A student memorizes every detail for the final and freezes as soon as she opens the blue book. A star forward hits 50 consecutive free throws in practice but flubs every last one during the championship. Is choking under pressure self-sabotage, mockery of the gods, or just plain bad luck? According to assistant professor of psychology Sian Beilock, it may be the menace of pressure itself.

"Often our abilities," explains Beilock, "are characterized by these very small snippets of performance that take place in environments that may not represent our true skill set." As anyone who's choked knows, pressure situations can fundamentally alter the way individuals think about and exercise their skills. To understand how, Beilock—first as a graduate student at Michigan State University, then as assistant professor at Miami University of Ohio, and now at Chicago—transformed several labs into well-calibrated pressure cookers. Using a combination of common stressors—a "brute-force method" that includes potential monetary compensation, third-party observation, and peer pressure—she has watched dozens of individuals take a performance nosedive. Along the way, she has discovered that golfers and mathematicians choke for different reasons, high performers are the most common victims, and real-life practice is the best prevention.

Her own experience as a lacrosse player at the University of California, San Diego, fueled Beilock's first questions about performance. To answer them, she retired her lacrosse stick and hit the putting green. Like riding a bike, Beilock says, putting becomes largely automatic once mastered, making it a "nice test bed" to gauge pressure's impact on golfers. When skilled players—undergraduate subjects with two or more years of varsity golf experience or a PGA handicap lower than eight—were asked to sink the ball while simultaneously identifying a specific word from a tape recording, putting ability came through unscathed, despite extra demands on concentration. Force these same experts, however, to think about their skill in a way they normally don't, such as focusing on club-swing distance or elbow position, and performance suffers. The extra attention, explains Beilock, is a common side effect of pressure situations that disrupts the flow of a well-honed activity, throwing off even the most talented individuals.

Other skills work in the opposite way. While a math whiz might perform calculations more quickly than a less-qualified classmate,
successful execution still demands the expert's dedicated focus. In contrast to a sensorimotor task like putting, many cognitive tasks call upon reserves of "working memory." It's the same type of short-term brain activity used to remember a number from the Yellow Pages long enough to make the call, and retention varies from person to person. In a low-stress situation—Beilock's subjects were told they were doing practice questions—individuals who showed greater working-memory capacity did better on a challenging math task than lower-working-memory subjects. When pressure kicked in, however, these high-performers suffered the sharpest performance plunge. The discrepancy, Beilock says, suggests that individuals with high working memory may rely on complicated problem-solving techniques that naturally require more working-memory capacity than available under pressure. When anxiety begins to crowd that mental space, skilled individuals may not have enough room left over to solve the equation as quickly or successfully as usual.

Such findings drive the debate over the predictive validity of real-world exams like the SAT. After all, if pressure takes the greatest toll on those otherwise most likely to succeed, do such tests end up measuring the skill itself or the ability to perform under pressure? Granted, there are times—the MCAT for pre-meds comes to mind—when picking out those who do well under stress may be a useful indicator. Still, explains Beilock, who is studying these issues as part of a three-year U.S. Department of Education grant, it is important to remember that such tests are "just one snippet of performance that may not be reflective of all ability."

A related choking hazard is something called "stereotype threat," in which an individual's awareness of negative stereotypes linked to his or her social identity—gender, race, age—undermines performance. For example, female subjects told right before a math test that women generally aren't as good at math score lower than women not explicitly given this information. Like other forms of choking, stereotype threat overwhelmingly afflicts high performers. "Sometimes," says Beilock, who won a National Science Foundation grant to study the concept, "having skill in an area or feeling an area is important may actually be a curse."

The good news, she advises, is that those who prepare by mimicking real-life situations can bypass pressure's pitfalls. Whether timed practice tests or full-length football scrimmages, such simulations reduce the novelty of stressful events and curtail choking. Beilock herself helps undergraduates by minimizing high-stakes testing in her classes, offering multiple quizzes, papers, and other ways of demonstrating subject mastery.

From her office in Green, Beilock continues to uncover evidence for choking's causes. This spring she'll delve into facial expression and other physiological measures. Initial data suggests that a choker's predicament shows up on his mug as well as in performance. She'll also study neural correlates and factors like heart rate. Always seeking connections between different skill types, Beilock plans to assess performance-related thought patterns of novice and expert hockey players, possibly using fMRI studies.

So has Beilock ever choked? "There have been moments where I performed more poorly than I would have liked," she confesses, politely declining to provide a play-by-play.—B.E.O.

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March of the ground squirrels

Emerging from underground and surveying—for the first time—the bunchgrass meadow, sagebrush outcrops, and giant wild rye beyond their burrows, Belding's ground-squirrel pups get pretty stressed out. Only 25 days old, they're food for almost every predator within range (including canibals among their own species), and in the next ten weeks they must eat enough leaves, seeds, and grasshoppers to see them through an eight-month hibernation. The pups leave the nest in late June. By the end of September, when snowfall prompts them to hibernate, raptors, snakes, coyotes, and a host of other hazards will have thinned their numbers by more than half. Sixty percent of the survivors will starve or freeze that first winter.

"I can mark 200 kids one year, and I'll be lucky if I see five of them the next year," says Jill Mateo, an animal behaviorist in the Institute for Mind and Biology and the Department of Comparative Human Development, who spends her summers studying Belding's ground squirrels in California's High Sierra Mountains.

What Mateo wants to know is this: just how stressed are the young squirrels, and how much does that pressure sharpen their survival skills? "When the kids first come above ground, their stress hormones"—specifically cortisol—"are elevated, generally twice as high as in the second or third week" above ground, she explains. "Cortisol mobilizes the energy to get them out of the nest and start them feeding."

And, Mateo believes, cortisol also hastens pups' understanding of essential early lessons: "They've got a lot to figure out in the first few days," she says. "How to find food, where mom's territory is, who's the mean lady next door, which animals are predators—and, of course, alarm calls." Youngsters must learn to dive for their burrows when they hear fellow squirrels' high-pitched whistle, signaling a winged predator's swooping approach. Staccato trills, meanwhile, warn of earthbound hunters. A less urgent alarm, it prompts other squirrels to stand up and look around.

"One way they learn what to do is by watching mom," Mateo says, "So at first I thought the learning was social." Surging cortisol readings, however, sent her in search of a biological component: perhaps youngsters emerged from the nest with cortisol raised to help them absorb their mothers' behavior.

First, though, Mateo needed to make certain the elevated hormone didn't simply reflect stress from an unfamiliar and often unfriendly environment where predators regard each new crop of pups as "a bowl of potato chips." After all, adult cortisol levels do indicate real danger. At perilous Lundy Canyon, where distant predators are difficult to see and alarm calls ring out frequently, day-to-day hormone readings for full-grown squirrels remain lower—and therefore leave

Less urgent warning calls prompt squirrels to stand and watch for predators.