Journal of Science & Cycling
Breakthroughs in Cycling & Triathlon Sciences

OPEN ACCESS

Editorial

Antidoping 2.0: Is it time to add power data to the biological passport?

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Received: 25 June 2023; Accepted: 28 June 2023; Published: 30 June 2023

The main purpose of any doping strategy is to increase performance. Curiously, the anti-doping interventions that are currently in use do not measure nor consider these abnormal changes in performance. The main purpose of these measures is to detect either the doping substance, its metabolites, or the effects of its use in the cyclists' body (Vernec, 2014). This limitation is partially addressed with out of competition testing, although some dopers have been capable to surpass the system by exploiting the time lag between the doping act, the substance detection window and the increase in performance that results from these forbidden and unfair methods (Ljungqvist, 2014).

The democratization in the use of mobile power meters brings new possibilities to the antidoping field: First, tracking mean maximal power outputs over time may provide data that could indicate abnormal changes in performance and thus, together with the biological passport results, deliver substantial basis for targeted testing (Perneger, 2010). Second, power data may produce complementary indicators in cases in which biological testing may be corrupted: bleeding wounds, altitude or drug use may alter hematological values even in cases in which blood manipulation was not performed (Lodewijkx & Brouwer, 2011). Finally, collection and processing of power data is much cheaper and practical than the entire process associated with biological testing: abnormal performances as a result of out of competition doping could be highlighted without the need to rely on out of competition tests (Schumacher & Pottgiesser, 2009).

Despite the potential benefits associated with the use of power data for doping detection, this intervention is associated with important setbacks that should be addressed in the near future: As in the case of the biological passport, Bayesian statistics must be used to establish the probability and positivity of an abnormal result (Saugy, Lundby & Robinson, 2014). These reference ranges have not been studied to date and thus the sensibility and sensitivity of this method remains unknown. Further, power data could be classified as ultra-sensitive information, as it remains in the private domain of each rider and gives insight into his/her athletic capabilities. Whether athletes would accept to publish these datasets for better antidoping measures is highly debatable. Finally, power data obtained from races only shows what the athlete did but does not necessarily establish what the athlete is capable of, leaving open the possibility of false negatives (Passfield et al., 2017).

Power-based training has definitely improved the training process in cyclists and power data represents an interesting addition to the biological data when attempting to chase dopers. However, as explained in Table 1, its limitations and many unresolved questions must be addressed before we attempt to incorporate these datasets into antidoping strategies.

Table 1. Limitations and explanations of unresolved questions.

Limitation	Explanation
Privacy concerns	Some athletes could feel uncomfortable while sharing their training and performance data with external observers. If direct power outputs are not recovered, there is need to rely on power estimations.
Environmental factors	Temperature, humidity, wind speed, road surface, air pressure and some other factors limit the precision of power data estimations.
Material validation	Not all power meters currently in use in professional cycling have been scientifically validated. The calibration methods vary according to each manufacturer. The inter and intra device variability in power measurements obtained from different power meters should also be taken into account.
Inter-subject variability	Individual biomechanics, pedaling efficiency, body mass and frontal area may render different power outputs for the same climbing speed and vertical velocity.
Financial expenses	The financial cost of the implemented measures (retributions for external observers, precise timing for specific segments during races, etc) must be covered by some or all the stakeholders.
Detection thresholds	Normal inter and intra-season power variability must be assessed in road cyclists in order to provide a benchmark and limit the possibility of false positives and negatives when attempting to determine abnormal power outputs.
Selection of parameters	The specific parameters that would be included in the assessment need to be carefully chosen. W' and critical power variations may discriminate between different types of doping as they relate to different physical capabilities. Further, the assessment of the entire power curve may provide additional information but concurs with an increase in complexity during data recovery.

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