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**On Par**

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## When Golfers Overthink: The Science Behind the Choke

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### Correction Appended

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Golf may be a four-letter word, but the curse of the game comes in five letters: choke.

It is largely an unspoken word in golf, one rarely uttered on broadcast television. It has little favor in the recreational golf world as well. Any number of euphemisms spring up to describe evident failure under pressure — a putt is said to have been misread or a chip misjudged — but in the back of every golfer's mind is a tacit understanding of what has happened.

It was those five letters. And we have all been there.

At this week's United States Open, the competition among the world's greatest golfers may come down to a 3-foot putt, a task most of them could perform 98 or 99 times out of 100.

But 3-foot putts, even 18-inch putts, have been missed to lose major championships. Many more of those putts, thankfully, have been made. The misses are excruciating.

Why some golfers succeed in these moments and others do not has largely been left to pop psychology. But in recent years, the awful truth — the choke — has met its scientific match.

In her human performance laboratory at the [University of Chicago](#), [Sian Beilock](#), an associate professor with degrees in cognitive science, kinesiology and psychology, has put hundreds of athletes under duress and identified the anatomy of a choke. She especially

likes to work with golfers, because there is nothing so obviously off the mark as an accomplished golfer who cannot make a 2- or 3-footer.

I began talking with Beilock last year after I wrote an article wondering why it is that young children learning the game always seem so good at putting. A 10-year-old, in my experience, almost never misses an easy, short putt. I figured it was because a 10-year-old doesn't feel the weight of expectations and doesn't have the scars of previous misses.

Beilock wrote to say that there was a more complete brain science explanation. For example, the prefrontal cortex of the brain develops with age and does not reach its full maturity until well into adulthood. When children perform a task, sensory and motor cortex brain areas often take a more prominent role.

Guess what part of the brain gets us into trouble when we choke? That's right, the prefrontal cortex. It is the prefrontal cortex that gets in the way of executing a practiced routine task by essentially overthinking it.

But there is hope for all of us over 10. Beilock says we can learn to think like a child again.

In her lab, using fMRI — functional magnetic resonance imaging — tests, Beilock can in effect see inside the brain when golfers are missing short putts they would usually make with ease. By locating which areas of the brain are working hardest under various specific, stressful circumstances, she can examine the hows and whys of misses. Last year, she published a book, [“Choke: What the Secrets of the Brain Reveal About Getting It Right When You Have To.”](#)

“The first thing to understand is that choking is a real thing, and the second thing to understand is that choking is not random,” she said. “You hear people who choke say afterward that they let their brain get in the way. And there's truth to that.”

But first, here are some of Beilock's most hopeful findings:

¶ Choking is not a lifetime curse. You can train, even hardwire, your brain to react more productively.

¶ Experience at performing under pressure makes a significant difference. Practicing under even mild pressure helps prepare you for the more intense version of a championship-winning or match-winning putt.

¶ When you're faced with a pressure shot, distracting yourself from the task at hand is helpful.

¶ Performing quickly in pressure situations leads to more success.

“It is not the pressure in a pressure situation that distracts us into performing poorly,” Beilock said. “The pressure makes us worry and want to control our actions too much.

And you cannot think your way through a routine, practiced action, like making a 3-foot putt.

“Compare it to quickly shuffling down a flight of stairs. You could do that without thought. But if I asked you to do it, and at the same time think about how much you bend your knee each time or what part of your foot is touching the stair, you would probably fall on your face. That’s what happens when people choke. They try to think their way through the action.”

As Beilock details in “Choke,” one of her early studies involved a number of L.P.G.A. players who while hooked up to fMRI technology were asked to hit shots to a flagstick 100 yards away. The fMRI technology immediately noticed that players with only a few years of experience activated a diffuse set of brain areas, including areas involved in fear and anxiety.

The brains of the more experienced L.P.G.A. players were considerably more calm. How many athletes over the years have you heard describe a successful last-second shot by saying that in the moment they had a “quiet mind”? Sometimes they call it “being in the zone.”

It is a real phenomenon, but Beilock says it is not usually an innate skill. The quiet-mind sensation can be learned.

Beilock, for instance, did research in her laboratory in which one group of golfers practiced putting alone in a room and another group practiced putting in front of an audience. That’s mild pressure for the second group. There was no money on the putts, no punishment or penalty for missing. But Beilock saw on the fMRI readouts that the golfers with an audience were feeling the scrutiny.

When the two groups were combined to compete in front of an audience, the players who practiced alone did much worse.

“It happens very subtly, but understanding how your body is going to feel under pressure and learning to handle it is a skill in itself,” Beilock said.

Beilock suggested that golfers play games for small change with their friends on the practice putting green. If practicing alone, she said, a golfer ought to put some sort of incentive on the task, like promising to make 10 3-footers in a row before going home.

“Anything that holds you to the consequences of not succeeding will be effective,” Beilock said.

Practice under pressure doesn’t make perfect. It does appear to hardwire the brain for better performance. Or as Sam Snead said prophetically many years ago, “Practice puts brains in your muscles.”

Through experimentation in her lab, Beilock has also come up with some antichoking techniques, whether you're a pro playing for \$1 million or a weekend duffer desperately trying to will a 3-footer into the hole to save face. Her tips:

¶ Be quick on the greens — not hurried, but not overly deliberate. “It helps to have a routine, but putting as quickly as was reasonable is a good idea,” she said. “We told people to err on the side of being quick, and it worked.”

¶ Find something to focus on, like the manufacturer's name or logo on the ball. It can help prevent the prefrontal cortex from too closely regulating your movements.

¶ A one-, two- or three-word mantra helps. Like the word “smooth” while putting, or a three-word timing device during your swing. Something like, “back, and, through.”

¶ If you have serious putting problems, like [the yips](#), changing your putting grip can reprogram the brain circuits to help you execute.

¶ Focus on the goal or target, not mechanics. Some people look at the hole rather than the ball, or visualize the back of the cup. “It sends a signal to the brain to achieve a certain outcome,” she said.

Most of all, Beilock wants to debunk the notion that society is separated into clutch players and chokers.

“If you have had problems performing under pressure,” she said, careful, it seemed, not to use the C word, “you are not destined to do it forever. It is something you can fix. Your brain is amazingly powerful.”

In other words, your brain got you into this fix — deciding to play golf in the first place — and with some faith, your brain can get you out of it.

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***Correction: June 13, 2011***

*A slide show with this blog post erroneously states that Greg Norman lost the lead in all four majors in 1986. In fact, Norman lost the lead in three of the four majors that year, but won the British Open.*