

SCIENCE AND SPORT



Dr Mark Downs
Chief Executive, Society of Biology

... the best nutritional strategies to improve athletes' recovery and endurance ...

British scientists work to improve the performance of athletes, protect them from injury, and improve recovery. Just as the impact of the Olympics on sport goes well beyond the athletes competing, the benefits of sport science can be felt by the wider population.

ELITE ATHLETE PERFORMANCE

Britain still holds some spectacular world records, including the women's marathon, with Paula Radcliffe claiming the title in 2 hours 15 minutes 25 seconds (2003). In men's athletics, Jonathan Edwards holds the triple jump world record (1995) with a distance of 18.29m, the equivalent length of a double decker bus!

Traditionally, coaches have relied on trial-and-error and gut reaction to improve performance. Science has revealed techniques, some of which seem counter-intuitive, with the potential to improve performance.

Researchers studying how athletes change their technique as they sprint round a bend, for example, have gained a deeper understanding of why sprint speeds are slower on bends than on the straight. Leaning inwards on the bend changes a sprinter's gait, for example the angle of the knee when the athlete puts down their foot, which is known to be associated with performance. They found that 'reduced touchdown distance' could be the key to improving performance on the bend.

Also emerging from research are genetic factors which affect performance. Our muscles contain two types of fibres; slow-twitch fibres are more efficient at continuous contractions, while fast-twitch

help generate a lot of force quickly. Most of us have a genetically determined mix of roughly 50% of each, and the ratio cannot be altered, whereas the fastest sprinters are born with up to 90% fast-twitch muscle fibres.

As athletes enter nerve-racking world competitions, psychology can have a major impact on who comes out on top. Interestingly, there has been a sudden improvement in performance of top sprinters over the past 4 years, ever since they had Usain Bolt to chase. Since Bolt came onto the blocks the top 25 sprinters have improved by nearly 1% – which is a lot when you consider how small the margins of victory can be in sprinting!

Nutrition during training and competition is an important factor in performance and overall health. Research teams

are working to determine what the best nutritional strategies are to improve athletes' recovery and endurance. Such findings will contribute to our general understanding of human nutrition and physiology – and will have lasting benefits after the Games are over.

PREVENTING AND TREATING INJURIES

Sport can have negative as well as positive outcomes; sporting injuries include damage to muscles and joints, repetitive motion injuries, and heat-related illnesses. Research is taking place in the UK to ensure that sport and physical education are safe, and maximise psychological, social and physical benefits.

Gymnastics is a demanding discipline which is known to put young people in particular at risk of injury. The bodies of gymnasts are subjected to frequent high-impact, weight-bearing activities, and scientists have studied ways to reduce injury risk. These include changes to landing technique and posture, medical screening, strength training, and an adequate warm up and cool down.

It is not only human athletes whose health must be guaranteed in international competition.

At the Olympic equestrian 3-day event, the horses will be subject to a veterinary inspection each day to ensure they are fit to compete in the demanding



events. Techniques are constantly being developed to judge a horse's gait to detect signs of injury before they are visible to the naked eye, and equine physiology and nutrition are being studied to improve horse performance and wellbeing.

Biology's members' magazine, covered a new threat to the integrity of competitive sport on the horizon: gene doping. Gene doping has been banned by the World Anti-Doping Agency since 2003, though there is currently no evidence that it has been attempted.



KEEPING COMPETITION FAIR

The anti-doping laboratory at the 2012 Olympics will work around the clock to test over half the estimated 18000 competitors taking part for drugs. By improving the speed of anti-doping tests, researchers have increased the chance of detecting athletes using banned performance-enhancers during the games.

At London 2012 a number of new technologies will be used to provide the most comprehensive data possible on the composition of the athletes' urine samples.

However, anti-doping tests may become more challenging. An article in the June edition of *The Biologist*, the Society of

Gene doping is the enhancement of athlete performance using cells, genes, or genetic material, or altering gene expression. There are huge technical challenges to gene doping, but current research suggests it has potential to enhance athlete performance.

Unlike drugs, which are chemical compounds that do not occur naturally in the body, gene doping would result in the production of biological molecules, making them very hard to detect without invasive tissue biopsies.

The kind of scientific advances which increase the potential for gene doping could also have positive outcomes for competitive sport. The time may not be far off when someone's genes could be used as an

additional tool to identify performance potential, or shape training, nutrition and drugging regimes.

SPORT FOR ALL

The benefits of sport and sport science are by no means limited to elite athletes. We are all aware of the overwhelming scientific evidence that sport has major health benefits and can improve general wellbeing. People who do regular activity have a lower risk of many chronic diseases, such as heart disease, type 2 diabetes, stroke and some cancers.

This knowledge has helped fuel campaigns to encourage more people to increase their level of exercise, and hopefully many lives can be improved and saved through exercise.

Many of the lessons elite athletes can learn from sport science are applicable to everyone, such as appropriate nutrition and hydration.

With approximately 70% of our body made up of water, optimal hydration is essential for health and maximum performance. Milk, for example, has gained scientific support for its role in promoting hydration, due to its high water and sodium content. About 20% of daily water intake comes from

food, and maintaining hydration can be helped by eating foods such as lettuce and watermelon.

THE IMPORTANCE OF SCIENCE

Behind every athlete at the London Olympics is a dedicated team of coaches, advisors and friends. Jenna Stevens-Smith, Public Engagement and Events Executive at the Society of Biology and a former international volleyball player, experienced the varied roles scientists have to play in supporting our athletes. She says: "Athletes from all sports, depending on the funding, have a whole team of scientists and experts around them: when I played volleyball for Great Britain, our support team included a physiotherapist, sports masseuse, nutritionist, sports psychologist, strength and conditioning coaches, lifestyle advisors, biomechanicists, technical coaches and even a sports optician!"

This summer's Olympic Games will not only be a testament to the strength of British sport, but also to the many and varied scientists who support it.

The benefits of science in sport will be one of the key legacies of the London Olympics.



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