



Contents lists available at [ScienceDirect](https://www.sciencedirect.com)

Performance Enhancement & Health

journal homepage: www.elsevier.com/locate/peh



Fifty shades of grey? On the concept of grey zones in elite cycling*

Bertrand Fincoeur^{a,*}, April Henning^b, Fabien Ohl^a

^a University of Lausanne, Institute of Sports Sciences, Switzerland

^b University of Stirling, Faculty of Health Sciences and Sport, United Kingdom

ARTICLE INFO

Article history:

Received 11 March 2020
Received in revised form 25 June 2020
Accepted 4 September 2020
Available online xxx

Keywords:

Doping
Grey zones
Deviance
Cycling

ABSTRACT

In this article, we elaborate on grey-area concepts in elite cycling. First, we show how grey areas take place in a certain lack of conceptual clarity in anti-doping regulations. Then, we analyse the changing attitudes of elite cycling stakeholders towards grey zones. Finally, we discuss our results by articulating the stance on grey areas with the quest for performance enhancement which characterizes any elite sport culture, including elite cycling.

© 2020 The Author(s). Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

1. Introduction

Anti-doping policies aim to preserve health and fairness, that is what is deemed intrinsically valuable about sport. As a result, various lists of prohibited performance enhancing substances and methods (hereinafter referred to as performance enhancing drugs or PEDs) have been developed since the 1960s. However, there was considerable variation between sports disciplines and/or national policies regarding what was banned and what was not (Houlihan, 2002). The World Anti-Doping Agency (WADA) was established in 1999 to harmonise anti-doping regulations worldwide. Since its core document, the World Anti-Doping Code (WADC), was adopted in its first version in 2004, any use of a substance or method that is not explicitly banned can be considered allowed. In fact, through its Prohibited List, which addresses numerous classes of substances (e.g., anabolic steroids, stimulants, diuretics) and methods (e.g., blood transfusions), WADA simply relies on the 'principle of legality', the legal ideal that requires all law to be clear, ascertainable, and non-retrospective, since it would be unfair to impose sanctions for acts that were not illegal at the time of their commission (*nullum crimen sine lege*: no crime without law) (Meron, 2011). However, although WADA rules aim to establish clear distinctions between banned and allowed activities, concepts such as enhancement or

health cannot always be reduced to black and white categories. Several enhancers are allowed or prohibited only under certain conditions (e.g., in- or out-of-competition, or depending on whether their use may be justified by a therapeutic use exemption). Other enhancers, such as several research chemicals, are simply not covered by anti-doping regulations. PEDs in the so-called 'grey zone' – i.e. products that are neither explicitly banned nor explicitly allowed under WADA regulations (Van Thuyne, 2006) – are thus increasingly considered a controversial issue within anti-doping policies, and they can leave room for juridical insecurity.

Our theoretical framework primarily relies on Howard Becker's seminal theory of deviance (Becker, 1963). Becker argues that deviance is not a quality of the act the person commits, but rather a consequence of the application by others of rules and sanctions to an offender. Performance enhancement covers a large array of practices but not all of them are labelled illicit by anti-doping authorities. In fact, several effective enhancing substances and methods are allowed, while others are not, and these labels may change over time: something that was authorized may become prohibited, and vice versa. For example, there are on-going debates about substances such as glucocorticoids (Orchard, 2008) and cannabis (Bergamaschi & Crippa, 2013). No substance or method is banned for the sole reason that it is performance enhancing. Instead, a PED is banned because it has been labelled banned by those who are empowered to do so. Yet, the norms and values of the dominant culture (i.e., those promoted today by WADA) may differ from other subcultural sets that then develop their own socializing patterns (Berger & Luckmann, 1966; Ohl, Fincoeur, Lentiillon-Kaestner, Defrance, & Brissonneau, 2015; Pappa & Kennedy, 2013). In par-

* This manuscript has not been published and is not under consideration for publication elsewhere

* Corresponding author.

E-mail addresses: bertrand.fincoeur@unil.ch (B. Fincoeur), april.henning@stir.ac.uk (A. Henning), fabien.ohl@unil.ch (F. Ohl).

<https://doi.org/10.1016/j.peh.2020.100179>

2211-2669/© 2020 The Author(s). Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

ticular, [Coakley \(2015\)](#) demonstrated how doping practices could be seen as 'deviant overconformity' by the sports subculture. That is, PED-using athletes are actually complying with the expectations and standards of elite sport. The quest for performance drives elite athletes and sports organisations, but debates exist about the acceptable limits of performance enhancement ([Loland, 2015](#)). Marginal gains and the grey zone issue then raise important questions in this respect. As part of sporting culture, marginal gains are often perceived positively by athletes and staff. They participate to the win-at-all-costs culture ([Hughes & Coakley, 1991](#)) in which athletes are socialised. However, this culture is challenged by a culture of anti-doping. The WADA Code in each iteration has shaped a different approach to performance, defining more strictly what is allowed and not. Consequently, for some athletes and staff, the sporting habitus for which marginal gains is part of the performance, contradicts the strict respect of the anti-doping rules and principles. Cycling is a sport in which grey areas have recently received significant attention, and this article addresses how the grey zone issue is perceived by elite cycling stakeholders. Further, it explores how grey areas challenge the anti-doping debate more broadly.

2. Literature review: the growing debate about grey areas and its application to elite cycling

The doping grey zone may be understood as the space where PEDs of unclear acceptability or legality in sport sit ([Van Thuyne, 2006](#)). Unclear acceptability refers to how legitimately athletes perceive the use of certain PEDs, regardless of their legality. Unclear legality, rather, derives from changing regulations and/or semi-illegal status of PEDs in different contexts (e.g., allowed in country A, prohibited in country B). In addition, debates about grey zones often rest on the sometimes-unclear distinctions made between concepts such as therapy and enhancement, or enhancement and doping. Owing partly to the lines and policies that determine these distinctions being far from black and white, athletes who are actually in compliance with anti-doping rules may find themselves accused of operating in the grey zone for various reasons. The grey zone consists of various shades of grey, each of which has its own peculiarities and challenging issues for anti-doping.

One key grey zone is the use of prohibited substances for medical reasons. Understanding that athletes may require the use of prohibited substances for legitimate medical reasons, WADA sought to draw a line between therapy and enhancement through Therapeutic Use Exemptions (TUE). TUEs are exemptions for which athletes must apply and demonstrate that use of a prohibited substance is required. There are strict criteria for one to be granted: the athlete would suffer significant health problems without taking the substance, use under the TUE is highly unlikely to produce any additional significant enhancement of the performance, there is no reasonable therapeutic alternative to the prohibited substance, and such need is not due to prior use without a TUE (WADC, 2018). While this looks like a reasonable accommodation to address the line between therapy and enhancement, in practice it has led to suspicions around who gets TUEs and why ([Bloodworth, Cox, & McNamee, 2019](#)). Two surveys of French-speaking and Danish athletes found that many athletes thought TUEs were unnecessarily granted, and these feelings of mistrust were more likely if the surveyed athlete had themselves received a TUE ([Bourdon, Schoch, Broers, & Kayser, 2014](#); [Overbye & Wagner, 2013](#)).

Several athletes seemingly understand TUEs as a vehicle for authorized doping. This issue took on greater prominence in 2016 following the release of athlete anti-doping records after a database was hacked by the Fancy Bears group. Several high-profile athletes were found to have received previously undisclosed TUEs ([Ingle,](#)

[2016a](#)). Despite these athletes being transparent with anti-doping officials about their use of prohibited substances and that use being approved as necessary, questions swirled about potential misuse of TUEs to gain an edge in competition ([Ingle, 2016b](#)). The hackers are not the only ones who raised concerns about the misuse of TUEs. According to Richard McLaren, the author of the report into Russian doping, the TUE system is open to abuse ([McLaren, 2016](#)). The Cycling Independent Reform Commission (CIRC) also found evidence that the TUE programme was being systematically abused to enhance performance ([Marty, Nicholson, & Haas, 2015](#)). This raises further questions about the integrity of the TUE process, as well as the ease with which elite athletes are granted TUEs ([Dasgupta, 2019](#); [Gleaves et al., 2019](#)). However, published evidence of TUE abuse is scant, and anti-doping officials basically maintain that it is hard to get a TUE and that there are very few that are applied for and approved. The percentage of athletes competing with a valid TUE at the Olympic Games is less than 1%, and there is "no meaningful association between being granted a TUE and the likelihood of winning a medal" ([Verneck & Healy, 2020](#)). A WADA official we interviewed noted, '(when athletes) claim that the TUE system is one of the principle areas of abuse, (...) repetition of unsubstantiated claims (...) lend them an element of truth even if they are false statements.'

Another category of grey zone identified by researchers and athletes is legal enhancers. These include substances, such as painkillers and nutritional supplements, or methods, such as hypoxic chambers. For example, athletes may use supplements for a variety of reasons, one of which is performance enhancement. This is where the distinction between enhancement and doping becomes blurred: something that enhances is not necessarily doping, and vice versa. In the former case, many substances or methods known to enhance are allowed in sport. Researchers have debated the allowance of such substances as caffeine ([Henne, Koh, & McDermott, 2013](#); [Marcora, 2016](#)) and methods such as simulated altitude ([Levine, 2006](#); [Malloy, Kell, & Kelln, 2007](#)). While widely accepted that both can enhance performance, they are nonetheless allowed and therefore not considered doping. Conversely, use of non-enhancing drugs may be, or may have been, considered doping. Several recreational drugs are or were prohibited by WADA at various times in and out of competition. One drug currently prohibited under certain circumstances is cannabis, despite its growing acceptance as a therapeutic drug and new legislation allowing recreational use. Debates over the inclusion of cannabis on the Prohibited List continue ([Henne et al., 2013](#); [Kayser & O'Hare, 2013](#); [Waddington, Christiansen, Gleaves, Hoberman, & Møller, 2013](#)).

Supplement use—including inadvertent or accidental ingestion of prohibited substances through supplements—also form a major grey zone issue ([Henning & Dimeo, 2018](#); [Martínez-Sanz et al., 2017](#)). This is of high importance due to the widespread use of supplements among athletes ([Knapik et al., 2016](#); [Outram & Stewart, 2015](#)), and the poor regulations around the manufacture of such products. This then leaves athletes at risk of inadvertently testing positive through supplement use ([Denham, 2017](#); [Mathews, 2018](#)). A study of WADA's results management database found that up to 40 % of all athletes sanctioned for a positive test were likely to have unintentionally used a prohibited substance ([de Hon & van Bottenburg, 2017](#)). When athletes use a product for enhancement but do not intend to take a prohibited substance, the line between enhancement and doping, and between doping and cheating, is unclear at best ([Pluim, 2008](#)). WADA has clarified their position through the application of strict liability, but concerns about athletes being caught up in accidental use are not unwarranted ([Cox, 2014](#); [Moston & Engelberg, 2019](#)).

Finally, the grey zone also consists of unapproved or unregistered PEDs. The Prohibited List contains section S0, according to which 'any pharmacological substance which is not addressed by any of the subsequent sections of the list and with no cur-

rent approval by any governmental regulatory health authority for human therapeutic use (e.g. drugs under pre-clinical or clinical development or discontinued, designer drugs, substances approved only for veterinary use) is prohibited at all times.' However, section S0 acts as a kind of residual category to cover situations not included in the other sections of the WADC. This black box generates grey areas for potential PEDs users. It is unclear, for example, whether a substance that is not listed and approved by several health authorities is allowed or, in particular, if it has been approved by several health authorities from countries with laxer regulations than others. Such use could be seen as violating the 'spirit of sport' as described in the introduction of the WADC, because it concerns enhancement that not all athletes would have access to, leading to unfair competition. As such, there is room for discretionary power causing uncertainty for athletes (McNamee, 2015).

2.1. Grey areas in elite cycling

There have been major changes with regard to riders' attitudes and patterns of use towards PEDs over the last few years (Waddington, 2019). It is worth recalling that during the 1998 Tour de France, an investigation revealed systematic doping among teams after a large haul of doping products was found in a car belonging to the Festina team a few days before the start of the race (Christiansen, 2005; Waddington & Smith, 2009). The peloton then staged a solidarity sit-down protest against doping allegations from the media and the fact that hotels were searched by police (Mignon, 2003). In the months following the scandal, the few riders who broke down the walls of silence and acknowledged that doping was endemic to elite cycling were promptly fired from the peloton (Bassons, 2014). Like any other sport, elite cycling had to face the expansion and intensification of anti-doping policy from 1999. At this point doping was described in language highlighting the harms of doping to sport, health, and ethics, and the need to promote and preserve 'clean' sports (Sandvik, 2019). As a result, the perceived legitimacy of undisputable doping practices has decreased considerably among riders (Ohl et al., 2015). This is due in part to the need to restore riders' and teams' spoiled identities (Sefiha, 2017), and elite cycling's image in order to keep sponsorships (Dimeo, 2014).

Scandals pertaining to elite cycling over the last few years have shown how blurred lines might in fact characterise the approach towards performance enhancement, as well as part of the anti-doping regime. In particular, several medical practices from Team Sky, one of the most successful elite cycling team of the last decade, were highlighted because they would have transgressed ethical boundaries by misusing TUEs—a key grey zone we identified. The report from the select committee that investigated Team Sky's practices indicated that several riders were treated with drugs to enhance the performance of riders and not just to treat medical need, although without violating WADA rules (House of Commons, 2018). As we will show in the results section, the use of certain PEDs was seen as a form of cheating not because they were on the banned list, but because they allegedly went against what was deemed morally acceptable, that is the 'spirit of sport' for which there is no legal or uncontested basis (Kornbeck & Kayser, 2018; McNamee, 2015). "Is it doping or is it just using the rules?" asked International Cycling Union (UCI) President David Lappartient according to whom grey areas should be eradicated because they are likely to damage cycling's credibility (Cycling News, 2018). Similarly, as early as in July 2010, John Fahey, the former President of WADA, claimed that taking caffeine pills was against the spirit of sport (Cooper, 2012a: 176). However, 'one is left with the impression that it is the implication that something is a medicine that is the problem, not the chemistry itself' (Cooper, 2012b). (Elite) sport is full of chemistry, such as the widespread use of supplements among athletes (Knapik et al., 2016), but the use of medication by

athletes seems increasingly controversial. Research investigating public opinion and attitudes towards doping has found no acceptance of 'pure' doping products, such as EPO, anabolic steroids, and amphetamines (Engelberg, Moston, & Skinner, 2012; Stamm, Lamprecht, Kamber, Marti, & Mahler, 2008). It is much less clear with regard to PEDs that could be categorized as belonging to grey zones, such as hypoxic chambers (Solberg, Hanstad, & Thøring, 2010). Although other sports have been affected by scandals related to grey areas (Gordon, 2017; Walker, 2014), research pertaining to attitudes on grey areas is scant. As such, we are focusing on this issue with respect to elite cycling.

3. Methods

This article relies on aggregated results from two main research projects. First, we used the results from a doctoral dissertation on doping in Belgian and French male elite cycling (2012–2016). Second, this article is based on results from a three-year research project funded by the Swiss National Science Foundation (SNF) on performance enhancement in men's elite cycling (2016–2019). Seventy-seven and sixty-nine semi-structured interviews, respectively, were conducted with elite riders, staff members (team managers, sports directors, team physicians), and other stakeholders (anti-doping policy-makers at WADA and UCI, sports agents, journalists). Interviewees within elite cycling teams belong(ed) to either WorldTour or ProContinental teams, the two top-tier divisions in elite cycling. The teams represent a diverse range of demographics, originating from countries that have a strong tradition in cycling (e.g., Belgium, France, Italy) and those that do not (e.g., Anglo-saxon countries). Interviewees came from a large array of countries: Austria, Belgium, Canada, Estonia, France, Germany, Italy, Kazakhstan, the Netherlands, Spain, South Africa, Switzerland, and UK. Riders included those who were present in the 'old generation' of cycling who were active from the early 1990s on, and up to the new generation of riders who were only at the beginning of their careers.

Interviewees were selected by convenience and/or snowball sampling (Emerson, 2015). There was no requirement for riders or staff to participate and all interviews were given on a voluntary basis. Each interviewee was informed of the purpose of the project, and that the study was independently funded and not attached to any cycling or anti-doping governing bodies. Interviews were conducted in English, French, Dutch, Italian, or Spanish, either at the home of interviewees or in hotels during races or training camps. Several participants were interviewed up to four times in order to better understand the longitudinal evolution in the attitudes towards doping – i.e., do interviewees stick to their initial views or can we observe some shift in their attitudes depending on environmental factors such as the changing economic context of cycling and advances in anti-doping? Multiple interviews also allowed us to deal with some provisional results in depth. Field notes and observations were also recorded in order to engage in a self-reflexive analysis of the data. The data collection period was spread out over several years (2012–2019). As a result, we benefit from a longitudinal perspective that enabled us to track the evolution in the doping-related attitudes within elite cycling.

Each interview was transcribed verbatim. Open coding of the transcripts was utilized in order to establish a broader sense of understanding of pertinent themes for further investigation. Data were processed using Nvivo. The analysis was cross checked for inter-observer reliability. A basic content analysis was implemented and involved treating each interview as one unit of analysis. The Nvivo software facilitated the coding process and the organisation of the interview data into nodes, which allows researchers to easily identify patterns and themes in the data (Braun & Clarke,

2006). Although grey areas were not a research question from the very beginning of the research project, the topic progressively emerged from the data analysis as a key issue for anti-doping and a primary concern for cycling stakeholders.

4. The increasingly negative attitudes towards grey areas among cycling stakeholders

Important changes in the line-up of the medical staff of elite teams have taken place over the last decade. Undoubtedly, the history of sports doping is intertwined with that of sports physicians, who played a prominent role in prescribing, monitoring, and/or providing athletes with prohibited PEDs (Brissonneau & Montez de Oca, 2018; Paoli, 2019; Waddington, 1996). Elite cycling is no exception. For instance, EPO turned out to be endemic in the mid-1990s after a biomedical research team from the Italian University of Ferrara ensured its appropriate use among elite riders (Donati, 2012). There is strong evidence of the embeddedness of team physicians within the doping supply chains, at least until the early 2000s. Team-unrelated doctors began to play an increased role from the mid-2000s as a result of changes in elite cycling and in anti-doping policies (Fincoeur et al., 2019). Since then, elite teams have been increasingly committed to a new approach to anti-doping (Ohl et al., 2019). As a result, many 'old' doctors have modified their practices and are now expected to supervise their riders rather than aid them in outperforming their competition.

'Due to the new team policy and the various scandals elite cycling has faced these past few years, I am now expected to behave like a policeman who is supposed to verify that his riders are compliant with anti-doping rules. I understand this because I don't want to be responsible for making sixty people unemployed but, basically, my motivation to do this job got lost' (Team doctor).

In addition, a new generation of team doctors, with little to no background in the 'dark period of cycling' (i.e., the period of widespread doping between the early 1990s and the end of the Armstrong years), is replacing the older generation that worked through the team-sponsored doping era. This new generation currently in the field has established a new *doxa* or "an agreement to comply with an order which, as a compulsory element for understanding the world, is accepted without asking" (Bourdieu, 1996: 471). This generation does not hold the same attitudes towards PEDs as their predecessors, and no longer considers them as a legitimate mean to obtain cycling results.

"I think I would be really uncomfortable using a product (in the grey zone) purely because it boils down to the spirit of sport and you know, if we knew about something that directly enhances performance and no other teams knew about it, that's really defined the whole spirit of sport because then you are on a different level to everyone else. (...) I still think it crosses that ethical line and my job is not to be getting someone a medication purely to increase their performance" (Team doctor).

Doctors', sports directors' and riders' views on enhancement have seemingly turned into a clear-cut division between acceptable and unacceptable PEDs. While this shift may be understood regarding banned PEDs, there is a trend towards defining PEDs in general as unacceptable ('deviant' in Becker's words). Hence, we elaborate and focus on elite cycling stakeholders' attitudes towards grey zones. In particular, we emphasise that TUEs, hypoxic chambers, painkillers, and supplements, are increasingly labelled deviant though they are not prohibited.

4.1. Complaints about the (mis)use of therapeutic use exemptions

Our results show that false TUEs—TUEs without any medical reason—fall under the new moral condemnation of doping. Top riders recently complained about the alleged TUE-related misconduct and criticised the UCI for its weakness in managing the crisis (Cycling Weekly, 2017). The controversy around Team Sky (Bloodworth et al., 2019) illustrates these complaints and suspicions over how TUEs are delivered, regardless of whether riders' perceptions are well-founded or not. Cycling actors today are calling for a tougher stance on practices that come to be seen as 'artificially performance enhancing.' Top French rider Romain Bardet demanded a stricter approach on the use of corticoids (Le Monde, 2016), which are authorised out of competition and by request via TUE in competition, depending on the administration mode:

"The real problem is that corticoids are permitted. One prohibits lots of products but not corticoids, although they have anti-inflammatory properties and enhance the performance. There are far too many riders in the peloton – and we riders all know them – who allegedly have knee problems before their athletic objectives and use unnatural products for that purpose. Then, the day of the competition, you see chubby guys with very skinny legs, no one is credulous".

In the same vein, Belgian Tim Wellens preferred to abandon the 2018 Tour de France rather than accept a TUE, seemingly for fear of reputational damage (L'Equipe, 2018). Similarly, most of our interviewees, especially riders in the first half of their career and "new" team doctors, reported very uncomfortable feelings with TUE.

"I understand that a rider can be sick and require some medication. But one should not exaggerate. Otherwise, everybody can tell he's asthmatic. I'm aware several riders have borderline practices but my generation we really try to do the job clean. If you need medication, you stay at home. Modern doping, it's not testing positive but playing with the limits and unfortunately I'm aware that several riders behave in that way" (Rider).

"A big concern is grey areas where it's not necessarily illegal but it's certainly unethical and cortisone is a big one. (...) I've never once written a TUE for cortisone in my career. It's very performance enhancing and we know that, and yes just disappointing that it's not on the banned list" (Team doctor).

Surprisingly, it is not only the misuse of TUEs that has become controversial. Since the TUE regime is viewed as open to abuse, even legitimate TUEs have begun to raise questions among riders and staff. Other enhancement techniques provide further evidence of the retreat from both authorized and banned PEDs. Similar resistance to allowed enhancers is observed with regard to hypoxic chambers, painkillers, and supplements.

4.2. When authorized enhancers turn undesirable

Since EPO is prohibited by anti-doping regulations, one could argue that the legality of simulated altitude, either with hypobaric or with normobaric hypoxic chambers, is purely an application of Becker's *labelling theory*, as explained above (Becker, 1963). Both EPO and hypoxic chambers can increase the quantity of red blood cells to improve aerobic performance. But while EPO users need syringes as a means of improving their athletic performance, athletes using hypoxic chambers only need to sleep in them as part of their training regimen. In the end, both techniques have similar purposes to training at high altitude, but only EPO is deemed to provide an unfair athletic advantage.

Given both means could be said to meet two of the three criteria for including substances and methods on the Prohibited List (i.e. potential to enhance sport performance and violation of the spirit of sport), several authors suggest that there is no moral difference between using EPO and a hypoxic chamber (Levine, 2006; Malloy et al., 2007). Although results are not uncontroversial (Millet, Chapman, Girard, & Brocherie, 2019), other research has shown that the “live high, train low” (LHTL) approach, which is the idea behind hypoxic chambers, has no greater effect on performance output measured in watts or on any relevant physiological parameters than does “live low, train low” (LLTL) (Bejder et al., 2017; Siebenmann et al., 2012). However, WADA regulations do distinguish between the two techniques, as EPO use is banned while hypoxic chambers are not. Nevertheless, the latter are prohibited in Italy and there have been debates over their inclusion on the WADA Prohibited List (Lippi, Franchini, & Guidi, 2007). This values-driven inconsistency in how EPO and hypoxic chambers are treated by anti-doping policy-makers contributes further to the grey zone.

“As an Italian citizen, I may not use a tent when I’m at home. But several of my teammates, who live abroad, have the right to do so. And if I’m out of Italy? What am I supposed to do? This situation is beyond understanding! What is the rule? We all do the same job but we do not have the same opportunities. I don’t know if tents should be allowed or not, but please apply the same regulations everywhere” (Rider).

Yet, no matter the potential similarity of effects of these two performance-enhancing techniques, most elite cycling stakeholders make a clear distinction between them. Although EPO was widespread at least until the late 1990s (Gleaves et al., 2019), its use is now condemned by an overwhelming majority of riders and there is evidence that most elite teams, if not all, no longer supply their riders with EPO (Fincoeur, van de Ven, & Mulrooney, 2014). The changing attitudes towards EPO use could also be influenced by the ‘no needle policy’ that was adopted by the UCI in 2011 (Cycling News, 2013). The UCI Regulations prohibit injections with the aim of artificially improving performance or helping recovery. This means riders can no longer inject vitamins, sugars, enzymes, amino acids, or antioxidants to aid recovery. The UCI Regulations only allow injections when they are medically justified and when there is no alternative treatment available (Lopez, 2017). In a context where elite cycling needs to provide evidence of its commitment to clean sport, our interviewees increasingly considered hypoxic chambers to be part of the grey zone. They tended to label their use as undesirable because it could harm the efforts of elite cycling to convince stakeholders that cycling is now committed to ‘clean sport’.

“Well, our team leader does use a hypoxic chamber. . . I don’t know if there is academic research on the acceptance of altitude chambers by the public and cycling fans, and I know the technique is not illegal according to anti-doping rules but, due to its past, elite cycling today needs to be totally clean” (Team manager).

“I have heard that L. has equipped his whole flat in hypoxia. I don’t know how much it has costed but that is very borderline, I think. That is a bit unfair. He plays with the rules” (Rider).

The reluctant attitudes towards hypoxic chambers echo similar changing attitudes towards the use of supplements and painkillers. Garthe and Maughan (2018) have shown that between 40 % and 100 % of athletes typically use supplements, depending on the type of sport and the level of competition. Since small factors can compound to impact the outcome of sporting contests, supplements may actually be seen as part of a ‘marginal gains’ approach. The notion of marginal gains was popularised by Dave Brailsford, team

manager of Team Sky, who applied this approach to cycling (Harrell, 2015) and made it an important communication strategy for his team. Marginal gains consist of the 1 % margin for improvement in everything riders and teams do. The main idea is that if one improves every area related to cycling by just 1 %, then those small gains are expected to add up to remarkable improvement. Marginal gains include optimisation of: nutrition, training programmes, ergonomics of the bike seat, weight of wheels, etc. It also covers improvement in tiny areas that are usually overlooked, such as using the most effective type of massage gel or the pillow that offers the best sleep. To be clear, in our research we did not find anyone who disagreed with the objective of improving a training plan or body posture on the bike. However, we did find various stakeholders who perceive supplements as enhancers that they ideally would do without. Young riders in particular seem to be increasingly educated to consider supplements as something unnecessary and alien to the needs of an elite athlete.

“Especially when I discuss with some of our old sports directors, I sometimes struggle to change mentalities within the team about the use of supplements but I try to convince them that it is not a good signal for our young riders. It suggests that an elite rider needs something artificial to do the job” (Team manager).

There is some evidence that supplement use is a step towards further medication, including prohibited PEDs (Hurst, Kavussanu, Boardley, & Ring, 2019). This view understands the use of supplements in ways similar to the ‘gateway hypothesis,’ a theory that suggests early experimentation with legal or social drugs escalates to addictive illicit drugs later in adulthood (Kandel, 2002; Lynskey, Heath, & Bucholz, 2003).

Similar conclusions can be drawn regarding painkillers. In a context where athletes are looking for the outer edge of their potential in order to win, painkillers may also simply be overused to cope with pressure to perform through pain at high levels (Selanne et al., 2014; Tscholl, Feddermann, Junge, & Dvorak, 2009). Although using painkillers is authorized, the deputy director of the World Anti-Doping Laboratory in Cologne explained that analgesic use ‘is a grey zone. (. . .) Painkillers fulfill all requirements of a doping substance because normally pain is a protection mechanism of the body and with painkillers you switch off this protection system’ (McNamee, 2014: 191). Just like supplements, and despite some doubts about effectiveness (Da Silva, Pinto, Cadore, & Kruehl, 2015), the use of painkillers and sleeping tablets in the peloton has long been considered part of the life of an elite rider. Here again, voices are now being raised against the use of anything that is related to pharmacological assistance, even when authorized. The British elite rider Alex Dowsett spoke out against this pill culture: ‘There is still reliance on things that come in a tablet form. In every team that I’ve been in, the doctor does the rounds at night and it’s not a case of if they want the sleeping tablet, it’s how many, or which ones’ (Smith, 2014). From our interviewees, we collected numerous similar accounts.

“What I don’t think is normal is when I see, during the races, numerous riders taking a Tramadol (= a painkiller) for the last 100 km. It is very common, even among my teammates, but that’s not my conception of cycling” (Rider).

Importantly, UCI decided to start tramadol testing in January 2019. Tramadol is an opiate that is not on the WADA Prohibited List, but the UCI President announced several painkillers to be banned: ‘Tramadol is a problem in cycling, we needed to do something about it’ (Velonews, 2018). It is worthwhile to note that the painkillers described here are widely used outside of sport for treating minor ailments. In fact, this is no more than an additional illustration of the changing culture towards PEDs in elite cycling. Any enhancers are more often labelled deviant, and therefore considered suspicious,

within a sports community whose new *doxa* is articulated around claims of purity in order to restore a tarnished image and attract sponsorships.

4.3. The grey zone pushes back its frontiers

Our results highlight a major evolution in the perception of what falls under grey areas, and about how these grey areas are being considered among insiders. This evolution is summarized in our Fig. 1 below. In fact, elite cycling stakeholders increasingly tend to label PEDs, including authorized ones, as deviant, and therefore alien to cycling culture. While grey areas, just like marginal gains, did not raise a major issue a decade ago (bottom-right in Fig. 1), they are now undesirable for an increasing number of cycling actors, even though their use is not problematic from a legal perspective (top right-hand corner in our figure). Of course, this is not a minor evolution if looking back at the recent history of doping in elite cycling. This is where Becker's theoretical framework comes into play.

The scholarly community has documented that although EPO use was prohibited, a widespread culture of tolerance towards PEDs was entrenched in elite cycling, and many doping products were not considered deviant within elite cycling until the late 1990s or early 2000s (bottom-left of Fig. 1) (Brissonneau & Montez de Oca, 2018; Christiansen, 2005). Yet, there is evidence that elite cycling has faced several major changes regarding patterns of doping use over the last two decades (Waddington, 2019). In particular, increased anti-doping efforts and the incremental confessions of different riders helped break down cycling's secret doping culture (Dimeo, 2014). As a result, while the (il)licit status of PEDs may have remained unchanged, their perceived legitimacy (i.e. deviant character) within cycling may switch from acceptable to unacceptable. A distinction therefore needs to be made between deviance and delinquency. Although a delinquent necessarily breaches regulations, the deviant is one to whom a negative label has successfully been applied (Becker, 1963). Following a secondary socialisation process through which the athlete learns standards, values, and know-how, and the language of the environment step by step (Berger & Luckmann, 1966), what falls under a deviant label may include or exclude new practices.

Various grey zone enhancers are increasingly considered controversial, and their use is consequently perceived deviant among the cycling community. In this regard, the grey zone is extending its frontiers. Yet, it is worth emphasizing a paradox around grey areas: athletes or riders using grey areas still keep up with all means to improve their performance, and outperforming is the spirit of (elite) sport. Labelling grey areas as deviant seems contradictory given the widely accepted performance-driven culture endorsed in elite sport. Most interviewees acknowledged, for example, that Team Sky's marginal gains approach gave a real boost to the entire elite cycling community.

"Team Sky's approach brought a lot to cycling. They really wanted to reach the top in each aspect. They were very methodic. But in fact, this has helped all teams to be more professional, to question themselves, to be innovative. According to me, cycling should be just grateful to them" (Rider).

Any quest for performance enhancement was praised. In fact, marginal gains are commonplace and desirable except when they come out of pharmacological assistance, even when compliant with the WADC. How can we understand the recent questions raised by the ketone regime allegedly used by several elite teams otherwise (Cary, 2018; Cycling Weekly, 2019)?

5. Discussion and conclusion: quest for performance enhancement vs grey areas

Given the amount of money from sponsors required to keep elite cycling alive, it is not unreasonable that cycling stakeholders would take a hard line on the types of doping that have plagued the sport in recent decades (Dimeo, 2014). Regaining credibility for the sport in order to keep and attract new investments was crucial in the wake of high-profile scandals (Waddington & Smith, 2009). However, this drive for 'clean' sport has led to a new brand of cycling puritanism as well as a new brand of deviance. The need to maintain an image of drug-free sport has made athletes and support personnel fearful of appearing unethical for seeking even completely legal enhancements. Where cyclists had previously been happy to use grey zone products and seek out innovative, boundary pushing technologies (Ohl et al., 2015; Waddington, 2019), cyclists now fear the backlash of potential criticism of any perceived deviance. This transformed culture seems to have bred a new conservatism, taking much of the excitement and innovation out of many aspects of the sport. In the push to avoid becoming delinquent under WADA rules, many are now doing all they can to avoid being labeled deviant (Ohl et al., 2019). Several claims in the media, such as those from the Movement for Credible Cycling (MPCC) (Fincoeur, 2016), and new UCI policies may suggest that cycling culture has turned very orthodox. This new orthodoxy is illustrated by the imposition of stricter rules than even those required by WADA (e.g., controversy about the use of tramadol in Baltazar-Martins et al., 2020). As a result, elite riders must navigate an expanding grey zone in addition to anti-doping regulations, which further adds uncertainty in yet precarious work conditions (Fincoeur, Cunningham, & Ohl, 2018).

The dynamic and growing Prohibited List compounds this challenge. The IOC Medical Commission, as well as the scientific community and the sporting world, did not know what to make of blood transfusions in the mid-1970s. As reported by Llewellyn, Gleaves, and Wilson (2015: 95), some academic researchers suggested reclassifying blood transfusions as a 'grey zone of legality' alongside selected vitamins and minerals, food supplements, or other drugs consumed for therapeutic or gastronomical reasons. This temptation to lump ever more substances and methods into the grey zone under the guise of 'clean sport' is strong for athletes and policymakers, as it serves as a shield against impropriety. Many grey zone PEDs actually fall into clearer categories of allowed or not allowed (Solberg et al., 2010). Depending on their specific contents, painkillers, supplements, and hypoxic chambers can be put into these categories. But lingering perceptions lead to uncertainty, which leads to more additions to the grey zone, a cycle that continuously repeats.

Expanding grey zones also calls into question the contemporary emphasis on continuing improvements in sport performance in areas such as race times, records, and margins of victory. Athletes are encouraged to exceed previous performances through team and sponsorship contracts, media and fan expectations, and high-performance culture. Such advances would likely require athletes to undertake some behaviours currently understood as deviant, such as using of grey zone PEDs. However, these same forces simultaneously demand adherence to a partly unclear set of expectations around enhancement and deviance. These contradictory expectations pose a conundrum to cyclists: continue to use whatever authorized means necessary to continue to improve, but avoid anything that might be called into question despite its compliance with WADC. Rather than clarifying, this aversion to being viewed as deviant adds further shades to the grey zones.

		DELINQUENCY	
		YES	NO
DEVIANCE	YES	Doping since the 2000s	Grey Zone since the late 2010s
	NO	Doping until the late 1990s/ early 2000s	Grey Zone until the 2010s Training techniques, nutrition, material (“marginal gains”)

Fig. 1. Perceived Legitimacy vs. Legal Status of Performance-Enhancement Modes.

As the boundaries of acceptability shrink, the grey zone seems to expand to engulf ever more legal, or at least not prohibited, substances and methods. As Brands (2016) noted about military conflicts, grey is becoming the new black and deviance inching closer to delinquency. Grey zones are becoming so large and sweeping that any explanatory power drawn from the concept is lost and the category becomes meaningless. The price, then, is increased ambiguity. Not only ambiguity for athletes who must constantly remain on the ‘right’ side of the shifting ethical line, but also for policy-makers who have to determine how to respond to grey zones in ways that are consistent, logical, and fair.

The WADA Code is already a very complex policy that was not well understood by many of the riders we interviewed. Confusion about anti-doping rules can create uncertainty for cyclists. To address these issues, there have been calls for reforming anti-doping that may help clarify policies for athletes. One such suggestion is to shorten the Prohibited Substances List (e.g. Kayser, 2019; Overbye, 2018; Pielke & Boye, 2019). A shortened List could focus on substances and methods that have either a scientifically supported enhancing effect (Pielke & Boye, 2019) or that pose an actual (rather than potential) threat to athlete health (Kayser, 2019; Overbye, 2018). By limiting the List to these categories may also more clearly delineate what is allowed in sport and reduce negative perceptions of current grey zone substances and reduce anxieties around their use. Outside of sport, individuals are rarely reluctant to use products such as painkillers or supplements. Moreover, in a sports context, little is known of the ergogenic effects and potential side effects of products such as tramadol in cycling (Holgado et al., 2018). This approach could further help minimise the risks of the professional and social stigmatisation athletes face when they mistakenly appear in the headlines for alleged doping practices. The case of the salbutamol use by British multiple Tour de France winner Christopher Froome is illustrative of reputation damage resulting from an unclear policy towards grey areas (Heuberger, van Dijkman, & Cohen, 2018).

For these reasons, academic work on grey zones across sport is warranted to understand if these patterns hold in different contexts. We see two main avenues of future research. First, prevalence work that includes grey zones in addition to clearly prohibited PEDs is necessary. Current prevalence studies tend to exclude grey zones, likely for a variety of definitional and clarity reasons. However, improving our understanding of how widely used these are could inform both how we understand doping behaviours and how policy is understood practically. Second, there is need for more qualitative work focused on athletes’ perceptions of grey zones. This is particularly important on the question of TUE misuse (Gleaves et al., 2019), including if this process occurs, in what ways it is able to happen, and how athletes view themselves and others who use the system this way. Researchers have suggested ending the TUE program (Dimeo & Møller, 2018) but the extent of this issue remains unclear. In-depth research would provide an evidence base

for doping policy-makers seeking to prevent TUE abuse. It would also provide better insight into how anti-doping may be structured for athletes’ benefit.

Declaration of Competing Interest

None.

Acknowledgments

This study was funded by the research grant “Cycling Culture, Organisations and Doping” from the Swiss National Science Foundation.

References

Baltazar-Martins, J. G., Plata, M., Muñoz-Guerra, J., Muñoz, G., Carreras, D., & Del Coso, J. (2020). Tramadol: should it be banned in athletes while competing, particularly in road cycling? *British Journal of Sports Medicine*, 54, 120–121.

Bassons, C. (2014). *A clean break: My story*. London: Bloomsbury Sport.

Becker, H. S. (1963). *Outsiders*. Glencoe: Free Press.

Bejder, J., Andersen, A. B., Buchardt, R., Larsson, T. H., Olsen, N. V., & Nordsborg, N. B. (2017). Endurance, aerobic high-intensity, and repeated sprint cycling performance is unaffected by normobaric Live High-Train Low: A double-blind placebo-controlled cross-over study. *European Journal of Applied Physiology*, 117(5), 979–988.

Bergamaschi, M., & Crippa, J. (2013). Why should cannabis be considered doping in sports? *Frontiers in Psychiatry*, 4, 32.

Berger, P., & Luckmann, T. (1966). *The social construction of reality*. New York: Doubleday.

Bloodworth, A., Cox, L., & McNamee, M. (2019). What to do with the TUE process? Bradley Wiggins, therapeutic use, and data sharing: A critical analysis. In B. Fincoeur, J. Gleaves, & F. Ohl (Eds.), *Doping in cycling: Interdisciplinary perspectives* (pp. 220–233). London: Routledge.

Bourdieu, P. (1996). *Distinction. A social critique of the judgement of taste*. Cambridge: Harvard University Press.

Bourdon, F., Schoch, L., Broers, B., & Kayser, B. (2014). French speaking athletes’ experience and perception regarding the whereabouts reporting system and therapeutic use exemptions. *Performance Enhancement & Health*, 3(3–4), 153–158.

Brands, H. (2016). *Paradoxes of the Gray Zone* (5 February) Retrieved from. Foreign Policy Research Institute. <https://www.fpri.org/article/2016/02/paradoxes-gray-zone/>

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77–101.

Brissonneau, C., & Montez de Oca, J. (2018). *Doping in elite sport: Voices of french sportspeople and their doctors, 1950-2010*. London: Routledge.

Cary, T. (2018). *Tour de France riders ready to fuel up on ketones – The mysterious energy drink developPEDs at Oxford University* (5 July) Retrieved from. The Telegraph. <https://www.telegraph.co.uk/cycling/2018/07/05/tour-de-france-riders-ready-fuel-ketones-mysterious-energy/>

Christiansen, A. V. (2005). The legacy of festina: Patterns of drug use in european cycling since 1998. *Sports in History*, 25(3), 497–514.

Coakley, J. (2015). Drug use and deviant overconformity. In V. Møller, I. Waddington, & J. Hoberman (Eds.), *Routledge handbook of drugs and sport* (pp. 379–392). New York: Routledge.

Cooper, C. (2012a). *Run, swim, throw, cheat: The science behind drugs in sport*. Oxford: Oxford University Press.

Cooper, C. (2012b). The art of medicine. Drug cheating at the Olympics: who, what, and why? *Lancet*, 380, 21–22.

- Cox, T. W. (2014). The international war against doping: Limiting the collateral damage from strict liability. *Vanderbilt Journal of Transnational Law*, 47, 295–329.
- Cycling News. (2018). *L'appartient wants CADF to investigate team sky* (7 March) Retrieved from. <https://www.cyclingnews.com/news/lappartient-wants-cadf-to-investigate-team-sky/>
- Cycling News. (2013). *UCI approve change to No needle policy* (12 February) Retrieved from. <https://www.cyclingnews.com/news/uci-approve-change-to-no-needle-policy/>
- Cycling Weekly. (2019). *Questions raised over use of ketone 'miracle drink' at Tour de France* (16 July) Retrieved from. <https://www.cyclingweekly.com/news/racing/tour-de-france/questions-raised-use-ketone-miracle-drink-tour-de-france-431463>
- Cycling Weekly. (2017). *Tony Martin gets 'clarification' phone call after accusing UCI of 'double standards' over Chris Froome case* (18 December) Retrieved from. <https://www.cyclingweekly.com/news/racing/tony-martin-gets-clarification-phone-call-after-accusing-uci-of-double-standards-over-chris-froome-case-363645>
- Da Silva, E., Pinto, R. S., Cadore, E. L., & Krueger, L. F. (2015). Nonsteroidal anti-inflammatory drug use and endurance during running in male long-distance runners. *Journal of Athletic Training*, 50(3), 295–302.
- Dasgupta, L. (2019). *The world anti-doping code: Fit for purpose?* New York: Routledge.
- de Hon, O., & van Bottenburg, M. (2017). True dopers or negligent athletes? An analysis of anti-doping rule violations reported to the world anti-doping agency 2010–2012. *Substance Use & Misuse*, 52(14), 1932–1936.
- Denham, B. E. (2017). When contaminated dietary supplements cause positive drug tests: Methylhexanamine as a doping agent in sport. *International Journal of Sport Policy*, 9(4), 677–689.
- Dimeo, P. (2014). Why Lance Armstrong? Historical context and key turning points in the 'Cleaning up' of professional cycling. *The International Journal of the History of Sport*, 31(8), 951–968.
- Dimeo, P., & Möller, V. (2018). *The anti-doping crisis in sport: Causes, consequences, solutions*. London: Routledge.
- Donati, A. (2012). *Lo sport del doping. Chi lo subisce, chi lo combatte*. Torino: Edizioni Gruppo Abele.
- Emerson, R. W. (2015). Convenience sampling, random sampling, and snowball sampling: How does sampling affect the validity of research. *Journal of Visual Impairment & Blindness*, 109(2), 164–168.
- Engelberg, T., Moston, S., & Skinner, J. (2012). Public perception of sport anti-doping policy in Australia. *Drugs Education Prevention & Policy*, 19(1), 84–87.
- Fincoeur, B. (2016). L'instrumentalisation de l'éthique dans la lutte antidopage en cyclisme sur route. *Science & Motricité*, 92, 49–56.
- Fincoeur, B. (2019). Kicked out: How experts are being deterred from playing on the doping market. In B. Fincoeur, J. Gleaves, & F. Ohl (Eds.), *Doping in cycling: Interdisciplinary perspectives* (pp. 65–78). London: Routledge.
- Fincoeur, B., Cunningham, R., & Ohl, F. (2018). I'm a poor lonesome rider. Help! I could dope. *Performance Enhancement & Health*, 6(2), 69–74.
- Fincoeur, B., van de Ven, K., & Mulrooney, K. (2014). The symbiotic evolution of anti-doping and supply chains of doping substances: How criminal networks may benefit from anti-doping policy. *Trends in Organized Crime*, 17, 1–22.
- Garthe, I., & Maughan, R. J. (2018). Athletes and supplements: Prevalence and perspectives. *International Journal of Sport Nutrition and Exercise Metabolism*, 28(2), 126–138.
- Gleaves, J. (2019). Everyone was doing it: Applying lessons from cycling's EPO era. In B. Fincoeur, J. Gleaves, & F. Ohl (Eds.), *Doping in cycling: Interdisciplinary perspectives* (pp. 112–124). London: Routledge.
- Gordon, A. (2017). *How mamadou sakho fell victim to drug testing's Grey Areas*. *Vice sports* (2 Mar) Retrieved from. https://sports.vice.com/en_uk/article/jp8b4b/how-mamadou-sakho-fell-victim-to-drug-testings-grey-areas
- Harrell, E. (2015). *How 1% performance improvements led to olympic gold* Retrieved from. Harvard Business Review. <https://hbr.org/2015/10/how-1-performance-improvements-led-to-olympic-gold>
- Henne, K., Koh, B., & McDermott, V. (2013). Coherence of drug policy in sports: Illicit inclusions and illegal inconsistencies. *Performance Enhancement & Health*, 2(2), 48–55.
- Henning, A. D., & Dimeo, P. (2018). The new front in the war on doping: Amateur athletes. *International Journal of Drug Policy*, 51, 128–136.
- Heuberger, J., van Dijkman, S. C., & Cohen, A. F. (2018). Futility of current urine salbutamol doping control. *British Journal of Clinical Pharmacology*, 84(8), 1830–1838.
- Holgado, D., Zandonai, T., Zabala, M., Hopker, J., Perakakis, P., Luque-Casado, A., et al. (2018). Tramadol effects on physical performance and sustained attention during a 20-min indoor cycling time-trial: A randomised controlled trial. *Journal of Science and Medicine in Sport*, 21(7), 654–660.
- Houlihan, B. (2002). *Dying to win: Doping in sport and the development of anti-doping policy*. Strasbourg: Council of Europe Publishing.
- House of Commons. (2018). *Combatting doping in sport* (fourth report of session 2017–2019). London: Digital, Culture, Media and Sport Committee. <https://publications.parliament.uk/pa/cm201719/cmselect/cmcmds/366/366.pdf>
- Hughes, R., & Coakley, J. (1991). Positive deviance among athletes: The implications of overconformity to the sport ethic. *Sociology of Sport Journal*, 8, 307–325.
- Hurst, P., Kavussanu, M., Boardley, I., & Ring, C. (2019). Sport supplement use predicts doping attitudes and likelihood via sport supplement beliefs. *Journal of Sports Sciences*, 37(15), 1734–1740.
- Ingle, S. (2016a). *What is a TUE? 11 key questions on the Fancy Bears WADA leak* (15 Sept) Retrieved from. The Guardian. <https://www.theguardian.com/sport/2016/sep/15/tue-fancy-bears-wada-leaks>
- Ingle, S. (2016b). *WADA hacking scandal: Debate turns to use of powerful legal drugs* (15 Sept) Retrieved from. The Guardian. <https://www.theguardian.com/sport/2016/sep/14/wada-hacking-abuse-debate-therapeutic-use-drugs>
- Kandel, D. (2002). *Stages and pathways of drug involvement: Examining the gateway hypothesis*. Cambridge: Cambridge University Press.
- Kayser, B. (2019). What might a partially relaxed anti-doping regime in professional cycling look like? In B. Fincoeur, J. Gleaves, & F. Ohl (Eds.), *Doping in cycling: Interdisciplinary perspectives* (pp. 164–174). London: Routledge.
- Kayser, B., & O'Hare, P. (2013). Flawed reasoning for testing for recreational drugs in anti-doping. *Performance Enhancement & Health*, 2(2), 68–69.
- Knapik, J. J., Steelman, R. A., Hoedebecke, S. S., Austin, K. G., Farina, E. K., & Lieberman, H. R. (2016). Prevalence of dietary supplement use by athletes: Systematic review and meta-analysis. *Sports Medicine*, 46(1), 103–123.
- Kornbeck, J., & Kayser, B. (2018). Do public perception and the 'spirit of sport' justify the criminalisation of doping? A reply to Claire Sumner. *The International Sports Law Journal*, 18(1–2), 61–78.
- L'Equipe. (2018). *Tim Wellens « refuse d'utiliser un inhalateur »* (11 January) Retrieved from. <https://www.lequipe.fr/Cyclisme-sur-route/Actualites/Tim-wellens-lotto-soudal-refuse-d-utiliser-un-inhalateur/865734>
- Le Monde. (2016). *Cyclisme: Bardet « stupéfait » par la prise de corticoïdes de Wiggins* (30 September) Retrieved from. https://www.lemonde.fr/cyclisme/article/2016/09/30/bardet-stupefait-par-la-prise-de-corticoïdes-de-bradley-wiggins_5006131_1616656.html
- Levine, B. D. (2006). Should "artificial" high altitude environments be considered doping? *Scandinavian Journal of Medicine & Science in Sports*, 16(5), 297–301.
- Lippi, G., Franchini, M., & Guidi, G. C. (2007). Prohibition of artificial hypoxic environments in sports: Health risks rather than ethics. *Applied Physiology Nutrition and Metabolism*, 32(6), 1208–1209.
- Llewellyn, M., Gleaves, J., & Wilson, W. (2015). *The 1984 Los Angeles Olympic Games. Assessing the 30-year legacy*. London: Routledge.
- Loland, S. (2015). Performance enhancing biomedical technology in sport: Where are the limits? In V. Møller, I. Waddington, & J. Hoberman (Eds.), *Routledge handbook of drugs and sport* (pp. 54–63). New York: Routledge.
- Lopez, B. (2017). From needle phobia to doping phobia: Can the fear of injections help us understand anti-doping? *Drugs Education Prevention & Policy*, 24(3), 314–320.
- Lynskey, M. T., Heath, A. C., & Buchholz, K. T. (2003). Escalation of drug use in early-onset cannabis users vs co-twin controls. *Journal of the American Medical Association*, 289, 427–433.
- Malloy, D. C., Kell, R., & Kell, R. (2007). The spirit of sport, morality, and hypoxic tents: Logic and authenticity. *Applied Physiology Nutrition and Metabolism*, 32(2), 289–296.
- Marcora, S. M. (2016). Can doping be a good thing? Using psychoactive drugs to facilitate physical activity behaviour. *Sports Medicine*, 46(1), 1–5.
- Martinez-Sanz, J. M., SosPEDsra, I., Ortiz, C. M., Baladía, E., Gil-Izquierdo, A., & Ortiz-Moncada, R. (2017). Intended or unintended doping? A review of the presence of doping substances in dietary supplements used in sports. *Nutrients*, 9(10), 1093.
- Marty, D., Nicholson, P., & Haas, U. (2015). *Cycling independent reform commission: Report to the president of the union cycliste internationale*. Lausanne: Union Cycliste Internationale.
- Mathews, N. M. (2018). Prohibited contaminants in dietary supplements. *Sports Health*, 10(1), 19–30.
- McLaren, R. (2016). *The independent person 2nd report*. Montreal: World Anti-Doping Agency.
- McNamee, M. (2015). The spirit of sport and the world anti-doping code. In V. Møller, I. Waddington, & J. Hoberman (Eds.), *Routledge handbook of drugs and sport* (pp. 41–53). New York: Routledge.
- McNamee, M. (2014). *Sport, medicine, ethics*. London: Routledge.
- Meron, T. (2011). The principle of legality in International criminal law. In T. Meron (Ed.), *The making of International criminal justice* (pp. 110–114). Oxford: Oxford University Press.
- Mignon, P. (2003). The Tour de France and the doping issue. *The International Journal of the History of Sport*, 20(2), 227–245.
- Millet, G., Chapman, R., Girard, O., & Brocherie, F. (2019). Is live high train low altitude training relevant for elite athletes? Flawed analysis from inaccurate data. *British Journal of Sports Medicine*, 53, 923–925.
- Moston, S., & Engelberg, T. (2019). And justice for all? How anti-doping responds to 'Innocent Mistakes'. *International Journal of Sport Policy*, 11(2), 261–274.
- Ohl, F. (2019). Cycling teams preventing doping: Can the fox guard the hen house? In B. Fincoeur, J. Gleaves, & F. Ohl (Eds.), *Doping in cycling: Interdisciplinary perspectives* (pp. 125–139). London: Routledge.
- Ohl, F., Fincoeur, B., Lentillon-Kaestner, V., Defrance, J., & Brissonneau, C. (2015). The socialization of young cyclists and the culture of doping. *International Review for the Sociology of Sport*, 50(7), 865–882.
- Orchard, J. (2008). Why glucocorticoids should be removed from the World Anti-doping Agency's list of banned products. *British Journal of Sports Medicine*, 42, 944–945.
- Outram, S., & Stewart, B. (2015). Doping through supplement use: A review of the available empirical data. *International Journal of Sport Nutrition and Exercise Metabolism*, 25(1), 54–59.

- Overbye, M. (2018). An (un) desirable trade of harms? How elite athletes might react to medically supervised 'doping' and their considerations of side-effects in this situation. *International Journal of Drug Policy*, 55, 14–30.
- Overbye, M., & Wagner, U. (2013). Between medical treatment and performance enhancement: An investigation of how elite athletes experience Therapeutic Use Exemptions. *International Journal of Drug Policy*, 24(6), 579–588.
- Paoli, L. (2019). The peculiarities of the market for doping products and the role of academic physicians. In B. Fincoeur, J. Gleaves, & F. Ohl (Eds.), *Doping in cycling: Interdisciplinary perspectives* (pp. 79–96). London: Routledge.
- Pappa, E., & Kennedy, E. (2013). 'It was my thought... he made it a reality': Normalization and responsibility in athletes' accounts of performance enhancing drug use. *International Review for the Sociology of Sport*, 48, 277–294.
- Pielke, R., Jr., & Boye, E. (2019). Scientific integrity and anti-doping regulation. *International Journal of Sport Policy*, 11(2), 1–19.
- Pluim, B. (2008). A doping sinner is not always a cheat. *British Journal of Sports Medicine*, 42(7), 549–550.
- Sandvik, M. R. (2019). Sport, stories, and morality: A Rortyan approach to doping ethics. *Journal of the Philosophy of Sport*. Online first.
- Sefiha, O. (2017). Riding around stigma: Professional cycling and stigma management in the "Clean cycling" era. *Communication & Sport*, 5(5), 622–644.
- Selanne, H., Ryba, T. V., Siekkinen, K., Kyröläinen, H., Kautiainen, H., Hakonen, H., et al. (2014). The prevalence of musculoskeletal pain and use of painkillers among adolescent male ice hockey players in Finland. *Health Psychology and Behavioral Medicine*, 2(1), 448–454.
- Siebenmann, C., Robach, P., Jacobs, R. A., Rasmussen, P., Nordsborg, N., Diaz, V., et al. (2012). Live high-train low using normobaric hypoxia: a double-blinded, placebo-controlled study. *Journal of Applied Physiology*, 112(1), 106–117.
- Smith, S. (2014). *Painkillers in the peloton*. *Cycling weekly* Retrieved from. <https://www.cyclingweekly.com/news/latest-news/painkillers-peloton-124672>
- Solberg, H. A., Hanstad, D. V., & Thøring, T. A. (2010). Doping in elite sport – Do the fans care? Public opinion on the consequences of doping scandals. *International Journal of Sports Marketing and Sponsorship*, 185–199.
- Stamm, H., Lamprecht, M., Kamber, M., Marti, B., & Mahler, N. (2008). The public perception of doping in sport in Switzerland, 1995–2004. *Journal of Sports Sciences*, 26(3), 235–242.
- Tscholl, P., Feddermann, N., Junge, A., & Dvorak, J. (2009). The use and abuse of painkillers in international soccer. *The American Journal of Sports Medicine*, 37(2), 260–265.
- Van Thuyne, W. (2006). *The grey zone in doping*. Ghent University. Doctoral dissertation.
- Velonews. (2018). *UCI to start tramadol testing in January 2019* (29 September) Retrieved from. https://www.velonews.com/2018/09/news/uci-to-start-tramadol-testing-in-january-2019.479553?fbclid=IwAR0p_E2DoZPljscfgMiiUWRozYZ0skuTV5H6n7Qfjvh_OjanDGRbkhgZyJA
- Verne, A., & Healy, D. (2020). Prevalence of therapeutic use exemptions at the Olympic Games and association with medals: An analysis of data from 2010 to 2018. *British Journal of Sports Medicine*, <https://bjsm.bmj.com/content/early/2020/05/06/bjsports-2020-102028>
- Waddington, I. (2019). Changing patterns of drug use in professional cycling: Implications for anti-doping policy. In B. Fincoeur, J. Gleaves, & F. Ohl (Eds.), *Doping in cycling: Interdisciplinary perspectives* (pp. 31–44). London: Routledge.
- Waddington, I. (1996). The development of sports medicine. *Sociology of Sport Journal*, 13, 176–196.
- Waddington, I., & Smith, A. (2009). *An introduction to drugs in sport: Addicted to winning?* London: Routledge.
- Waddington, I., Christiansen, A. V., Gleaves, J., Hoberman, J., & Møller, V. (2013). Recreational drug use and sport: Time for a WADA rethink? *Performance Enhancement & Health*, 2(2), 41–47.
- Walker, P. (2014). *Asthma rife among elite athletes, finds study* (28 Dec) Retrieved from. The Guardian. <https://www.theguardian.com/society/2014/dec/28/asthma-elite-athletes-study-swimmers-cyclist-eid>