Olympics: Science in the starting blocks

July 23 2016

Faster, Higher, Stronger: Scientists, too, are doing their bit to make the Olympic motto real. Here are some potentially performance-boosting discoveries, just in time for the Rio Games:

Running: Shoes or no shoes?

In the decades since Ethiopian Abebe Bikila (Olympic gold, marathon: 1960) and South Africa's Zola Budd (5,000-metre world record: 1985) raced barefoot into sporting history, debate has raged over the wisdom of runners spurning shoes.

Many athletes insist that sneakers alter their natural gait and hamper performance. Some have reverted to running without shoes, while others have turned to minimalist "barefoot shoes".

Statistics suggest that increasingly souped-up kicks have not reduced injury rates.

In a recent study published in the *Journal of Sport and Health Science*, Spanish scientists asserted that barefoot running can "considerably" decrease the risk of being hurt.

Runners with shoes tend to crash down on their heels while barefoot runners land on the mid- and forefoot, where the in-built shock absorbers in the arch soften the trauma.

Scientists from the universities of Granada and Jaen studied more than

30 volunteers who had never run barefoot before, while training them to do so over 12 weeks.

The runners significantly altered their ground-strike pattern, the team found, switching away from the heel-first landing.

Done correctly, barefoot running minimises impact force and "therefore, leads to a lower risk of injury," concluded study co-author Victor Soto.

But this does not mean all runners must immediately hang up their boots.

Barefoot running requires special technique, without which athletes may expose themselves to other dangers—including rocks, nails and glass shards.

Swimming: S or I?

It comes as no surprise that the arms are key to success in the crawl stroke. But it's not muscle alone, a recent study found—the "shape" of the stroke is key.

Seeking to settle a long-standing argument, scientists from Japan and Australia compared the so-called I- and S-shaped downstrokes in the freestyle front crawl.

Among their tools: a robot arm executing different strokes, allowing the team to measure forces on the hand and flow fields in the water around it.

The I stroke sees the arm follow a straight line through the water, from the front where it enters the water, to the back where it exits again.

The S stroke, by contrast, draws a double-bellied curve—the arm enters the water near the head, strokes outward, back inward, and out again at the hip as it exits.

The S stroke, popular in the 1960s and 70s, has largely fallen out of favour. But the new study found it may still have a place.

"S stroke is better suited for swimming middle and long distances, while the I stroke is better for short distances," study lead author Hideki Takagi of the University of Tsukuba's School of Health and Sport Sciences told AFP.

The S stroke yields more propulsive power for less physical exertion, he said, while the I stroke delivers maximum speed in short bursts when energy efficiency is not important.

Knuckleballs: the ins and outs

The knuckleball, a bizarre zig-zag ball flight that has stumped many a batsman and goalkeeper, has been demystified.

Scientists from the Ecole Polytechnique in Paris have figured out why knuckleballs bamboozle athletes in some ballsports, such as football, volleyball or baseball, but not others such as table tennis.

Unlike "spin" used in cricket by turning the ball with the fingers or wrist, knuckleballs must be launched with the least amount of spin to achieve their unpredictable side-to-side motion.

Using a wind tunnel and high-speed cameras, the French team observed that all spinless balls follow a zig-zag trajectory—a major surprise.

This was the case even for sports in which knuckleballs were thought not too exist, such as squash and basketball, said Baptiste Darbois, who coauthored the study in the *New Journal of Physics*.

The team then turned to maths for an explanation.

They found that when the shooting distance is too short, as in handball or basketball, or when the zig-zag width is much smaller than the ball diameter, as in tennis and Ping-Pong, the effect will not be strong enough to befuddle the receiver.

A knuckleball must also hit just the right velocity at which "drag crisis" kicks in and the layer of air around the ball becomes turbulent—a sweet spot which is easier to find in certain games, such as soccer.

Unfortunately, understanding the science will not help those who have to face these balls, said Darbois.

"Our study shows that the lateral deviations of zigzag paths remain unpredictable and thus knuckleballs will always be a nightmare for receivers," he told AFP.

The findings may be useful for ball designers, though, whether they want to boost or diminish the knuckleball effect.

Citation: Olympics: Science in the starting blocks (2016, July 23) retrieved 11 May 2024 from https://phys.org/news/2016-07-olympics-science-blocks.html