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I think, therefore I choke

By Jaimal Yogis
ESPN The Magazine

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IT WAS A CHIP SHOT. With just 15 seconds left in the AFC championship game against the Patriots in January, the Ravens' [Billy Cundiff](#) faced a 32-yarder to send



Science is turning the corner on why athletes choke and how to prevent it.

the game into overtime. Like all NFL kickers, Cundiff uses the scoreboard to keep track of downs and where he should be in his prekick routine. As the Ravens stalled at the Pats' 14-yard line, the Gillette Stadium scoreboard showed third down. Problem was, it was wrong, the Ravens say. Unprepared and probably a bit confused, Cundiff was rushed onto the field by screaming coaches. He hadn't missed a fourth-quarter kick all season. But he got a mediocre snap; the laces weren't quite out. His kick came low off of his foot and hooked left. With his teammates looking on in horror and disbelief, Cundiff had just choked -- badly.

In 2010, Cundiff had booted the football as far as anyone in history, with a record 40 touchbacks, earning a spot in the Pro Bowl. Of the 66 field goals he'd attempted in the past two seasons, he'd missed only 12. Considering that Cundiff had played for eight different teams in the previous seven years, with only 11 touchbacks combined, he'd seemed nothing short of a new kicker.

What very few people outside out of Cundiff's inner circle knew was that he'd become a guinea pig for the new science of clutch. For decades, sports psychologists have been trying to keep athletes from cracking under pressure, with no measurable sign of success. But now a breed of scientists is putting new technology to work for athletes like Cundiff under game conditions. They have a much clearer grasp on why athletes choke and are at least in the ballpark when it comes to preventing it.

If you'd been watching Cundiff on the sideline this past season, you'd have seen him toying with a silver gizmo the size of an iPod. Given to him the previous year by psychologist Louis Csoka, one of his mental trainers, it's known as an emWave, and it measures heart rate variability (HRV). Not beats per minute -- that's

old-school. Designed by the research company HeartMath, the emWave examines in real time how athletes are responding to old sports psychology tricks like visualization and meditative breathing. It's the same gizmo used by military elite tactical teams to regulate stress levels before deployment.

Cundiff had been using the HeartMath methods since 2007. A green light on the gizmo meant Cundiff felt confident and prepared, his heartbeats evenly spaced. When Cundiff was nervous or even panicked, however, the emWave flashed red and he knew to focus on his breathing as he'd been trained.

Historically, anyone who dares to give pro athletes mental advice -- be they M.D.s, psychologists or shamans -- often gets the eye roll or the pat on the back. But in an email, Cundiff told HeartMath trainer John White that his hocus-pocus was making all the difference. "Not only were my mental skills continually improving," he wrote, "but they were working in game conditions, not just practice ... I was killing the ball and having a great time doing it. People, in general, don't deal with stress. Moving forward, stress will be the least of my worries."

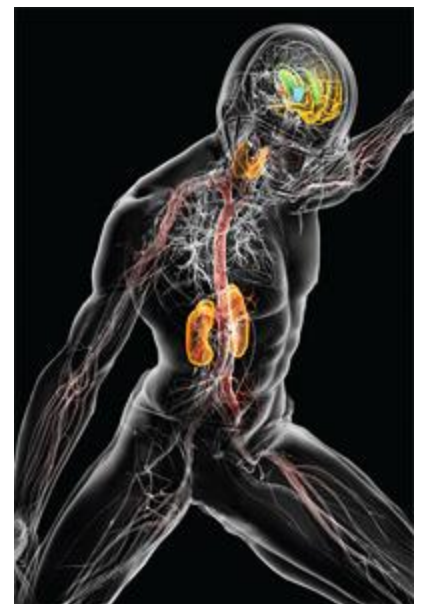
SOON AFTER Cundiff's kick sent the Ravens back to Baltimore, I travel to the Institute of HeartMath in Boulder Creek, Calif. In an office shaded by mountain redwoods, White hooks me up to an emWave and rigs it to a computer screen. There is my heart rate -- the rhythm looked far more like a jagged mountain range than the uniform pulse I'd expected.

"This is perfectly healthy," White says, but not so ideal for performance. The anxiety I was feeling with all those scientists staring at me was causing the wild heartbeats that can harm academic and athletic results. Feelings of gratitude and love, on the other hand, create gentle, repeating HRV waves that HeartMath terms "coherence." That's the state in which expert archers shoot more accurately, pro golfers hit the ball farther and kickers (though there hasn't yet been an official study) get closer to Cundiff circa 2010 and 2011.

It's easy to be skeptical of coherence -- until you see it. White asks me to breathe -- five seconds in and five seconds out -- visualizing each breath entering and exiting my heart. Instantly the peaks become more even slopes. One minute later, White asks me to conjure up people I love, and the wave looks even more consistent. "It's not perfect," says White, "but close." That is in just two minutes. Imagine, White adds, how coherent athletes and soldiers who practice every day could be.

If the zone is real -- a biologically measurable state -- how could Cundiff have gotten back into it during the chaotic last seconds against the Patriots? Ask 15 psychologists, psychiatrists or biologists this question and you'll get somewhere around three times as many answers.

Still, a semiconsensus is developing among the most advanced scientists. In the typical fight-or-flight scenario, scary high-pressure moment X assaults the senses and is routed to the amygdala, aka the unconscious fear center. For well-trained athletes, that's not a problem: A field goal kick, golf swing or free throw is for them an ingrained action stored in the striatum, the brain's autopilot. The prefrontal cortex, our analytical thinker, doesn't even need to show up. But under the gun, that super-smart part of the brain thinks it's so great and tries to butt in. University of Maryland scientist Bradley Hatfield got expert dart throwers and



Most of a pro's moves are so hardwired by practice that even the kind of pressure that causes the heart to race and stress hormones to rage won't throw him off. As soon as doubt or unfamiliar thoughts rise up, however, all bets are off. Click for more.

marksmen to practice while wearing a cumbersome cap full of electrodes. Without an audience, their brains show very little chatter among regions. But in another study, when dart throwers were faced with a roomful of people, the pros' neural activity began to resemble that of a novice, with more communication from the prefrontal cortex.

"Stress and worry aren't what necessarily cause the problem," says Sian Beilock, a University of Chicago psychologist and author of the book *Choke: What the Secrets of the Brain Reveal About Getting It Right When You Have To*. "But if they lead to trying to control performance" -- that is, trigger the prefrontal cortex -- "it's more likely to end in a choke."

The body's reaction to that is akin to what happens when your computer runs on RAM rather than the hard drive, says Dr. Michael Lardon, author of *Finding Your Zone* and a trainer for many PGA golfers, Olympians and NFL players: "Reaction and accuracy decrease."

It's the athlete's job to shut up the prefrontal cortex, and Cundiff -- given his leading-edge routine -- surely could have done this under normal circumstances. (The kicker refused *The Mag's* interview requests.) But he simply may not have had the time, or enough experience with a scoreboard snafu, to get back out of his head.

That's why the most advanced mental trainers now discourage thinking, instead encouraging athletes to embrace the rush of competition that can freak them out. Rather than urging "just relax," they show athletes how to reframe stress as a positive. "If you view that feeling of adrenaline as a reason you're going to fail, it can work against you," Lardon says. "But if you view it as a signal that you're going to do well, it can boost performance."

Take long-snapper [David Binn](#), who worked with Lardon during 17 years with the [San Diego Chargers](#). Long-snapping is a lot like kicking field goals -- a single repetitive act that exposes choking. Yet because he understands stress is a tool, Binn hardly ever makes a mistake. "He's very low on the neuroticism scale," Lardon says. "You or I steal a piece of bubble gum and our blood pressure goes through the roof. This guy is unflappable."

Lardon, Binn and I go to dinner in San Diego three weeks after Binn signed with the Broncos, which was a mere 24 hours before Denver's divisional playoff game. The snapper admits that 17 years of unfettered success has stopped him from getting horribly nervous before big games. Yet he frames the nerves as a reason he's going to once again nail it.

Other athletes are less bulletproof than Binn, however, and need more high-tech TLC to find coherence. Lardon has been working with the man Binn used to snap to, Chargers kicker [Nate Kaeding](#), and helped him become the NFL's most accurate field goal kicker ever (86.5 percent). "Nate is the best kind of athlete to work with," Lardon says, "because he does everything diligently, mental or physical."

Along with having Kaeding practice on the emWave, Lardon has taken Kaeding to the San Diego lab of his friend Dr. Richard Gevirtz, one of HRV's pioneers. Gevirtz obtained Kaeding's perspiration levels and heart rate to determine his ideal breathing -- eight breaths per minute at rest -- to get into coherence. Gevirtz then matched this rate to one of his musical tracks -- think computerized flamenco guitar -- over which Lardon records spoken visualizations that he updates according to what Kaeding is working on. "You look forward to kicking from the right hash," says one snippet of reinforcement. "You enjoy the feeling, you accept the challenge." Lardon and the Chargers' production team also feed Kaeding highlight reels of his best recent kicks, accompanied by the same HRV music, for Kaeding to watch the night or morning before a game.

The point here is to rewire Kaeding's amygdala -- the hothouse where memories of extreme highs and lows are consolidated and seared into our being. Because recollections of disasters often trigger self-consciousness, Lardon is force-feeding Kaeding an antidote: memories of success. He even recommends his athletes move on as quickly as possible when they mess up to avoid ingraining the memory more deeply (though he encourages them to celebrate with a fist pump or a "yeah" when they do well). He wants them to be less likely to think when the heat is on.

It has worked oh so beautifully. Except when it hasn't. After a fantastic regular season in 2009 in which he missed only three field goals out of 25 [he went 23-for-28 in the 2010 season and was out with an injury this past season], Kaeding missed all three in a playoff game against the Jets. Kaeding also declined to comment for this story, saying he wanted to let his play speak for him in 2012. But after the playoff loss, The New York Times quoted Kaeding as saying that he couldn't recover from the first miss of the game, a mere 36-yarder. "For some reason," Kaeding says, "I was unable to make that turn in my head." The Chargers lost the game by three.

THE TRUTH IS, all athletes choke at some point. Can the new HRV science help them choke less often? Cundiff's and Kaeding's careers indicate the jury is still out. Golfer Charlie Wi, however, strikes a more hopeful note. Wi was skeptical of the HeartMath shtick when he first tried it, but White told him to judge by his results. "And over a four-year period, we have watched his scores get steadily better," White says. "For him, this isn't fluff anymore. It's cold, hard cash."

White felt particularly proud this past February watching Wi duke it out with Tiger Woods and Phil Mickelson at Pebble Beach. After playing really well the first three days of the AT&T pro-am, Wi started to choke on the front nine Sunday, shooting three over par. This was where Wi used to lose his cool. But White watched as Wi closed the back nine with three birdies, finishing second overall. "That's exactly what we worked on," White says. "How to turn that corner."

What that entails, of course, isn't all that different from what yogis have been trying for millennia. But athletes aren't yogis. They need results. They need action. "Athletes seem to like emWave because you can get better at it and see the progress," White says. As Lardon tells me, "it's hard to get NFL players to meditate, but you can always get them to play video games." And so HeartMath has video games -- for example, one where a race car's movement is determined by how coherent a player can stay while driving through increasingly stressful obstacle courses. Soldiers who use the emWave during intense conflict exercises are proud to boast that they can stay in coherence even when their psychologically induced heart rates rise 100 beats per minute.

As for Cundiff, he likes to turn the difficulty on his emWave up to the highest level, which uses a much narrower algorithm to determine if you're in the green, and then listen to the loudest, most jarring noises he can find. "That's really tough to do," says White. Apparently it wasn't tough enough to prepare for an error on the scoreboard and a yelling coach. But then again, "no gizmo is going to solve all your problems," White says.

I ask White what he thinks Cundiff has to do to get back on track in 2012. "Just remember that he was a great



Cundiff has had some great seasons quietly practicing with the emWave. But the gizmo, which monitors the nuances of heart rate, couldn't prevent his crushing miss against the Patriots.

kicker before this," White says, "and he still is." And stick with the regime. (Maybe change the jarring music to recordings of a screaming coach?) And for the love of God, he needs to forget his failure and lodge a bunch of new fourth-quarter victories in his amygdala.

*[Jaimal Yogis](#) spent the last two years interviewing scientists and athletes for his next book, *The Fear Project*, due out January, 2013 from Rodale. Follow *The Mag* on Twitter, [@ESPNmag](#), and like us on [Facebook](#).*
