

When $2 + 2 =$ major anxiety: Math performance in stressful situations

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Imagine you are sitting in the back of a classroom, daydreaming about the weekend. Then, out of nowhere, the teacher calls upon you to come to the front the room and solve a math problem. In front of everyone. If just reading this scenario has given you sweaty palms and an increased heart rate, you are not alone. Many of us have experienced math anxiety and in a new report in *Current Directions in Psychological Science*, a journal of the Association for Psychological Science, University of Chicago psychologist Sian L. Beilock examines some recent research looking at why being stressed about math can result in poor performance in solving problems.

Much of Beilock's work suggests that working memory is a key component of math anxiety. Working memory (also known as short term memory), helps us to maintain a limited amount of information at one time, just what is necessary to solve the problem at hand. Beilock's findings suggest that worrying about a situation (such as solving an arithmetic problem in front of a group of people) takes up the working memory that is available for figuring out the math problem.

The type of working memory involved in solving math problems may be affected by the way the problems are presented. When arithmetic problems are written horizontally, more working memory resources related to language are used (solvers usually maintain problem steps by repeating them in their head). However, when problems are written vertically, visuo-spatial (or where things are located) resources of working memory are used. Individuals who solve vertical problems tend

to solve them in a way similar to how they solve problems on paper. Beilock wanted to know if stereotype-induced stress (i.e. reminding women of the stereotype that "girls can't do math") would result in different results for solving vertical versus horizontal math problems. The findings showed that the women who had been exposed to the negative stereotype performed poorly, although only on the horizontal problems (which rely on verbal working memory). Beilock suggests that the stereotype creates an inner monologue of worries, which relies heavily on verbal working memory. Thus, there is insufficient verbal working memory available to solve the horizontal math problems.

It has generally been shown that the more working memory capacity a person has, the better their performance on academic tasks such as problem solving and reasoning. To further explore this, Beilock and her colleagues compared math test scores in individuals who had higher levels of working memory with those who had less. The subjects took a math test either in a high pressure situation or low pressure situation. It turns out that the subjects with higher working memory levels performed very poorly during the high pressure testing situation—that is, the subjects with the greatest capacity for success were the most likely to "choke under pressure". Beilock surmises that individuals with higher levels of working memory have superior memory and computational capacity, which they use on a regular basis to excel in the classroom. "However, if these resources are compromised, for example, by worries about the situation and its consequences, high working memory individuals' advantage disappears," Beilock explains.

As more schools start emphasizing state-exam based curricula, these studies will become increasingly relevant and important for the development of exams and training regimens that will ensure optimal performance, especially by the most promising students.

Source: Association for Psychological Science

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