

Anatomy of a meltdown

Pressure can wreck performances and define careers, but psychology and neuroscience are helping athletes fight back, as the author of new book *The Athletic Brain* explains

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There's a BASE jumper throwing up in the bathroom. We're at the GSK Human Performance Lab, a squat industrial unit just off the M4 near Brentford, and the smell of sweat and effort fills the air.

The room is filled with cutting-edge technology, but all eyes are on two exercise bikes at its centre, where Professor Vincent Walsh is putting another athlete through their paces in an experiment for Dunlop Tyres: two minutes of maximum effort in four 30-second bursts. "Go! Go! GO!" - Walsh screams encouragement at Olympic skeleton champion Amy Williams, before releasing her to walk, somewhat unsteadily, through a frosted glass door marked 'Cognition'.

Walsh studies pressure. He works with sports teams and Olympic athletes to try to understand how pressure affects their decision-making, and how to stop it affecting their performance. Behind the door that Williams has just walked through, a battery of computer tests taken before and after their exercise confirms that athletes are very good at maintaining their decision-making abilities under this kind of physical pressure (when they're knackered). On some tasks, they even improve. "I didn't have a choice to give the headache or my nausea any attention," says Alexander Polli, the BASE jumper who, as soon as his tests were finished, darted away from the computer to be sick. "Somehow I was able to zone them out."

But there are other types of pressure, and they are not as easy to ignore through will alone. Emotional pressure can explain why England capitulated against Iceland at Euro 2016, why Jordan Spieth collapsed at the Masters, and why Luis Suarez has bitten an opponent on three separate occasions. By understanding how pressure affects the brain, and preparing athletes for it with new training tools and tech, Walsh and others like him are fighting back.

Biting back

There's a part of the brain called the amygdala that seizes control in times of panic. It is a hijacker that bypasses the prefrontal cortex - the conscious, rational,

sensible part of your mind - and prepares the body for action. The amygdala sends a distress signal and triggers what's known as the 'fight, flight or freeze' response. This leads to the release of hormones such as adrenaline to get the heart racing and prepare the body for action.

This is a helpful evolutionary response if you are fleeing a tiger in the jungle, but it's not quite as handy if you've just missed an important chance in the World Cup and you need to keep your cool.

"The adrenaline levels in a game can be so high; the pulse is racing and sometimes the brain doesn't keep up," said Suarez in his autobiography. "The pressure mounts and there is no release valve."

Just before his bite on Giorgio Chiellini in the 2014 World Cup, Suarez had missed a great chance to put Uruguay in the lead. "All I could think was: 'I didn't score. We're out of the World Cup.' The fear of

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failure clouds everything for me - even the blatantly obvious fact that I have at least 20,000 pairs of eyes on me; it is not as if I am not going to be seen. Logic doesn't come into it."

Different people react to emotional pressure in different ways. Some fight, like Suarez, Zinedine Zidane, or Ben Flower, who was banned for six months after a senseless punch on Lance Hohaia in the 2015 Super League Grand Final. Others flee, like England players during penalty shootouts; research has found that they rush their kicks, taking far less time than other nations. "All I wanted was the ball," said Gareth Southgate of his famous miss against Germany at Euro '96. "Put it on the spot, get it over and done with."

Feel the squeeze

But most freeze. Athletes spend years making their movements second nature. Thousands of hours of practice change the way skills are processed in their brains - moving them from conscious control to automatic. The same thing happens when people learn to drive - at first they have to think about the individual movements, but eventually they can do it while listening to music or holding a conversation. For athletes, it means they can control a pass while thinking about the next one, or think about where they need to bowl to that stubborn batsman instead of focusing on their arm movements.

But with the adrenaline pumping and the pressure on - when there's something at stake - athletes can start paying too much attention to what they're doing. Skills that should be fluent and automatic revert back to the clunky movements of an amateur when you think about them too much. Psychologists call this 'paralysis by analysis', and it's one of the reasons that athletes choke under pressure.

"Emotional pressure has affected my results," recalls Formula E driver Sam Bird. He had qualified on pole for a race in prestigious Monaco, but let the occasion get the better of him.

"I put so much pressure on myself to get to the first corner first. I went round and round in my head - you have to get off the line, you have to get off the line, you have to get to the first corner first, you have to do a brilliant start. I overanalysed the start, I overthought it, tried to do something far too complicated and stalled the car."

You can actually see this happening in the brain. The left prefrontal cortex, which is heavily involved when people initially learn new skills, grabs control again when 'paralysis by analysis' strikes, knowing this can help athletes fight back. One way to stop this kind of choking is to give the prefrontal cortex something else to do. Professor Sian Beilock, author of *Choke*, played lacrosse in college and found that she won the ball more often at face-offs if, for example, she sang to herself.

One experiment asked 30 semi-pro footballers to take penalty kicks to

determine their base level of performance. The next day they were asked to do the same thing again, but this time in front of a crowd of 300 students. The players who took penalties as normal missed more shots in front of a crowd. But half the group squeezed a small ball in their left hand while they took their shots on day two - and they managed to maintain their performance levels. Similar results have been found in badminton and judo.

Because the left side of the body is controlled by the right hemisphere of the brain, clenching your left hand draws blood (and therefore energy and oxygen) away from the interfering left prefrontal cortex. Automatic skills stay automatic, and athletes keep performing like experts.

There is another type of choke, as Jean van de Velde will tell you. At the 1999 Open, the Frenchman turned a three-stroke lead into a catastrophic failure for the ages with a series of really bad decisions. This kind of collapse is not paralysis by analysis. In fact, it seems to happen for almost the opposite reason.

Our brains only have a limited capacity. Psychologists call this 'working memory' - it's a bit like the RAM on a computer, and determines how many things you can hold in your head at once. For most people, it's normally around seven items. Under pressure, working memory can become overloaded with negative thoughts, so when athletes have to make decisions about what club to use or how to play a shot, they don't have the mental resources available to properly reason through the options as they normally would. Stress eats up mental bandwidth.

It's an interesting conundrum. If athletes think too much about what they're doing, their physical movements will become clunky and awkward because of paralysis by analysis. They choke. On the other hand, if their working memory gets filled with negative thoughts, there's a danger that they won't think enough, and they'll make bad decisions and choke. Elite athletes are on a constant tightrope. Plainly, they need all the help they can get.

Diamonds are forever

Recreating pressure is one of the biggest challenges for coaches and researchers. At the Human Performance Lab, they use a tense soundtrack featuring random beeps to distract, and a simulated heartbeat to ramp up the emotion for their iPad-based tests of reaction time and decision-making.

One study of golfers found that filming them during practice and telling them that a top golf coach was going to watch the tapes made them perform better in a subsequent pressure-filled competition. Introducing random free-throw drills with a forfeit of sprinting around the court for every miss helped Southern Utah's college basketball team rise from 217th in the free-throw rankings to first. At the English

Institute for Sport, they tested judo players by making their fighting area smaller, and by forcing them to fight when already tired to prepare them better for competitions.

"I don't think we are born able to thrive or succeed versus fail under pressure," said Beilock in a documentary on BBC Radio 4. "I think the reason some people are able to perform well is because they've developed the tools, and I would argue *psychological* tools so that in the moment they can put their best foot forward."

Walsh would like to see athletes taught these tools from a much earlier age.

not the first time the athlete has been in that situation, and that they're prepared.

Earl Woods was a talented athlete in his own right - he'd won a baseball scholarship to Kansas State University - but when watching his son Tiger practising on the golf course he would turn into the clumsiest man alive. Woods Senior would drop golf bags, jingle change in his pocket, cough as his son pulled his club back for drives, and roll balls across his line of sight when he was putting.

Richard Williams went a step further. He actually hired local school kids - had



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“Think of the pressures and the judgement these people get,” he says. “Even politicians only get judged once every five years. The pressures are immense, and it's actually an abdication of responsibility for people not to take on board the wealth of expertise we've got in psychology and neuroscience.

“If you can practise physical skills, and if you can practise routines and drills, you can practise the mental skills that go with them.”

Walsh uses tools like those at the Human Performance Lab to build profiles of athletes' decision-making styles, and to design training programmes that target the types of pressure that affect them the most. The aim is to make sure that, no matter what happens in competition, it's

them bussed in - to shout abuse at his young daughters Venus and Serena as they played tennis. “In order to be successful, you must prepare for the unexpected - and I wanted to prepare for that,” he said.

Pressure shapes performances and defines careers. It can dismantle skill and send athletes into meltdown. But applied in the right way, pressure can also make diamonds. ●

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The Athletic Brain - How Neuroscience Is Revolutionising Sport And Can Help You Perform Better is out now (£16.99, Simon & Schuster)

