

ORIGINAL SCIENTIFIC PAPER

Sociodemographic Factors Associated with Doping Tendency in Recreational Athletes; Cross-Sectional Analysis

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Abstract

Doping is not uncommon in recreational sports, but studies rarely have examined factors associated with doping tendency (DT) in recreational sport settings. The aim of this study was to evaluate the sociodemographic factors associated with DT in recreational athletes. The participants were athletes involved in various recreational sports (n=503; 272 females, 31.1±6.7 years of age) who were tested for sociodemographic factors (gender, age, experience in recreational sports, partnership/marital status, parenthood, educational level, and personal knowledge and awareness of doping). The DT was evaluated by one question, and participants were grouped into those who reported negative DTs and those who reported neutral/positive DTs. A lower neutral/positive DTs was detected in better educated athletes (OR=0.62, 95% CI: 0.43–0.89) and in participants who were parents (OR=0.66, 95% CI: 0.50–0.78). Males were more prone to neutral/positive DTs than females were (OR=1.41, 95% CI: 1.28–1.59). Sociodemographic factors are strongly associated with DT, and future studies should explore this problem in more detail, including evaluations of the impacts of other potential factors, such as health literacy, recreational sport type, training intensity, and social influences within specific recreational sport communities.

Keywords: *gender identity, educational status, health knowledge, logistic regression models*

Introduction

Doping in sports is a pervasive issue that undermines the principles of fair play and ethical competition. Athletes who use performance-enhancing drugs gain an unfair advantage over those who compete cleanly, compromising the integrity of sporting events (Tahiraj, Zenic, Musa, Zeljko, & Rodek, 2024). The use of banned substances poses significant health risks to athletes, potentially leading to serious long-term consequences (Özkan et al., 2020). Additionally, doping scandals erode public trust in sports, casting doubts on the achievements of athletes and diminishing the enjoyment of fans. The pressure to succeed at the highest level, coupled with the lure of financial rewards and sponsorships, can create a culture where doping becomes normalized. Combating doping requires a multifaceted approach, including rigorous testing, strict sanctions, and ongoing education to prevent its use and

protect the spirit of sports (Liposek et al., 2018; Varfolomeeva, Kozyreva, & Beresneva, 2023; Versic, Uljevic, & Pelivan, 2022).

While doping is often associated with elite competitive sports, its presence in recreational sports is a growing concern. Individuals who participate in noncompetitive settings may use performance-enhancing drugs to improve their physical appearance, increase their self-esteem, or enhance their recreational experience (Levernæs et al., 2024). The easy accessibility of these substances online and the lack of stringent testing protocols in recreational sports contribute to their prevalent use. Moreover, the social pressure to achieve a certain physique or surpass peers in recreational activities can further fuel this behavior. This trend raises concerns about the potential health risks associated with unsupervised drug use and the distortion of the true spirit of recreational sports, which should prioritize enjoyment, personal



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challenges, and social interaction. Addressing doping in recreational sports requires raising awareness about its detrimental effects and promoting a culture that values healthy participation and personal well-being over artificial enhancement (Hilkens, Cruyff, Woertman, Benjamins, & Evers, 2021).

Although the true prevalence of doping in recreational sports remains unclear, fitness centers are considered high-risk environments for the use of performance and image-enhancing drugs. A 2021 study conducted by the FAIR+ consortium in eight European countries sought to shed light on the prevalence, social determinants, and psychological drivers of doping in recreational sports (Pitsch, 2022). This research highlights the growing recognition of doping as a concern in recreational settings and the need for further investigation. Another interesting study related to the problem of doping in recreational sports analyzed how the structure and organization of different recreational sports can influence the prevalence of doping (Christiansen, Frenger, Chirico, & Pitsch, 2023). In brief, a study revealed variations in the prevalence of doping between different categories of recreational sports, such as games (e.g., football), cyclic and gravity sports (CGS) (e.g., cycling), and artistic sports (e.g., fitness), suggesting that the formal structures inherent in certain sports might contribute to a greater likelihood of doping (Christiansen et al., 2023).

Sociodemographic factors play a significant role in influencing doping behaviors in sports (Devic et al., 2018; Zmuda Palka, Bigosińska, Siwek, Angelova-Igova, & Mucha, 2023). Athletes from disadvantaged socioeconomic backgrounds may be more susceptible to doping due to limited access to resources, training facilities, and nutritional support, leading them to seek shortcuts for success. Cultural norms and societal pressures can also contribute to doping, particularly in environments where winning is highly valued or where there is a lack of awareness about the harmful effects of performance-enhancing drugs (Zmuda Palka et al., 2023). Furthermore, gender disparities in sports can influence doping patterns, with female athletes facing unique pressures and challenges that may increase their vulnerability to doping (Uyar et al., 2022). Understanding these sociodemographic influences is crucial for developing targeted prevention and education programs that address the root causes of doping and promote fair and ethical participation in sports across all social groups. Moreover, little is known about sociodemographic factors that could be associated with doping in recreational sports.

This study aimed to evaluate the sociodemographic factors associated with doping attitudes (doping tendency – DT) in athletes involved in recreational noncompetitive sports. The initial hypothesis of the investigation was that sociodemographic factors would be significantly associated with DT in the studied athletes.

Materials and methods

Participants and design

The participants in this cross-sectional study were recreational athletes, specifically adults, who regularly participate in some form of recreational physical exercise ($n=503$; 272 females, 31.1 ± 6.7 years of age). They were selected from fitness centers (gyms), recreational sport clubs in Split Dalmatia County, and the city of Zagreb in Croatia between 2023 and 2024. A minimum of 6 months of participation in recreational sports was the main prerequisite for involvement in this investigation. Fitness instructors and coaches in recreational sport clubs contacted their partici-

pants and asked them to complete the online questionnaire. All participants were older than 18 years, were informed of the study purpose, aims and eventual risks, and voluntarily participated in the study. The study was approved by the Ethical Committee of the Faculty of Kinesiology, University of Split, Split, Croatia.

Variables and measurement

The variables were collected via a previously validated questionnaire used in studies on correlates of doping attitudes in competitive athletes (Liposek et al., 2018; Rodek, Sekulic, & Pasalic, 2009; Tahiraj et al., 2024), and in this study, the variables included sociodemographic factors and doping attitudes.

The sociodemographic factors observed in the study were gender (male, female, not defined), age (in years), experience in recreational sports (in years), partnership/marital status (married/partnership, single), parenthood (yes, no), and educational level (elementary school, high school, college/university student, college/university level). Additionally, the participants were asked about their personal knowledge and awareness of doping (responses included no knowledge at all, poor, average, above-average, and good).

Doping attitudes (doping tendency – DT) were evaluated by one question, namely, Would you consider the use of doping? (No, I don't know, maybe, yes). For the purpose of this study, the responses were grouped into negative-doping-tendency (NDT; those who responded “No”) and neutral/positive-doping-tendency (PDT; remaining answers).

Statistics

The Kolmogorov–Smirnov test was used to check the normality of the distributions, and consequently, means and standard deviations were calculated for age and experience in recreational sports, whereas descriptive statistics for other variables included calculations of frequencies and percentages.

Differences between identified groups of athletes who reported “neutral/positive doping tendency (PDT)” and those who reported “negative doping tendency” (NDT) were calculated via the chi-square test (for nominal variables), the Mann-Whitney test (for ordinal variables), and the t test for independent samples (for age and experience in recreational sports).

The associations between sociodemographic factors and doping tendency were evaluated via univariate and multivariate logistic regressions. Specifically, in the first phase, all sociodemographic factors were independently correlated with a binarized criterion—doping tendency. In the second phase, all factors that were found to be univariately significantly correlated with the criterion were simultaneously included in the multivariate logistic regression model to control for possible confounding effects. The PDT was used as a reference value. The Odds Ratio (OR) and 95% Confidence Interval (95% CI) were reported, and the Hosmer–Lemeshow test was applied to check the appropriateness of the model fit.

Statistica 13.5 (Tibco, Inc., CA, USA) was used for all calculations, and a p value of 0.05 was applied.

Results

The descriptive statistics and significance of the t test differences between groups formed on the basis of doping tendency for age and experience in recreational sports are presented in Figure 1. The groups did not differ significantly in terms of age (t test = 0.98, $p > 0.05$; Figure 1A) or experience in recreational sports (t test = 0.99, $p > 0.05$; Figure 1 B).

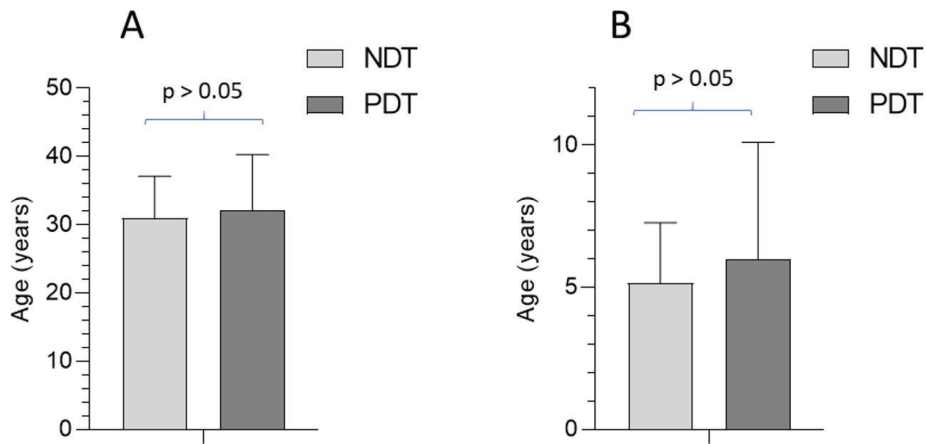


FIGURE 1. Descriptive statistics (data are given as the means ± standard deviations) and differences between groups based on doping tendency (NDT – negative doping tendency, PDT – neutral/positive doping tendency) by age (1A) and recreational sport experience (1B)

Table 1 presents descriptive statistics and differences between groups on the basis of doping tendency for ordinal and nominal variables. The groups differed in several

sociodemographic characteristics. First, more participants with PDT were males than females ($\chi^2=7.15$, $p<0.01$). Additionally, significant differences were found for par-

Table 1. Descriptive statistics (F – frequencies, % - percentage), and differences between groups in terms of doping tendency (DT) evaluated via the chi-square test (χ^2) or the Mann–Whitney test (MW).

	Total		Negative doping tendency		Neutral/Positive doping tendency		χ^2 /MW (p)
	F	%	F	%	F	%	
Gender (χ^2)							
Females	272	54.08	208	57.94	64	44.76	
Males	230	45.73	151	42.06	79	55.24	7.15
Missing	1	0.20	0	0.00	1	0.75	(0.001)
Marriage (χ^2)							
Single	44	8.75	36	9.76	8	5.97	
Married/Partnership	458	91.03	333	90.24	125	93.28	1.71
Missing	1	0.20	0	0.00	1	0.75	(0.19)
Parenthood (χ^2)							
Yes	28	5.57	26	7.05	2	1.49	
No	474	94.23	343	92.95	131	97.76	5.7
Missing	1	0.20	0	0.00	1	0.75	(0.02)
Educational level (χ^2)							
Elementary school	52	10.34	30	8.13	22	16.42	
High school	321	63.82	234	63.41	87	64.93	
Student (College/University)	94	18.69	72	19.51	22	16.42	
High school education	35	6.96	33	8.94	2	1.49	14.59
Missing	1	0.20	0	0.00	1	0.75	(0.001)
Knowledge on doping (MW)							
No knowledge at all	92	18.29	53	14.36	39	29.10	
Poor	106	21.07	73	19.78	33	24.63	
Average	171	34.00	142	38.48	29	21.64	
Above average	84	16.70	67	18.16	17	12.69	
Good	49	9.74	34	9.21	15	11.19	1.36
Missing	1	0.20	0	0.00	1	0.75	(0.17)

Note: (MW) denotes variables where differences between groups were evaluated by the Mann–Whitney test; (χ^2) denotes variables where differences between groups were evaluated by the chi-square test

enthood, with less common PDT among participants who were not parents ($\chi^2=5.7$, $p<0.01$). Finally, those participants who were better educated were less prone to PDT ($\chi^2= 4.59$, $p<0.001$).

Univariate and multivariate logistic regression results where sociodemographic factors were correlated with outcome – PDT – are presented in Table 2. At the univariate level, several factors were correlated with PDT. First, older participants were less likely to declare PDT (OR=0.93, 95% CI: 0.88–0.98). Furthermore, there was a greater likelihood of PDT in males (OR=1.41, 95% CI: 1.30–1.61). Next, participants who were parents had a lower likelihood of receiv-

ing PDT (OR=0.65, 95% CI: 0.51–0.77). Finally, education was associated with PDT, with a lower likelihood of PDT in better educated participants (OR=0.57, 95% CI: 0.42–0.78). When all the significant predictors were simultaneously included in the multivariate regression model to control for possible confounding effects, male sex (OR=1.41, 95% CI: 1.28–1.59), parenthood (OR=0.66, 95% CI: 0.50–0.78), and educational level (OR = 0.62, 95% CI: 0.43–0.89) were retained as significant predictors of PDT, with a higher likelihood of PDT in males and a lower likelihood in parents and better educated participants. Hosmer Lemeshow test indicated appropriate model fit

Table 2. Results of the univariate and multivariate logistic regression for the outcome - neutral/positive doping tendency (OR – Odds Ratio, 95%CI – 95% Confidence Interval)

	Univariate logistic regression		Multivariate logistic regression *	
	OR	95%CI	OR	95%CI
Age	0.93	0.88-0.98	0.97	0.91-1.03
Experience in recreational sport	0.99	0.85-1.15		
Male gender	1.45	1.30-1.61	1.41	1.28-1.59
Married/partnership	1.36	0.68-2.75		
Parenthood	0.65	0.51-0.77	0.66	0.50-0.78
Educational level	0.57	0.42-0.78	0.62	0.43-0.89
Knowledge on doping	1.05	0.75-1.51		

Note: * - A multivariate model was calculated for variables significantly associated with outcome at the univariate level.

Discussion

Our results showed that sociodemographic factors are strongly correlated with doping attitudes in recreational athletes. Specifically, a lower likelihood of doping is evident in better educated athletes and athletes who are parents. In contrast, males are more prone to doping than females are. Therefore, our initial study hypothesis can be accepted.

Sociodemographic factors such as age, gender, education, and parental status play crucial roles in understanding health-threatening behaviors, including doping in recreational sports. These factors interact in complex ways to shape individuals' perceptions of risk, their access to information and resources, and their social and cultural norms, which can significantly impact risk perception and health behaviors (Deeks, Lombard, Michelmore, & Teede, 2009). For example, younger individuals may be more prone to risk-taking behaviors because of developmental factors and social pressures (Deeks et al., 2009). Similarly, gender norms and the influence of coaches and peers can influence participation in certain sports and the perceived acceptability of doping (Szwarcwald et al., 2021). Therefore, our general findings of strong associations between the studied sociodemographic factors and doping attitudes in recreational athletes are not surprising. In the following text, we specifically discuss each of the identified significant predictors and offer potential explanations for such results.

We have reported that male recreational athletes are more prone to doping than their female peers are, which is frequently reported in competitive sports (Devicic et al., 2018; Tahiraj et al., 2024). In sports in general, numerous factors contribute to the disproportionate rate of doping among males compared with females. Biological differences play a role, as males naturally possess relatively high levels of testosterone,

a hormone frequently abused for performance enhancement (Handelsman, Hirschberg, & Bermon, 2018). Societal pressures and expectations surrounding masculinity can also contribute, with males often feeling compelled to achieve success and dominance in sports at any cost. The highly competitive nature of elite sports, coupled with the lure of financial rewards and recognition, can further incentivize doping behavior among males. Additionally, historical data and research have focused predominantly on male athletes, potentially leading to an underestimation of the prevalence of doping among females.

Within recreational sports, the motivations for doping differ slightly. While some recreational male athletes may still succumb to pressures to excel and achieve a lean and muscular physique, others may turn to doping to expedite recovery, overcome plateaus, or simply enhance their training experience. The increasing availability and accessibility of performance-enhancing substances, coupled with a lack of stringent testing protocols in recreational sports, can create an environment conducive to doping. Furthermore, the emphasis on body image and aesthetics in contemporary society can influence recreational male athletes to engage in risky behaviors, including doping, to attain an idealized physique (Tavares, Serpa, Horta, & Rosado, 2019).

Importantly, while some research suggests a link between gender, goals, and doping prevalence, generalizations should be avoided, as individual motivations are complex. However, some studies indicate that a greater proportion of male recreational athletes prioritize muscle mass gain as a primary training goal, which is sometimes associated with positive doping attitudes (Jankauskienė, Kardelis, & Pajaujienė, 2007; Molanorouzi, Khoo, & Morris, 2015). This pursuit of hyper-

trophy can be influenced by societal ideals of masculinity, media portrayals of the idealized male physique, and the subculture within certain fitness communities. Doping, particularly with anabolic-androgenic steroids, is known to accelerate muscle protein synthesis and enhance muscle growth, making it a tempting option for some men seeking rapid physical transformations.

Conversely, research suggests that female recreational athletes often prioritize fat loss, improved body composition, and overall health and well-being (Bratland-Sanda & Sundgot-Borgen, 2013). While societal pressures regarding appearance certainly exist for women, the desired aesthetic often leans toward leanness rather than significant muscle mass. Consequently, doping methodologies typically associated with muscle gain hold less appeal. This is not to say that women are immune to doping. Concerns around performance enhancement and body image can still contribute to its use, but the specific aims and chosen substances may differ.

Our research revealed a notable correlation between participants' educational level and their doping tendency in recreational sports, which is consistent with previous reports (Zmuda Palka et al., 2023). It is likely that recreational athletes with higher levels of education exhibited a reduced inclination toward doping, likely due to several interconnected factors. First, education empowers individuals with enhanced health literacy (Geets-Kesic, Maras, & Gilić, 2023). Health literacy could enable them to better comprehend the potential risks and adverse effects associated with doping substances. This heightened awareness probably fosters informed decision-making and responsible behavior regarding performance enhancement and doping, as already suggested for university athletes from Japan (Murofushi, Kawata, Kamimura, Hirose, & Shibata, 2018).

Second, education equips athletes with a deeper understanding of the ethical implications of doping, reinforcing the principles of fair play and sportsmanship (Zmuda Palka et al., 2023). Of course, it is questionable if this influenced our results, since the problem of fair-play is mostly associated to competitive sport, while we studied recreational athletes. On the other hand, it is possible that those recreational athletes who were once involved in competitive sport inherited this behavior and therefore translated it even into their practice of recreational sport.

Third, educated persons (recreational athletes) often possess broader knowledge of training principles and alternative performance enhancement strategies, reducing their reliance on prohibited substances (Murofushi et al., 2018). For example, proper sports nutrition and supplementation play crucial roles in optimizing recovery from training. By providing the body with the necessary nutrients, athletes can replenish energy stores, repair muscle damage, and reduce inflammation. This can lead to improved performance and a reduced risk of injury, making it a safe and effective alternative to doping.

Finally, access to some form of anti-doping education programs is more common in situations of "advanced education". This study contributes to a stronger understanding of anti-doping rules and regulations. Moreover, they foster a culture of clean sport by emphasizing ethical conduct and fair play (Deng, Guo, Wang, Huang, & Chen, 2022). By equipping athletes with the necessary knowledge and promoting a value-based approach, better education could play a significant role in deterring doping and encouraging informed deci-

sion-making, even among our participants.

Our findings suggest that recreational athletes who are parents demonstrate a lower tendency toward doping behavior. Although this issue has rarely been studied in recreational sports, it is in agreement with studies where doping behavior has been studied in competitive athletes (i.e., weight-lifters) (Rodek et al., 2009). Broadly, this observation could be attributed to the significant social context of parenthood.

First, parents often prioritize their family responsibilities and the well-being of their children, which may influence their decision-making regarding performance enhancement. Doping carries potential health risks and ethical concerns, and parents might be more averse to such behaviors to safeguard their health and serve as positive role models for their children. Second, when considering recreational sports in particular, parents may find greater fulfillment in their sport pursuits through shared experiences with their children and the positive example they set. The social context of parenthood may promote a shift in values, where sports participation and physical activity emphasize personal health, enjoyment, and family bonding rather than solely focusing on competitive achievements. This finding highlights the potential influence of social roles and responsibilities on shaping attitudes and behaviors toward doping in recreational sports. These findings suggest that promoting positive social connections and emphasizing the values of fair play and health within the recreational sports community could be effective strategies for discouraging doping behavior.

A potential confounding factor could be the association between parenthood and age (note that age was negatively associated with positive doping tendency in univariate logistic regression). In other words, one might argue that older athletes, who are more likely to be parents, might naturally have a lower inclination toward doping because of factors such as decreased competitiveness or increased awareness of health risks (as a result of their older age). However, our study addressed this by including age as a variable in our regression model. Specifically, the multivariate analysis demonstrated that even after accounting for age, parenthood remained a significant independent predictor of lower doping tendency, whereas age itself was not statistically significant. This finding strengthens our conclusion that parenthood, in addition to age, plays a unique role in influencing attitudes toward doping in recreational athletes. This finding suggests that the social context and responsibilities associated with parenthood have a distinct effect on an athlete's decision-making process regarding performance enhancement, independent of their age.

This study is limited by its cross-sectional design, which prevents the establishment of causality between variables. Additionally, the restricted number of variables examined may not fully encompass all the factors influencing the doping tendency of recreational athletes. Finally, the lack of qualitative analysis limits the ability to gain a deeper understanding of the experiences and motivations of participants regarding the use of doping. Future research employing longitudinal designs, incorporating a wider range of variables, and integrating qualitative methodologies would provide a more comprehensive understanding of this topic.

Despite these limitations, this study has several notable strengths. First, the relatively large sample size enhances the generalizability of the findings. Second, this research addresses an evident gap in the literature by being one of the few

studies to specifically examine doping in recreational sports in southeastern Europe. Finally, the research team possesses significant experience in this field, ensuring rigorous data collection and analysis procedures.

Conclusion

The observed associations between sociodemographic factors and doping attitudes in recreational athletes can be attributed to a complex interplay of biological, psychological, and social influences. For example, societal pressures and expectations surrounding masculinity may contribute to the higher prevalence of doping among male athletes. Moreover, higher education levels may foster greater health literacy and ethical awareness, reducing the likelihood of doping behavior.

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Conflict of interest

The authors declare that there are no conflict of interest.

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Similarly, the responsibilities and social connections associated with parenthood may promote a shift in values, leading to a decreased inclination toward doping.

Future research should explore this problem in more detail, including the evaluation of the impact of other potential factors, such as health literacy, recreational sport type, training intensity, and social influences within specific recreational sport communities. Longitudinal studies would be particularly valuable in establishing causal relationships and tracking changes in doping attitudes over time. By deepening our understanding of the multifaceted factors contributing to doping in recreational sports, we can develop targeted interventions to promote clean sports and protect the health and well-being of recreational athletes.