

## Is Doping-Free Sport a Utopia?

In October, what was a doping myth fueled by suspicion, but lacking hard evidence, became a doping-related fact beyond reasonable doubt. The impressive legend of 7-time Tour de France winner Lance Armstrong died, replaced by an equally impressive legacy of shameless lying and cheating on a grand scale, team doping orchestration and discipline on and off the road, and conspiracy to fool the world while earning tens of millions of dollars. As sport scientists watching cycling during Armstrong's decade of domination, we tried to maintain neutrality and probably wanted to believe that his negative doping tests were strong evidence of "innocence." It made for a nice story, even if the numbers never added up: *such large powers in the big climbs . . . so consistently, and beating others who we knew were doping*. Like fans of science-fiction films, we suspended our disbelief.

But, the harsh reality is that the doping-control system did not catch arguably the biggest, boldest, and most brazen drug cheat in the history of sport. Hundreds of analytical doping tests performed over nearly a decade in state-of-the-art laboratories failed to reveal his charade. And the same system failed to catch any of his teammates as long as they were on his team. Riders have confessed under oath how easily the tests could be manipulated. Doping testing failed miserably. A federal investigation compiling 1000 pages of evidence and testimony from 26 different cycling teammates and support staff finally caught Armstrong. All of this evidence is now public.<sup>1</sup> If one of the world's most visible athletes evaded detection despite "500 doping tests" (probably the real number was about half that) over all those years while the whole world watched and the doping-control officials took blood and urine samples, why should we have any confidence that the situation is better today? Was the professional peloton doping free(er) in 2011 and 2012? Were the London Olympics "a cleaner games"? The editorial staff at *IJSP* wants to believe so. But, many of us wanted to believe Lance Armstrong's claim, "What am I on? I'm on the bike 6 hours a day." Alas, he proved once and for all that if the prize is big enough, the entire system can be corrupted. Still, we think there is some reason for cautious optimism moving forward. Just as there was inconclusive evidence throughout the 1990s and early 2000s that strongly suggested that doping was rampant even when positive tests were nearly absent, in the last few years, we see glimpses of encouraging anecdotes pointing in the right direction.

SRM power data from tour riders<sup>2</sup> and analyses of often-repeated stages such as the famous Alpe d'Huez and Tourmalet are one cause for careful optimism. Ross Tucker has analyzed the power-output-to-weight ratio fingerprint for the Tour de France from 1989 and forward.<sup>3</sup> We do not

subscribe to the idea that performance above some fixed power-output threshold clearly indicates doping. However, large shifts in performance capacity that happen in the peloton over a short time are not easily explained by any of the strategies that are legal that we study as scientists. The contours seen in the Tucker analysis are well explained by a rise in doping over the timeline that doping confessions now support and a decline in performances in most recent years that can most reasonably be seen as a return to "reasonable" levels<sup>4</sup> of doping, whatever that is. In numbers, the power-to-weight ratio for the best cycling climbers in the world on their hardest, most decisive climbs rose from about 5.8 W/kg in the late 1980s and early 1990s quite rapidly to  $\geq 6.3$  W/kg by the mid-1990s and remained there to the mid-2000s, before beginning to fall again to 5.8 to 6.0 W/kg in the most recent tours. This anecdote suggests that EPO plus consumption/injection of anabolic agents facilitating accelerated recovery may have been "worth" as much as a  $\sim 10\%$  increase in sustainable power over climbs of 30 to 40 minutes. The Festina doping scandal of 1998 seemed to scare the peloton straight in 1999, because climbing power (otherwise) inexplicably dropped about the same 10%, before rising again in 2000 and thereafter. That is a measurable, chronologically precise blip that adds some contrast to the doping fingerprint. With the exception of doping-positive Alberto Contador, the fastest climbs in Tour history were performed during the 1996–2006 time window, with slower climbing times since by the best climbers and the Tour de France winners in the last 2 years. So, we interpret these anecdotal data as reason for very cautious optimism.

The now infamous argument we heard so often was that "I have been tested 500 times and never had a positive test." Even if the number was exaggerated, no official positives "stuck" to Armstrong despite frequent testing. That seems to suggest total failure of the doping-detection system. But was Armstrong's often-repeated line even true? Sadly, no. There can be little doubt that detecting EPO use and other forms of blood doping (as well as microdosing of anabolic steroids) is extremely challenging.<sup>5</sup> And yet, Armstrong's doping violations were detected by antidoping laboratories on several occasions. But these results appear to have been systematically swept under the rug at a higher level. A broom-shaped checkbook may have been used, as evidenced by large "financial contributions" by Armstrong to the International Cycling Union (UCI). This would mean not that doping testing systematically failed but that the system was corrupt. The UCI has agreed to commission an independent investigation of its own role in the failure of drug testing. We think this is a second small piece of

evidence that the drug labs can go a long way toward keeping cycling and all sports cleaner, provided that the sport-governing bodies they serve are 100% clean.

A third source of encouragement amid all the gloom is that the culture of collective “tight lips” among athletes has collapsed. In addition to a substantial increase in positive tests since 2006, a large share of a generation of top cyclists has confessed their doping practices. And more are confessing every day. One third of the top 10 finishers in the tour since 1998 have either been officially linked to doping or admitted using performance-enhancing drugs in their careers.<sup>6</sup> It is telling that the UCI will not award the 7 Tour de France victories stripped from Armstrong to *anyone*. At least when compared with that dismal back-drop, the peloton’s rules of professional ethics seem to have changed. A long-standing code of silence has now been broken. We can read from the extensive witness testimony that Lance Armstrong both threatened teammates with and depended on this code more than any other method of deception. The collapse of the code of silence may have an even more powerful effect than better analytical chemistry.

Effective doping on the immense scale uncovered with Team US Postal (and subsequent versions of Team Armstrong) exemplifies how critical the cooperation of athletes, sport scientists, doctors, and coaches is to achieving the combined goals of extensive and effective doping on one hand and detection avoidance on the other.<sup>5</sup> Clearly, doctors and sport scientists reading this journal have a crucial role to play in preventing the development of new doping collusions. We are either part of the solution or part of the problem.

The editors of *IJSP* are big fans of great athletic performances. A number of us are directly involved with national sports federations, professional teams, and Olympic federations in research or consulting capacities. A few of us are directly involved with the training process of individual performers. Whether the prize is the yellow jersey or a gold medal, winning at the highest levels of sport is an increasingly expensive enterprise, measured in energy and in dollars. It can also be very lucrative for the winners. Good sport science and the open dissemination of research and best-practice methodology in all aspects of athlete preparation have probably contributed to making the race to the top of the international podium more expensive. The top-20 medal-winning countries are winning a smaller share of the total medals in the Olympics, from 90% in 1992 down to 75% in 2012. This is great for sport and in part a result of better sport-science support in a larger number of countries, all along the path from talent identification to physiological and technical development, to performance peaking, to race management. The difference between a gold medal and finishing out of the medals is smaller than ever before. Good sport science can make the tiny difference between gold and fourth place on a given day. The problem is that doping is just about a sure thing; its effects are so relatively huge that athletes and their support teams can often be persuaded to take the “calculated risk” that drives so much of the athletic doping culture. At the world-class level, the

performance-enhancing effects of doping clearly exceed what cutting-edge sport science can achieve with further optimization of training programs, recovery methods, etc. Any training program a cyclist or cross-country skier chooses will look more effective if they are using low-dose anabolic steroids to enhance recovery and EPO to push their hemoglobin concentrations up to just under the legal limit. We also know that designer drugs are still out there. The only reason that THG, or “the Clear,” as it was called by BALCO labs, was identified back in 2003 was because a sample of it was leaked to the UCLA drug-testing lab. The resulting drug test then helped roll up dozens of track-and-field athletes and may have kept the record for single-season home runs in American professional baseball from exceeding 100 today.

So, we are cautiously optimistic that sport is cleaner and freer of doping today than 10 years ago, but we are not naïve. Seiler et al<sup>7</sup> showed convincingly that women’s sprint performances in Olympic and World Championship finals had actually deteriorated after the “steroid peak” of the late 1980s. The most reasonable explanation was improved doping control. We think it is definitely harder to get away with cheating today than 10 years ago . . . if you are a woman. Interestingly, though, that same study showed that men’s sprint performances had continued to improve linearly. Have we eliminated doping, or just forced the doses to become smaller? Even more concerning, we have to ask ourselves whether USADA inadvertently wrote a 1000-page textbook for would-be dopers? When the performance effect of doping is so large, the difference between first and sixth so small, and the economic rewards so large, the temptation to cheat will remain powerful.

*IJSP* publishes performance-oriented research investigating training methodology, the physiology and methodology of recovery optimization, talent identification and development, technology innovation, and other avenues that contribute to helping athletes achieve the *Citius, Altius, Fortius* that makes sport the attraction that it is. Cycling is not alone in facing challenges to its integrity due to doping. But, the doping crisis now facing cycling and threatening numerous professional and amateur sports can help bring sport science even more to the forefront. Can great sport science boost athlete performances 5% to 10% in an 8-week cycle? No, it cannot. The last time “sport science” appeared to achieve something like that was perhaps around the time when Ron Hill first employed “glycogen loading” to win the Boston Marathon in 1970.<sup>8</sup> But, if doping is effectively reigned in, the real differences that optimization of training organization, recovery methods, nutrition, pacing, and all the research areas in which *IJSP* endeavors to provide cutting-edge science will become even more important in determining who rises to the top of the podium. For the sake of sports, we hope that good sport science, and not just good chemistry, matters more in the future.

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