

Bend it like Bolt

Researchers at Loughborough University are working on new technology to tailor the soles of sprinters' shoes to individual athletes in time for 2012



Jamaica's Usain Bolt won the 100m and 200m sprint double in Beijing wearing customised golden running shoes

1 Dynamics

The angles of an athlete's feet and ankles are measured using high-speed digital video at different stages of the step on the foot's movement. The aim is to harness the full explosive power of an athlete – crucial to success in sprinting or jumping

3 Stiffness

Loughborough researcher Dan Trew, who heads the programme, says that calibrating the stiffness of the soles of a pair of runner's spikes can double the amount of mechanical energy generated at the ankle – enough to give the athlete a definite advantage

2 Production

A process called "Selective Laser Sintering" uses small particles of plastic to create precise 3D components. This allows the researchers to change the properties of footwear in order to match the needs of each athlete – without the need for expensive moulding and tooling

4 In a shop near you

Once tested and proven by elite athletes, shoes with personalised soles will be available to the public, suitable for a wide range of sports and activities

The appliance of science

Cutting-edge labs aim for top performance, report John Goodbody and Bruce Millar

In the struggle for medals in 2012, the tiniest margins will make the difference between victory and defeat, and Team GB is determined to stay at the forefront of the global "arms race" in sports science.

Dave Brasherford, performance director for the triumphant Great Britain cycling team, describes the process as "the aggregation of marginal gains".

Coaches, psychologists, doctors and engineers around the world are striving to improve training methods and athletes' equipment to produce competitive advantages.

Many of the developments skirt the limits of what is legal. Speed's LZR Racer swimsuit won official approval, but has been described by one Italian coach as "technological doping". The company is already looking ahead. Jason Ranoc, head of Aquafab, Speed's research unit, says: "We're working on London 2012 full speed. A spray-on suit, perhaps? We'll have to see..."

In many sports, athletes are training at their absolute physical limits, so avoiding stress injury is crucial to their 2012 preparations. We can expect to see more

developments such as the "azil-govity" machine, a treadmill originally devised by NASA for astronaut training, which bears some of the weight of an athlete. "You get the cardiovascular fitness but without the wear and tear on the soft tissues," says Steve Coan, the former 100m and mile world record-holder. He leads the English Institute of Sport (EIS), which co-ordinates

innovative sports science and medicine for elite athletes.

The next big advance on the medical front is likely to be genomics, says Richard Denton, a sports scientist at Napier University, Edinburgh. Genetic tests will identify not only an individual's aptitude for a particular sport but also an athlete's potential to improve with training.

The technology is still in its early stages so the effects may not be felt in 2012 but there are certain to be more cases of athletes switching sports to magnify their potential, following the lead of Britain's Rebecca Bunnor, who won silver in rowing four years ago and gold as a cyclist in Beijing. The former

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hockey player Louise Jones (profiled on page 8) has joined the handball squad for 2012 under the Sporting Giants initiative run by UK Sport and IIS.

In the battle against drug cheats, British sports authorities are considering placing a chip in each athlete's mobile phone to make them easier to locate for random tests. This would make it more difficult for an athlete to miss a test "by mistake".

Andy Wilkinson, acting head of anti-doping at UK Sport, is greatly concerned at the availability, in the UK and abroad, of performance-enhancing drugs, such as EPO and human growth hormone, that cannot easily be detected. "We have to make sure

that every athlete in 2012 thinks 16 times before they even consider bringing anything into this country," he says.

The EIS Sports Technology Institute at Loughborough University, which opened in February, employs about 30 researchers and the number is expected to double in the run-up to 2012.

The swimming researchers will use underwater monitoring technologies to examine the angle of the dive at the beginning of a race, the glide at the turn, and the roll of swimmers' bodies as they breathe during freestyle. Information will be conveyed to a screen on the side of the pool so that the coach can make adjustments before the session ends.

"The sooner you can correct any action, the better," explains Mike Cairns, the director of the institute.

But he knows too, the institute is working on personalising body protection armour, which is currently standardised and restricts athletes' flexibility.

Last month the institute and UK Sport launched two competitions offering grants of £25,000 and £10,000 for individuals who produce ideas for sports clothing, footwear or equipment. The winners will work with the institute to develop their ideas. Cairns says: "In sport, most advances in high street products stem from funding secured because of the desire to provide the elite with the best possible equipment."

Never mind the medals — what about the money?

The stars of Team GB and 2012 hopefuls have far greater earnings potential from sponsorship and endorsements than their predecessors, with the prospect of a home Games keeping the focus on Olympic sports, writes Bruce Millar.

Britain's best gold medal haul for a century has coincided with a wet summer and national failure of football and cricket, which have all helped to boost Olympic appeal. Even the credit crunch

helps, according to sports agent Alan Smith, the former Crystal Palace manager.

"Companies are looking for something to fill their product in what is a difficult market situation. Our Olympic athletes have provided a feel-good factor," he says. "There's also a feeling among the public and in the City that footballers earn too much money. Olympic athletes are better value, costing perhaps a third as much."

Smith believes that

athletes who missed out on medals in Beijing but emerge as genuine contenders in the next few years will benefit as companies compete to build "long-term, good-value" relationships with potential London 2012 success stories.

The biggest winners will be the superstars of the current Team GB. Max Clifford, the celebrity PR, says the multi-medal-winning cyclist Chris Hoy and swimmer Rebecca Adlington could earn up to £5m each in the next

year. But he adds: "It's crucial for them to be selective in their deals. It is more important what they sign down than what they sign up for: they must choose quality rather than quantity."

Clifford says the public is losing its appetite for "no-talent" celebrities from reality television shows. Adlington and Hoy should capitalise on their achievements by being visible role models, encouraging the young to take up sport.