guardian.co.uk
SCIENCE
BLOG

How to outrun Usain Bolt: Superhuman technologies for sprinters

To run faster than Bolt, fellow athletes may have to wear carbon-fibre springs on their feet and elaborate aerodynamic fairings. They could even have electrodes implanted in their muscles. Sports engineer **Simon Choppin** reviews the options

Usain Bolt wins the 100m final at the World Championships setting a world record time of 9.58 seconds. Photograph: Kerim Otken/EPA

What are sprinters to do when faced with an opponent like Usain Bolt? Sport statisticians say the extraordinary Jamaican's latest 100m world record came 20 years ahead of schedule. In the same race, America's Tyson Gay ran the third fastest time in history – but even this awesome feat left him trailing Bolt by over a metre.

Could technology give sprinters an edge over the flighty Jamaican?

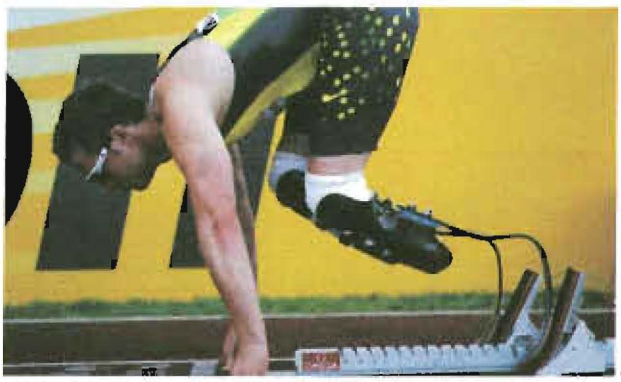
Science has vastly improved the performance of athletes through better track design, footwear and training techniques. These advances have gone largely unnoticed even as record sprint times continue to fall. But there's still plenty of scope for using technology to boost performance – something that rival athletes might have to embrace if they're to challenge the lightning Bolt.

What tools are available to them?

On appeal, officials allowed the hugely successful Paralympian Oscar Pistorius to attempt qualification for the 2008 able-bodied Olympics, despite the fact he competes with carbon-fibre blades or "Cheetah prosthetics" attached to both legs. Some might argue that this gives the green light for the use of similar devices by able-bodied athletes.

The blades act as highly efficient springs, effectively doing the work of the tendons, muscles and ligaments around the ankle. A study by the International Association of Athletics Federations found that Pistorius achieved a reduction in energy demand of around 25% compared with an able-bodied sprinter.

Next



South African runner Oscar Pistorius on the starting blocks. Carbon-fibre blades could also benefit able-bodied athletes. Photograph: Stu Forster/Getty Images

The ankle of an able-bodied athlete reinforced with carbon fibre could also prove more efficient. More of the athlete's energy would be used to propel them forwards and less would be wasted as heat within the muscle structures of the ankle. But any athlete who strapped on Cheetah prosthetics would face an inevitable battle with governing bodies because IAAF rules prohibit the use of any spring structures (the same rule that was originally used to justify barring Oscar Pistorious from the Olympics).

What about the track? A modern track is a mixture of rubbers and polymers and is a compromise between comfort and efficiency. Competition tracks tend to be stiffer in order to return more energy to the athlete and produce better times, but this can cause problems over longer distances when shock absorption helps prevent injury. Also, if you increase the stiffness of the track too much the track will be stiffer than the muscle systems of the athletes, which actually lowers running efficiency.

Ideally, track and sprinter should be harmonised so that the deformation of the track surface corresponds with the movements of the athlete. When a mathematical model was used in the 1970s to create such a track surface, athletes were able to run faster on the "tuned" track than they did when running at other competition venues.

But of course such a track gives a boost to all the competitors, which won't help them beat Bolt.

As recent media criticism has shown, not all new sports technologies are welcomed with open arms. Skinsuits were condemned after their widespread use at the world swimming championships in Rome, with some saying they're the equivalent of "tech-doping". Despite this, swimmers have seen an unprecedented improvement in performance associated with their use.

Sprinters have tried the technology, including Cathy Freeman at the 2000 Sydney Olympics, but the suits have never become mainstream on land because the same performance benefits aren't apparent in air as in water.

In principle, a skin suit reduces the drag generated by the flow of any fluid – air or water – over an athlete's body. In swimming, this force is proportionally very large and any small benefit by reducing it yields real results. Water is more than 800 times denser and 90 times more viscous than air at room temperature, making it much more difficult to move through. Drag is much less of a problem for a sprinter, accounting for only around 8% of their total expended energy.

Even if a skinsuit were to prove useful, there's the question of style. A hi-tech body suit would look ridiculously out of place in some sporting events. Skinsuits were banned from downhill mountain biking recently, a ruling welcomed by some on the grounds of style as much as fairness – sentiments which may well be echoed by fans of 100m sprinting.

Other technologies could help sprinters who find themselves up against the mighty Bolt.

How about electrodes painstakingly inserted into an appropriate group of muscles?

Connected to a lightweight battery and system that reacts to the sound of the pistol, the device would instantly fire hundreds of volts into the athletes' muscles, launching them from the blocks like a careless electrician. Or elaborate fairings attached to the front of an athlete, enabling them to cut through the air like a bullet train?

Unfortunately these Dick Dastardly solutions contravene the rules on several counts.

Advances in training techniques and improvements in track and equipment design have pushed sprinters to achieve ever more impressive times. That hasn't helped the majority of more ordinary mortals because Usain Bolt has also had access to them. Would an unfettered technology drive detract from the purity of an event such as the 100m sprint? Would it make you more or less likely to watch?

We might have to wait for someone else to come along with the rare and formidable physiology of Bolt in order to challenge his supremacy.

***Simon Choppin** is a sports engineer at Sheffield Hallam University*

Previous
Blog home

Ads by Google

University Clearing 2009
Start Your Course in Sep 2009. More Courses Info Available Online!
www.Sunderland.ac.uk/AppliedSeience

Degree Sports & Health
Anatomy, Physiology, PT, Coaching Degree Course Info & Sign Up Here
www.westsuffolk-ac.eo.uk/SportHealt

Wired Technology News
The only place to get the latest in depth scienee & technology news.
www.wired.co.uk/tech

Comments

In order to see comments, please turn JavaScript on in your browser.

guardian.co.uk © Guardian News and Media Limited 2009