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Synthetic Cannabinoid Use and Descriptive Norms among Collegiate Student-Athletes

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Abstract

Synthetic cannabinoids have gained popularity over the past decade, especially among young adults, due to sharing similar psychoactive properties with Tetrahydrocannabinol (THC). A limited number of studies have examined synthetic cannabinoid use among college students but none have examined use exclusively by collegiate student-athletes. The objective of this study was to examine synthetic cannabinoid use among collegiate student-athletes. In the spring of 2013, 3,276 freshmen and transfer collegiate student-athletes from 47 NCAA Division I, II, and III institutions participated in a web-based survey on substance use. Bivariate logistic regression was used to analyze the relationship between collegiate student-athlete characteristics, substance use, and descriptive norms with lifetime use of synthetic cannabinoids. Sixty-two individuals (1.9%) reported lifetime use of synthetic cannabinoids, and 3 (0.1%) reported past-30-day use. Males, current drinkers, and athletes who used hookah and marijuana in the past 30 days were more likely to use synthetic cannabinoids. Peer use of synthetic cannabinoids was estimated to be higher than actual use, and such overestimation was positively associated with personal use of synthetic cannabinoids. Our findings suggest that campaigns addressing normative beliefs should be implemented on college campuses to prevent synthetic cannabinoid use among college students and collegiate student-athletes.

Keywords

Athlete; college student; K2; spice; synthetic cannabinoid

Introduction

Synthetic cannabinoids are novel psychoactive substances with functional similarities to Tetrahydrocannabinol (THC), the active ingredient in marijuana. Due to these similarities, synthetic cannabinoids have been used recreationally by young adults and college students (Egan et al. 2015; Johnston et al. 2014; Xingdi et al. 2011). In 2013, 2.3% of a nationally representative sample of college students reported synthetic cannabinoid use within the past year (Johnston et al. 2014). Similarly, in a 2013 regional sample of college students, 17% reported lifetime use and 1.0% endorsed past-six-month use (Egan et al. 2015).

Adverse events have been reported following synthetic cannabinoid use, especially among youth and young adults (Faircloth, Khandheria, and Shum 2012; Forrester et al. 2012; Jerry, Collins, and Strem 2012; Office of National Drug Control Policy 2014; Schwarz 2015). There were 11,406 synthetic-cannabinoid-related emergency department (ED) visits in 2010, and 28,531 ED visits in 2011 (Substance Abuse and Mental Health Services Administration (SAMHSA) 2014). Among young adults aged 18–20, ED visits jumped from 1,881 in 2010 to 8,212 in 2012 (SAMHSA 2014). These adverse events included cardiovascular disturbances (Faircloth, Khandheria, and Shum 2012; Law et al. 2015; Mir et al. 2011), psychosis (Every-Palmer 2011; Haiken 2013; Law et al. 2015), seizure (Hoyte et al. 2012; Lapoint et al. 2011; Law et al. 2015), and death (Alexander 2014; Law et al. 2015). In response to these events, the Drug Enforcement Administration (DEA) instated the Synthetic Drug Abuse Prevention Act of 2012, which placed a temporary and then permanent ban on the manufacturing, sale, and use of synthetic cannabinoids (DEA 2012). Prior to the ban, synthetic cannabinoids were legally available for purchase in convenience stores, gas stations, head shops, and on the Internet.

Among youth and young adults, synthetic cannabinoid use is more common among males (Castellanos et al. 2011; Egan et al. 2015; Forrester et al. 2012; Hoyte et al. 2012; Stogner and Miller 2014; Vandrey et al. 2012; Wood 2013; Xingdi et al. 2011), Whites (Stogner and Miller 2014; Vandrey et al. 2012), sensation seekers (Egan et al. 2015), poly-drug users (Castellanos et al. 2011; Egan et al. 2015; Stogner and Miller 2014; Vandrey et al. 2012; Xingdi et al. 2011), and youth of higher socioeconomic status (Stogner et al. 2014; Vandrey et al. 2012).

Due to the National Collegiate Athletic Association's (NCAA) drug testing requirements and the inability to detect synthetic cannabinoids through standard means of drug testing, collegiate student-athletes may use synthetic cannabinoids as an alternative to marijuana to minimize the likelihood of a positive drug test (Rosenbaum, Carreiro, and Babu 2012; Seely et al. 2012; Spaderna, Addy, and D'Souza 2013; Stogner and Miller 2014). A limited number of studies have examined the association between synthetic cannabinoids and collegiate student-athlete status (Egan et al. 2015; Stogner and Miller 2014; Vidourek, King, and Burbage 2014). Although these studies did not find a statistically significant relationship

between athlete status and synthetic cannabinoid use, the samples were not restricted to collegiate student-athletes and were limited to the southeastern United States (Egan et al. 2015; Stogner and Miller 2014). Hence, it is important to examine synthetic cannabinoid use among a larger, more diverse sample of collegiate student-athletes, and to investigate factors associated with its use in this population.

According to Social Norms Theory, norms—socially constructed expectations of appropriate behavior—impact health behaviors such as substance use (Perkins and Berkowitz 1986). Descriptive norms are a type of norm addressed in the Social Norms Theory that refers to individuals' perceptions of the prevalence of a specific behavior (i.e., peer use of synthetic cannabinoids). Studies have found that individuals tend to overestimate the use of substances by others (Aas and Klepp 1992; Kilmer et al. 2015; Larimer et al. 2011; Martens et al. 2006; McCabe 2008), and individuals who overestimate use are also more likely to report personal use (Aas and Klepp 1992; Campo et al. 2003; Kilmer et al. 2015; Martens et al. 2006). One study assessed descriptive norms among a sample of college students at a single university and found that lifetime synthetic cannabinoid use was associated with their friend's use of synthetic cannabinoids (Vidourek, King, and Burbage 2014). To our knowledge, descriptive norms have yet to be explored for synthetic cannabinoids among the collegiate student-athlete population.

Given the need to examine synthetic cannabinoid use among a larger, national sample of collegiate student-athletes and the concern that athletes may be susceptible to synthetic cannabinoid use, the objectives of this study were to assess (1) the prevalence of synthetic cannabinoid use; (2) demographic characteristics associated with use; and (3) descriptive norms of synthetic cannabinoid use among a national sample of collegiate student-athletes. Based on literature on synthetic cannabinoid use among college students (Egan et al. 2015; Xingdi et al. 2011), we hypothesized that male collegiate student-athletes and athletes who used other substances would be more likely to report synthetic cannabinoid use. Additionally, we hypothesized that collegiate student-athletes would overestimate use of synthetic cannabinoids by their peers, and overestimates would be associated with personal use.

Methods

Participants

Data for this manuscript were collected as part of a larger study aimed at testing the effectiveness of an evidence-based, online behavioral intervention to prevent alcohol and other drug use among collegiate student-athletes. Eligible NCAA institutions were invited to participate through the *Institute to Promote Athlete Health & Wellness'*, Division I's, and Division II's listservs. A total of 56 four-year NCAA member institutions were invited to participate in the study. Following informational webinars, nine institutions withdrew, leaving 47 NCAA Division I, II, and III colleges and universities that agreed to participate. As the target audience of the intervention, NCAA Division I, II, and III collegiate athletes, over 18 years of age, and new to their institution (i.e., freshman or transfer) were eligible to participate in the intervention and data collection procedures. Survey participation could not be required of participants; however, schools were encouraged to require their freshman and

transfer collegiate student-athletes to complete the online alcohol and other drug prevention program. Of the 4,941 collegiate student-athletes who received an e-mailed invitation to participate, 3,276 completed the pre-intervention survey (response rate = 66.3%).

Procedures and data collection

Data collection procedures of the larger study occurred over a two-month period during the spring semester of 2013 and included surveys immediately prior to (pre), immediately following (post), and 30 days after (follow-up) completing the online behavioral intervention. In order to assess behaviors and perceptions prior to the exposure of an intervention, data from the pre-intervention survey were used for this manuscript. Once started, participants were not permitted to re-enter the survey; therefore, the survey had to be completed within one sitting. The survey took approximately 20 minutes to complete. Based on NCAA policy, collegiate student-athlete participants are ineligible to receive incentives; however, participating institutions were given the opportunity to earn participation incentives by encouraging their collegiate student-athletes to complete each of the three surveys. Human subject participation and data collection procedures were approved by the Institutional Review Board located at the University of North Carolina Greensboro.

Measures

Collegiate student-athlete demographics—Sex (female/male), age (response options were continuous starting at 17 through 25+), race (White, Black/African American, Asian, American Indian/Alaskan Native, Native Hawaiian/Pacific Islander, and other), and ethnicity (Hispanic/Latino vs. Non-Hispanic/Latino) were assessed using standard measures. Collegiate student-athlete characteristics included Division (coded based on academic institution selected) and “In” or “Out-of-Season” (currently competing vs. not currently competing).

Synthetic cannabinoid use—Lifetime and past-30-day use of synthetic cannabinoids were assessed with the following item: “How often have you used each of the following?” [Synthetic cannabinoids (ex, K2, Spice)]. Response options were categorical and included “I have NEVER used this,” “I have used this but not in the past 30 days,” “1 day out of the past 30 days,” “2 days out of the past 30 days,” “3–5 days out of the past 30 days,” “6–9 days out of the past 30 days,” and “10 + days out of the past 30 days.” Lifetime use of synthetic cannabinoids was determined based on affirmative responses to all except “I have NEVER used this.” Past-30-day use of cannabinoids was determined based on affirmative responses to all except “I have NEVER used this” or “I have used this but not in the past 30 days.”

Descriptive norms of synthetic cannabinoid use—The following items were used to assess descriptive norms: “In general, what PERCENTAGE of each group [college students, college student-athletes, your close friends] do you think have used synthetic cannabinoids (ex, K2, spice) during the PAST 30 DAYS?” Response options were ordinal and categorical, ranging from 0–100% in 10% increments.

Other substance use—Past-30-day prevalence of other substances was assessed with the following item: “How often have you used each of the following?” [Alcohol; Marijuana;

Hookah or Waterpipe; Prescription drugs (other than prescribed to you)]. The response options were categorical and included “I have NEVER used this,” “I have used this but not in the past 30 days,” “1 day out of the past 30 days,” “2 days out of the past 30 days,” “3–5 days out of the past 30 days,” “6–9 days out of the past 30 days,” and “10+ days out of the past 30 days.” Responses were coded as “yes” or “no” based on use in the past 30 days.

Statistical analysis

Descriptive univariate statistics (frequencies and percentages) for sample characteristics, synthetic cannabinoid use, and perceptions of peer synthetic cannabinoid use were calculated for both the overall sample and ever-users of synthetic cannabinoids. Bivariate logistic regression was used to analyze the relationship between collegiate athlete characteristics, other substance use, and descriptive norms with ever use of synthetic cannabinoids (dichotomous dependent variable). For the three models that examined the relationship between descriptive norms and ever use of synthetic cannabinoids, each descriptive norms variable (college students, college student athletes, and close friends) was treated as a continuous independent variable. Clustering of collegiate student-athletes within schools was accounted for using randomized fixed effect models (the GENLINMIXED procedure). All analyses were computed using SPSS version 22 (IBM Corp., Armonk, NY).

Results

Demographic characteristics

An equal number of males and females participated in the study (47.1% and 48.6%). The majority of the participants were 18 (40.2%) and 19 (41.1%) years of age. The majority of the participants were Non-Hispanic (87.5%) and White (74.0%), followed by African American (12.1%), and Asian (2.1%). The sample consisted of collegiate student-athletes from Division I (39.9%), Division II (32.5%), and Division III (27.6%). Slightly more than half of the sample was “in-season” (54.1%). Almost half of the sample consumed alcohol in the past 30 days (40.4%). Only 2.5% used marijuana and 3.8% used hookah in the past 30 days (Table 1).

Prevalence of synthetic cannabinoid use

There were 62 collegiate student-athletes (1.9%) in the sample who endorsed lifetime use of synthetic cannabinoids. Of those, 3 (0.1%) reported past-30-day use of synthetic cannabinoids (Table 1).

Characteristics associated with synthetic cannabinoid use

Females were 30% less likely to have used synthetic cannabinoids compared to males, although not statistically significant at $p < 0.05$ (OR = 0.70; CI = 0.49, 1.01). Collegiate student-athletes who used synthetic cannabinoids were 50% more likely to use alcohol within the past 30 days compared to those who did not use synthetic cannabinoids (OR = 1.50; CI = 1.05, 2.15). Compared to non-users, those who used synthetic cannabinoids were approximately 180% more likely to have used marijuana and hookah within the past 30 days (OR = 2.83; CI = 1.34, 5.97 and OR = 2.84; CI = 1.53, 5.23). There were no significant differences in age, race, ethnicity, athletic division, season, and past-30-day non-medical

prescription drug use between participants who did and did not use synthetic cannabinoids (Table 1).

Descriptive norms of synthetic cannabinoid use

The majority of the collegiate student-athletes thought that less than 30% of each of three potentially influential reference groups (college students, collegiate student-athletes, and their friends) used synthetic cannabinoids in the past 30 days (Table 2). Those who reported personal synthetic cannabinoid use perceived that synthetic cannabinoid use was more prevalent among all three categories. However, this finding was only statistically significant for “close friends” (OR = 1.17; CI = 1.01, 1.35).

Discussion

In a large, national sample of collegiate student-athletes, less than 2% reported lifetime use of synthetic cannabinoids and 0.1% reported past-30-day use. The prevalence of synthetic cannabinoid use in our sample is less than national (Johnston et al. 2014) and regional (Egan et al. 2015) samples of college students (2.3% past year and 17% lifetime prevalence, respectively), suggesting that collegiate student-athletes do not report more synthetic cannabinoid use than their non-athlete counterparts. This is consistent with other studies that did not find a statistically significant relationship between athlete status and synthetic cannabinoid use (Egan et al. 2015; Stogner and Miller 2014).

Male collegiate student-athletes and poly-drug users were more likely to endorse lifetime synthetic cannabinoid use. The demographic characteristics associated with lifetime use of synthetic cannabinoids in our study of collegiate athletes was consistent with findings of other studies conducted with non-athlete college students (Egan et al. 2015; Stogner and Miller 2014; Xingdi et al. 2011). The subset of collegiate student-athletes who reported synthetic cannabinoid use may be at higher risk of experimentation and substance abuse in general, rather than intentionally using synthetic cannabinoids to avoid detection in eligibility drug screenings. Future studies should examine motivations for synthetic cannabinoid use among collegiate student-athletes.

Within our sample, collegiate student-athletes perceived that college students, student-athletes, and close friends used synthetic cannabinoids at higher rates than were actually reported. Furthermore, those who reported personal synthetic cannabinoid use were more likely to overestimate use among all three groups, with only “close friends” being statistically significant. This is consistent with another study of college students that found a relationship between personal synthetic cannabinoid use and friends’ use (Vidourek, King, and Burbage 2014). According to the literature, the accuracy of descriptive norms increases as the reference group becomes more proximal (Larimer et al. 2011). While little is known about the context of synthetic cannabinoid use, Hu et al. (2011) found that college students used hookah, a social activity (Braun et al. 2011; Heinz et al. 2013; Sutfin et al. 2011), to smoke synthetic cannabinoids. Thus, those who reported synthetic cannabinoid use may have either used synthetic cannabinoids with close friends or observed their close friends’ use of synthetic cannabinoids.

The study has several limitations. The large sample included 47 colleges across the United States and consisted of Division I, II, and III student-athletes. However, the results may not be generalizable to all collegiate student-athletes due to the inclusion of solely institutions that were willing to participate in a substance use prevention program and freshman and transfer students. Previous studies of the general college student population have found that freshman and sophomore students were more likely to report synthetic cannabinoid use than upperclassmen (Egan et al. 2015; Xingdi et al. 2011), which suggests that the prevalence of synthetic cannabinoid use and descriptive norms of use may be higher in our sample than in a sample with all academic classifications. Synthetic cannabinoid use was self-reported, which is subject to social desirability bias, especially if there were concerns about athletic eligibility. However, the web-based mode of the survey should have minimized the impact of social desirability bias (Shadish et al. 2002; McCabe et al. 2006d). Additionally, all participants were provided with details of how their data would be protected and would not be reported back to their school and/or cannabinoid use may have occurred during college or the NCAA. Assessment of lifetime synthetic cannabinoid use makes it impossible to determine if synthetic cannabinoid use may have occurred during college or prior to college. While past-30-day synthetic cannabinoid use was examined, the number who endorsed use during this timeframe was too small to conduct statistical analyses. The lowest response option for perceived peer synthetic cannabinoid use was “0–10%,” which makes it impossible to determine if participants selected the option because they perceived 0% or 1–10% used synthetic cannabinoids.

Conclusion

To our knowledge, this is the first study on synthetic cannabinoid use among a large, national sample of collegiate student-athletes. We found the prevalence of synthetic cannabinoid use by collegiate student-athletes to be lower than reported by studies of general populations of college students. Estimates of peer synthetic cannabinoid use were higher than actual use reported by the sample, especially among those who used synthetic cannabinoids. Our findings suggest that colleges should consider implementing norms campaigns to address synthetic cannabinoid use among college students and student-athletes.

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Table 1

Characteristics of the sample and individuals who ever used synthetic cannabinoids.

	Overall sample	Ever used synthetic cannabinoids		OR (95% CI)
	(N = 3276) Frequency (%) ^a	No (n = 3214) Frequency (%) ^a	Yes (n = 62) Frequency (%) ^a	
Synthetic cannabinoid use				
Ever use	62 (1.9)	0 (0.0)	62 (100)	
Past 30 day use	3 (0.1)	0 (0.0)	3 (4.8)	
Demographics				
Sex				
Male (referent)	1543 (47.1)	1480 (48.5)	47 (78.3)	0.70 (0.49, 1.01)
Female	1592 (48.6)	1572 (51.5)	13 (21.7)	
Age				
18	1316 (40.2)	1287 (42.2)	20 (33.3)	1.04 (0.87, 1.24)
19	1346 (41.1)	1306 (42.9)	29 (48.3)	
20	235 (7.2)	229 (7.5)	6 (10.0)	
21	157 (4.8)	151 (5.0)	3 (5.0)	
22	50 (1.5)	48 (1.6)	2 (3.3)	
23	17 (0.5)	17 (0.6)	0 (0.0)	
24	5 (0.2)	5 (0.2)	0 (0.0)	
25+	4 (0.1)	4 (0.1)	0 (0.0)	
Race				
White (referent)	2423 (74.0)	2356 (79.6)	48 (82.8)	0.92 (0.50, 1.67)
Black or African American	349 (12.1)	340 (12.1)	5 (9.1)	0.94 (0.25, 3.59)
Asian	61 (2.1)	60 (2.1)	1 (1.8)	1.54 (0.24, 9.88)
American Indian/Alaskan Native	20 (0.7)	19 (0.7)	1 (1.8)	0.71 (0.07, 7.53)
Native Hawaiian/Pacific Islander	25 (0.9)	25 (0.9)	0 (0.0)	0.71 (0.03, 14.88)
Other	15 (0.5)	15 (0.5)	0 (0.0)	
Ethnicity				
Non-Hispanic (referent)	2867 (87.5)	2191 (92.3)	53 (89.8)	1.11 (0.58, 2.13)
Hispanic	238 (7.3)	232 (7.7)	6 (10.2)	
Athletic characteristics Division				
Division I (referent)	1307 (39.9)	1264 (39.9)	21 (33.9)	1.11 (0.73, 1.68)
Division II	1064 (32.5)	1027 (32.4)	24 (38.7)	1.04 (0.67, 1.63)
Division III	905 (27.6)	876 (27.7)	17 (27.4)	
Season				
“Out of season” (referent)	1365 (41.7)	1325 (43.4)	25 (41.7)	1.02 (0.71, 1.47)
“In season”	1773 (54.1)	1729 (56.6)	35 (58.3)	
Other substance use				
Past 30 day alcohol use	1324 (40.4)	1275 (41.1)	43 (76.8)	1.50 (1.05, 2.15) [*]
Past 30 day marijuana use	81 (2.5)	112 (3.5)	12 (19.7)	2.83 (1.34, 5.97) ^{**}
Past 30 day hookah use	124 (3.8)	73 (2.3)	8 (12.9)	2.84 (1.53, 5.23) [†]

	Overall sample	Ever used synthetic cannabinoids		
	(N = 3276) Frequency (%)^a	No (n = 3214) Frequency (%)^a	Yes (n = 62) Frequency (%)^a	OR (95% CI)
Past 30 day nonmedical prescription drug use	49 (1.5)	44 (1.4)	4 (6.8)	2.41 (0.87, 6.67)

^a% may not add to 100% due to missingness.

* p < .05,

** p < .01,

[†] p < .001.

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Table 2

Perceptions of past 30 day synthetic cannabinoid use by subgroup (n = 3276).

	College students		College student-athletes		Your close friends	
	Ever used synthetic cannabinoids	Yes (n = 62) n (%) ^a	Ever used synthetic cannabinoids	Yes (n = 62) n (%) ^a	Ever used synthetic cannabinoids	Yes (n = 62) n (%) ^a
0-10%	1283 (40.0)	19 (31.7)	2259 (70.3)	39 (65.0)	2865 (89.1)	46 (76.7)
11-20%	697 (21.7)	14 (23.3)	443 (13.8)	9 (15.0)	123 (3.8)	8 (13.3)
21-30%	468 (14.6)	9 (15.0)	179 (5.6)	3 (5.0)	41 (1.3)	2 (3.3)
31-40%	269 (8.4)	5 (8.3)	102 (3.2)	3 (5.0)	22 (0.7)	0 (0.0)
41-50%	181 (5.6)	8 (13.3)	63 (2.0)	2 (3.3)	23 (0.7)	1 (1.7)
51-60%	94 (2.9)	2 (3.3)	37 (1.2)	1 (1.7)	17 (0.5)	0 (0.0)
61-70%	67 (2.0)	0 (0.0)	20 (0.6)	1 (1.7)	10 (0.3)	1 (1.7)
71-80%	32 (1.0)	1 (1.7)	11 (0.4)	1 (1.7)	5 (0.2)	0 (0.0)
81-90%	13 (0.4)	0 (0.0)	7 (0.3)	1 (1.7)	2 (0.1)	1 (1.7)
91-100%	12 (0.4)	2 (3.3)	2 (0.1)	0 (0.0)	3 (0.1)	1 (1.7)

^a% may not add to 100% due to missingness.

^bp < 0.05.