

ORIGINAL ARTICLE

Do varsity college athletes have a greater likelihood of risky alcohol and cannabis use than non-athletes? Results from a National Survey in Brazil

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Objective: We examined the prevalence of risky alcohol and cannabis use among Brazilian varsity college athletes and whether this group had a greater likelihood of risky use than non-athletes.

Methods: In 2009, Brazilian college students (n=12,711) were recruited for a national stratified random survey. Their sociodemographic characteristics, mental health, substance use, and participation in varsity sports were assessed. Binary logistic regression models were used to examine the association between varsity athlete status and moderate to high-risk alcohol and cannabis use.

Results: Among varsity athletes, 67.6 and 10.7% reported risky alcohol and cannabis use, respectively. Varsity athletes had greater odds of risky alcohol consumption than non-athletes (aOR = 2.02, 95%CI 1.08-3.78). Varsity athletes also had greater odds of risky cannabis use than non-athletes in unadjusted analyses (OR = 2.57, 95%CI 1.05-6.28), although this relationship was attenuated after covariate adjustment.

Conclusions: Among college students in Brazil, varsity athletes had a higher prevalence of risky alcohol and cannabis use than non-athletes. The rates were considerably higher than those observed among samples of U.S. college athletes. Future research should examine the use of these substances among varsity college athletes in other middle-income countries since these findings will likely guide prevention and treatment efforts.

Keywords: College; college athletes; substance use

Introduction

Many varsity college athletes, or college students who compete in a university-sponsored individual or team sport,¹ are afforded social, financial (e.g., scholarships), academic (e.g., tutors, early course registration), and health (e.g., nutritionists, physical trainers, and medical care) benefits that are not necessarily provided to their non-athlete peers. Many college athletic departments also provide varsity athletes with career resources, and sports competition reinforces qualities that assist with a successful transition from college and sport to non-athletic roles, including teamwork, leadership, and communication.² These benefits are particularly important, since

approximately 98% of athletes do not compete at the professional level after graduation.³ Recreational sports participation is also common among university students.⁴ Recreational athletes, or college students who participate in non-varsity campus or community sports activities for the primary purpose of leisure, enjoyment, social involvement, or to improve physical fitness, also experience academic, social, and health benefits.⁴ However, participation in college sports also has its drawbacks, especially for varsity athletes. The rigorous demands of academic and athletic responsibilities can contribute to negative psychological consequences, including stress, anxiety, and depression.⁵ The unique circumstances experienced by varsity athletes may also influence the use of alcohol

and other substances in an attempt to enhance socialization, improve athletic performance, and relieve symptoms of psychological distress.⁶

Substance use among varsity college athletes in the U.S. is well documented, with two of the most commonly used substances in this population being alcohol and cannabis.⁷ Early national studies in the U.S. showed that varsity college athletes were more likely than non-athletes to consume alcohol, binge drink, and experience negative consequences from alcohol use.⁸ However, partially due to robust prevention efforts, binge drinking among male and female college athletes has decreased during the past 15 years, and rates are now comparable to similarly aged non-athletes.⁹ Preliminary evidence suggests that the prevalence of cannabis use is lower among varsity athletes than non-athlete college students.¹⁰ However, the use of cannabis is becoming more prevalent among college athletes.⁶ Among U.S. varsity college athletes, the negative consequences of alcohol use include accidents, higher injury rates, delayed injury recovery, impaired psychomotor skills, and missed athletic obligations.^{11,12} The consequences of cannabis use on athletic performance are less clear, though it may deleteriously effect reaction time, coordination, motivation, and anxiety.⁶ More severe cannabis use can also impede optimal athletic performance due to missed practice and workouts or to diminished cardiovascular functioning.¹³

Although alcohol and cannabis use among U.S. varsity college athletes is a well-studied topic, little is known about their prevalence among college athletes in other nations, especially middle-income countries. This is an important gap in the literature, since college athletes from the U.S. may not be representative of athletes from other countries, in part due to the high financial implications of National Collegiate Athletic Association sports competition, which may result in more vigorous health and performance demands for U.S. athletes.¹⁴ Thus, the following research questions remain unanswered: 1) how do the rates of moderate- to high-risk alcohol and cannabis use among varsity college athletes from a middle-income country compare to those of their counterparts in developed countries, and 2) are varsity college athletes from a middle-income country at higher or lower risk of moderate- to high-risk alcohol and cannabis use than non-athletes? Brazil is an advantageous country for researching these questions due to the high popularity of sports and the country's extensive college athletic programs.¹⁵ Since 2018, Brazilian varsity college athletes in sports such as badminton, basketball, futsal (i.e., indoor soccer), handball, judo, karate, swimming, taekwondo, tennis, and volleyball have participated in the Brazilian University Games, a competition that includes a regular season culminating in nationwide finals. During each season, the 27 State University Federations organize events in their respective states, and teams who win their regional tournament advance to the national stage of the Brazilian University Games. In 2019, more than 7,000 varsity athletes competed in the Brazilian University Games, making it the largest university sports competition in Latin America.¹⁶

Unlike the U.S., where most high school athletes are required to attend college for at least one year before

entering professional competition, many other countries, including Brazil, have no such regulations.¹⁷ Because of the high economic stakes for U.S. universities and the career aspirations of their athletes (i.e., the desire to become a professional), varsity athletic programs may require a higher level of commitment than college athletes in other countries. In Brazil, where fewer resources are allocated to athletic departments and performance expectations are less rigorous, substance use may be more common. Therefore, drawing on data from a national sample of Brazilian university students, including varsity college athletes, we examined: 1) the prevalence of moderate- to high-risk alcohol and cannabis use; and 2) associations between varsity athlete status and moderate- to high-risk alcohol and cannabis use. We hypothesized that the prevalence of moderate- to high-risk alcohol and cannabis use among Brazilian varsity college athletes would be higher than that of U.S. varsity college athletes but lower than that of Brazilian non-athletes.

Materials and methods

Participants and procedures

A probability sample of Brazilian college students ($n=12,721$) was recruited in 2009 for an epidemiological investigation that characterized the health of a nationally representative sample of university students in the 27 Brazilian state capitals. Data were collected using a two-stage approach: 1) participating universities were randomly selected and 2) a sample of students at each university was recruited by a random selection of courses offered at those institutions. Of the 114 selected universities, 100 agreed to participate (88%). Among the 100 participating universities, 923 classes were selected and 654 agreed to participate (70.8%). The student response rate was 95.6% in the selected classes, although the final response rate was 72.1% after including students from non-participating classes (12,721 of 17,651). Of the 12,721 students, ten were excluded due to incorrect responses on embedded validity indicators, which yielded a total sample of 12,711 participants.

All participants provided written informed consent. Sociodemographic characteristics, substance use measurements (tobacco, alcohol, cannabis, and other illicit substances), general psychological distress, depressive symptoms, and varsity athlete status were determined through a questionnaire adapted from the World Health Organization's (WHO) research instrument.^{18,19} The 98-item, anonymous questionnaire takes approximately 50 minutes to complete and has been previously used with Brazilian college students.^{20,21}

Measures

Outcomes

Moderate- to high-risk alcohol and cannabis use. The Alcohol, Smoking and Substance Involvement Screening Test (ASSIST) was used to assess the severity of participant alcohol and cannabis use in the past three months. The

ASSIST consists of eight questions that measure substance use frequency, associated health and behavioral consequences, and prior attempts to reduce substance use. In line with ASSIST scoring guidelines, the total risk score ranges from 0 to 39, with higher scores indicating more severe substance use. Consistent with the WHO's recommended clinical severity levels of substance use, moderate- to high-risk use was defined as a score of ≥ 11 and ≥ 4 for alcohol and cannabis, respectively.¹⁸ The ASSIST has demonstrated strong psychometric properties across various clinical populations, including Brazilian primary care patients.¹⁹⁻²²

Exposure

Athlete status. Athletic involvement was determined from a list of activities assessed with the following question: "Except for your vacation period, which activities do you usually engage in when out of classroom?" University students reporting no athletic participation were categorized as non-athletes. Varsity athletes participated in a university athletic program ("I take part in intercollegiate sports competition"). Recreational athletes reported sports participation as a hobby or leisure activity ("I take part in physical or sporting activities") and did not report intercollegiate sports competition. For the purpose of this study, athlete status was a three-level variable: non-athletes, recreational athletes, or varsity athletes.

Covariates

Depression. The Beck Depression Inventory-2 (BDI-II) was used to assess depressive symptoms over the past 14 days with 20 Likert scale questions ranging from 0 (rarely or never) to 3 (most of or all of the time). The BDI-II is among the most commonly used measures for depressive symptoms and demonstrates strong reliability and validity.²³ Total scores on the BDI-II range from 0 to 63. Depressive symptoms were examined as a continuous variable, with higher scores indicating more severe symptomatology.

Psychological distress. The Kessler Psychological Distress Scale (K6) was used to assess the severity of general psychological distress in the past 30 days through six Likert scale questions ranging from 0 (all of the time) to 4 (none of the time).^{24,25} The K6 has demonstrated strong psychometric properties across many different clinical populations and has been adapted and validated for Portuguese-speaking populations.^{26,27} Total scores on the K6 range from 0 to 24. Psychological distress was examined as a continuous variable, with higher scores indicating more severe distress.

Moderate- to high-risk tobacco and other illicit drug use. The ASSIST also measured moderate- to high-risk use of tobacco and any illicit drug use other than cannabis (i.e., ecstasy, inhalants, amphetamines, crack/cocaine, and sedatives/hypnotics) in the past 3 months. College students were dichotomized according to substance use severity: no or mild use (0 to 3) and moderate- to high-risk use (≥ 4).¹⁸

Sociodemographic and academic characteristics. Age, sex, race, religion, employment, marital status, university region, academic performance, area of study, and socioeconomic status (SES). University region was a categorical variable, divided into the following groups: north, northeast, south, southeast, and midwest. Academic performance was dichotomized into conditional pass (at least one failed class/below average class performance) or satisfactory overall performance. Area of study was coded as a three-level variable: Biological/Health Sciences (i.e., Physical Education, Nursing, Pharmacy, Medicine, Biology, Psychology, Public Health) Exact Sciences (i.e., Physics, Chemistry, Geosciences, Mathematics), and Humanities (i.e., Communications, Architecture, Education, Law, Art, Business, Philosophy). SES was measured according to the Brazilian Association of Research Companies (ABEP) Economic Classification Criteria (<http://www.abep.org/criterio-brasil>), which determine SES based on personal assets and possessions (e.g., home ownership, motor vehicle, television, washing machine, etc.). Composite scores range from 1.5 to 33.5, with higher scores indicating higher SES.²⁸

Statistical analysis

All analyses were performed using SPSS version 27 and were weighted and adjusted for the complex survey design. Bivariate statistics were used to indicate potential differences in sociodemographic characteristics, mental health, and moderate- to high-risk substance use according to athlete status (i.e., non-athlete, recreational athlete, or varsity athlete) using chi-square or analysis of variance (ANOVA) tests for categorical and continuous variables, respectively. For each outcome (moderate- to high-risk alcohol and cannabis use), separate binary logistic regression models were then fit adjusted for variables associated ($p < 0.05$) with athlete status in bivariate analyses; these variables included age, sex, race, SES, religion, marital status, employment, university region, area of study, psychological distress, and depressive symptoms. We present adjusted odds ratios with 95% confidence limits. All analyses used non-athletes as the designated reference group.

Ethics statement

This study was approved by the Universidade de São Paulo (USP) School of Medicine Ethics Committee.

Results

Sample characteristics

The mean age of the sample ($n=12,711$) was 25.77 years (95% confidence interval [95%CI] 23.36-28.19), and the majority of participants were female (56.9%), White (62.3%), Catholic (50.0%), single (75.7%), and employed (60.1%). Over 25% of the sample attended a university in the northeast region. Nearly half (48.1%) of participants studied humanities and most (87.7%) achieved satisfactory academic performance. The participants' mean score

was 4.61 (95%CI 4.49-4.73) on the K6 and 6.34 (95%CI 5.98-6.71) on the BDI-II. Approximately 17.0, 43.2, 5.9, and 6.7% reported moderate- to high-risk use of tobacco, alcohol, cannabis, and any other illicit drug, respectively. Over half (54.1%) of the participants were recreational athletes; only 3.2% (n=416) of the participants were varsity athletes. Approximately 67.6 and 10.7% of varsity athletes reported moderate- to high-risk alcohol and cannabis use, respectively.

Bivariate associations between sociodemographic characteristics, mental health, substance use, and athlete status

There were significant associations between athlete status and age ($p < 0.001$), SES ($p < 0.0001$), and depressive symptoms ($p < 0.001$). Varsity athletes were younger, had higher SES, and reported fewer depressive symptoms than non-athletes or recreational athletes.

The distribution of athlete status groups differed by sex ($p < 0.0001$), race ($p < 0.001$), religion ($p < 0.001$), marital status ($p < 0.0001$), employment ($p = 0.013$), region ($p < 0.0001$), and area of study ($p < 0.0001$). Varsity athletes were more likely to be male, Black, single, unemployed, without a religion, were enrolled in a university in the Midwest region, and studied biological/health sciences. Varsity athletes were also more likely to engage in moderate- to high-risk alcohol ($p < 0.0001$) and cannabis ($p < 0.001$) use than non-athletes or recreational athletes (Table 1).

Adjusted association between athlete status and moderate- to high-risk alcohol use

Prior to covariate adjustment, varsity athletes (OR = 3.43, 95%CI 1.86-6.32) had greater odds of moderate- to high-risk alcohol consumption than non-athletes. The overall logistic regression examining the association between athlete status and moderate- to high-risk alcohol use was significant ($\chi^2 [24] = 80.03$, $p < 0.0001$) and explained 15.8% of the outcome variance. After adjusting for all other variables in the model, varsity athletes had greater odds of moderate- to high-risk alcohol consumption than non-athletes (adjusted odds ratio [aOR] 2.02, 95%CI 1.08-3.78; Table 2).

Adjusted association between athlete status and moderate- to high-risk cannabis use

Prior to covariate adjustment, varsity athletes (OR = 2.57, 95%CI 1.05-6.28) had greater odds of moderate- to high-risk cannabis use than non-athletes. The overall logistic regression examining the association between athlete status and moderate- to high-risk alcohol use was significant ($\chi^2 [24] = 87.78$; $p < 0.0001$), and explained 25.8% of the outcome variance. After adjusting for all other variables in the model, the relationship between varsity athlete status and moderate- to high-risk cannabis use was attenuated and became non-significant (aOR = 1.36, 95%CI 0.49-3.78; Table 3).

Discussion

This is the first study to examine the prevalence and correlates of moderate- to high-risk substance use among varsity college athletes in a middle-income country. Our findings demonstrated that Brazilian varsity athletes had greater odds of engaging in moderate- to high-risk alcohol use than non-athletes. Varsity athletes also had the highest rates of moderate- to high-risk cannabis use, though this relationship was attenuated after accounting for sociodemographic and mental health characteristics. These results suggest that features specific to Brazilian varsity athletics may influence alcohol use patterns in this group, while cannabis use may be more attributable to personal characteristics, irrespective of varsity athlete lifestyle.

Over 67% of varsity college athletes engaged in moderate- to high-risk alcohol use, and this group had a 2-fold greater likelihood of moderate- to high-risk alcohol use than non-athletes. The rate of moderate- to high-risk alcohol use among varsity athletes in this study is considerably higher than that observed among other populations of varsity and professional athletes.^{7,29-30} This could be due to the high proportion of men in the group, since male college athletes consume more alcohol than their female counterparts.³¹ Aspects of college athlete lifestyle may also influence alcohol use in this group. Specifically, the athletes in this study may consume alcohol to enhance socialization and improve team cohesion.⁶ In Brazil, intercollegiate sports competitions frequently occur on weekends. Following sporting events, athletes from the participating universities socialize at parties, breweries, and bars.³² This phenomenon is particularly notable in soccer, which is the most popular sport in Brazil and is more associated with alcohol use than other sports.³³ Moreover, these athletes may also be consuming alcohol to strengthen athletic identity, alleviate performance anxiety, or reduce stressors associated with participation in varsity sports.³⁴ It is also possible that varsity athletic involvement and alcohol use share etiological characteristics such as poorer body image, peer acceptance, social connectedness, self-esteem, and certain personality traits.³⁵ However, we did not assess this information, and although we controlled for many variables that could confound the relationship between varsity athlete status and moderate- to high-risk alcohol use, the cross-sectional design of this study limited our ability to assess whether participation in varsity athletics predicts alcohol use.

Varsity athletes also had a higher rate of moderate- to high-risk cannabis use (10.7%) than recreational athletes (8.4%) and non-athletes (4.5%). This contrasts with the findings of previous U.S. studies that cannabis use is less prevalent among varsity college athletes than their non-athlete peers.^{9,36} Despite the elevated rate of moderate- to high-risk cannabis use among varsity athletes in this sample, the association between varsity athlete status and moderate- to high-risk cannabis use was attenuated after adjusting for sociodemographic characteristics. Specifically, higher SES was associated with greater odds of moderate- to high-risk cannabis use, while being

Table 1 Sociodemographic characteristics, mental health, and substance use by athlete status (n=12,711)

Variables	Non-athlete (n=7,978) % or M (95%CI)	Recreational athlete (n=4,317) % or M (95%CI)	Varsity athlete (n=416) % or M (95%CI)	Total (n=12,711) % or M (95%CI)	Test statistic [†]	p-value
Sociodemographic characteristics						
Age (16-84)	26.38 (23.85-28.91)	24.82 (22.60-27.05)	21.76 (29.92-22.60)	25.77 (24.12-28.78)	60.93	< 0.0001
Sex					788.48	< 0.0001
Male	37.4	57.4	79.6	43.1		
Female	65.3	42.6	20.4	56.9		
Race					57.26	< 0.001
White	60.5	66.4	51.3	62.3		
Black	7.4	4.5	11.1	6.5		
Biracial	25.7	22.6	27.0	24.7		
Asian	1.8	3.6	2.9	2.5		
Other	4.5	2.9	7.8	4.1		
Socioeconomic status [‡]	20.89 (20.36-21.43)	22.86 (21.97-23.75)	23.27 (21.37-25.16)	21.60 (20.92-22.28)	209.56	< 0.0001
Religion					77.74	< 0.001
None	15.2	13.8	22.6	14.9		
Catholic	46.9	56.0	49.4	50.0		
Spiritist	9.6	7.9	3.5	8.9		
Evangelical	19.4	14.1	6.7	17.4		
Other	8.9	8.1	17.8	8.8		
Marital status					141.74	< 0.0001
Single	72.3	81.1	94.4	75.7		
Married	22.9	15.5	5.4	20.1		
Divorced/widowed/separated	4.8	3.3	0.2	4.2		
University region					143.39	< 0.0001
North	20.4	14.7	10.8	18.1		
Northeast	25.8	24.2	22.1	25.2		
South	17.4	22.8	16.6	19.2		
Southeast	19.9	20.4	23.1	20.2		
Midwest	16.4	17.9	27.4	17.3		
Employment					8.72	0.013
Unemployed	40.1	39.4	40.7	39.9		
Any employment	59.9	60.6	59.3	60.1		
Academic performance					0.906	0.636
Conditional pass	11.3	13.5	20.6	12.3		
Satisfactory	88.7	86.5	79.4	87.7		
Area of study					202.14	< 0.0001
Biological/health sciences	24.3	26.1	47.8	25.7		
Exact sciences	24.0	30.4	27.2	26.2		
Humanities	51.6	43.5	27.2	48.1		
Mental health						
Psychological distress [§]	4.88 (4.78-4.99)	4.12 (3.76-4.49)	4.32 (3.65-4.99)	4.61 (4.49-4.73)	23.42	< 0.001
Depressive symptoms	6.52 (6.22-6.83)	6.08 (5.35-6.81)	5.70 (4.68-6.72)	6.34 (5.98-6.71)	25.95	< 0.001
Moderate- to high risk substance use ^{¶,††}						
Tobacco	16.3	18.4	14.0	17.0	1.16	0.558
Alcohol	37.8	52.1	67.6	43.2	204.54	< 0.0001
Cannabis	4.5	8.4	10.7	5.9	46.01	< 0.001
Other illicit drugs ^{‡‡}	6.3	7.4	4.3	6.7	0.052	0.974

M = mean.

Bold values indicate $p < 0.05$.[†] Chi-square value for categorical predictors and F-value for continuous predictors.[‡] Continuous measure from 1.5-33.5; higher values indicate higher socioeconomic status.[§] The Kessler 6 is a continuous measure from 0-24; higher values indicate more severe psychological distress over the past 30 days.^{||} The Beck Depression Inventory-2 is a continuous measure from 0-63; higher values indicate more severe depressive symptoms over the past two weeks.[¶] Moderate- to high-risk substance use in the past 3 months.^{††} The Alcohol, Smoking and Substance Involvement Screening Test assessed moderate- to high risk substance use, which was defined as a score of ≥ 11 for alcohol and ≥ 4 for cannabis, tobacco, and other illicit drugs.^{‡‡} Includes ecstasy, inhalants, amphetamines, crack/cocaine, and sedatives/hypnotics.

female, Black or biracial, religious, and married all reduced the likelihood of engaging in moderate- to high-risk cannabis use. Previous literature suggests that use is influenced by factors separate from athlete lifestyle.³⁷ Specifically, cannabis use in Brazilian adolescents and young adults is associated with academic, personality, socioeconomic, and cultural factors,³⁷⁻³⁹ and these

characteristics could have a stronger influence on cannabis use among Brazilian varsity college athletes than athletic factors.

In the U.S., annual college sports revenue exceeds 18 billion dollars, which has implications for varsity athletes.¹⁴ To promote high athletic achievement and the well-being of athletes, U.S. athletic departments deploy

Table 2 Associations between athlete status and moderate- to high-risk alcohol use (n=12,711)

Variables	OR (95%CI)	aOR (95%CI) [†]
Athlete status		
Non-athlete	Ref	Ref
Recreational athlete	1.79 (1.29-2.47)	1.37 (0.89-2.13)
Varsity athlete	3.43 (1.86-6.32)	2.02 (1.08-3.78)
Age	0.98 (0.97-1.00)	0.99 (0.98-1.02)
Sex		
Male	Ref	Ref
Female	0.49 (0.44-0.56)	0.61 (0.48-0.78)
Race		
White	Ref	Ref
Black	0.59 (0.37-0.94)	1.08 (0.54-2.18)
Biracial	0.84 (0.68-1.04)	1.00 (0.81-1.23)
Asian	1.05 (0.70-1.55)	1.06 (0.61-1.86)
Other	0.75 (0.40-1.38)	0.77 (0.31-1.87)
Socioeconomic status [‡]	1.08 (1.06-1.10)	1.07 (1.05-1.09)
Religion		
None	Ref	Ref
Catholic	0.63 (0.53-0.74)	0.69 (0.55-0.87)
Spiritist	0.86 (0.67-1.11)	0.92 (0.64-1.31)
Evangelical	0.18 (0.12-0.29)	0.26 (0.19-0.34)
Other	0.78 (0.36-1.65)	0.68 (0.31-1.49)
Marital status		
Single	Ref	Ref
Married	0.61 (0.46-0.83)	0.87 (0.61-1.24)
Divorced/widowed/separated	1.39 (0.98-1.97)	1.17 (0.65-2.09)
Employment		
Unemployed	Ref	Ref
Any employment	1.16 (0.96-1.40)	1.15 (1.04-1.28)
University region		
North	Ref	Ref
Northeast	1.35 (1.01-1.83)	1.08 (0.66-1.76)
South	2.05 (1.51-2.77)	1.31 (0.77-2.26)
Southeast	1.52 (1.02-2.25)	1.69 (1.02-2.81)
Midwest	1.65 (1.22-2.21)	1.25 (0.76-2.01)
Area of study		
Humanities	Ref	Ref
Biological/health sciences	0.85 (0.64-1.14)	0.86 (0.61-1.22)
Exact sciences	1.31 (0.96-1.78)	0.75 (0.55-1.03)
Psychological distress [§]	1.03 (1.01-1.05)	1.35 (1.11-1.65)
Depressive symptoms	1.03 (1.02-1.04)	1.03 (1.02-1.04)

95%CI = 95% confidence interval, aOR = adjusted odds ratio; OR = odds ratio.

Bold values indicate statistical significance at $p < 0.05$.

[†] Model included athlete status, age, sex, race, socioeconomic status, religion, marital status, employment, university region, area of study, psychological distress, and depressive symptoms.

[‡] Continuous measure from 1.5-33.5; higher values indicate higher socioeconomic status.

[§] The Kessler 6 is a continuous measure from 0-24; higher values indicate more severe psychological distress over the past 30 days.

^{||} Beck Depression Inventory-2 (BDI-II) is a continuous measure from 0-63; higher values indicate more severe depressive symptoms over the past two weeks.

rigorous drug testing programs and mental health services for their student-athletes, which may lead to lower substance use.^{40,41} Varsity college athletes in the U.S. are highly encouraged to engage in health-promoting behaviors, which may also deter substance use. The less rigorous athletic demands for Brazilian college athletes may influence their use of alcohol and cannabis. This idea is supported by research results that college athletes in less competitive environments (i.e., U.S. Division III) have higher rates of substance use than those involved in more intense competition (i.e., U.S. Division I).⁹ Consequently, the findings of the present study are likely more generalizable to college athletes in countries where the level of sports competitiveness is similar to that of Brazilian college athletics.

Systematic screening, assessment, and brief interventions for substance use and substance-related problems

would likely benefit the health and athletic performance of Brazilian college athletes.⁴² The use of team-integrated mental health clinicians is particularly effective for pre-season screening and early detection of substance misuse and the psychiatric symptoms that can precipitate them.⁴³ Behavioral and pharmacological interventions for alcohol use may enhance athletic performance by improving sleep, injury recovery, and academic standing, which is particularly important for college athletes who must maintain their eligibility.⁴⁴ Brief supportive and psychoeducational interventions might also lower cannabis use among the varsity athletes in this sample.⁴⁵

This study has certain limitations. First, due to the cross-sectional design, we cannot determine the temporality of the observed relationships or other characteristics that precipitate participation in varsity sports or substance use. Second, athlete status was determined via self-

Table 3 Associations between athlete status and moderate- to high-risk cannabis use (n=12,711)

Variables	OR (95%CI)	aOR (95%CI) [†]
Athlete status		
Non-athlete	Ref	Ref
Recreational athlete	1.97 (1.20-3.23)	1.59 (0.94-2.71)
Varsity athlete	2.57 (1.05-6.28)	1.36 (0.49-3.78)
Age	0.94 (0.92-0.96)	1.02 (0.97-1.07)
Sex		
Male	Ref	Ref
Female	0.41 (0.31-0.55)	0.47 (0.23-0.99)
Race		
White	Ref	Ref
Black	0.08 (0.04-0.19)	0.22 (0.07-0.62)
Biracial	0.31 (0.21-0.47)	0.48 (0.18-1.26)
Asian	0.30 (0.08-1.08)	0.20 (0.03-1.55)
Other	1.64 (0.49-5.39)	1.25 (0.42-3.69)
Socioeconomic status [‡]	1.13 (1.06-1.20)	1.09 (1.04-1.16)
Religion		
None	Ref	Ref
Catholic	0.26 (0.17-0.39)	0.23 (0.15-0.35)
Spiritist	0.41 (0.24-0.70)	0.13 (0.03-0.54)
Evangelical	0.04 (0.01-0.13)	0.09 (0.03-0.24)
Other	0.60 (0.34-1.06)	0.49 (0.29-0.84)
Marital status		
Single	Ref	Ref
Married	0.29 (0.17-0.50)	0.27 (0.12-0.55)
Divorced/widowed/separated	0.37 (0.05-2.47)	0.15 (0.02-1.45)
Employment		
No employment	Ref	Ref
Any employment	1.15 (0.60-2.20)	1.05 (0.36-3.05)
University region		
North	Ref	Ref
Northeast	0.97 (0.34-2.74)	0.92 (0.29-2.96)
South	2.61 (0.95-7.20)	2.72 (0.96-7.75)
Southeast	2.49 (0.90-6.91)	2.59 (0.87-7.71)
Midwest	2.01 (0.77-5.26)	2.15 (0.70-6.55)
Area of study		
Humanities	Ref	Ref
Biological/health sciences	0.55 (0.19-1.57)	0.79 (0.22-2.77)
Exact Sciences	0.86 (0.49-1.50)	1.01 (0.26-3.95)
Psychological distress [§]	1.00 (0.95-1.05)	1.19 (0.88-1.63)
Depressive symptoms	1.03 (1.01-1.07)	1.05 (0.98-1.11)

95%CI = 95% confidence interval, aOR = adjusted odds ratio; OR = odds ratio.

Bold values indicate statistical significance at $p < 0.05$.

[†] Model included athlete status, age, sex, race, socioeconomic status, religion, marital status, employment, university region, area of study, psychological distress, and depressive symptoms.

[‡] Continuous measure from 1.5-33.5; higher values indicate higher SES.

[§] The Kessler 6 is a continuous measure from 0-24; higher values indicate more severe psychological distress in the past 30 days.

^{||} The Beck Depression Inventory-2 is a continuous measure from 0-63; higher values indicate more severe depressive symptoms over the past two weeks.

report and participation in specific sports was not assessed. Third, since this was a sample of Brazilian university students, the findings may not be generalizable to college athletes from other countries or to professional athletes. Fourth, data from this study were collected in 2009; substance use patterns among Brazilian college students may have changed since then. Furthermore, no data was obtained about the perception of cannabis as risky. Considering that the legalization/decriminalization of cannabis is proliferating in many other South American countries, including Argentina, Chile, and Colombia, Brazilian university students may be more exposed to liberal attitudes about cannabis use via media outlets and online social networks, potentially leading to increased use. Further studies are necessary to examine this issue. This may be particularly salient for college athletes, who had the

highest rates of moderate- to high-risk cannabis use in this study and perceived less risk associated with cannabis use than non-athletes.⁴⁶ Fifth, information on pain or physical function was not collected and, thus, could not be examined as a possible confounder. Despite these limitations, this study has several important strengths. These include use of the ASSIST, a valid and comprehensive measure of current (past 3 months) substance use and related problems. Furthermore, this large, national stratified probability sample was powered to control for many possible confounders of the relationship between varsity athlete status and moderate- to high-risk substance use. Finally, we were able to compare substance use among varsity athletes to that of recreational athletes and non-athletes, a major improvement over most studies of college athletes, which do not include groups for direct comparison.

In conclusion, this study examined the association between varsity athlete status and moderate- to high-risk alcohol and cannabis use among Brazilian college students. In most sports, U.S. varsity college athletes use alcohol and cannabis at lower rates than the general population.⁶ However, the results from this study indicate an opposite trend: Brazilian varsity athletes had higher rates of alcohol and cannabis use than recreational athletes and non-athletes. Future research involving Brazilian varsity athletes would benefit from longitudinal designs to examine the onset (i.e., incidence) of substance misuse and the course and resolution of its consequences. Future research should also evaluate the rates of substance use among varsity college athletes from other middle- and low-income countries. This is particularly important for determining the influence of varying athletic environments on substance use behaviors among athletes.

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Disclosure

The authors report no conflicts of interest.

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