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Editorial

Artificial Intelligence in Sport: Are We Repeating the Mistakes of the Doping Era?

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Abstract

Two decades ago, endurance sport, and cycling in particular, learned what happens when a powerful performance technology spreads faster than the ethical and regulatory architecture meant to contain it. Artificial intelligence (AI) is now reshaping how athletes are trained, monitored, selected and governed at a comparable pace. This editorial asks whether sport is repeating the mistakes of the doping era. Drawing on evidence about elite athletes' attitudes to doping, we argue that doping and the uncritical adoption of AI share a common incentive architecture rather than a common moral status: perceived competitive benefit, a false-consensus belief that rivals are already doing it, opaque systems that resist scrutiny, inequity between well- and poorly-resourced teams, and governance that reacts rather than anticipates. We map this structural parallel across seven dimensions and identify where the analogy breaks down: doping is a problem of rule-breaking, whereas AI is largely a problem of rule-absence, and therefore requires purpose-built governance rather than prohibition. We propose three priorities: explainability as an athlete's right, independent accountability and bias auditing, and athlete data sovereignty. Building these safeguards in advance, supported by genuine AI literacy among sport scientists, coaches and governing bodies, is the central lesson of the doping era and the ethical core of the Cycling 3.0 paradigm.

Keywords

AI; cycling 3.0; sport ethics; anti-doping; algorithmic governance.

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1 Introduction

Two decades ago, the endurance disciplines, with cycling foremost among them, learned a painful lesson about what happens when a powerful performance technology spreads faster than the ethical and regulatory architecture meant to contain it. The technology then was pharmacological. Today it is computational. Artificial intelligence (AI) is transforming how athletes are trained, monitored, selected and governed, and it is doing so at remarkable speed. The question we pose is deliberately uncomfortable: in embracing AI, is sport repeating the mistakes of the doping era?

We believe the parallel is instructive, but it must be handled with care. Our argument is that doping and the uncritical adoption of AI share a common *incentive architecture*, not a common moral status. The doping crisis was never, at root, a chemistry problem; it was a failure of culture and governance that science happened to enable. If sport treats the arrival of AI as a purely technical matter (a question of better models and faster sensors), it risks recreating exactly that failure in a new medium. Understanding the shared architecture beneath the two phenomena can help sport science avoid a second, slower-motion governance breakdown.

2 What the Doping Literature Actually Tells Us

In a widely cited review of athlete attitudes to doping, Morente-Sánchez and Zabala[1] synthesised evidence from elite athletes worldwide and found a consistent psychosocial pattern. Athletes turned to banned substances when they perceived clear performance and financial benefits, when they believed detection was unlikely, and when they assumed, often wrongly, that their rivals were already doing the same, the so-called "false-consensus effect". Strikingly, most athletes acknowledged that doping was cheating and unhealthy, yet its perceived effectiveness outweighed those concerns. The authors concluded that anti-doping systems had over-invested in detection and under-invested in education, and that changing the culture required sustained pedagogical effort, not merely more testing.

That diagnosis maps closely onto the current moment in AI. The teams and entourages adopting AI perceive concrete competitive benefits; they assume everyone else is adopting it; and they rarely pause to ask whether the tools are fair, transparent or safe for the athlete's autonomy. The Cycling 2.0 framework[2], built explicitly on scientific measurement, multidisciplinary cooperation and ethical responsibility, was the sport's answer to the first crisis. The proposed Cycling 3.0 paradigm[3] extends those same values into the AI age. Both insist on the same lesson: a performance technology without an ethical and educational scaffold reproduces the pathologies it was meant to solve.

3 The Scale of What AI Already Does

AI is already deeply embedded in high-performance sport. Machine-learning models trained on wearable-sensor data can already predict perceived exertion during cycling exercise with considerable accuracy, opening the door to real-time adjustment of training load.[4] Physiology-based "digital twins" (virtual replicas of an athlete's physiological system) can simulate race performance and time-to-exhaustion with high concordance to field data.[5] In biomechanics, a recent scoping review documents AI applications spanning fatigue detection, technique optimisation and injury prediction that surpass traditional analytical methods.[6] Reviews of the field increasingly frame the sport scientist's role as one of orchestrating these tools rather than being replaced by them.[7,8] The very breadth of this adoption is what makes the governance question urgent: a technology this pervasive, introduced this quickly, leaves little room for after-the-fact correction.

4 A Structural Parallel, Mapped

Table 1 sets out the parallel across seven dimensions. In both cases the actor perceiving the immediate benefit is the team rather than the athlete; in both cases the athlete bears the cost, whether to health, integrity or autonomy; and in both cases governing bodies have tended to respond reactively rather than by design. The detection analogy is instructive. Just as microdose erythropoietin regimens were shown to evade the Athlete Biological Passport,[9] the opacity of deep-learning "black-box" models resists meaningful scrutiny unless explainability is built in from the outset.[10,11]

The social-normalisation lever deserves emphasis, because it is the mechanism that most reliably converts an individual choice into a collective inevitability. In doping, the false-consensus effect meant that the mere belief that rivals were doping became a self-fulfilling justification.[1] In AI, an equivalent narrative is already audible: that the technology is objective, that resistance is futile, and that any team declining to adopt it will simply be left behind. Both narratives share a subtle rhetorical move: they relocate responsibility away from the human decision-maker and onto an impersonal external force, whether "the peloton" or "the algorithm". Recognising that move for what it is may be one of the most useful contributions the doping literature can make to the AI debate.

Table 1. A structural (not literal) parallel between doping and unregulated artificial intelligence (AI) adoption in sport.

Dimension	Doping	Unregulated AI
Primary driver	Performance gain, financial reward, faster recovery	Competitive edge, tactical superiority, cost efficiency
Social enabler	"Everyone is doing it" (false-consensus effect)	"The algorithm is objective and everyone will adopt it"
Governance gap	Opaque supply chains; limited testing reach	Opaque "black-box" models; unregulated data flows
Inequity	Wealthier teams access substances others cannot	Wealthier teams access AI others cannot; scouting bias
Autonomy cost	Coercion; fear of exclusion	Surveillance; dependence on opaque outputs
Detection / audit	Microdose EPO regimens evaded the Athlete Biological Passport	Opacity resists oversight without explainability
Ethical anchor	Education and prevention (Athlete 2.0)	Transparency and governance (Cycling 3.0)

5 Where the Analogy Breaks Down

It would be intellectually dishonest, and strategically counter-productive, to push this comparison too far. The parallel is structural, not literal, and the differences matter. Doping is, by definition, prohibited: it involves the intentional use of banned substances to gain an unfair and often dangerous advantage. AI, by contrast, is neither banned nor inherently illegitimate; used well, it can improve athlete health, democratise expertise and even strengthen anti-doping itself. Doping is fundamentally a problem of *rule-breaking*; AI is largely a problem of *rule-absence*. The harms of doping are principally physiological and fall on the individual athlete; the harms of poorly governed AI are more diffuse (privacy erosion, algorithmic bias, inequity and the slow surrender of human judgement) and fall on the sporting ecosystem as a whole. Doping has a mature global regulator; AI in sport, at present, does not. Precisely because of these differences, AI cannot simply be folded into the anti-doping model. It requires its own purpose-built governance, one that regulates a legitimate technology rather than prohibiting an illegitimate practice.

6 Designing Governance Before, Not After

If the doping era teaches one lesson, it is that governance introduced after a technology has become entrenched arrives too late and costs too much. The emerging literature on trustworthy and responsible AI offers a ready foundation.[12,13] Three priorities stand out for sport.

6.1 First, Explainability as a Right, Not a Feature

Any AI-based decision that affects an athlete's selection, health or integrity should be explainable and contestable. Explainable AI (XAI) has matured rapidly,[10,14] yet reviews caution that many current techniques satisfy institutional demands for legitimacy better than they genuinely empower the individuals affected.[11] In an anti-doping or talent-selection context, an unexplainable output should carry no evidentiary weight, just as an anti-doping sanction requires a transparent chain of evidence.

6.2 Second, Accountability and Bias Auditing

Algorithmic accountability requires that someone can be held to account for an algorithmic system throughout its lifecycle, which in practice means auditable datasets and models that are periodically examined for bias.[15] The risk is concrete: analyses of AI in sport identify gender and performance-level bias in training data as a critical weakness,[16] and policy-oriented reviews of AI-driven talent identification warn of "digital determinism", whereby models trained on past success entrench existing inequities.[17,18] An independent audit function, analogous to the expert panels that review Athlete Biological Passport profiles, would make this operational.

6.3 Third, Athlete Data Sovereignty

Biometric and performance data originate in the athlete's body, yet legal ownership remains strikingly unsettled.[19] Under the European Union General Data Protection Regulation (GDPR), athletes' health and biometric data fall within the special categories of personal data, but jurisdictions diverge and enforcement is uneven. As wearables, smart fabrics and AI-linked sensors turn continuous monitoring into the norm, the line between assistance and surveillance becomes harder to draw, and the athlete, nominally the source of the data, is often the party with the least control over it. Collective bargaining agreements in some professional leagues already refer to wearable technology, but most fail to define ownership, access conditions or benefit-sharing obligations; co-ownership and shared-governance models offer a more promising template.[19] Sport should generalise these models rather than wait for litigation to define them, and should treat data rights not as a legal afterthought but as an extension of the same athlete-agency principle that anchored the Athlete 2.0 concept.[2]

7 Conclusion: A Warning, Not a Verdict

AI is not the new doping. To say so literally would be alarmist and would misrepresent a technology of enormous legitimate promise. But the *conditions* that allowed doping to take hold (powerful incentives, permissive social norms, governance that lagged behind capability, and an under-investment in education relative to enforcement) are visibly present again. The value of the doping analogy is not as an accusation but as an early-warning system. The anti-doping movement learned, belatedly and at great cost, that culture and education matter as much as control, and that a technology cannot be governed by testing alone.[1,2] Sport now has a rare opportunity to apply that lesson in advance: to build explainability, accountability and athlete data rights into the foundations of AI in sport, rather than retrofitting them after the next scandal. Doing so will require sport scientists, coaches and governing bodies to develop genuine AI literacy, that is, the capacity to interrogate an algorithm rather than defer to it, just as the first generation of clean-sport advocates had to become fluent in the science of doping. Without it, algorithms risk becoming a new "Troy horse" that occupies roles requiring qualified coaching and sport-science professionals.[20] Whether we take that opportunity is, as ever, a question of ethics before it is a question of technology. The algorithm must serve the athlete, not the other way around; and the measure of Cycling 3.0, and of AI in sport more broadly, will not be how much it can predict, but how faithfully it protects the human being at its centre.

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