower-income students were less likely to view stress as helpful."

**Rethinking Stress**

To break that cycle, the researchers randomly assigned some of nearly 1,200 9th graders to take their mid-term and end-of-year tests as usual. Others were asked to write for 10 minutes just before taking the tests, expressing and exploring their thoughts and feelings before the exam. Still other students read and reflected on an excerpt from a 2011 study in the Journal of Psychophysiology, including a passage nothing that:

"Sometimes in important situations, people notice that they have a faster heartbeat, sweaty palms, shortness of breath, butterflies in their stomach, and lots of energy running through their body. People usually think that this means that they are nervous, anxious, or worried. However, these feelings happen for all kinds of reasons, and it does not mean that we need to feel worried or nervous. For example, we feel this same way when we are excited about a surprise, when we are getting ready for a fun sports competition, or when we fall in love. So, feeling a faster heartbeat, for example, doesn't mean you will perform badly. Having these feelings could actually help you!"

This is because when people care about something, such as doing well on a test, our body's nervous system tells the body to release energy and deliver more oxygen to the brain. This helps you to stay alert and pay attention to the important thing that is going on in your life. Therefore, experiencing a faster heartbeat, heavy breathing, or sweaty palms could actually be a good thing. It is your body's way of pumping you full of energy and attention! But it all depends on whether you choose to use this energy. ..."

Participating in the writing tasks before the fall and spring tests had little effect on higher-income students, but for low-income students, the benefits were significant. For students who participated in the writing exercises, the test-score gap between students in poverty and higher-income students was 17 percentage points, 7 percentage points less than the performance gap between low- and higher-income students who had not participated in the writing tasks.

"A lot of lower-income students are really hovering on this line between passing and failing the test in the control group," Rozeck said. "We bumped [low-income students] up 6 or 7 percentage points, which could move a student from an F to a D. That's a very important distinction for students, not only in terms of passing or failing the course, but just for what it feels like to get an F in that class."

By the end of the year, only 18 percent of the participating low-income students failed biology—less than half the 39 percent of low-income students who had not participated in the writing tasks.
students in the control group who failed the course.

Also, low-income students who had completed either of the writing exercises showed beliefs about the benefits of stress that were closer to those of their higher-income classmates:

The researchers found equal benefits for students who wrote expressing their feelings, those who read and reflected on reinterpreting their anxiety, or both, and Rozek said the researchers plan to follow up with more experiments to try to boost the benefits of the writing exercises done together or separately. However, both he and Beilock suggested similar exercises could be helpful for students before taking other types of assessments, such as oral exams.

The takeaway for teachers, Rozek said, is, “there is great value in understanding that a student's emotions are an important part of their performance and their social-emotional well-being in school and for their academic achievement. ... Writing exercises like we used in this study could be used with their students to help support emotional well-being and help them do better on these kinds of high-stakes tests.”

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