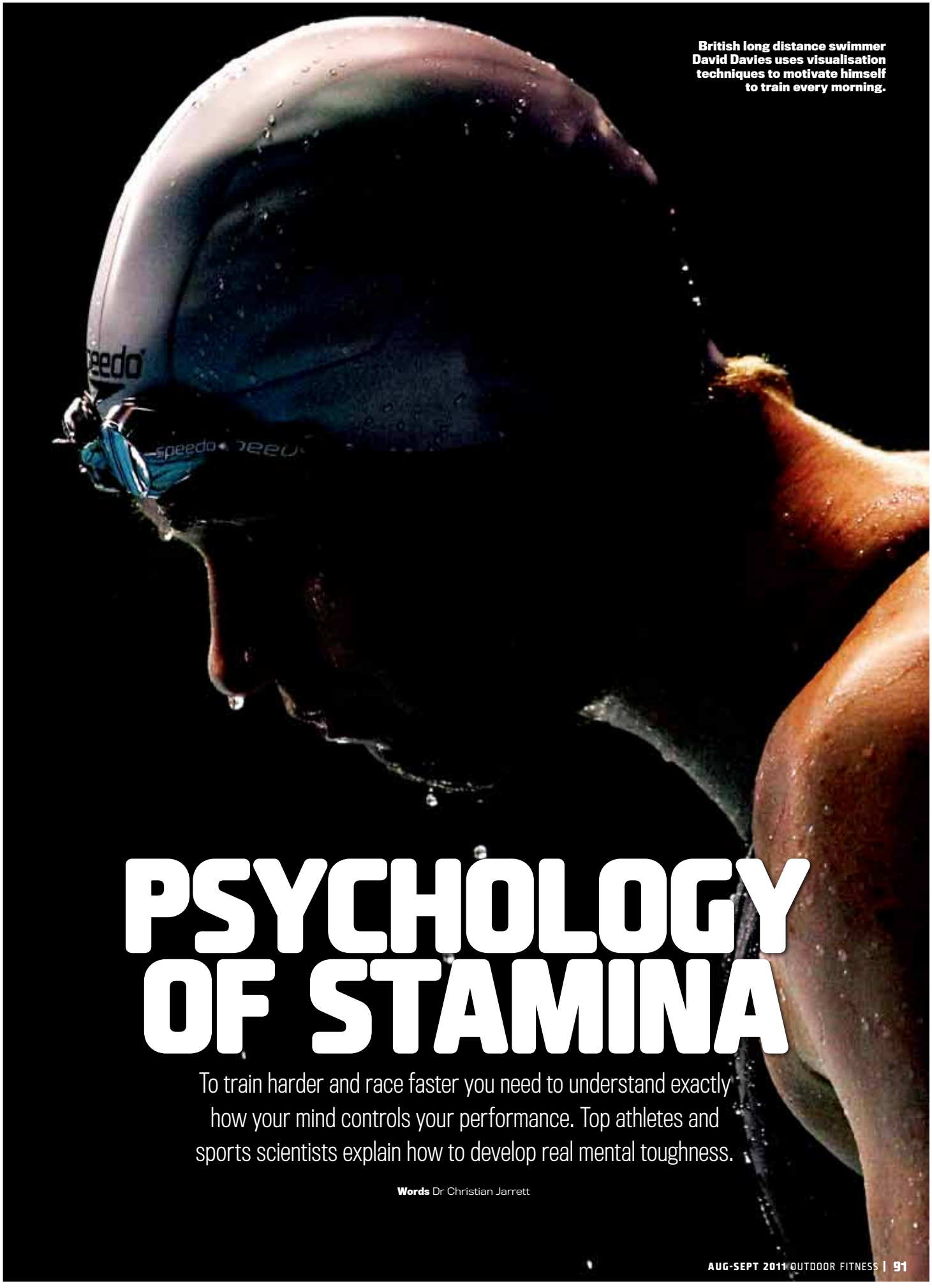


British long distance swimmer David Davies uses visualisation techniques to motivate himself to train every morning.

PSYCHOLOGY OF STAMINA

To train harder and race faster you need to understand exactly how your mind controls your performance. Top athletes and sports scientists explain how to develop real mental toughness.

Words Dr Christian Jarrett

OPPOSITE
Chrissie Wellington on the Ironman-Triathlon World Championship 2008 where she recovered from a puncture to win by a huge margin.
PICTURE: ALAMY

RACE-DAY PREPARATION

Good mental preparation before a race is vital if you want to achieve your potential, says triathlete Rich Allen. Here's his recipe for success...

☐ I remind myself that I've done the training and I'll think back to all the good workouts that I've done. I'll say to myself 'I am in great shape, I can do this, I'm ready for this'.

☐ **Before the race I'll break it down into goals and I'll think about my goal for each section of the race. Once the race starts, I think about one goal at a time.**

☐ I go over everything that could conceivably go wrong and check that I'm going to be able to deal with all of those things.

☐ **Finally, it's simple, but it's a big thing – I'll remind myself to have fun and just enjoy it.**

www.richardallenfitness.com

Halfway into the bike stage of the 2008 Ironman World Championships – a non-stop 3.86km swim, 180.25km bike ride plus a marathon in the stifling Hawaiian humidity – defending champ Chrissie Wellington suffered a puncture and misapplied her gas canister. In peak physical condition, it was her mental approach that saved the day.

"Stranded at the side of the road, I had to keep my head, keep calm, keep focused and above all stay confident that I could get back into the game," Chrissie says. After an agonising 11 minute wait, a fellow competitor threw Chrissie a canister. She calmly applied the canister, retook the bike lead within 20 minutes and ultimately won the whole contest by a significant margin.

A triple World Ironman Champion and world record-holder, Chrissie says that successfully defending her title by passing this psychological test remains her proudest sporting moment. The story highlights the critical role of psychology in endurance events – the need for self-belief, time-management, mental preparation and controlled pacing. In fact, according to Rich Allen, another triathlete and winner of nine pro British Championships and races, psychology is the most important factor in endurance performance. "You can do all the training and have all the right equipment," he says, "But if you don't have the right mental approach and strategy then it's game over."

WINNING OBSESSION

Successful endurance athletes have a burning desire to win and an unwavering belief in their ability to do so – a loose set of traits that psychologists call mental toughness. "You need to be obsessive compulsive," Chrissie says. "You need to be able to follow a programme in a regimented way, day in, day out."

For when you're struggling to get out of bed for that early morning training, David Davies, silver medallist at the 10km open-water swim in Beijing, recommends thinking of your rivals. "I think of other competitors in Germany or China," he says, "and I think that they're probably getting up already and training and I don't want them to have that on me."

It's also important to remind yourself of why you're competing in the first place. Rich Allen came out of retirement because of a girl he knew who died of cancer (see www.ellisharrietclark.org). Chrissie Wellington was inspired by the memory of Jon Blais, the triathlete who completed the Hawaii Iron Man after being diagnosed with motor neurone disease, a devastating condition that causes the muscles to waste away. "Everyone has a reason for competing," says Rich. "It's thinking of the reason why you're doing it and reminding yourself of that."

WORST CASE SCENARIO

Planning ahead for unexpected hitches like Chrissie's flat tyre is a key component of mental preparation. Rich Allen used to be sceptical about the importance of mental attitude, but in the squad for the Sydney Olympics he was made to sit down with the team's sports psychologists. "For me in races, my biggest problem was that little things would go wrong and I'd fall apart. It wasn't catastrophic, but for me the race was over in my head. So basically, I learned from the psychologists to think of everything that could possibly go wrong – flat tyres, goggles coming off in the swim and so on. After that, when things went wrong I'd just go 'bang!' – I knew how to deal with it and could get on with the race."

"Successful endurance athletes have a burning desire to win and an unwavering belief in their ability to do so..."

David Davies agrees. "It's not just a case of diving in and hoping for the best," he says. "You have to put in the mental preparation in terms of what you want to do, how you're going to do it, and which processes you need to achieve that."

Explicit 'if-then' plans are an effective way to prepare yourself for every eventuality, according to Professor Andy Lane, a sports psychologist at the University of Wolverhampton. 'If-then' plans are a concept borrowed from health psychology and involve rehearsing how you'll respond in specific situations, such as 'If my goggles come off then I'll stay calm, roll on my back and replace them.' By repeatedly pairing the cue situation and solution in your mind, you'll make it more likely that you'll do the right thing in the adrenalin-fuelled blur of competition.

LEARN FROM THE BURN

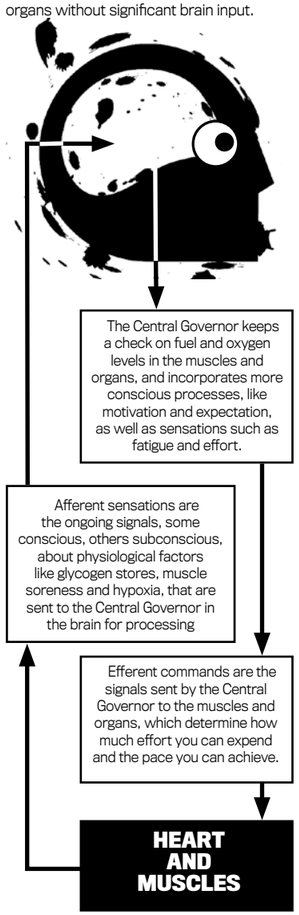
Competing in endurance sports, there's no escaping the fact that it's going to be gruelling. "Elite endurance athletes are pushing themselves to an extent that it hurts pretty much the whole way," says Professor Lane. Part of coping with this pain is accepting it and recognising it as normal. "If you feel tired, you remind yourself that it's hard and that you're meant

continues over>

OPPOSITE
Use your training sessions to learn what your body is capable of and your mind will be able to better control your performance during an actual event.
PICTURE: GETTY IMAGES

THE CENTRAL GOVERNOR THEORY

This theory suggests power output by muscles is continuously adjusted by the brain to ensure you stay within a safe level of exertion. Your brain makes calculations based on earlier experience with strenuous exercise, the duration of the exercise, and the present metabolic state of the body. This diagram is based on Tim Noakes and Alan St Clair Gibson's Central Governor Theory. Traditional models claimed fatigue was controlled entirely in the muscles and organs without significant brain input.



to feel that way," says David Davies. "I try to focus on my stroke because that can easily deteriorate when you're tired."

Rich Allen recommends recalling times that you've successfully coped with the pain and fatigue in the past, thus shoring up what psychologists call 'self-efficacy' – belief in your own ability to survive and excel. He tries to push himself in training so he feels the pain and pictures himself feeling that pain in a competitive race and getting through it. "Keep doing that during training, then when you get to a real race and you start to hurt, it is imprinted in your mind that the pain is OK, it's normal, you can cope with it. Then your body will follow your mind and carry on."

If your body literally runs out of fuel – known as 'hitting the wall' in running or 'the bonk' in cycling – every movement will suddenly feel incredibly difficult, like you're wading through treacle. Prevention is the best strategy here, by making sure you take on enough energy drinks and gels along the way (in a marathon, the risk is greatest at about the 20-mile mark). If you do hit the wall, you'll have to adjust your goals radically, and try adopting an easier stride pattern or switch into an easier bike gear. Make sure you plan prior to a race how you'll deal with hitting the wall, practically and psychologically, so as to avoid panic or loss of morale once the contest is under way.

"The whole essence of a race is your negative side talking to you then your positive side coming in to get rid of that..."

Other tricks for coping with fatigue and boredom include the use of mantras, positive self-talk and goal-setting. Chrissie Wellington has Rudyard Kipling's poem 'If' written all the way round her water bottle and will use imagery to help herself battle through difficult phases. "You put positive images in your bank and then when the going gets tough, you draw on them – things like winning in the past or the time I cycled across the Himalayas or thinking of my mum and dad. Sometimes it's meaningless images like chips."

Positive self-talk can also help your battle with fatigue. "The whole essence of a race is your negative side talking to you and then your positive side coming in and getting rid of that," says Rich Allen. One tip Professor Lane proposes is to try recording some of your own self-talk – the positive and negative – and then reading it back later on. "You'll see what messages you're sending yourself," he says. "Most people are very critical and they'll see that they'd never speak that way to a friend or relative and they can think about ways to rephrase so it isn't so damning."

Also, be sure to set yourself sub-goals. "The Ironman bike ride is 112 miles, which is an eternity out there," says Rich. "You have to break it down and just think about it one bit at a time – you never think about the whole race in one go." This is a philosophy that Chrissie follows in life, not just in a race. "There has to be a goal to every session in terms of training, recovery, sleep and rest," she says. "And those are the stepping stones to the bigger goals which are the races and events.'

THE BRAIN'S REVOMETER

It must have been tempting for Chrissie Wellington to bolt off at full-speed after mending her puncture in the 2008 championships, but to do so would have been short-sighted, imperilling her later race strategy. Indeed, judging how fast to run, cycle or swim at different race stages is possibly the most important mental factor in endurance events.

Sports physiologists traditionally considered fatigue to be a state localised to the muscles. When fuel runs too low or toxins too high, a muscle shuts down, thus affecting how fast a person can perform, or so it was once thought. Experts are now recognising the mental side to fatigue and the implications this has for pacing.

Tim Noakes, a professor of sport and exercise science based at the University of Cape Town and his colleague Alan St Clair Gibson, have developed what's known as Central Governor Theory (CGT; see left). According to CGT, important signals about fuel and toxins originate in the muscles and organs but this information is sent to the brain where it's weighed in the context of psychological factors such as motivation, belief, and expectations, ultimately determining how hard a person feels they are working and the pace they can achieve.

Consider a classic study from 1980 by Walter Rejeski and Paul Ribisl in which they had two groups of men run consistently at 85% of VO2max (an objective measure of exertion based on the body's oxygen consumption). One group were told it would be for 20 minutes, the other for 30 minutes. In fact both groups were stopped after 20 minutes, at which point those who thought they had another 10 minutes to go reported feeling significantly less tired than the others. If

continues over>

OPPOSITE
French sailor Marc Thiercelin during training for the Vendee Globe. The mental preparation of solo round the world navigators is second to none.
PICTURE: GETTY IMAGES

MUSIC AS A PSYCHOLOGICAL TOOL

When the long-distance runner Haile Gebrselassie broke the 2000-metre indoor record in 1998, he did it to the tune of the techno track Scatman. Research in the lab has confirmed that this is an effective way for people to increase exercise intensity.

Music can also be used as a distraction and motivator, with lab results showing that it can make exercise feel less arduous and prolong the time taken to reach exhaustion point. This is particularly beneficial for untrained athletes and those who struggle with motivation. However, there's limited evidence that it can be counter-productive for elite athletes, probably by interfering with their well-developed pacing strategies.

Research from Florida State University found that classics like Eye of the Tiger made no difference to people's heart rate or perceived exertion when they ran on a treadmill at high intensity, probably because the intense physiological effort drowned out the distracting effects of the music.

Music can be used before an event to calm nerves (the Olympic champion boxer Audley Harrison used to relax to Japanese classical music) or to stoke adrenalin (prior to rowing victory at the Athens Olympics, James Cracknell reportedly listened to the Red Hot Chilli Peppers).

But beware becoming dependent on music. Many events, including triathlons, forbid competitors from using music.

fatigue was purely a peripheral, bodily state, this finding would make no sense. A similar effect was demonstrated recently by Hugh Morton at Massey University in New Zealand. He found that men asked to cycle to exhaustion carried on for longer when a clock in front of them was secretly tampered with, so it ran 10 per cent more slowly than real time.

The purpose of the Central Governor, according to sports psychologist Dr Dominic Micklewright, based at the University of Essex, is to protect the body from the risk of catastrophic failure, a task it performs well considering how rare it is for an athlete to run themselves to the point of utter exhaustion. "The car is capable of achieving higher revs but doing so risks breaking the engine and the revometer helps stop that from happening," he says. "The Central Governor is the biological rev meter. You can experience critical failure and physiological catastrophe only through sheer bloody mindedness."

"You can experience critical failure and physiological catastrophe only through sheer bloody mindedness..."

Crucially, how fast the Central Governor allows you to go is dictated in large part by psychological processes. In a study published just this year, a team led by Jos de Koning at the VU University of Amsterdam analysed moment-by-moment how hard cyclists and runners in the lab felt they were working (their 'rate of perceived exertion') and compared this against how much further they had to go. The analysis provided further evidence for the Central Governor in action – at any given moment, how hard an athlete felt they were exerting themselves and how far they had to go (the researchers called this the 'hazard score') together predicted the likelihood that they would subsequently speed up or slow down.

This perspective explains why athletes are able to achieve last-minute spurts – the short distance remaining allows them to extract extra effort from their muscles knowing catastrophic failure is unlikely. Traditional sports physiology would predict athletes' muscles to be at peak fatigue at the end of a race and therefore incapable of these last-ditch surges.

What does all this mean for your own racing strategy? It might be tempting to trick the Central Governor, perhaps by giving yourself false feedback about how far you have left to go, so as to squeeze more effort out of your muscles. However, Dr Micklewright warns that it's vital for you to listen to and respect the sensations from your body. "Everyone has an ideal performance they are capable of achieving," he says. "The question is – how close to your theoretical, ideal performance can you achieve, without suffering failure." The more you train and learn what your body is capable of, the more informed your Central Governor will be, and the closer you'll get to your full potential.

With 11 Iron Man events behind her, Chrissie Wellington knows exactly what pace she can sustain. "I work below, at and above race pace to be able to sense the various effort levels. That way I develop an intuition for what 'race pace' feels like," she says. "I train myself to sustain that pace for certain lengths of time, although I never ride the full distance in training. The key is to know what pace is fast enough to enable you to be competitive on the bike, but not to over exert yourself so that you are still able to run a fast marathon.

"I do keep half an eye on my bike computer but I also listen to my breathing, trying to keep it controlled and ensure I am never over exerting.'

And setting realistic expectations is essential according to Dr Micklewright. "If you set yourself unrealistic goals it will affect your initial pace and if that's unrealistically fast, you'll quickly end up in survival mode, struggling round the remainder of the course," he explains.

CELEBRATE YOUR SUCCESS

Training doesn't need to be a relentless round of blisters and rain-soaked runs. Professor Lane suggests learning to run or cycle while listening to the radio, a podcast or while chatting to a friend. The point is to learn that you can maintain a certain pace for a decent length of time. "Many people have this belief that exercise has to be tortuous – it doesn't," he says. "In order to train regularly for endurance events you need to be able to do plenty of training that isn't arduous at all."

Rich Allen used to get uncomfortably nervous prior to a race and place so much pressure on himself. "I'd think 'It's such a big race, it's the most important thing in the world'. But really it's not. I know now that there will be other races and I've learnt to just enjoy it," he says.

And post-race you also need to celebrate your achievements. Think about what went well and the lessons you can take forward to your next event. "Celebration is key," says Chrissie. "Do some things that you wouldn't ordinarily do, give yourself a bit of a mental break... You've worked hard, now have some chips or even a burger."

LESSONS FROM THE OCEAN

One of the ultimate endurance challenges is the Vendée Globe – a single-handed, round-the-world sailing race, starting and finishing in Les Sables-d'Olonne in France.

The skippers are alone at sea, for about 100 days. They average three to five hours sleep a night and sometimes 48-hour stretches of sleep deprivation. Dr Neil Weston, a sports psychologist at the University of Portsmouth who's currently interviewing these solo skippers, says they are people who "are physically hardy, have a relentless and resilient determination to achieve their end goal, and a real passion and selfishness to achieve that goal."

Sometimes fatigue reaches a point where they are hallucinating. In this state of utter exhaustion they have to cope with life-threatening storms and swells, make crucial decisions, and complete technical tasks on the boat. How do they survive? Dr Weston has found that these sailors have an incredible attention-to-detail, planning for every conceivable eventuality. They imagine and rehearse every scenario to be sure they'll be able to manage vital tasks in lashing rain and pitch black darkness. Many of them write motivational mantras on the inside of their yachts, reminding themselves of why they're there. Playlists and surprise treats in their food stores (packed by their shore team) help combat boredom during quiet stretches of the route. Others depend on visualisation techniques, thinking of sailors from the past who have successfully sailed around the world, imagining they're looking down, willing them to succeed.