

Self-Reported Use of Prohibited Substances and Methods Among Athletes of the Brazilian Delegations

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Abstract

Use of prohibited substances and methods (doping) by elite athletes is a complex and multifactorial behavior. Understanding the factors associated with doping behavior is crucial to identifying potential intervention targets to reduce doping among this group. However, there are limited data on the prevalence and correlations of self-reported prohibited substance use among Brazilian Olympic athletes. We present data from a cross-sectional, self-reported online survey. Participants were elite Brazilian athletes who participated in the 2020 Olympic and Paralympic Games. A total of 209 athletes (52.6% females) from both Brazilian delegations were surveyed. The self-reported doping use of prohibited substances or methods was found to be 7.2%. Receiving a recommendation from a medical doctor, even knowing that the substance is prohibited, was associated with an increased risk of self-reported doping use (OR = 17.474; 95% CI = 4.664–65.470, $P < 0.001$). Nearly 1 in 10 athletes reported use in their careers. Medical recommendation to use substances was the only factor associated with an increased risk of doping among elite athletes.

by scientific and technological advancements (2). These advancements have facilitated the development of increasingly complex and sophisticated substances designed to augment human performance (3). However, the indiscriminate use of prohibited substances and methods, known as doping, in various sports disciplines has significantly compromised the educational and social values traditionally associated with sports (4). Such scenarios have catalyzed collaborative efforts among organizations and governments at multiple levels to uphold the ethical foundation and integrity of sports competitions (5).

The World Anti-Doping Agency (WADA) is at the forefront of enforcing global antidoping regulations and conducting tests among elite athletes in Olympic

Introduction

Physical training has been an integral component of human societies, historically aimed at preparing for competition or physical exhibition and enhancing physical, emotional, and mental health (1). In competitive sports, the quest to achieve peak physical performance has consistently been paralleled

sports. A majority of athletes acknowledge that doping equates to cheating and entails risks, such as health problems for athletes (thrombosis, cardiac arrhythmias, stroke, sudden death) sanctions and bans from the sport (6). Despite this recognition, doping remains a pressing issue in elite sports (7). Antidoping policies and initiatives continually confront the challenge posed by the diverse and evolving compounds and technical strategies athletes utilize to secure a competitive edge (8). In spite of WADA's concerted efforts to combat doping, there were 4180 adverse analytical findings out of 278,047 laboratory tests conducted in 2019 (9).

Sociodemographic factors, such as age and sex, along with psychosocial factors, including low self-esteem and personality disorders (notably narcissistic, borderline, and antisocial), are significant contributors to doping in sports. Situational factors like peer interaction, motivational elements, and environmental influences, including the sociocultural environment, legislation, and punitive measures, collectively play a role in the doping phenomenon (10). However, it is important to note that the phenomenon of doping has primarily been studied from a biomedical perspective. To prevent doping from becoming normalized and seen as

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necessary for those involved in sports, whether at an amateur or professional level, it is pivotal to consider this psychosocial approach (7,11,12). Additionally, the Systems Theoretic Accident Model and Processes, which considers various interactions and interdependencies among the factors contributing to a specific event, can provide a deeper understanding of doping (10).

Nevertheless, the complexity of the educational process in the sports environment often hinders the acquisition of knowledge based on the practical reality of doping (13). As a result, several initiatives have been undertaken to raise awareness of the harmful effects of prohibited substances and methods in sports. In Brazil, the Brazilian Doping Control Authority (ABCD), in collaboration with WADA, has developed educational actions utilizing an interdisciplinary approach (11). This comprehensive approach is the foundation for positive improvements in this field in various environments (14). However, it remains unclear whether these actions have successfully increased awareness and knowledge of the risks associated with doping among elite Brazilian athletes who participated in the 2020 Olympic Games in Japan.

Previous studies have already scrutinized the prevalence of substance abuse in Finnish and Canadian Olympic athletes (15,16). In fact, the study on Finnish Olympic athletes reported that self-reported doping was more common in speed and power sports compared to sports requiring motor skills, and males had a higher risk of doping than females (15). In Brazil, a study on professional football players, participants in national and state championships identified a prevalence of adverse analytical findings of 48.7% in doping control tests (17). The most used substances were stimulant substances (31%), glucocorticoids (21.2%), diuretics and masking agents (19.5%), anabolic agents (15.0%), cannabinoids (8.0%), growth factors or peptide hormones (4.4%), metabolic modulators or hormones (3.5%), and beta-2 agonists (0.9%) (17). However, this study was limited to soccer players (17). Other studies found a prevalence of prohibited substance use of 33.3% and 20.6%, respectively, in Brazilian athletes, but also limited mainly to samples of bodybuilding athletes (18,19). Thus, there is a paucity of data on the prevalence of self-report substance use and its correlates among Brazilian Olympic and Paralympic athletes. Given this context, this study sought to evaluate the prevalence of self-reported doping use of prohibited substances or methods among Olympic and Paralympic athletes who participated in the Tokyo 2020 Olympic Games and identify possible factors associated with the use of these substances.

Methods

This is a cross-sectional study. All the Olympic and Paralympic athletes were invited to answer a self-reported questionnaire on the SurveyMonkey platform. The survey links were sent via email or social media platforms (e.g., WhatsApp or Telegram). The link was distributed only to the athletes via the Brazilian Olympic and Paralympic Committees. Data collection took place from November to December 2021. This study received ethical approval from the research ethics committee of the Federal University of Santa Maria (protocol no. 4.897.495).

The questionnaire, adapted from the literature (20), encompassed sociodemographic queries (age, sex, sport, delegation, etc.), a question regarding the athletes' participation in doping-related courses or lectures and their perceptions of these substances, and an inquiry about their previous experiences

with doping tests or control procedures. To assess susceptibility to the use of prohibited substances or methods, participants were presented with the following scenario: "If a prohibited substance or method were recommended to you under medical advice, with a guarantee of performance enhancement and assured nondetectability, how would you react?" The response options provided were "I would categorically reject it" and "I would consider it and/or accept the recommendation for use." The full questionnaire in Portuguese can be seen at the link: Analysis of the impact of educational actions developed by the Brazilian Doping Control Authority on Olympic and Paralympic athletes.

Descriptive analyses were employed to characterize the sample, presenting data as means and standard deviations or absolute and relative frequencies, contingent upon the nature of the variable. The prevalence of athletes and para-athletes who reported ever using a prohibited substance or method was calculated and expressed as a percentage. Logistic regression analyses were conducted to ascertain whether factors such as gender, delegation, engagement in antidoping education programs, receipt of sponsorship, age, type of sport

Table 1.
Sociodemographic data of the sample.

Variables	Total N (%)
Gender^a	
Female	110 (52.6)
Delegation	
Paralympic	126 (60.3)
Age	
< 20	6 (2.9)
21–24	29 (13.9)
25–28	46 (22)
29–32	41 (19.6)
33–36	31 (14.8)
≥ 37	56 (26.8)
Educational level^a	
< Higher education	139 (66.5)
Monthly income^{a,b}	
< 1.100	5 (2.4)
1.101–2.200	23 (11)
2.101–6.600	62 (29.7)
6.601–8.800	31 (14.8)
8.801–13.200	40 (19.1)
> 13.201	47 (22.5)
Funding national program	
Yes	209 (100)
Sponsorship	
Yes	158 (76.6)
Dedicated only to sport	
Yes	182 (87.1)

^aMissing.

^bBrazilian reals.

Table 2.
Antidoping education and susceptibility to the use of prohibited substances and methods.

Variables	Total N (%)
Participated in courses on doping	
Yes	173 (82.8)
No	36 (17.2)
About courses	
They bring knowledge that I do not have	
Yes	179 (85.5)
No	30 (14.5)
Have been subjected to doping control tests	
Yes	200 (95.7)
No	9 (4.3)
Likelihood of substance use ^a	
I would not use it at all	189 (90.4)
Likelihood of accept the use	19 (9.1)

^aMissing.

(individual or team), and propensity for substance use served as predictors of doping behavior. The data analysis was performed using the IBM SPSS Statistics software package.

Results

A total of 209 Brazilian athletes responded to the questionnaire. Among them, 52.6% were female, 26.8% were aged above 37 years, 87.1% dedicated themselves exclusively to sports, and 60.3% were members of the Paralympic delegation (Table 1).

In terms of educational background, 82.8% of the respondents had participated in a course or lecture on doping, with 85.5% acknowledging that these educational programs provided them with new knowledge about doping. The vast majority of participants had previously undergone doping control procedures, and 9.1% expressed susceptibility to using prohibited substances or methods if recommended by a doctor, coupled with assurances of nondetectability (Table 2).

The prevalence of self-reported doping use of prohibited substances or methods among the athletes and para-athletes was 7.2%, as depicted in the Figure. Logistic regression analysis identified the propensity to accept medical advice for substance use as the sole statistically significant predictor of prohibited substance or method use. Those willing to follow medical advice to use a prohibited substance were found to be 17 times more

likely (OR = 17.474; 95% CI = 4.664–65.470) to have engaged in the use of a prohibited substance or method (Table 3).

Discussion

This study represents the first and only investigation to date detailing the prevalence and associated factors of self-reported doping use of substance and methods prohibited among Brazilian Olympic and Paralympic athletes who participated in the Tokyo 2020 Olympic Games. Our findings showed a prevalence of self-reported doping use of 8.4% among Olympic athletes and 6.2% among Paralympic athletes. The singular factor associated with an increased risk of self-reported doping use was the receipt of medical recommendations for substance or methods use. Other variables such as sex, age, sport type, delegation (*i.e.*, Olympic or Paralympic), and sponsorship did not correlate with self-reported doping use of substance and methods prohibited. These findings suggest that personal variables (*e.g.*, age, attitudes, sex), interpersonal factors (*e.g.*, financial support), and contextual/environmental elements (*e.g.*, training group and sports modalities) do not significantly influence the use of prohibited substances and methods among high-performance athletes.

In line with this view, a study in Saudi Arabia surveyed 1142 male athletes from diverse sports disciplines and reported a 4.3% prevalence of prohibited substance and method misuse (21). Predictors identified included being younger than 20 years, not possessing higher education, previous dietary supplement usage, and limited awareness of sanctions (21). A Dutch study by Blank et al. found a 12.3% prevalence (95% CI = 3.0–24.4) of prohibited substance or method use among 249 elite athletes, although it did not delve into the associated factors (22). In another study with a cohort of 281 elite Spanish athletes, the authors found a 9.5% prevalence of self-reported doping use, pinpointing moral considerations and referencing group opinions as key influences on doping susceptibility (23).

The study by Ulrich et al. (24), who evaluated 2167 athletes from the world athletics championship (13th WAC) and the Quadrennial Pan-Arab Games (12th PAG) using a random response technique (RRT), identified in this sample of athletes an estimated prevalence of doping in the previous year of 43.6% and 57.1%, respectively (24). The authors highlight that this technique guarantees the anonymity of participants, stating that this method would encourage honesty among respondents and increase the reliability of the data collected. However, it must be considered that, despite being a robust technique, it still depends on the willingness of respondents to participate in the research and to answer honestly the questions asked (25). Furthermore, as it is a complex technique to implement and interpret, errors in formulating questions or even in data

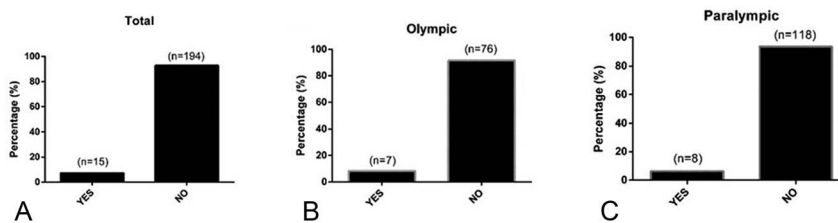


Figure: (A) Total prevalence of self-reported doping use (both delegations). (B) Prevalence of self-reported doping use in Olympic delegation. (C) Prevalence of self-reported doping use in Paralympic delegation.

Table 3.

Logistic regressions to analyze associations between gender, delegation, participation in antidoping education courses, receipt of sponsorship, age, type of sport practiced (individual or team), and likelihood of substance use were predictors of the use of prohibited substances or methods.

Independent Variable	OR	95% CI	P
Gender	2.504	0.686–9.134	0.165
Age	1.857	0.732–4.710	0.192
Delegation	0.436	0.118–1.613	0.213
Receipt of sponsorship	0.582	0.154–2.200	0.425
Participation in antidoping education courses	0.708	0.134–3.752	0.685
Type of sport practiced (individual or team)	0.868	0.331–2.274	0.773
Likelihood of substance use	17.474	4.664–65.470	<0.001

CI, confidence interval; OR, odds ratio.

analysis can compromise the interpretation of results, potentially over- or underestimating the prevalence of doping (25–27). As for Brazilian data regarding doping, existing studies are limited to athletes from single sports, such as football and bodybuilding (17,19). Thus, this study has an innovative character, considering that it was possible to analyze, in a single study, high-performance athletes from different modalities.

Regarding those who had used prohibited substances or methods, logistic regression analysis found no significant association between their participation in antidoping courses and doping decisions. To evaluate the effectiveness of antidoping education among Tokyo 2020 Olympic and Paralympic athletes, we sought to explore athletes' perceptions of these educational programs. Of the 209 athletes and para-athletes surveyed, 173 (82.8%) had engaged in doping-related education provided by ABCD, with 85.5% acknowledging the acquisition of new knowledge. These findings underline the complexity of antidoping behaviors and the importance of informed decision-making among athletes. Additionally, considering healthcare implications for athletes, regulating the use of substances based on unsubstantiated claims or anecdotal effects poses a challenge.

Moreover, our results indicated that the 7.2% of athletes and para-athletes who had used prohibited substances or methods did so following medical advice, emphasizing the need for comprehensive education and vigilant oversight of athletes' development by all team members. Cultural and environmental factors may influence doping, but the true prevalence remains uncertain, with only two-thirds of tests showing evidence of prohibited substance use (24). One effective strategy to discourage doping is to increase control and testing among athletes. However, this strategy must be effective and gain athletes' trust. Athletes must believe that doping control is indeed more effective in punishing only those who use banned substances (25). This awareness will make athletes less likely to engage in doping, as they will acknowledge the likelihood of being discovered and the severe consequences and sanctions they may face (26).

The strength of this study lies in its innovative approach, as only a handful of studies have explored this topic in Latin America. In addition, our findings have the potential to influence public actions aimed at preserving not only the ethical aspects of competition but also the health of participating athletes. However, the study is not without its limitations. Despite a sample representative of the Olympic and Paralympic delegations, challenges were encountered in recruiting athletes

and para-athletes who did not benefit from financial support. Furthermore, the study's cross-sectional design precludes the establishment of causal relationships or the determination of association directionality. Additionally, there is a possibility that our results are influenced by social desirability bias, given the sensitive nature of the subject of doping.

Conclusion

This study is the first to evaluate self-reported doping use among athletes from the Olympic and Paralympic Brazilian delegations participating in the Tokyo 2020 Games. A prevalence rate of 7.2% was identified, with the only significant correlation being the advice for doping from a medical professional.

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