

3Qs: How much 'faster, higher, stronger' can Olympic athletes get?

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Exercise science expert Greg Cloutier explains why Olympic athletes are able to continue breaking world records. Photo: Mary Knox Merrill

The United States won more hardware in the 2012 London Olympics than any other country, amassing 104 medals in some 300 events. But competitors as a whole were perhaps even more impressive, setting a grand total of 25 Olympic records. We asked Greg Cloutier, the project manager for the Human Performance and Exercise Science Laboratory

in the Bouvé College of Health Sciences, to explain why athletes have been able to continue breaking world records every four years.

Why have Olympians been able to continue breaking records? Will the human body eventually reach an unsurpassable threshold?

Each Olympic event is subject to “extreme-value statistics.” This type of statistics tells us that, all things being equal, the frequency of world records will tend to diminish. All sporting events are a combination of chance and achievement, which will always offer the possibility of a breakthrough. The mathematics of chance, however, tells us that at a certain point new world records will decline — we will have rolled the dice so many times that the chance of beating the best score drops close to zero. This is one of the reasons why new sports and new classes of competitors typically produce more records than old ones. Female athletes, for example, were not allowed to compete in the Olympic marathon until 1984. For this reason, the women’s world record time has dropped by about 10 minutes, while the men have managed to shave off only five.

The science of sports performance training has come a long way from locker room talk to peer-reviewed clinical trials. Athletes are much better conditioned than they were in the first modern Olympics, held in 1896. Another change is that many competitors are now professionals instead of amateurs and therefore have developed new techniques. High jumpers, for example, used to go over the bar face down, and now they go over backward and have new equipment that is lighter and cooler and provides better support. Each of these developments has accelerated the pace of record-breaking and must continue for future record-breaking.

What role does technology play in assisting elite

athletes? Are there any circumstances under which technology could provide a competitor with an unfair advantage?

World records tend to build up slowly at first and then go through a period of rapid acceleration as new technologies are created and more people compete. Once this period of innovation ends, however, the record-breaking curve flattens out. The design of bicycles, for example, dramatically affects cyclists' performance; the introduction of carbon fiber helped riders to break multiple records. Likewise, new swimwear fabrics that reduce drag in the water are helping swimmers set new standards in that sport.

Is there any legitimate use of performance-enhancing drugs or doping in top-tier athletics? How have these new tools changed athletic training and competition?

I feel that there is no legitimate use for performance-enhancing drugs or doping in top-tier athletics. At the very least, not all athletes can safely take these performance-enhancing (ergogenic) aids. But there is no denying that ergogenic aids have dramatically changed the athlete's ability to train harder and longer, recover faster and become more muscular and stronger.

One's ability to produce oxygen-carrying blood cells, for example, improves with anabolic steroid use and other blood-doping techniques, which, like altitude training, allow delivery of more oxygen to working muscles to slow the onset of fatigue. Controversially, anabolic steroids may have contributed to recent firsts in some track events, and it is this type of technology that would provide an unfair advantage.

Provided by Northeastern University

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