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Doping in tennis, where we are and where we should be going?

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1. Tennis and anti-doping

Tennis, an ancient royal sport, has seen well-known athletes succumb to doping temptations, committing offences that that can potentially jeopardize their entire careers (Maquirriain & Baglione, 2016). Doping has now even reached the younger categories of the sport, with a teenage tennis player recently testing positive for an anabolic-androgenic steroid (TADP. Tennis Anti-doping Program, 2019). Anti-doping efforts in tennis, designed to tackle the increasingly prevalent use of illicit substances (e.g., marijuana, cocaine and methamphetamines) date back to the 1980s. However, it was not until the first Association of Tennis Professionals (ATP) Tour in 1990 and the first Women's Tennis Association (WTA) World Tour in 1993, organized, respectively, by the ATP and by the WTA, that the fight against the use of doping substances was really stepped up. After the founding of the ATP Tour, the International Tennis Federation (ITF) became the sole governing body responsible for anti-doping initiatives. The ITF has signed the World Anti-Doping Agency (WADA) Code and adopted a Tennis Anti-doping Program (TADP) that aims to preserve the integrity of tennis and protect the health and rights of tennis players participating in various competitions. The latest WADA report states that 322,050 doping controls were performed in all sports in 2017, and that only 1.48 % of tests were positive (WADA. World Anti-Doping Agency, 2017). This low percentage seems to suggest that doping in sport might not be as big an issue as people tend to think. However, negative doping tests are not necessarily a demonstration that athletes are "clean" we may think of the case of Lance Armstrong, for example. In particular, the WADA performed 5,959 checks in tennis players and the rate of positive tests was 0.5 %.

2. Doping in tennis: scientific studies and famous cases

To date, little research has been conducted into the use of doping substances in tennis. One study set out to establish attitudes to, and knowledge on, the topic in an international sample of 63 high-level tennis players. Athletes seemed little inclined to use doping substances in the future, even though most were convinced that doping is part of the tennis world (Kondric, Sekulic, Uljevic, Gabrilo, & Zvan, 2013). According to an earlier study that analyzed all the infringements committed by tennis players between 2003 and 2009, only 0.38 % of the samples were found to be positive, which seemed to indicate an absence of systematic doping in tennis (Maquirriain, 2010). A more recent study (Maquirriain & Baglione, 2016) analyzed how the careers of male tennis players evolve after sanctions for doping. The authors recorded all the doping offenses committed by professional players during the period

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2003–2014. These were analyzed in the light of their ranking positions when sanctioned, as well as their best ever ranking positions and best rankings after the doping violation. The authors concluded that sanctions seem to significantly influence players' careers, leading them to retire early from the sport (Maquirriain & Baglione, 2016).

In the late 1980s and early 1990s, rumors of cocaine use by leading tennis players were frequent. Despite this, the first anti-doping violation in the tennis world did not come to light until 1996, during a Challenger tournament (Maquirriain, 2010). The same year, one of the best tennis players of all time, André Agassi, admitted in his autobiography that he had used amphetamines to improve his performance (Harrison & Stewart, 2010), even though he was never sanctioned for this. In 2007, Martina Hingis received a two-year suspension after testing positive for a cocaine metabolite. Similarly, the Czech player Petr Korda as well as several Argentinian players (Guillermo Coria, Juan Ignacio Chela, Guillermo Canas and Mariano Puerta) tested positive for anabolic-androgenic steroids. Another case worth mentioning is that of Maria Sharapova. During the 2016 Australian Open, she tested positive for meldonium, a drug with anti-ischemic and cardioprotective properties that is used in patients with angina pectoris, chronic heart failure and cerebral circulation disorders (Rabin et al., 2019). Since there are no studies demonstrating any real efficacy of this drug in athletes, this case underlines the fact that athletes sometimes even use substances without proven efficacy, thereby risking a sanction (as in as Sharapova's case) for no real "benefit" (Heuberger & Cohen, 2018).

3. Conclusions

It is well known that sportsmen and women can become attached to certain beliefs or rituals even though these have no real basis or efficacy, and, worse still, that they can be drawn to the use of substances known to be harmful to health. Despite the efforts of recent years, the sporting world continues to lack a solid scientific culture. This tends to result in the communication of messages based on incomplete, often incorrect and misleading information. Doping in tennis has, to date, received limited attention in the scientific literature, even though it is a problem that can harm athletes' health.

Why, despite the existence of improved observational research methodologies allowing investigation of athletes' knowledge of doping, are there still so few scientific studies focusing on doping in tennis? What role does the ITF play? Further efforts, also supported by the bodies involved, are needed in order to shed light on the phenomenon of doping in tennis, given that it is one of the most widely played sports in the world (Pluim, Groppel, Miley, Crespo, & Turner, 2018). The ITF and national federations should implement preventive actions and make concerted educational efforts in order to counter doping practices potentially harmful to the health of their members.

Authors' contributions

TZ conceived, drafted and revised the manuscript. DH was involved in critical revision of the manuscript and final approval of the version to be published.

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Declaration of Competing Interest

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References

Harrison, H. S., & Stewart, G. R. (2010). *Open: An autobiography*. New York (U.S.A.): Aka Publishing LLC. http://dx.doi.org/10.2307/2792413

Heuberger, J. A. A. C., & Cohen, A. F. (2018). Review of WADA prohibited substances: Limited evidence for performance-enhancing effects. *Sports Medicine*, 1–15. http://dx.doi.org/10.1007/s40279-018-1014-1

Kondric, M., Sekulic, D., Uljevic, O., Gabrilo, G., & Zvan, M. (2013). Sport nutrition and doping in tennis: An analysis of athletes'attitudes and knowledge. *Journal of Sports Science & Medicine*, *12*, 290–297.

Maquirriain, J. (2010). Epidemiological analysis of doping offences in the professional tennis circuit. *Journal of Occupational Medicine and Toxicology*, *5*(1), 30. http://dx.doi.org/10.1186/1745-6673-5-30

Maquirriain, J., & Baglione, R. (2016). Doping offences in male professional tennis: How does sanction affect players' career? *SpringerPlus*, *5*(1), 10–13. http://dx.doi.org/10.1186/s40064-016-2765-5

Pluim, B. M., Groppel, J. L., Miley, D., Crespo, M., & Turner, M. S. (2018). Health benefits of tennis. *British Journal of Sports Medicine*, *52*(3), 201–202. http://dx.doi.org/10.1136/bjsports-2017-098623

Rabin, O., Uiba, V., Miroshnikova, Y., Zabelin, M., Samoylov, A., Karkischenko, V., . . . & Razinkin, S. (2019). Meldonium long-term excretion period and pharmacokinetics in blood and urine of healthy athlete volunteers. *Drug Testing and Analysis*, *11*(4), 554–566. http://dx.doi.org/10.1002/dta.2521

TADP. Tennis Anti-doping Program. (2019). *Decision of the International Tennis Federation pursuant to article 8.1.4 of the 2019 Tennis Anti-doping Programme* Retrieved 14th December 2019 from. https://antidoping.itftennis.com/media/313967/313967.pdf

WADA. World Anti-Doping Agency. (2017). *2017 anti-doping testing figures* (Vol. 9). Retrieved 12nd November 2019 from. https://www.wada-ama.org/sites/default/files/resources/files/2017_anti-doping_testing_figures_en_0.pdf

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