

Can a zen-like state of mind power super cyclist to one of sport's great world records?

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Sarah Storey in the zone. David Davies/PA

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A golden age of British cycling appears to be coming to an end. In the recent World Championships in Paris, the country's cyclists performed below expectations, recording their poorest showing at that level since 2001.

Yet the World Championships don't include the event that many purists regard to be the most demanding challenge in the sport: the one-hour time trial. The current women's world record stands at 46.065km, set by Dutch rider Leontien Zijlaard-Van Moorsel in Mexico City in 2003. The men's record under the current rules was set several weeks ago in Granges, Switzerland, by Australia's Rohan Dennis, who achieved 52.491km.

On February 28 at the Lee Valley Velodrome in London, Dame Sarah Storey will aim to break the women's mark. Only a handful of British riders – and none from the current generation – have held these records.

It is worth noting – but not central to the narrative – that Sarah Storey is a paralympic champion. Born without a functioning left hand, she is a 20-times world champion in swimming and cycling. She has been at six Olympics and has competed both against disabled and able-bodied athletes at the highest level. But more than any other challenge perhaps, the one-hour time trial is her opportunity to establish a position in the history of the sport.

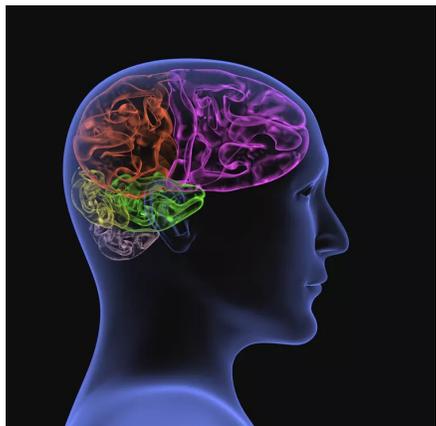
In sport, preparation is everything. The venue will be warmed to around 25 degrees to ensure the minimum of air resistance. The sport-science team behind Storey will have data to ensure the optimal gearing and weight of the bike. In the only concession to Storey's paralympian status, one side of her handlebars will be slightly shortened to accommodate her left limb.

The bike and her riding position will have been tested in a wind tunnel to identify the optimal position for reducing drag, thereby translating muscle power into velocity. And over the past months, data will have been collected on physiological parameters leading to the wattage required to go one metre beyond the record, such as blood lactate accumulation.

Mind v matter

Storey and her team will know that every 250m lap must be covered in an average time of around 19.3 seconds to give her a chance. But no rider, Storey included, is a pedal-pounding android. The factor which will ultimately determine whether she achieves her goal will be her 60-minute battle with fatigue, a battle in her mind.

In sports science, there is currently a debate about the extent to which fatigue is about mind over matter. Traditional theories argue that fatigue is a physiological state, independent of the central nervous system, and cannot be consciously overridden.



Fatigue: all in the mind? Lukyanova Natalia / frenta

This is being challenged by what is called the “central governor hypothesis”. It argues that the brain reaches an emotional decision that it is fatigued based on information from the body.

One of the main consequences of this debate is that the role of psychology in discussions about fatigue has been rehabilitated. Certainly the newer theory sounds intuitively right: anyone who has played sport will appreciate that fatigue is qualitatively different when you are winning as opposed to when you are losing.

What psychology can do

From a psychological perspective, Storey will need to effectively balance the paradox of keeping the

brain comfortable while the body suffers increasing discomfort. As the hour progresses, the brain's signals of fatigue will become more overt and require conscious action to manipulate the central nervous system to keep the record attempt on track.

The margins in this event are so fine that psychologically the rider must be engaged from the first second to the last. Storey has acknowledged that there will be "grippy" points – meaning that the little voice in her head will be intruding and presenting her with things that don't help.

Primarily these will be about how comfortable she feels. As the hour clicks by, the answer will progressively become "not very". For a physically well prepared performer, it is likely that they will feel "comfortable" for maybe the first five minutes of the event at most.

One of the most effective strategies for managing a large and difficult task is to chunk it down into manageable sections, with goals for each. The team will be giving feedback on where she is in relation to these.

This feedback is both vital in itself and will also serve to fuel her internal dialogue and the "what ifs" involved – "I'm ahead of schedule, what if I'm going too fast and will exhaust myself before the hour?"; "I'm behind schedule, what if I can't recover the required tempo?"; or even "I'm bang-on but I'm going at my limit and I've still got 40 minutes to go – what if I can't sustain this?"

She may dissociate from the discomfort through carefully monitoring her thinking, filtering out the unhelpful and reconnecting with positive cues. She may engage in an internal conversation with her legs, as Jens Voigt (a previous holder of the men's hour record) famously did. He coined the phrase "shut up legs", which is known to all top riders.

Jens Voigt - Shut Up



The pain barrier

Ultimately, Storey is searching for a method of coping with profound and potentially overwhelming pain. We know that the body produces its own natural painkillers – endorphins. Recent studies have shown that painkilling drugs do allow riders to ride harder, reporting improved lactate tolerance and maximum safe heart rate.

Yet the solution ought to be natural. The ideal for Storey would be reaching the “zone”, a “zen-like” state in which performers report altered perceptions of effort and pain tolerance.

The search for this state has its roots in some of the earliest research in modern sport psychology. Work as far back as 1977 linked peak performance to “loss of fear” and “ability to execute basic skills”, together with “no thought about the activity being undertaken” and “total immersion in the activity”.

These findings and later research on the concept of “flow” offer some ideas about how riders like Storey should approach the mental side. Flow is about total absorption and engagement in an activity, to the point where normal perceptions of effort and time become distorted. This is often linked to the production of endorphins.

The problem for time-triallists such as Storey is that this so-called “runner’s high” appears spontaneous. Yet some recent work using advanced brain-scanning techniques gives some clues to what a rider can do to capture and harness it.

It suggests for example that Storey should avoid higher-level cognitive thoughts such as calculating lap times or pacing. Better to mindfully focus on attention and awareness cues, such as engaging with the sprinters’ line on the velodrome track, the feeling of her feet on the pedal and every face in the crowd. And she should relax, as much as one can when your heart is going at around 190bpm and you are moving at just over 28 miles per hour.

There will be a moment, at around three-quarters distance, where Storey’s emotion will change. This could be in a positive way, where she will know that the record is hers, which will re-engage her and lift her emotionally. Or it could be negative, knowing that it is highly unlikely. At this point she may just get off her bike. The interesting thing to the sport scientist is that physiologically, these two completely different outcomes are identical. What better way to illustrate the vital part that the mind plays in this kind of challenge.

This piece was co-written by Ian Campbell, a student on the M.Sc Sport Performance Enhancement programme at Edinburgh Napier



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Storey in Mexico in April 2014. Christian Palma/PA



Sports psychology

British cycling