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Graduate degree completion: Associations with alcohol and marijuana use before and after enrollment☆

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ABSTRACT

Research has shown that alcohol and marijuana use are associated with academic performance difficulties, but the relationship to completion of a graduate degree has not been explored. Undergraduate students (n = 1253) were assessed during their first year of college and annually thereafter until age 29. Among the subset of the original sample who enrolled in graduate school (n = 520), measures of alcohol and marijuana use were averaged separately for the time periods before and after graduate school enrollment. Logistic regression models were developed to examine the associations between these variables and graduate degree completion, adjusting for other factors. In general, a minority of the sample were excessive drinkers or frequent marijuana users. The majority of drinkers (70%) drank an average of twice a week or less each year, and 62% of marijuana users used marijuana once a month or less each year. After adjusting for demographic and program characteristics, marijuana use frequency after graduate school enrollment was negatively associated with odds of graduate degree completion. Alcohol use frequency before graduate school enrollment was positively associated with odds of graduate degree completion. Results add to the growing body of literature on marijuana use and decreased academic achievement, but results should be interpreted with caution given the small, but significant, effect sizes found. The positive association between alcohol use frequency and degree completion might be attributed to engagement in the academic environment. Future studies should examine the potential mechanisms through which alcohol and marijuana use are related to the academic achievement of graduate students.

1. Introduction

Substance use among young adults is a major public health concern and is associated with academic problems. The bulk of research in this area has focused on undergraduate students, as alcohol and marijuana use among this population are fairly common (Schulenberg et al., 2017). In addition to academic difficulties, alcohol and marijuana use are associated with other negative consequences during the college years, including risky sexual behaviors, social and interpersonal problems, injury, and impaired driving (Caldeira et al., 2009; Merrill & Carey, 2016; Pearson, Liese, Dvorak, & Marijuana Outcomes Study Team, 2017; White & Hingson, 2013).

Longitudinal research has shown that alcohol and marijuana use during college might have long-term consequences after college graduation. Heavy drinking and marijuana use during college are associated with post-college substance abuse and dependence, unemployment, less prestigious employment, and lower income (Arria, Garnier-Dykstra, et al., 2013; Jennison, 2004; Schulenberg et al., 2005; Wilhite, Ashenhurst, Marino, & Fromme, 2017). Marijuana use during college and the immediate post-college years, particularly heavy use, is associated with several negative health outcomes at ages 24 and 27, including emotional problems, injury, illness, decreased quality of life, and less service utilization for physical and mental health problems (Arria, Caldeira, Bugbee, Vincent, & O'Grady, 2016; Caldeira, O'Grady, Vincent, & Arria, 2012).

Degree non-completion as a consequence of substance use has been

Abbreviations: Y, year

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found in longitudinal studies of high school and college students. Adolescents who use alcohol, tobacco, and marijuana during ninth grade are less likely to complete high school than nondrug users (Kelly et al., 2015). One study integrated data from three longitudinal studies and found that daily marijuana use during adolescence was significantly associated with decreased odds of both high school and college completion (Silins et al., 2014). In a study of college students, frequent marijuana use during the course of college was associated with increased likelihood of dropping out (Suerken et al., 2016).

Despite evidence of associations between alcohol and marijuana use and high school and undergraduate degree non-completion, the possible impact on graduate degree completion has not been explored. An increasing number of college graduates are enrolling in graduate school, with almost 40% of college graduates pursing a graduate degree within four years of graduation (Baum & Steele, 2017). However, only 50% to about 75% of those who enter graduate school ultimately complete their degree, with differences by degree type and academic discipline (Ali & Kohun, 2006; Baum & Steele, 2017; Lovitts & Nelson, 2000).

Existing theories of student attrition, centered primarily on the undergraduate student experience, posit that attrition is influenced by individual, institutional, and social factors (Aljohani, 2016). Institutional factors include program characteristics, administrative policies, and academic requirements, and social factors include peer culture, faculty/staff interactions, and social integration. Individual pre- and post-matriculation factors include demographic characteristics, skills and abilities, goals and expectations, external commitments, and academic history. Largely missing from theories of student attrition are health status and health behaviors, particularly substance use prior to and after enrollment in an academic degree program.

The relationship between alcohol and marijuana use and graduate degree completion is likely influenced by demographic characteristics. Both heavy drinking and marijuana use are more prevalent among college males than females (Schulenberg et al., 2017), and substance use disorders are associated with being male, white, and unmarried (Anthony, Warner, & Kessler, 1994; Haberstick et al., 2014). Having children is associated with a lower prevalence of substance use among both men and women (Oesterle, Hawkins, & Hill, 2011). Demographic characteristics are also associated with graduate school completion, with burnout and attrition highest among women (Baum & Steele, 2017; Dahlin, Joneborg, & Runeson, 2007). Attrition is also more common among African-American/Black students (Lovitts & Nelson, 2000), domestic students (Most, 2008), and students enrolled in master's degree programs (Baum & Steele, 2017).

This study aimed to fill a gap in the literature by assessing the relationships between alcohol and marijuana use before and after graduate school enrollment and graduate degree completion. It is hypothesized that lower levels of alcohol and marijuana use both before and after graduate school enrollment are associated with graduate degree completion after adjustment for potentially confounding variables.

2. Methods

2.1. Study sample

The College Life Study is a longitudinal study of young adults who were recruited from a large, mid-Atlantic university. During the first stage of sampling, a ten-minute survey was administered to all incoming first-time, first-year students ages 17 to 19 that contained questions on demographic characteristics and tobacco, alcohol, and other drug use behaviors. During the second stage of sampling, the sample was stratified by race, gender, and substance use history. Students who had tried a drug or used a prescription drug nonmedically at least once prior to college entry were oversampled. A random sample was chosen for longitudinal follow-up, and 1253 students completed a personal interview at baseline [Year 1 (Y1); modal age 18]. Follow-up assessments were then conducted annually from Years 2 through 8 (Y2-Y8) and then again in Years 10 and 12 (Y10 and Y12; modal age 29) through face-to-face interviews, self-administered surveys, and web-based surveys. Follow-up rates were high, ranging from 91% ($n = 1142$) in Y2 and 73% ($n = 908$) in Y12. The university's Institutional Review Board approved the study, and informed consent was obtained. Additional detail on recruitment methods and follow-up procedures can be found elsewhere (Arria et al., 2008; Vincent et al., 2012).

From the original sample of 1253 young adults, 541 participants (43%) enrolled in a degree-seeking graduate program at some point by Y10 of the study. Of these, 21 participants were excluded from analyses. Five of these participants were excluded because upon further examination of other assessment responses, they had listed graduate school enrollment by mistake, and one participant was excluded because information on their specific graduate degree type could not be identified. In addition, to ensure participants had adequate time to complete their degree, 15 participants who first enrolled in a doctorate or professional degree program in Y10 were excluded, giving a final analytic sample of 520 participants.

2.2. Measures

2.2.1. Degree completion

Completion of a graduate degree was assessed in the following ways throughout the study period. In Y7, participants indicated if they had completed an M.A., M.S., M.B.A., M.P.H., M.S.W., J.D., or other degree. In Y8, additional options for completed degrees were added (M.Ed., M.A.T., M.P.S., J.D., D.P.T., Pharm.D., or joint/double degree). In Y10 and Y12, participants indicated their highest completed academic degree, with graduate degree options including master's degree, doctoral degree, J.D., M.D., or other degree. 'Joint/double degree' and 'other degree' responses were individually analyzed and coded. A dichotomous variable was created to represent whether or not participants completed their graduate degree by Y12.

2.2.2. Alcohol and marijuana use

Alcohol use was measured annually in Y1-Y12. To assess frequency of alcohol use, participants were asked, "In the past 12 months, on how many days have you drank any drink with alcohol in it?". To assess quantity of alcohol use, participants were asked the number of drinks they had on a typical drinking day (Substance Abuse and Mental Health Services Administration, 2003). Data on days used during the past year were used to estimate average alcohol use frequency (e.g., monthly, weekly) for descriptive purposes.

Marijuana use frequency was assessed annually in Y1-Y12 with the question "In the past 12 months, on how many days have you used any type of marijuana?" (Substance Abuse and Mental Health Services Administration, 2003). Data on days used during the past year were used to estimate average marijuana use frequency (e.g., monthly, weekly) for descriptive purposes.

Past-month frequency of both alcohol and marijuana use were also assessed, but because of the high degree of correlation with past-year measures (Pearson *r*s ranging from 0.57 to 0.96), only past-year variables were used in the analyses.

For each participant, alcohol use frequency, alcohol use quantity, and marijuana use frequency were averaged separately for each of two time periods: before and after the first year they indicated enrollment in a graduate degree program. The mean for each of the six separate variables (before enrollment alcohol quantity, after enrollment alcohol quantity, before enrollment alcohol frequency, after enrollment alcohol frequency, before enrollment marijuana frequency, and after enrollment marijuana frequency) was used to capture variation in substance use during the pre- and post-enrollment periods, particularly because the before enrollment period included the undergraduate college years as well as the interim years after college graduation but before graduate

school enrollment.

2.2.3. Demographic characteristics

Gender was coded by the interviewer in Y1 as either male or female. Race/ethnicity was measured in Y3, and response options included white; Black/African-American; American Indian or Alaskan Native; Native Hawaiian; Other Pacific Islander; Asian; and Hispanic, Latino, or Spanish. Participants could also write in a response or choose "Don't Know/Refuse to Answer". Given that the majority of the sample (68%) was non-Hispanic white, race was dichotomized into white and non-white. Marital status was measured in Y4-Y8, Y10, and Y12. Participants indicated whether they were married, divorced, widowed, separated, in a civil union or domestic partnership, or never married. A dichotomous variable was created to represent whether or not participants were married at any point during Y4-Y12. The number of children participants had was measured in Y4-Y8, Y10, and Y12. A dichotomous variable was created to represent whether or not participants ever had children by Y12.

2.2.4. Program characteristics

Degree type was coded as the highest level of program participants enrolled in by Y10 (Y8 for doctoral and professional degree programs), and a dichotomous variable was created to represent enrollment in either a master's program or a doctorate/professional degree program. Possible master's degrees included M.A., M.S., M.B.A., M.P.H., M.S.W., M.Ed., M.A.T., M.P.S., and other master's degree, and possible doctoral/professional degrees included Ph.D., Psy.D., M.D., J.D., D.P.T., O.D., Pharm.D., and other doctoral/professional degree. To account for possible differences in the number of years needed to complete a degree, year of enrollment was computed based on the first year participants indicated enrollment in any graduate program. Options were Y5 (modal age 22), Y6, Y7, Y8, and Y10 (modal age 27).

2.3. Statistical analyses

Descriptive statistics (e.g., frequencies, means, and standard deviations) were used to analyze the distributions of all study variables. Pearson correlation coefficients were used to analyze the relationships between all six alcohol and marijuana use predictor variables.

A series of logistic regression models were fit to assess the relationships between alcohol and marijuana use and graduate degree completion. First, in Stage 1, separate logistic regression models were fit to analyze the relationships between each alcohol and marijuana use predictor variable and graduate degree completion while controlling for demographic and program characteristics. Second, in Stage 2, a best-fitting model was obtained by entering each of the six alcohol and marijuana use predictor variables into the model one at a time, retaining any predictor variable that was statistically significant and dropping those that were not significant. All demographic and program characteristic variables were retained in the final model regardless of significance. The Nagelkerke R^2 value was used to examine the variance in graduate degree completion explained by the Stage 2 variables. A similar method has been used in prior work by the research team (Arria, Caldeira, et al., 2013).

SPSS Version 24.0 was used for all analyses, and the alpha level was set at 0.05.

3. Results

3.1. Sample characteristics

The majority of the sample was female (61%) and non-Hispanic white (68%), with 42% of participants getting married and 14% having children by Y12 (see Table 1). About two-thirds (69%) had enrolled in master's degree programs and 31% had enrolled in doctorate or professional degree programs, with Y5 (modal age 22) as the most common year to begin graduate school. The majority of the sample (82%) completed their graduate degree by Y12.

Table 1
Sample characteristics, by graduate degree completion (n = 520).

	Completed (n = 424)	Not completed (n = 96)	Total (n = 520)
	n (row %)	n (row %)	n (column %)
Gender			
Male	152 (74.5)	52 (25.5)	204 (39.2)
Female	272 (86.1)	44 (13.9)	316 (60.8)
Race			
White, non-Hispanic	299 (84.9)	53 (15.1)	352 (67.7)
Non-white	125 (74.4)	43 (25.6)	168 (32.3)
Marital status			
Married	196 (89.5)	23 (10.5)	219 (42.1)
Never married	228 (75.7)	73 (24.3)	301 (57.9)
Children			
Yes	62 (84.9)	11 (15.1)	73 (14.0)
No	362 (81.0)	85 (19.0)	447 (86.0)
Graduate degree type			
Masters	287 (80.2)	71 (19.8)	358 (68.8)
Doctorate/professional	137 (84.6)	25 (15.4)	162 (31.2)
First year of graduate school enrollment			
Y5 (modal age 22)	176 (92.6)	14 (7.4)	190 (36.5)
Y6 (modal age 23)	83 (79.8)	21 (20.2)	104 (20.0)
Y7 (modal age 24)	72 (82.8)	15 (17.2)	87 (16.7)
Y8 (modal age 25)	51 (77.3)	15 (22.7)	66 (12.7)
Y10 (modal age 27)	42 (57.5)	31 (42.5)	73 (14.0)

3.2. Alcohol and marijuana use

The majority of participants drank alcohol during at least one year before graduate school enrollment (98%) and after graduate school enrollment (98%). Among drinkers, the average alcohol use frequency was about 75 days during the past year before enrollment in graduate school and 88 days during the past year after enrollment (see Table 2). Among drinkers, mean alcohol use quantity decreased from a mean of 3.9 drinks per drinking day before graduate school enrollment to 2.6 drinks per drinking day after enrollment. The typical quantity consumed for male drinkers was greater than female drinkers both before and after graduate school enrollment (4.9 and 3.2 drinks for male drinkers; 3.2 and 2.2 drinks for female drinkers). Based on past-year data, it was estimated that about 35% of drinkers drank less than weekly and about 24% drank twice a week or more before graduate school enrollment. After graduate school enrollment, 32% of drinkers drank less than weekly and about 31% drank twice a week or more (*data not shown in table*).

The prevalence of marijuana use was 72% prior to graduate school enrollment and 49% after graduate school enrollment. As seen in Table 2, marijuana use frequency among users was about the same prior to and after graduate school enrollment with a mean of about 40 days during the past year. Among those who used marijuana prior to graduate school enrollment, 56% used once a month or less and about a quarter used at least weekly (estimated from past-year data). Among those who used marijuana after graduate school enrollment, 64% used once a month or less and about 18% used at least weekly (*data not shown in table*).

The correlations between the six alcohol and marijuana use predictor variables are presented in Table 3. There were moderate to strong correlations between the before enrollment estimates and the after enrollment estimates. Despite this statistical overlap, both before and after enrollment variables were retained due to their importance to the research question of interest. Alcohol use frequency before graduate school enrollment was strongly correlated with alcohol use quantity before graduate school enrollment (r = 0.722) and moderately

Table 2
Alcohol and marijuana use before and after graduate school enrollment, by graduate degree completion.

	Completed	Not completed	Total
	Mean ± SD	Mean ± SD	Mean ± SD
Alcohol frequency among drinkers			
Before graduate school enrollment (n = 508)	76.0 ± 48.3	68.2 ± 52.7	74.6 ± 49.2
After graduate school enrollment (n = 509)	90.2 ± 60.3	80.3 ± 75.9	88.4 ± 63.5
Alcohol quantity among drinkers			
Before graduate school enrollment (n = 508)	3.9 ± 2.4	3.7 ± 2.5	3.9 ± 2.4
After graduate school enrollment (n = 509)	2.6 ± 1.5	2.5 ± 1.5	2.6 ± 1.5
Marijuana frequency among users			
Before graduate school enrollment (n = 375)	40.0 ± 67.5	44.8 ± 75.7	40.9 ± 69.1
After graduate school enrollment (n = 257)	34.7 ± 78.2	85.2 ± 112.9	42.8 ± 86.5

Note. All quantity and frequency estimates measured past-year use that was averaged across the respective years for before or after enrollment. Frequency measures are number of days and quantity measures are number of drinks.

Table 3
Correlations among alcohol and marijuana use predictor variables (n = 520).

	1.	2.	3.	4.	5.
Before enrollment					
1. Alcohol use frequency	–				
2. Alcohol use quantity	0.722**	–			
3. Marijuana use frequency	0.462**	0.277**	–		
After enrollment					
4. Alcohol use frequency	0.564**	0.407**	0.227**	–	
5. Alcohol use quantity	0.510**	0.709**	0.170**	0.341**	–
6. Marijuana use frequency	0.245**	0.128**	0.676**	0.141**	0.056

Note. Statistics presented are Pearson correlation coefficients.
** $p < 0.01$.

correlated with alcohol use quantity after graduate school enrollment (r = 0.510). To avoid the potential for multicollinearity effects on the statistical models, only the alcohol use frequency variables were retained for further analyses. There is prior evidence that frequency of alcohol use increases during the post-college period while quantity of alcohol use decreases (Arria, Caldeira, Allen, et al., 2016), and alcohol use frequency has higher sensitivity and specificity in identifying alcohol-related problems than alcohol use quantity (Chung et al., 2012).

3.3. Graduate degree completion

Stage 1 results showed that, even after controlling for demographic and program characteristics, marijuana use frequency after enrollment was negatively associated with graduate degree completion (see Table 4).

The best-fitting model included alcohol use frequency before graduate school enrollment and marijuana use frequency after graduate school enrollment, which were both significantly associated with graduate degree completion after being entered into a model together and with the demographic and program characteristics. Alcohol use frequency before enrollment was positively associated with the odds of graduate degree completion (AOR = 1.007). In contrast, as marijuana use frequency after enrollment increased, the odds of graduate degree completion decreased (AOR = 0.996).

In the best-fitting model, gender, marital status, and first year of graduate school enrollment were associated with graduate degree completion. Female students had almost two times higher odds of graduate degree completion when compared with male students, and married students had more than two times higher odds of graduate degree completion when compared with those who had never been married. In comparison with students who began their graduate degree in Y10 (modal age 27), students entering graduate school in Y5 (modal age 22), Y6 (modal age 23), and Y7 (modal age 24) had significantly higher odds of graduate degree completion.

4. Discussion

This study examined whether or not alcohol and marijuana use before and after graduate school enrollment were associated with graduate degree completion. Alcohol and marijuana use were moderate among participants in this sample. Results showed that more frequent marijuana use after graduate school enrollment was associated with decreased odds of graduate degree completion after adjustment for potentially confounding variables. This finding is consistent with prior research that has shown a relationship between frequent marijuana use and degree non-completion among high school and undergraduate college students (Fergusson, Horwood, & Beautrais, 2003; Lynskey, Coffey, Degenhardt, Carlin, & Patton, 2003; Maggs et al., 2015; Silins et al., 2014; Suerken et al., 2016). Marijuana use was less prevalent after graduate school enrollment as compared with before, which is consistent with research showing that marijuana use declines as young adults age (Arria et al., 2017). However, while past-year marijuana use frequency among marijuana users who completed their graduate degree declined from 40 days before enrollment to 35 days after enrollment, frequency among users who did not complete their graduate degree increased from 45 days before enrollment to 85 days after enrollment.

There are several mechanisms through which marijuana use might affect degree completion. The first is through decreased academic performance, with underachievement cited as the most well-supported correlate of marijuana use (MacDonald & Pappas, 2016). While little research has been done on the relationship between marijuana use and decreased academic performance among graduate students, existing evidence among high school and college students shows that frequent marijuana use is associated with academic unpreparedness (D'Amico et al., 2016), lower grades (Arria, Caldeira, Bugbee, Vincent, & O'Grady, 2015; Suerken et al., 2016), and lower academic achievement (Hooper, Woolley, & De Bellis, 2014). The relationship between marijuana use and degree non-completion might also be explained by the effects of marijuana use on cognition (Battistella et al., 2014; Yücel et al., 2008). Verbal learning, memory, executive functioning, IQ, and attention, which are critical for academic success, are impaired by both acute and chronic exposure to marijuana (Broyd, van Hell, Beale, Yücel, & Solowij, 2016; Crean, Crane, & Mason, 2011; Indlekofer et al., 2009). Arria, Barrall, Allen, Bugbee, and Vincent (2018) suggest that the immediate, rewarding effects of substance use might lead to a re-prioritization of academic pursuits that are associated with longer-term rewards.

This study also observed a positive relationship between alcohol use frequency prior to graduate school enrollment and graduate degree completion. There is evidence that alcohol use is associated with dropout from both high school (Kelly et al., 2015) and college (Martinez, Sher, & Wood, 2008). However, some research has suggested that students who drink more frequently might be more likely to engage in the academic environment and elicit social support (Borsari & Carey,

Table 4
Results of logistic regression models predicting graduate degree completion (n = 520).

		AOR (95% CI)	p-value
Stage 1	Before graduate school enrollment		
	Alcohol use frequency	1.005 (1.000, 1.011)	0.053
	Marijuana use frequency	1.000 (0.966, 1.004)	0.921
	After graduate school enrollment		
	Alcohol use frequency	1.003 (0.998, 1.007)	0.222
	Marijuana use frequency	0.997 (0.994, 1.000)	0.047*
Stage 2	Gender = female	1.842 (1.113, 3.047)	0.017*
	Race = non-Hispanic white	1.455 (0.860, 2.462)	0.162
	Marital status = married	2.041 (1.130, 3.688)	0.018*
	Children = yes	0.624 (0.282, 1.381)	0.245
	Degree type = doctorate/professional	0.679 (0.373, 1.236)	0.206
	First year of graduate school enrollment		
	Y5 (modal age 22)	9.729 (4.258, 22.232)	< 0.001*
	Y6 (modal age 23)	3.040 (1.441, 6.410)	0.003*
	Y7 (modal age 24)	3.776 (1.727, 8.258)	0.001*
	Y8 (modal age 25)	2.170 (0.984, 4.786)	0.055
	Y10 (modal age 27)	Reference	
	Before graduate school enrollment		
	Alcohol use frequency	1.007 (1.001, 1.012)	0.019*
	After graduate school enrollment		
	Marijuana use frequency	0.996 (0.992, 0.999)	0.012*
	Stage 2 R^2 = 0.213		

Note. AOR = Adjusted Odds Ratio. All quantity and frequency estimates measured past-year use that was averaged across the respective years for before or after enrollment. All participants were included in analyses, regardless of past-year alcohol or marijuana use. The Stage 1 model represents a series of four models, where the associations between each of the four alcohol and marijuana use predictors on graduate degree completion are evaluated in turn, while adjusting for demographic and program characteristics. The Stage 2 model reflects the best-fitting combination of predictor variables, while adjusting for demographic and program characteristics and the other predictor in the model.

* $p < 0.05$.

2006). Molnar, Busseri, Perrier, and Sadava (2009) found a prospective relationship between alcohol use and higher levels of subjective well-being among college students, and Blank, Connor, Gray, and Tustin (2016) found increased self-efficacy among college students who consumed alcohol. Existing longitudinal studies have found paradoxical effects between alcohol use and education (Crosnoe & Riegle-Crumb, 2007; Patrick, Schulenberg, & O'Malley, 2016), highlighting the complex relationship between alcohol use and academic success and calling for increased research in this area. The present study findings should not be misinterpreted to mean that excessive drinking is associated with graduate degree completion, as the vast majority of the students in this sample were light to moderate drinkers.

A strength of this study was the use of longitudinal cohort data spanning twelve years of young adulthood. However, because the sample was originally enrolled in a single, large publicly-funded university, findings might not be generalizable to young adults starting their college career in different types of educational institutions. The present sample was somewhat homogenous with respect to demographic characteristics. Further research with larger, more diverse samples is needed to explore the associations between demographic variables and developmentally-salient variables, such as having children, on graduate degree completion. Additionally, graduate degree completion among this sample was 82%, which is higher than the national average of around 65% (Baum & Steele, 2017). Completion of a graduate degree was only analyzed through Y12, and students might have completed their graduate degree later on in adulthood. This study also did not account for several factors that might have influenced graduate degree completion, including academic ability, mental health, motivational factors, employment opportunities, personality, academic goals, external commitments, institutional factors, and social and professional support. Moreover, small sample sizes of students in different academic disciplines precluded meaningful analyses to understand whether or not the observed results held true for students pursuing different types of careers.

Future research that replicates the results of this study are needed, particularly in light of the small, yet significant, effect sizes observed. While the associations between graduate degree completion and both alcohol use frequency before enrollment (AOR = 1.007) and marijuana use frequency after enrollment (AOR = 0.996) were statistically significant, the magnitude of these effects calls into question the practical significance of these findings. As discussed, prior research among other student samples supports these findings. However, this study alone should not be used as sole evidence of the presence of an association between substance use and graduate degree completion, and results should be interpreted with caution.

This study contributes to the literature on the relationship between marijuana use and academic achievement. Results suggest that marijuana use can act as a barrier to graduate degree completion. For graduate students who appear to be struggling academically, a comprehensive assessment that includes marijuana use might be warranted in order to understand possible risk factors for dropout. University communities have a unique structure and set of resources (e.g., health and counseling centers that are student-oriented), and graduate school is an opportune time to intervene while these supports are in place.

A multitude of factors influence graduate degree obtainment other than alcohol and marijuana use, and future research is needed to provide a fuller understanding of the barriers and facilitators of success during graduate school. Of particular value would be multi-campus studies that capture graduate student populations from a wide range of degree types and academic disciplines.

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Contributors

H.K. Allen, F. Lilly, K.H. Beck, and A.M. Arria contributed to the overall scientific direction of the project. H.K. Allen developed the manuscript. H.K. Allen and K.B. Vincent assisted with reviewing the literature and summarized previous work. H.K. Allen performed the statistical analyses. K.B. Vincent managed the day-to-day operational aspects of data collection and supervised staff involved in data collection. All authors assisted with writing and editing and approved the final manuscript.

Conflicts of interest

No conflicts declared.

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