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Problematic cannabis use in student athletes and non-athletes: associations with mental health

BACKGROUND
Cannabis is the most widely used illicit substance, and young adults exhibit the highest prevalence of use in the United States. College athletes represent a unique subgroup where cannabis use may intersect with mental health outcomes differently than in non-athletes. This study investigated cannabis-related problems and mental health difficulties among college student athletes and non-athletes.

PARTICIPANTS AND PROCEDURE
497 participants from a Pacific Northwest university, including 183 athletes and 314 non-athletes, completed self-report measures assessing depression (Patient Health Questionnaire-9; PHQ-9), anxiety (Generalized Anxiety Disorder-7; GAD-7), and substance use problems (Cutting down, Annoyance by criticism, Guilty feeling, and Eye openers Adapted to Include Drugs; CAGE-AID). Statistical analyses included chi-square tests to compare cannabis-related problems between athletes and non-athletes and 2 × 2 analysis of variance to test interaction effects between athlete status and cannabis-related problems on mental health outcomes.

RESULTS
Non-athletes reported significantly more cannabis-related problems than athletes. Individuals with cannabis-related problems reported higher levels of depression and anxiety than those who did not report such problems. Likewise, non-athletes reported higher levels of depression and anxiety than athletes.

CONCLUSIONS
The findings suggest that athlete status may be protective against cannabis-related problems, but further longitudinal studies are needed to understand the directionality between cannabis-related problems and mental health symptoms among both athletes and non-athletes.

KEY WORDS
athletes; college students; cannabis

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BACKGROUND

CANNABIS USE IN YOUNG ADULTS

Cannabis is the most widely used illicit substance, and young adults show the highest prevalence of cannabis use in the United States (Patrick et al., 2024). According to the Monitoring the Future study, past-year cannabis use among young adults aged 19 to 30 remained at historic highs in 2023, with 42.4% of young adults reporting cannabis use in the previous year, reflecting a substantial increase from 30.8% in 1988 (Patrick et al., 2024). Most strikingly, daily use, (defined as using cannabis on 20 or more occasions in the last 30 days) increased from 3.3% in 1988 to 10.4% in 2023, which highlights a significant upward trend in cannabis consumption among young adults over the past three decades (Patrick et al., 2024). This rise in young adult cannabis use may be attributed to the increasing number of U.S. states that have legalized its recreational use (Athanassiou et al., 2023; Hopfer, 2014; Pawar et al., 2024), which has provided greater access to cannabis and reduced stigma around its use (Hall & Lynskey, 2020). Experts also warn that decriminalization may be a risk factor for future increases in youth cannabis use and acceptance (Midgette & Reuter, 2020). Increasing cannabis use among youth is concerning, as research indicates that weekly cannabis use is a significant risk factor for problematic use, which typically peaks during young adulthood (Leung et al., 2020; Swift et al., 2008). Although there is no clear consensus on what defines problematic use, previous research suggests that greater weekly use and higher scores on the Cannabis Abuse Screening Test, which can signal more psychological, cognitive, and interpersonal problems, are often used to assess risky use (Casajuana et al., 2016). In particular, problematic cannabis use, such as higher frequency of cannabis use, has been associated with academic difficulties, engagement in delinquent activities, and future mental health issues, including externalizing (attention-deficit hyperactivity, conduct, and oppositional) disorders, as well as internalizing problems (depression, anxiety, and suicidal behavior) (Fergusson et al., 2003; McGee et al., 2000; Rocca et al., 2019; Sanz-Pérez et al., 2026). Thus, given the escalating trends and broad societal and health ramifications, understanding the consequences of cannabis use among young adults is crucial for developing effective public health strategies for prevention and intervention.

CANNABIS USE IN ATHLETES

One population where cannabis use is prevalent among a high number of young adults is athletes, which encompasses individuals across a wide range of athletic levels and experience (Docter et al., 2020; Zeiger et al., 2019a, 2019b). A study that included a broad spectrum of athletes, from adolescents to professional athletes, indicated that approximately 26% of athletes used cannabis (in the past two weeks) for both medical and recreational purposes, highlighting its prevalence within this community (Zeiger et al., 2019a). Although difficult to compare due to differences in time frames, this rate is similar to the 29% of young adults and higher than the 19% of middle-aged adults who report past month cannabis use in the U.S. (Patrick et al., 2024). A systematic review of over 46,000 athletes reported similar findings, such that nearly a quarter of athletes reported using cannabis in the past year (Docter et al., 2020). While there is lack of evidence that cannabis use enhances athletic performance (Ware et al., 2018), there is still a considerable proportion of athletes who report cannabis use across several sports and geographic locations. In particular, cannabis use is more common among individuals who engage in high-risk sports such as ice hockey and sliding sports such as bobsledding (Brisola-Santos et al., 2016; Peretti-Watel et al., 2003; Ware et al., 2018). Furthermore, a systematic review of cannabis use among athletes indicated that it is the second most popular substance of choice, following alcohol (Brisola-Santos et al., 2016). A concerning statistic is that younger athletes (21-29 years) demonstrate some of the highest engagement with cannabis use, such that 33.3% report using both tetrahydrocannabinol and cannabidiol (CBD) for recreational and medical purposes (Zeiger et al., 2019a). In contrast, cannabis use is significantly lower among older athletes, with 22.0% of those aged 50-59 and 19.2% of those aged 60 and older reporting use. These athletes primarily favor CBD oil and tinctures for medical purposes. Additionally, in this same study, 26.2% of younger athletes reported using cannabis within one hour before the start of their exercise to enhance focus and 33.2% after exercise to aid with recovery. In comparison, older athletes showed significantly less use during these time periods, focusing on recovery, pain management, and sleep enhancement after exercise (Zeiger et al., 2019a). This indicates that cannabis use is present within young adult athletes at a significant rate, which is concerning as it has been associated with negative impacts on athletic performance and overall (gastrointestinal, cardiovascular, mental) health (Benoy et al., 2024). This suggests that athletes who report using cannabis may also experience more self-reported problems associated with cannabis use in several domains relative to non-athletes.

CANNABIS USE IN COLLEGE ATHLETES

In recent years, the prevalence of cannabis use among college athletes has emerged as a significant topic

of interest with implications for mental health and overall well-being. A survey study indicated that up to 24% of college athletes have used cannabis within the last year, reflecting a concerning trend in substance use among this demographic (NCAA, 2018). In a Brazilian study, varsity athletes reported the highest rate of risky cannabis use (10.7%), followed by recreational athletes (8.4%), and non-athletes (4.5%) (Mannes et al., 2022). Recent data based on sex and athletic participation indicated that both male and female athletes tend to use cannabis more infrequently than their non-athlete peers, who report higher rates of daily cannabis use (Buckman et al., 2011). Higher prevalence of past, occasional, and frequent cannabis use has also been reported in college student non-athletes compared to athletes (Charest et al., 2021). Despite lower prevalence in the frequency of cannabis use among college athletes than non-athletes, it is unclear whether there are differences in the prevalence of experiencing problems related to cannabis use between these groups. Furthermore, cannabis use is related to mental health symptoms that may differ between athletes and non-athletes. For example, use of cannabis in male athletes, particularly during their competitive season, has been associated with higher levels of anxiety and other mental health symptoms. These athletes also report greater negative mood disturbances and higher coping motivations for use (Buckman et al., 2011), in line with other research indicating higher self-reported depression among athletes with cannabis use compared to non-users (Benoy et al., 2024; Wilson et al., 2021). Thus, there is a critical need to better understand mental health outcomes for student athletes who do and do not report problematic cannabis use and determine whether the negative consequences may be greater for this demographic compared to those observed in non-athletes.

CANNABIS USE AND MENTAL HEALTH IN ATHLETES

Cannabis use may increase the risk of anxiety and depression among college athletes (Kilmer, 2019). Furthermore, cannabis use has been linked to an increased risk of depression, especially when use starts during adolescence, a critical period of brain development (Gobbi et al., 2019). Increased anxiety is also associated with cannabis use in some individuals, especially when taken at high doses (Beletsky et al., 2024). Several studies indicate a high incidence of co-occurring mental health symptoms, including depression and anxiety, particularly among male athletes reporting current cannabis use (Buckman et al., 2011). In a detailed examination of mental health among college athletes, there were notable differences in anxiety and depression symptoms between cannabis users and non-users. For male college athletes, cannabis users exhibited higher symptoms of anxiety and depression compared to their non-using athlete peers. Interestingly, among female athletes, those who used cannabis reported lower anxiety and depression symptoms than female athletes who did not use cannabis (Buckman et al., 2011). In contrast, in a more recent study, female university athletes who reported cannabis use had elevated rates of self-reported depression compared to non-users (Wilson et al., 2021). Another study indicated that anxiety related to athletic participation among college student athletes was significantly related to cannabis use (Knettel et al., 2021). Thus, student athletes may use cannabis as a coping mechanism related to the stress of college athletics participation (Williams et al., 2022).

Recent findings show that varsity student athletes experience high rates of mental health issues. Specifically, 64.5% and 62.9% reported elevated anxiety and depression symptoms, respectively, and over a quarter of these athletes met the clinical threshold for generalized anxiety disorder, while 14.5% of them met the clinical threshold for depression (Moore et al., 2025). Additionally, nearly half of these athletes scored in the range of problem use for cannabis and other substances (Moore et al., 2025). These mental health symptoms were elevated for in-season athletes when academic and athletic demands are at their peak (Moore et al., 2025). Taken together, these findings provide growing evidence of problematic substance use and concerning mental health symptoms in college athletes. Despite this evidence, Williams et al. (2022) noted that no studies have investigated cannabis-related problems (as assessed via self-reported problems related to use) among university athletes, nor had any studies examined the relationships of problematic use with self-reported mental health symptoms. This research is needed to better understand current substance use problems in college student athletes during a time when young adult cannabis use rates are at an all-time high and may be related to mental health difficulties.

STUDY AIMS AND HYPOTHESES

Based on significant evidence of negative mental health symptoms associated with problematic cannabis use in the general population, and growing evidence of hazardous substance use in college athletes, the current study aimed to further investigate problematic cannabis use and mental health in college student athletes and non-athletes. Thus, the first aim of this study was to determine whether college athletes report more cannabis use-related problems compared with non-athletes. The second aim of the study was to examine whether problems related to

cannabis use among athletes are associated with the presence of greater mental health difficulties compared to athletes who do not report problematic cannabis use and non-athletes. First, based on the potential for more significant consequences of cannabis use for student athletes across several domains that could negatively impact overall health, athletic and academic performance (Benoy et al., 2024; Parisi et al., 2019), we hypothesized that college student athletes would report a higher frequency of problems related to cannabis use than non-athletes. Second, we hypothesized an interaction, such that student athletes who report recent problematic cannabis use would have significantly higher levels of self-reported depression and anxiety relative to student athletes with no problematic cannabis use and non-athletes with and without problematic cannabis use.

PARTICIPANTS AND PROCEDURE

PARTICIPANTS

A total of 497 (183 student athletes, 314 non-athletes) participants were recruited from a Pacific Northwest Division I public university in the United States for the Pac-12 Mental Health Coordinating Unit parent study (Taylor et al., 2023). Participants completed informed consent, demographic questions and three mental health questionnaires to assess depression, anxiety, and substance use via the Research Electronic Data Capture (REDCap) system (Harris et al., 2009, 2019). Student athletes completed their assessments through REDCap as part of their mandatory annual fall pre-participation evaluations. Athletes were asked whether they consented to have their data used for research purposes. They were asked to sign a consent form if they agreed to participate. Only athletes who signed the consent form for their data to be used for research purposes were included in this study. As part of this process, they filled out a modified version of the International Olympic Committee Sport Mental Health Assessment Tool for a study examining the internal consistency of these measures in a college student sample (Taylor et al., 2023) and provided consent for using their de-identified data. Non-athletes were recruited separately through the SONA system, a psychology subject pool. Participation for both student athletes and non-athletes was voluntary; however, only non-athletes received compensation in the form of one credit hour. For the aims of the current study investigating problems related to cannabis use and mental health in college student athletes, three questionnaires examining self-reported anxiety, depression, and substance use were selected from the available data. All study procedures were approved by the University of Arizona multi-site Institutional Review Board (IRB# 2006751691).

MEASURES

The Generalized Anxiety Disorder-7 (GAD-7; Spitzer et al., 2006) is a 7-item questionnaire designed to assess symptoms of generalized anxiety disorder. The questions address various symptoms of anxiety including nervousness, uncontrollable worry, excessive worrying, difficulty relaxing, restlessness, irritability, and fear of something awful happening. The questionnaire evaluates how frequently participants have experienced these symptoms over the past two weeks. The responses are scored on a scale from 0 (*not at all*) to 3 (*nearly every day*), allowing for the range of scores to be between 0 and 21. Higher scores correspond to more severe anxiety than lower scores. A score of 10 or above is perceived as the threshold for identifying moderate to severe anxiety. Cronbach's α for the GAD-7 was .92 in the current sample.

The Patient Health Questionnaire-9 (PHQ-9) is a 9-item questionnaire that measures the frequency of depressive symptoms experienced over the past two weeks (Kroenke et al., 2001). Each item on the PHQ-9 corresponds to a core symptom of depression outlined in the DSM-IV, including loss of interest, feeling down, sleeping trouble, fatigue, appetite, feelings of worthlessness, difficulty concentrating, physical restlessness/slowness, and thoughts of self-harm or suicide. The responses are scored on a scale from 0 (*not at all*) to 3 (*nearly every day*), allowing scores to range from 0 to 27. Higher scores indicate more severe levels of depression, with score thresholds often set as follows: 5 (mild depression), 10 (moderate depression), 15 (moderately severe depression), and 20 or above (severe depression). Cronbach's α for the PHQ-9 was .90 in the current sample.

The Cutting down, Annoyance by criticism, Guilty feeling, and Eye openers Adapted to Include Drugs (CAGE-AID) questionnaire is a brief measure designed to help identify potential problems associated with substance use (Brown & Rounds, 1995). Each question addresses a different category of substance use concerns, including feeling the need to cut down on use, feeling annoyed by criticism about use, experiencing guilt about use, and using substances first thing in the morning. Each item has only two answer choices, yes (1) or no (0), with a score of 2 or more typically suggesting the need for further assessment for a possible substance use disorder. After participants complete the first four items of the questionnaire, they have optional items for which they are asked, "In the last 3 months, which drug(s) or substance(s) listed below caused concerns or problems in your life?" They can check all substances that apply. For this particular study, we examined whether cannabis or marijuana (flower) was checked, comparing responses between athletes and non-athletes to assess whether participants endorsed cannabis-related

problems. Cronbach's α for the CAGE-AID was .78 in the current sample.

STATISTICAL ANALYSIS

SPSS (IBM SPSS Statistics, Version 29) was used to perform statistical analyses for the current study. For Aim 1, a chi-square test was used to examine whether athletes and non-athletes significantly differed in reporting recent problems related to cannabis use. This was conducted by comparing participants who reported problems vs. no problems for the optional item related to cannabis (marijuana flower) use on the CAGE-AID measure. For Aim 2, a 2 × 2 analysis of variance (ANOVA) was performed to determine whether there were interaction effects between athlete status (athlete vs. non-athlete) and the report of cannabis-related problems (problems vs. no problems) on mental health outcomes. Specifically, this analysis examined whether depression and anxiety symptoms differed based on the interaction between athlete status (athlete vs. non-athlete) and cannabis-related problems (presence vs. absence).

RESULTS

PARTICIPANT DEMOGRAPHICS

Table 1 provides an overview of the demographics for athletes and non-athletes. Athletes were significantly younger, on average, than non-athletes ($U = 24958.00$, $Z = -2.49$, $p = .013$). Chi-square tests were conducted to assess other demographic group differences. There was a significantly lower percentage of females among athletes than non-athletes ($\chi^2 = 8.83$, $p = .003$), although 22 athletes did not respond to the demographic question on birth sex. The distribution of race was significantly different between athletes and non-athletes ($\chi^2 = 25.64$, $p < .001$). To better understand these differences, a post-hoc test was conducted (adjusted $p = .0042$). There was a significant difference, such that the percentage of participants who identified as Asian ($p < .001$) was significantly lower in athletes than non-athletes, and the percentage of participants who identified as Native Hawaiian and Pacific Islander was significantly higher in athletes vs. non-athletes ($p = .004$). There were no other significant racial differences between athletes and non-athletes after adjusting for multiple comparisons (all ps > .009). There was no significant group difference between the proportion of participants who identified as Hispanic or non-Hispanic ($\chi^2 = 0.56$, $p = .454$).

MAIN FINDINGS

The primary aim of the study was to investigate whether there is a significant difference in the report of cannabis-related problems between athletes and non-athletes. Chi-square analyses indicated that a greater proportion of non-athletes reported cannabis-related problems compared to athletes ($\chi^2 = 17.42$, $p < .001$; Table 2).

Table 3 includes the raw data for the PHQ-9 depression scores across athletes and non-athletes who do and do not report cannabis-related problems.

Table 1

Participant demographics by athlete status

Participant characteristic	Athlete (*n* = 183)	Non-athlete (*n* = 314)	*p*
Age (years)	20.48 (1.66)	21.94 (6.63)	.013
Birth sex (% male : female)	39.8 : 60.2	26.4 : 73.6	.003
Race, *n* (%)			< .001
White/Caucasian	147 (80.3%)	233 (74.2%)	
Black or African American	9 (4.9%)	5 (1.6%)	
Asian	9 (4.9%)	48 (15.3%)	
American Indian/Alaska Native	3 (1.6%)	5 (1.6%)	
Native Hawaiian/Pacific Islander	8 (4.4%)	2 (0.6%)	
Other	7 (3.8%)	21 (6.7%)	
Ethnicity, *n* (%)			
Not Hispanic or Latino	161 (88.0%)	283 (90.1%)	.454
Hispanic or Latino	22 (12.0%)	31 (9.9%)	

Note. *M* (*SD*), unless otherwise noted. Percentages may not sum to 100 due to rounding.

The results of the 2 × 2 ANOVA indicated both main effects of group status ($F(1, 493) = 24.58$, $p < .001$, $\eta_p^2 = .05$) and the report of cannabis-related problems ($F(1, 493) = 25.61$, $p < .001$, $\eta_p^2 = .05$) for PHQ-9 depression scores (Figure 1). Non-athletes reported higher depression symptoms than athletes regardless of reporting or not reporting problems related to cannabis use. Across all participants, those who indicated cannabis-related problems self-reported higher depression symptoms compared to those who did not indicate such problems. Contrary to the hypotheses, there was no significant interaction between athlete status and the report of cannabis-related problems for depression symptoms ($F(1, 493) = 0.00$, $p = .957$, $\eta_p^2 = .00$). Table 4 includes the raw data for the GAD-7 anxiety scores across athletes and non-athletes who do and do not report cannabis-related problems. The results of the 2 × 2 ANOVA indicated both main effects of group status ($F(1, 493) = 21.90$, $p < .001$, $\eta_p^2 = .04$) and the report of cannabis-related problems ($F(1, 493) = 17.63$, $p < .001$, $\eta_p^2 = .04$) for GAD-7 anxiety scores (Figure 2). Similar to depressive symptoms, anxiety symptoms were higher for non-athletes than for athletes. Additionally, individuals who indicated cannabis-related problems reported higher anxiety symptoms than those who did not indicate such problems. Contrary to the hypotheses, there was no significant interaction between athlete status and the report of cannabis-related problems for anxiety symptoms ($F(1, 493) = 0.12$, $p = .735$, $\eta_p^2 = .00$).

Table 2

Report of cannabis-related problems by athlete status

Report of cannabis-related problems	Athlete (n = 183)	Non-athlete (n = 314)
No	95.6%	82.8%
Yes	4.4%	17.2%

FOLLOW-UP ANALYSES

Since athletes and non-athletes significantly differed in age and sex, which may be related to problematic substance use and mental health, relationships among these variables were examined. Follow-up analyses controlling for covariates significantly related to outcome variables were conducted. Binary logistic regressions indicated that age was not significantly related to the report of cannabis-related ($p = .137$) problems. Bivariate correlations showed that age was not significantly related to PHQ-9 ($p = .650$) or GAD-7 ($p = .288$) scores. A chi-square analysis indicated that males and females did not significantly differ in the report of cannabis-related ($p = .593$) problems. However, independent samples t-tests showed that females reported significantly higher PHQ-9 ($p < .001$) and GAD-7 ($p < .001$) scores than males. Thus, birth sex was examined as a covariate in follow-up analyses. When controlling for birth sex in the 2 × 2 ANOVAs, the results remained the same, with significant main effects of group and main effects of endorsing problematic cannabis use on depression and anxiety scores.

Table 3

Mean PHQ-9 depression scores by athlete status and cannabis-related problems

Cannabis-related problems	Athlete (n = 183)			Non-athlete (n = 314)			Total	
	M	*SD*	95% CI	*M*	*SD*	95% CI	*M*	*SD*
No	2.89	4.28	2.13-3.64	7.77	5.09	7.15-8.39	5.81	5.34
Yes	7.88	6.01	4.34-11.41	12.87	7.07	11.51-14.23	12.23	7.10
All participants	3.10	4.47		8.65	5.80		6.61	5.97

Note. PHQ-9 – Patient Health Questionnaire-9.

Table 4

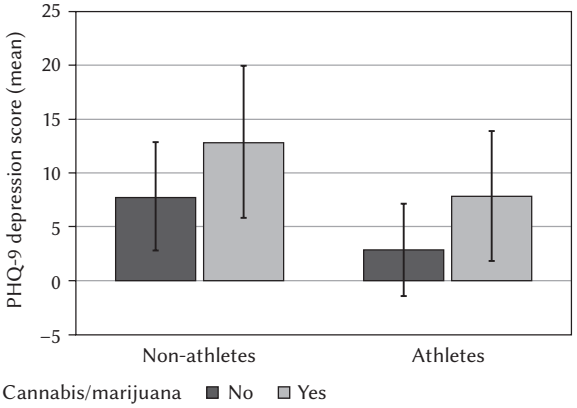
Mean GAD-7 anxiety scores by athlete status and cannabis-related problems

Cannabis-related problems	Athlete (n = 183)			Non-athlete (n = 314)			Total	
	M	*SD*	95% CI	*M*	*SD*	95% CI	*M*	*SD*
No	3.00	4.01	2.29-3.71	7.70	5.00	7.12-8.28	5.81	5.17
Yes	7.25	6.04	3.93-10.58	11.31	5.78	10.04-12.60	10.79	5.93
All participants	3.19	4.19		8.32	5.31		6.43	5.51

Note. GAD-7 – Generalized Anxiety Disorder-7.

Figure 1

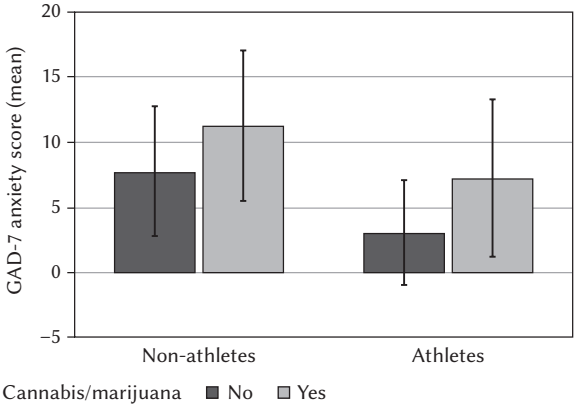
Depression levels (PHQ-9 scores) by athlete status and cannabis-related problems



Note. PHQ-9 – Patient Health Questionnaire-9. This bar graph illustrates the mean PHQ-9 depression scores based on athlete status and cannabis-related problems with error bars indicating standard deviation. There was a main effect of athlete status and cannabis-related problems for depression scores, such that non-athletes had higher levels of self-reported depressive symptoms than athletes, and individuals with cannabis-related problems had higher levels of self-reported depression than those with no such problems.

Figure 2

Anxiety levels (GAD-7 scores) by athlete status and cannabis-related problems



Note. GAD-7 – Generalized Anxiety Disorder-7. This bar graph displays mean GAD-7 anxiety scores by athlete status and cannabis-related problems with error bars representing standard deviation. There was a main effect of athlete status and cannabis-related problems for anxiety scores, such that non-athletes had higher levels of self-reported depressive symptoms than athletes, and individuals with cannabis-related problems had higher levels of self-reported anxiety than those without such problems.

DISCUSSION

Contrary to the initial hypothesis that athletes would report more cannabis-related problems due to the prevalence of cannabis use documented among athletes in prior studies (e.g., Zeiger et al., 2019a), the current results indicate that college athletes in this sample reported fewer cannabis-related problems than non-athletes. Despite research indicating that cannabis use is common among athletes (Docter et al., 2020; Zeiger et al., 2019a, 2019b), previous studies reported that the frequency of cannabis use was higher in non-athletes than athletes (Buckman et al., 2011; Charest et al., 2021). Thus, this higher frequency of use could lead to reports related to more problems of use among non-athletes. However, it is important to note that the current findings should not be interpreted as an indicator of lower rates of cannabis use among athletes, as the study did not collect data on the frequency or quantity of cannabis use, but instead only queried self-reported problems associated with substance use. While athletes reported fewer problems, whether this may be explained by lower frequency, quantity, and/or potency of cannabis use remains outside the scope of this study but should be an area for future research.

The second aim of this study indicated significant main effects of group and cannabis use problems for both depression and anxiety outcomes. These findings provide valuable insight into how athlete status and cannabis-related problems are independently associated with mental health. For depression, the results indicated that non-athletes reported higher levels of depressive symptoms compared to athletes, regardless of endorsing or not endorsing cannabis-related problems. Similarly, individuals who reported cannabis-related problems exhibited significantly higher levels of depressive symptoms compared to those who did not report such problems, regardless of athlete status. This indicates that both non-athlete status and the presence of cannabis-related problems are critical factors associated with higher depression levels. In the case of anxiety, the results mirrored those of depression. Non-athletes experienced higher anxiety symptoms than athletes, regardless of their cannabis use status. Higher levels of physical activity have been shown to reduce depression (Kandola et al., 2019) and anxiety (McDowell et al., 2019), which may serve as a protective mechanism for athletes. Furthermore, participants who reported cannabis-related problems showed significantly elevated anxiety symptoms compared to their counterparts without such issues, regardless of athlete status. These findings highlight that non-athlete status and cannabis-related problems each play a distinct and significant role in their relationship with mental health. While prior evidence suggests that cannabis use can negatively impact athletes' mental health (Benoy et al., 2024), no interaction effects were detected between group and endorsement of problematic use in either analysis. Future studies examining other cannabis use metrics (e.g., frequency, quantity,

potency) should be conducted to determine their associations with mental health symptoms and whether those relationships differ by athlete status.

IMPLICATIONS

The findings from this study underscore several important implications regarding substance use among young adults, particularly in athletes. Given the lower incidence of self-reported cannabis-related problems among athletes, student athlete status may be protective against problematic cannabis use during college, unlike alcohol use, which has been reported to be substantially elevated among college athletes (Brenner & Swanik, 2007; Martens et al., 2006; Nelson & Wechsler, 2001). Thus, future studies should continue to consider how substance use characteristics among college students may differ by athlete status, and investigate motives for using different types of substances, particularly for cannabis, which to our knowledge has only been examined in one study (Buckman et al., 2011). These are important questions, as substance use motives and problems stemming from substance use may not be uniform across commonly used substances during the college years.

STRENGTHS, LIMITATIONS, AND FUTURE DIRECTIONS

This study is among the first to explore self-reported cannabis use problems and mental health among college athletes and non-athletes, providing valuable insights into this specific demographic. This approach sets the groundwork for further investigations that could lead to targeted interventions and policies to prevent substance misuse and associated problems in college student athletes and non-athletes.

However, this study also has limitations that should be acknowledged. First, as a cross-sectional secondary data analysis, the findings are constrained by the available data. Since data were only collected at a single time point, it limits our ability to understand changes or trends in substance use problems and mental health over time, particularly during on- and off-season periods for athletes. The study also relies on self-reported data without clinical interviews examining prevalence of substance use disorders or other psychiatric disorders within this population. Furthermore, other studies of problematic cannabis use (Casajuana et al., 2016; Martin-Willett et al., 2024) more commonly use measures such as the Cannabis Abuse Screening Test (Legleye et al., 2007), Cannabis Use Disorder Identification Test-Revised (Adamson et al., 2010), or the Cannabis Problems Questionnaire (Copeland et al., 2001). As the original parent study was not designed to specifically focus on problems related to cannabis use, future studies in student athletes should consider the above alternatives to the CAGE-AID to better capture self-reported problems related to cannabis use. In addition, the current study did not collect detailed information on substance use, such as measures of frequency and quantity of cannabis use among athletes and non-athletes, which should be assessed in future research. Thus, we cannot determine whether the differences in reported substance use problems are in part explained by greater frequency or quantity of cannabis use in non-athletes relative to athletes. Additionally, there was a discrepancy in sex distribution in the current study, such that non-athletes had a higher percentage of females than athletes. This may stem from the recruitment methods, with athletes being recruited through the NCAA system and non-athletes through the SONA psychology subject pool system. However, controlling for sex in the models did not alter the main findings. Further, as noted in a previous review, future work should consider cannabis use motives among student athletes (Williams et al., 2022), as well as reasons for not using cannabis (e.g., drug testing, effects on athletic performance, and busy athletic and academic schedules) that may be protective against cannabis-related problems. Additionally, the sample only included athletes and non-athletes from one university population in the Pacific Northwest United States where recreational cannabis is legal, which may limit generalizability of the findings to the broader college athlete and non-athlete population. Finally, previous research suggests that mindfulness may be particularly beneficial to well-being among college students and may be assessed as a potential moderator of the association between cannabis-related problems and mental health among both athletes and non-athletes (Ediati & Kaloeti, 2025).

CONCLUSIONS

The study is among the first to examine cannabis-related problems and associated mental health outcomes among college athletes compared to non-athletes. Athletes reported fewer cannabis-related problems, which may be related to potential under-reporting of problems, lower frequency and/or quantity of cannabis use, or less high-risk cannabis use behaviors. Conversely, non-athletes reported more cannabis-related problems, stressing the need for targeted interventions that address substance misuse in college students. Both non-athlete status and cannabis-related problems are independently associated with negative mental health outcomes in college students. Future research should focus on longitudinal studies of college students to track substance use behaviors over time in an effort to better understand changes in patterns of use and associated outcomes,

and whether these differ between student athletes and non-athletes.

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Disclosures

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The authors declare no conflict of interest.

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