

# Data, science, and ethics around athletes' performance: $VO_{2max}$ does not win the Tour de France

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After decades of doping scandals around different sports, specially in elite level, we are now living like a sceptic era in which we still don't trust in sport success achieved in a clear manner. This means that many people as sport journalists, coaches, or public in general, don't trust on those that in the past would be considered heroes or, at least, amazing athletes. And this phenomenon appears specially when an important event takes place. In the case of cycling, we must recognize that control strategies have put this sport as one of the cleanest or maybe the cleaner of all competitive sports in the world; this can be argued based on the number of controls in and out competitions, ADAMS location system, or the use of the biological passport systematically. Although it must be also recognized that doping is out there and that new forms are always appearing (e.g. the so-called genetic doping), a promising era was opened years ago showing a clear pathway for the younger cyclists. Despite this objective improvements, the lack of credibility for many people makes them to doubt about those that win. A clear case is Chris Froome's, that has been insulted in a horrible way by some public during the 2015 Tour de France. Chris, like also sometimes other cyclists, has been put in doubt because of his significant performance, so that he and his coaches and directors had to explain his performance showing data about his wattage or body weight. In fact, Froome's physiological and performance data was demanded by some journalists, coaches, and even the general public. His team made some laboratory tests that were partly published trying to explain and prove they were working fair and clean. And the questions that arise from this particular situation are... Why while other sports don't make public athletes' own and personal data cycling must do? Should all data be available for the public? Or even more complex... Are journalists capable to interpret and use properly this kind of data?

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Received: 30 November 2015. Accepted: 27 December 2015.

In our opinion, data and its analysis is really useful and may explain a great percentage of athletes' performance, but there are also other variables apart of those measured in a laboratory that have been proven to be crucial to get the highest competitive level, meaning the difference between being a winner or not. We are pointing out, specially, at psychological variables that make possible to take advantage of physiological and physical variables. So, in a normal and individual range,  $VO_{2max}$ , HRmax, Hematocrit or Hemoglobin, Critical Power, Body fat percentage, muscle mass, body weight... are alone nothing.

First, we need to be sure that data has been taken respecting validity and reliability principles. Then we need to be sure we have the information to compare the data. For example, a body fat percentage itself says nothing if we don't know the sum of specific skinfolds, power measurements in a cycle ergometer can be just numbers if we don't know the exact protocol developed or the device used to measure. And if data is taken during competition, the only although again relative data is time and the position that the cyclists reaches in its context. If power estimations are compared to direct measurements by powermeters, many considerations must be taken into account, like powermeter's calibration, environmental conditions... and one that many times is forgotten: is the cyclist spending more or less time cycling sited or stand-up?

A greater amount of watts is developed stand-up compared to sitting position, and some riders use to ride much more time stand-up than others, so that measurement could be higher.

So, we encourage those people that use isolated data to make their own analysis and interpretations, to be cautious and serious and, if they are not capable to make such analysis, to give it up with honesty. We are talking about athletes' personal data that sometimes is just theirs and should be respected. So, the debate is served; and to intensify it we introduce some specific questions that scientific community should analyze trying to put in context those few people that sometimes want to know more than needed or they are prepared for:

Personal data should be made public (for all sports and/or athletes)? Did anybody ask any other icon athletes in sport history to "obligatory" show in public their own personal data? Would it be advisable when the risk of misinterpretation and decontextualization



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(intentionally or not) could be so high? Should be athletes' rights respected?

Our own thoughts are: Data publication, yes; when possible, available, or voluntary. Analysis and interpretation, yes; being serious (prepared and professional), and ethical.

In any case, we should not be slaves of any data alone; we should use the more quantity of useful data to better approach the truth (that never will be absolutely reached). So, just remember that  $VO_{2max}$  does not win the Tour de France. Just thinking loud.

**Conflict of interest**

The authors declare that they have no conflict of interest.