

Sport specialisation and performance-enhancing substance use by young athletes

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ABSTRACT

Objectives To investigate the association of reported legal performance enhancing substance (PES) use and consideration of banned PES use among sport-specialised and non-sport-specialised young athletes.

Methods and design Cross-sectional study of 1049 young athletes enrolled in an injury prevention programme from 2013 to 2020. We used logistic regression modelling to determine the independent association between sports specialisation. We reported (1) legal PES use and (2) consideration of banned PES use after adjusting for the effects of gender, age, having a relative as a coach, unrestricted internet access, use of a weight training regimen, and weeknight hours of sleep.

Results The final cohort consisted of 946 athletes with a mean age of 14. 56% were female, and 80% were sport-specialised athletes. 14% reported legal PES use, and 3% reported consideration of banned PES use. No difference was found between sport-specialised athletes who reported legal PES use (OR=1.4; 95% CI 0.81 to 2.43; p=0.23) or consideration of banned PES use (OR=3.2; 95% CI 0.78 to 14.92; p=0.1) compared with non-sport-specialised athletes. Reported legal PES use was more common among athletes who were male, older, used weight training, and slept less. Reported consideration of banned PES use was more common among male and older athletes.

Conclusions PES use is not independently associated with sport specialisation in young athletes. Athlete sex, age, training, and sleep patterns are important factors for young athletes to consider in PES use.

BACKGROUND

Sport-specialised athletes who have chosen to focus on one sport at the expense of other sports are at greater risk for overuse injuries, overtraining and social-emotional imbalances, including early burnout, stress and anxiety.¹⁻⁴ The increased risk for injury may be linked to the increased training volume, drive to succeed, and high competition levels inherent to sports specialisation.⁴⁻⁸ Furthermore, in a study that did not account for sport specialisation, athletes with increased hours of play, a variable often seen in

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Sports specialisation and legal and banned performance-enhancing substance (PES) use carry inherent risks for a young athlete, and their interplay remains unstudied.

WHAT THIS STUDY ADDS

⇒ No independent association was found between sport-specialised athletes and PES use in the study. Athletes who were male, older, slept fewer hours and used weight training had greater odds of reported PES use, while older athletes and males had greater odds of reported consideration of banned PES. These findings suggest that PES use may not be of concern for young sport-specialised athletes, but still supports the need for further research pertinent to unique young athlete characteristics associated with PES use.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ The results reemphasise the already established need for continued legislation and education initiatives surrounding legal PES among adolescents.

sport-specialised athletes, were more likely to use legal performance-enhancing substances (PES), independent of demographic characteristics and physical activity level.¹⁻⁹

The use of legal PES in sports is widespread.¹⁰⁻¹⁵ Sixty-five to eighty-nine percent of intercollegiate athletes use some form of legal PES supplement, with similar use patterns occurring at the scholastic level.¹⁰ This is particularly important, as legal PES are now referenced as possible gateway substances for banned PES use.¹¹ The motivation to use PES in the paediatric population (ie, athletes and non-athletes) includes improving physical attractiveness, obtaining a competitive advantage in sport and competition, and developing a professional athletic career.^{12 13} Other identified traits that may lead to PES use include heightened competitive performance, perfectionism, and 'winning at all



costs' mentality. These personality traits often share a common ground with sport-specialised athletes, and have been related to positive attitudes toward banned PES, as well as banned performance enhancing behaviours.^{14 15}

No studies to date have investigated PES use among young athletes and the associated risk related to sports specialisation. With this, we aimed to study legal PES use in a cohort of young athletes, and to compare sport-specialised athletes to non-sport specialised athletes to answer the question, *Is sport specialisation an independent risk factor for PES use in young athletes?* Our second aim was to investigate the consideration of banned PES use among young sport-specialised athletes compared with non-sport-specialised athletes. We hypothesised that young sport-specialised athletes would have greater odds of reported legal PES use and consideration of banned PES use than non-sport-specialised athletes.

METHODS

Between April 2013 and March 2020, 1049 athletes, 6–25 years of age, underwent an injury prevention evaluation (IPE) at a tertiary-level paediatric hospital-affiliated sports injury prevention centre. We conducted analyses of a subset of existing data structured around the athletes' responses and measurements. The institutional review board approved the current study before commencement.

A participant who completed the IPE was defined as an athlete if they partook in organised sport(s). Several hours were spent at the centre, where risk factors for sports-related injuries were measured, and a sports

injury risk-reduction plan individualised to the athlete was developed. Potential risk factors are based on available medical and scientific literature and include: age, gender, sport(s) participated in, position(s) played, medical history, training regimen and nightly hours of sleep, among others. The questionnaire takes approximately 30 min to complete by the athlete and is followed by a biomechanical and sports performance evaluation performed by an athletic trainer or kinesiologist. The goal is to obtain a comprehensive profile of injury risk. Athletes under 18 years old were accompanied by a parent or legal guardian.

Sports were categorised as either contact, limited-contact, or non-contact according to the American Academy of Pediatrics (AAP) groupings, and included baseball, basketball, boxing, cheerleading, crew, cross country, cycling, dance, equestrian, field hockey, figure skating, football, golf, gymnastics, ice hockey, lacrosse, long-distance running, martial arts, rugby, ski/snowboarding, soccer, softball, springboard diving, swimming, tennis, track and field (field), track and field (running), and wrestling.¹⁶

The AAP defines sport specialisation as an athlete focusing on only one sport, usually at the exclusion of any other and often year round.¹ For the study, a sport-specialised athlete was defined as one participating in a single sport or, if a multisport athlete, one practising or competing for a primary sport year round. All athletes who participated in multiple sports without year-round dedicated training for one activity were considered non-sport-specialised.

The 2021 World Anti-doping Agency (WADA) is the international standard for describing legal and banned PES in sports. Legal PES, often found over the counter, are not on WADA's banned list.^{1 17} Whey protein, caffeine, creatine and nutritional supplements are the most popular legal PES found in paediatric and intercollegiate populations.^{7–9} The IPE questionnaire included questions on using caffeine, energy drinks, creatine and nutritional weight gain supplements, including whey powder and protein bars. These substances were considered legal PES. The IPE questionnaire also recorded answers to the question, 'If you were offered a banned PES that guaranteed you would accomplish a major athletic accomplishment of your choice, and you would never get caught, would you take it?'^{18–20} For this study, an answer of *yes* to this question was recorded as *consideration of banned PES use*.

The Pew Research Center is a Washington, D.C., based, non-partisan group, providing information such as median income level to describe demographic variances within the USA. The research group set references for low-income, low-middle income, upper-middle income and high-income homes in a three-person household after adjusting for the cost of living in each state in 2016.²¹ Using Census Bureau statistics, each zip code recorded on the IPE was associated with a median income from 2019 data. Each athlete's median income per zip code

Characteristic	Freq.	(%)
Age	14	2.99
Gender (% male)	413	(44%)
Median income		
Low	0	(0%)
Lower-middle	81	(9%)
Upper-middle	707	(75%)
Upper	158	(17%)
Race (n=916)		
White	794	(87%)
Black American	21	(2%)
Asian	33	(4%)
Native Hawaiian or Pacific Islander	2	(0%)
American Indian or Alaskan Native	5	(1%)
Multiracial	61	(7%)
Sport-specialised athletes	759	(80%)
Reported legal PES use	136	(14%)
Consideration of banned PES use	28	(3%)
PES, performance-enhancing substance.		

Table 2 Comparison of participant characteristics between sport specialisation groups (n=946)

Characteristic	Sport-specialised athletes (n=759)		Non-sport-specialised athletes (n=187)		P value
	Freq.	(%)	Freq.	(%)	
Gender (% male)	304	(40%)	109	(58%)	<0.001
Age	14.2	± 2.91	13.4	± 3.22	0.002
Median income					0.05
Lower-middle	69	(9%)	12	(6%)	
Upper-middle	571	(75%)	136	(73%)	
High	119	(16%)	39	(21%)	
White (n=916)*	633	(86%)	161	(88%)	0.56
Medical history					
Asthma	141	(19%)	29	(16%)	0.33
ADD/ADHD	73	(10%)	18	(10%)	1.00
Anorexia/bulimia	3	(0%)	1	(1%)	0.79
Anxiety	51	(7%)	14	(8%)	0.71
Depression	22	(3%)	5	(3%)	0.87
Diabetes	3	(0%)	1	(1%)	0.79
Migraine	45	(6%)	12	(6%)	0.80
Sport					
Contact sport	588	(78%)	175	(94%)	<0.001
Limited-contact	184	(24%)	73	(39%)	<0.001
Non-contact	320	(42%)	70	(37%)	0.24
Cigarette use (n=663)*	1	(0%)	0	(0%)	0.36
Alcohol use (n=662)*	78	(14%)	18	(16%)	0.73
Reported legal PES use	117	(15%)	19	(10%)	0.09
Consideration of banned PES use	26	(3%)	2	(1%)	0.14
Age started organised sports	5	(4-6)	5	(4-6)	0.28
Relative is a coach	78	(10%)	35	(19%)	<0.001
Number of seasons with coach	0	(0-0)	0	(0-2)	<0.001
Unrestricted internet access	408	(54%)	76	(41%)	0.001
Reason for playing sports					0.001
To have fun	391	(52%)	119	(64%)	
Stay fit	64	(8%)	19	(10%)	
Make friends	11	(1%)	1	(1%)	
Win a championship	69	(9%)	8	(4%)	
Be part of a team	111	(15%)	27	(14%)	
To be strong	18	(2%)	3	(2%)	
To make parents happy	2	(0%)	1	(1%)	
Unspecified	93	(12%)	9	(5%)	
Use of weight training regimen	341	(45%)	57	(31%)	<0.001
Belief that athletic ability is influenced by weight	370	(49%)	83	(44%)	0.29
History of intentional weight loss	150	(20%)	35	(19%)	0.75
History of intentional weight gain	99	(13%)	19	(10%)	0.29
Weeknight hours of sleep	8	± 1.22	8.4	± 1.31	0.001
Weekend hours of sleep	9.1	± 1.29	9.3	± 1.29	0.23

*The number in parentheses represents the number of cases with available data for the given characteristic. PES, performance-enhancing substances.



was assigned as low-income, lower-middle-income, upper-middle-income, or high-income.²²

Athletes with no reported date of birth or incompleteness of sports specialisation questions were excluded from this set of data (n=103), resulting in a final cohort of 946 athletes 6–25 years old for analysis.

Univariable comparisons in participant characteristics were conducted across sport specialisation groupings to assess for potential confounders in each model. Variables with p values < 0.05 during initial unadjusted univariate analysis were included in a subsequent multivariable model, as there was reason to believe those variables may potentially confound the association between sport-specialised athletes and PES use or consideration. Multivariable logistic regression analysis was used to determine the independent association between sport-specialised athletes and the odds of reported legal PES use, as well as for the consideration of banned PES use while controlling for potential confounding characteristics referenced from univariate to create adjusted models. Subanalyses were performed to compare sport-specialised athletes and reported legal PES use and consideration of banned PES use within gender groups.

Equity, diversity and inclusion

The study recruitment included all races/ethnicities, all income levels, a diverse spectrum of athletic involvement and competitiveness, and male and female athletes. We acknowledge the generalisability of the results may not account for the LGBTQIA2S+ community, but we have since updated our questionnaire to account for this group in future analyses. Our research team comprised three females and four males from different research disciplines and stages of their careers and represented both a North American and Asian country.

Patient and public involvement

Patients and the public were not involved in the production of recruitment, question development, analysis or distribution of this research.

RESULTS

Cohort characteristics

The analysed cohort of 946 young athletes was predominantly female, white, and had a middle-upper family income (table 1). Most athletes were sport specialised. Few reported legal PES use, and fewer reported consideration of banned PES use (table 1). Comparison characteristics between sport-specialisation groups can be seen in table 2.

Sport specialisation and reported legal PES use

No significant difference was found between athletes who were sport-specialised and reported legal PES use compared with athletes who were non-sport-specialised (table 3). On univariable comparisons, gender, age, having a relative as a coach, unrestricted internet access, use of a weight training regimen, and weeknight hours

of sleep met our criteria for inclusion in the multivariable logistic regression model. After adjusting for these covariables, no independent association between sport-specialised athletes and reported legal PES use was found (OR=1.4; 95% CI 0.81 to 2.43; p=0.2) (figure 1). Athletes who were male (OR=1.73; 95% CI 1.17 to 2.56; p=0.007), older (OR=1.14; 95% CI 1.05 to 1.23; p=0.002), used a weight training regimen (OR=1.75; 95% CI 1.15 to 2.66; p=0.009), and had decreased hours of weeknight sleep (OR=0.81; 95% CI 0.67 to 0.98; p=0.03) had a greater odds of reported legal PES use (figure 1).

Among male athletes who reported legal PES use, there was no difference between sport-specialised (n=62/304: 20.4%) and non-sport-specialised athletes (n=14/109: 12.8%) (p=0.08). Among female athletes who reported legal PES use, there was no difference between sport-specialised (n=55/455: 12.1%) and non-sport-specialised athletes (n=5/78: 6.4%) (p=0.15).

Sport specialisation and consideration of banned PES use

No significant difference existed between athletes who were sport specialised and reported consideration of banned PES use compared with athletes who were non-sport-specialised (table 4). On univariable comparisons, gender, age, use of a weight training regimen, and weeknight hours of sleep met our criteria for inclusion in the final modelling. After adjusting for the effect of these covariables, we found no independent association between sport-specialised athletes and reported consideration of banned PES use (OR=3.42; 95% CI 0.78 to 14.92; p=0.1). However, male athletes had greater odds of reported consideration of banned PES use than females (OR=2.62; 95% CI 1.15 to 5.98; p=0.02) (figure 2). Additionally, for each additional year of age, the odds of reported consideration of banned PES use increased (OR=1.24; 95% CI 1.08 to 1.42; p=0.002) (figure 2).

Among male athletes who reported consideration of banned PES use, there was no difference between sport-specialised (n=17/304: 5.6%) and non-sport-specialised athletes (n=2/109: 1.8%) (p=0.12). Among female athletes who reported consideration of banned PES use, there was no difference between sport-specialised (n=9/455: 2%) and non-sport-specialised athletes (n=0/78: 0%) (p=0.32).

DISCUSSION

The main finding of our study was that there was no difference between sport-specialised athletes who reported legal PES use or consideration of banned PES use compared with non-sport-specialised athletes. Furthermore, although male athletes had greater odds of reported legal PES use, in subgroup analysis, sport specialisation was not an independent risk factor for either male or female athletes.

The findings of our study are important to consider because sport specialisation for young athletes is often discussed in line with *negative* ramifications, including serious overuse injury, relative energy deficiency

Table 3 Comparison of participant characteristics between reported legal PES use groups (n=946)

Characteristic	Reported legal PES use (n=136)		No reported legal PES use (n=810)		P value
	Freq.	(%)	Freq.	(%)	
Gender (% male)	76	(56%)	337	(42%)	0.002
Age	15.8	± 2.48	13.7	± 2.96	<0.001
Median income					0.718
Lower-middle	8	(6%)	73	(9%)	
Upper-middle	107	(79%)	600	(74%)	
High	21	(15%)	137	(17%)	
White (n=916)*	108	(81%)	686	(88%)	0.046
Medical history					
Asthma	25	(18%)	145	(18%)	0.892
Attention Deficit Disorder/Attention Deficit Hyperactivity Disorder (ADD / ADHD)	22	(16%)	69	(9%)	0.006
Anorexia/bulimia	2	(2%)	2	(0%)	0.07
Anxiety	17	(13%)	48	(6%)	0.006
Depression	11	(8%)	16	(2%)	<0.001
Diabetes	1	(1%)	3	(0%)	0.55
Migraine	7	(5%)	50	(6%)	0.64
Sport-specialised athlete	117	(86%)	642	(79%)	0.086
Sport group					
Contact sport	105	(77%)	658	(81%)	0.27
Limited-contact	33	(24%)	224	(28%)	0.41
Non-contact	50	(37%)	340	(42%)	0.25
Cigarette use (n=663)*	1	(1%)	0	(0%)	0.98
Alcohol use (n=662)*	35	(29%)	61	(11%)	<0.001
Age started organised sports	5	(5-6)	5	(4-6)	0.07
Relative is a coach	7	(5%)	106	(13%)	0.01
Number of seasons with coach	0	(0-2)	0	(0-2)	0.30
Unrestricted internet access	96	(71%)	388	(48%)	<0.001
Reason for playing sports					0.01
To have fun	57	(42%)	453	(56%)	
Stay fit	16	(12%)	67	(8%)	
Make friends	3	(2%)	9	(1%)	
Win a championship	13	(10%)	64	(8%)	
Be part of a team	22	(16%)	116	(14%)	
To be strong	4	(3%)	17	(2%)	
To make parents happy	0	(0%)	3	(0%)	
Unspecified	21	(15%)	81	(10%)	
Use of weight training regimen	89	(65%)	309	(38%)	<0.001
Belief that athletic ability is influenced by weight	97	(71%)	356	(44%)	<0.001
History of intentional weight loss	46	(34%)	139	(17%)	<0.001
History of intentional weight gain	49	(36%)	69	(9%)	<0.001
Weeknight hours of sleep	7.5	± 1.07	8.2	± 1.24	<0.001
Weekend hours of sleep	8.9	± 1.4	9.2	± 1.26	0.02

*The number in parentheses represents the number of cases with available data for the given characteristic. PES, performance-enhancing substances.

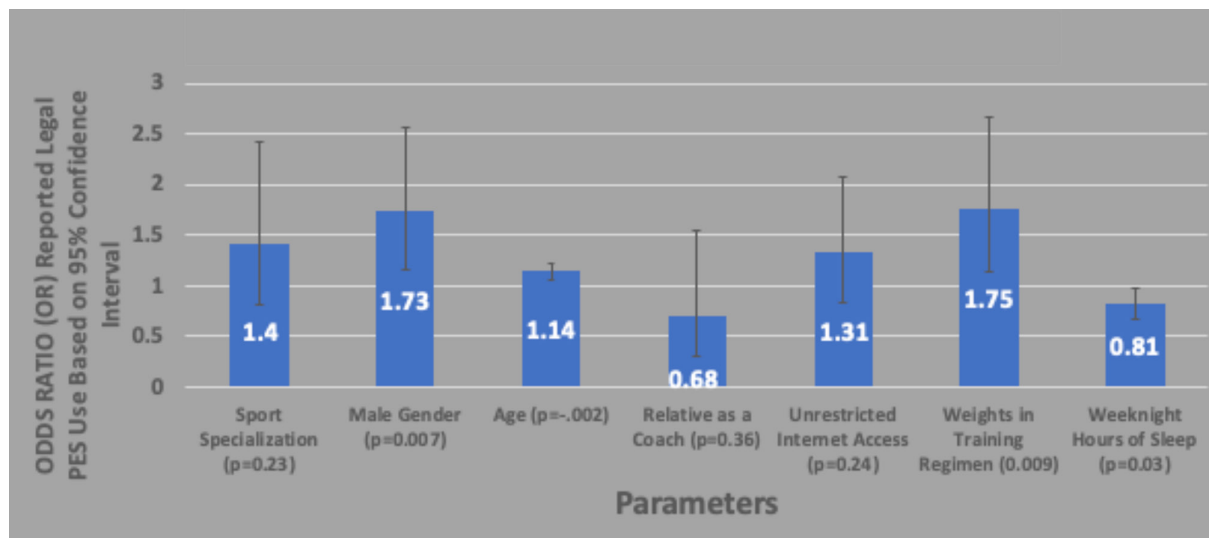


Figure 1 Multivariable analysis for reported legal performance-enhancing substances (PES) use.

syndrome, burnout, heightened stress levels, depression, and anxiety.^{1–4} In this sense, healthcare providers caring for young athletes may naturally conclude that sports specialisation places them at increased risk for PES use. Our study results do not support this assumption.

There is a shortage of research to discuss factors that affect risk for PES in young athletes. In a sample of 12 133 young adults aged 18–26 from 1994 to 2008, Ganson *et al* found that 16.1% of males and 1.2% of females, both athlete and non-athlete, reported legal PES use in the past year.²³ A higher prevalence of reported legal PES use in male athletes than female athletes is common at the high school and collegiate levels.²³ Similar patterns are noted regarding banned PES use, with the prevalence of male adolescent use almost twice that of female adolescents (2.4% male, 0.8% female).²⁴ Our study supports these findings, demonstrating that male and female PES use behaviours persist in the young athlete community, with male athletes maintaining greater risk.¹⁸ A clinical report by Labotz *et al* on using PES reiterates that gender differences in risk may be explained by males seeking more improved athletic performance and a body ideal focused on greater muscle mass.¹⁸

Our study found that weight-training regimens were associated with greater odds of reported legal PES use. Nagata *et al* classified the use of legal PES or banned PES as muscularity-oriented disordered behaviour and found that young adults who weightlifted had increased odds of muscularity-oriented disordered behaviours.²⁵ This finding supports the existing association, although the difference in age between the study cohorts should be noted. Resistance/weight training is often engrained in sports participation and performance enhancement training for young athletes.²⁶ Anticipatory guidance surrounding risk–benefit profiles of PES use early on may encourage safe sports participation habits for future young athletes.

Insufficient sleep can have detrimental physical and psychosocial side effects in all age groups. In the paediatric population, impaired sleep and associated parameters are significantly associated with anxiety, depression and behaviours such as alcohol, tobacco, and other substance use.²⁷ Insufficient sleep might also cause one to participate in risky behaviour that could include unsupervised and banned PES use while disregarding the negative consequences of these substances.²⁸ The behaviours of alcohol and tobacco use and psychiatric diagnoses of anxiety and depression are associated with the experimentation of legal PES use and banned PES use outside of sleep hours.²³ Additionally, high school students reporting moderate intake of the legal PES, caffeine, are nearly two times more likely to report concomitant difficulty sleeping.²⁹ Our findings that athletes with decreased sleep had greater odds of reported legal PES use aligns with the current literature. The interplay between substance use, sleep and mental health and the association with PES use patterns among young athletes is complicated, and will need continued investigation to disentangle.

Continued research on the associations between sport specialisation and PES use and studying individual factors that affect risk for PES use is important for clinical decision-making, patient education, and policy implementation for youth athletics. It will help guide a safe and active future.

The results of our research emphasise and support the already established need for continued legislation and education initiatives surrounding legal PES among adolescents as described by Ganson *et al*.³⁰ As research continues to enlighten risk factors for the use of PES among young athletes, healthcare providers, educators and policy-makers need to inform safety regulations better.

Table 4 Participant characteristics compared between consideration of banned PES use groups (n=946)

Characteristic	Has considered the use of banned PES (n=28)		Has not considered the use of banned PES (n=918)		P value
	Freq.	(%)	Freq.	(%)	
Gender (% male)	19	(68%)	394	(43%)	0.01
Age	16.4	2.64	13.9	2.97	<0.001
Median income					0.51
Lower-middle	0	(0%)	81	(9%)	
Upper-middle	24	(86%)	683	(74%)	
High	4	(14%)	154	(17%)	
White (n=916)*	22	(79%)	772	(87%)	0.21
Medical history					
Asthma	6	(21%)	164	(18%)	0.63
ADD/ADHD	6	(21%)	85	(9%)	0.04
Anorexia/bulimia	1	(4%)	3	(0%)	0.04
Anxiety	2	(7%)	63	(7%)	0.95
Depression	2	(7%)	25	(3%)	0.18
Diabetes	0	(0%)	4	(0%)	0.99
Migraine	2	(7%)	55	(6%)	0.80
Sport specialisation	26	(93%)	733	(80%)	0.14
Sport group					
Contact sport	25	(89%)	738	(80%)	0.25
Limited-contact	5	(18%)	252	(28%)	0.27
Non-contact	7	(25%)	383	(42%)	0.08
Cigarette use (n=663)*	0	(0%)	1	(0%)	0.99
Alcohol use (n=662)*	7	(27%)	89	(14%)	0.07
Age started organised sports	6	(5-7)	5	(4-6)	0.22
Relative is a coach	3	(11%)	110	(12%)	0.84
Number of seasons with coach	0	(0-2)	0	(0-0)	0.73
Unrestricted internet access	18	(64%)	466	(51%)	0.16
Reason for playing sports					0.76
To have fun	11	(39%)	499	(54%)	
Stay fit	3	(11%)	80	(9%)	
Make friends	2	(7%)	10	(1%)	
Win a championship	4	(14%)	73	(8%)	
Be part of a team	5	(18%)	133	(15%)	
To be strong	1	(4%)	20	(2%)	
To make parents happy	0	(0%)	3	(0%)	
Unspecified	2	(7%)	100	(11%)	
Use of weight training regimen	19	(68%)	379	(41%)	0.007
Belief that athletic ability is influenced by weight	20	(71%)	433	(47%)	0.02
History of intentional weight loss	10	(36%)	175	(19%)	0.03
History of intentional weight gain	10	(36%)	108	(12%)	<0.001
Weeknight hours of sleep	7.6	0.9	8.1	1.25	0.06
Weekend hours of sleep	8.8	1.18	9.2	1.29	0.18

*The number in parentheses represents the number of cases with available data for the given characteristic.

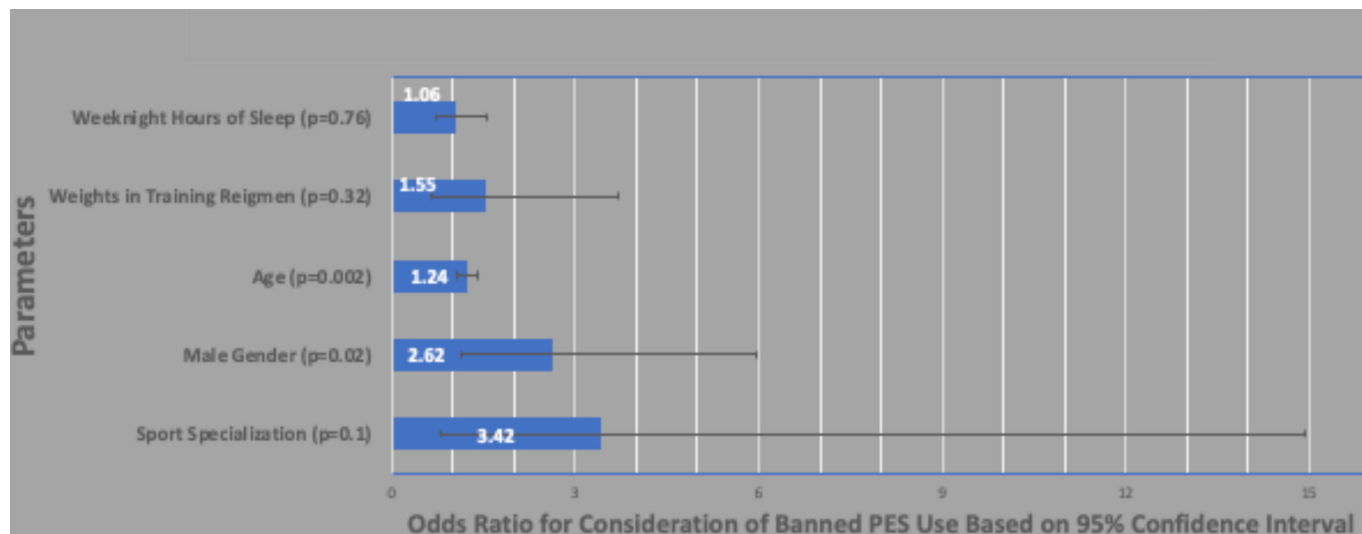


Figure 2 Multivariable analysis for consideration of banned performance-enhancing substances (PES) use.

Limitations

There were several limitations in our study to consider. The data was self-reported, so responses may not be accurate, as athletes may be reluctant to report PES use for fear of getting in trouble or social stigma. For the athletes that reported PES use, we could not ascertain whether they began using legal PES or considered using banned PES before or after they became sport specialised. The data's regionality and wide age range limit our findings' generalisability. During the study period, two educational initiatives became available in 2016: Adolescents Training and Learning to Avoid Steroids and Athletes Targeting Healthy Exercise and Nutrition Alternatives for boys and girls, respectively.¹⁸ We did not ascertain whether athletes in our study used these educational resources that may have influenced responses regarding PES use patterns. When the questionnaire was developed, options for gender were limited to male or female; it has since been updated to allow for free-text entries and an option for preferring not to answer to represent the LGBTQIA2S+ community accurately.

CONCLUSION

No independent association was found between sport specialisation and reported legal PES use or consideration of banned PES use. As athletes continue to specialise early in sports, this finding may shed a positive light on sport specialisation. Although inherent risks have been identified for sport-specialised young athletes, it does not seem appropriate to uniquely target sport-specialised athletes in education and policy efforts surrounding PES use. Athletes that were male, older, slept fewer hours, and used a weight training regimen had greater odds of reported legal PES use. Similarly, male athletes and older athletes had greater odds of reported consideration of banned PES use. Understanding PES use patterns in young athletes will guide anticipatory guidance and education efforts. Further cause–effect analysis may include objective measures of

substance use, increasing prospective verbiage in survey questions, accurate recording of income levels, inclusivity of different patient populations, and fostering a safe environment for patients to feel comfortable and confident in the confidentiality of data acquisition while answering difficult questions on intake or research surveys.

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Competing interests None declared.

Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Not applicable.

Ethics approval This study involves human participants and was approved by IRB-P00008365. Participants gave informed consent to participate in the study before taking part.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement Data are available upon reasonable request. The datasets generated during and/or analysed during the current study are not publicly available due to protected patient information but are available from the corresponding author on reasonable request.

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