First semester college experiences: Associations with substance use and mental health

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A B S T R A C T

Introduction: Substance use (SU) and mental health (MH) concerns often occur as students transition from high school to college and may be associated with first semester experiences.
Methods: Incoming first-year college students at a U.S., predominantly white, midwestern university were recruited for an intervention study. Participants reported on substance use, mental health, and college experiences at the end of their first semester of college (n = 781; 62.9 % female, mean age = 18.06 [*SD* = 0.24]; 77.2 % non-Hispanic white; 84.6 % heterosexual). Data for these current analyses were cross-sectional.
Results: Identifying as Black, Indigenous, or another Person of Color, as a sexual minority, or as female was associated with more challenging first semester experiences. Social experiences that represent more social engagement were associated with greater substance use. College experiences reflecting an easier transition were associated with fewer mental health concerns. Alcohol use moderated the relation between academic challenges and mental health with stronger associations found at greater levels of alcohol use.
Conclusions: First semester experiences were related to student mental health and substance use, suggesting the importance of early, targeted support for students to adjust to campus life.

1. Introduction

Globally, universities are in the midst of a mental health crisis, with ~ 31 % of students reporting an anxiety, mood, or substance use disorder in the past year (Auerbach et al., 2018). From 2007 to 2017, the prevalence of diagnosed mental health concerns increased from 21.9 % to 35.5 % (Lipson et al., 2019). From 2020 to 2021, one study found more than 60 % of U.S. college students met criteria for mental health concerns–a ~ 50 % increase from 2013 (Lipson et al., 2022). In 2021, ~60 % reported past month alcohol use and ~ 25 % past month marijuana use (Patrick et al., 2022); binge drinking decreased during COVID-related college closures compared to pre-closure, where ~ 4 % reported greater binge drinking after college closures (Bonar et al., 2021). Furthermore, approximately two in five students meet criteria for substance use disorder (Arterberry et al., 2020). Substance use can result in intoxicated driving, cognitive impairment, lower academic performance, and relationship problems (Metrik et al., 2016; Patrick, Terry-McElrath, et al., 2020). Identifying students not adjusting during the transition from high school to college is critical, as colleges could develop programs that support students with current or developing mental health concerns and reduce risky substance use.

The transition from high school to college is a time of exploration and growing autonomy for adolescents/young adults (Arnett & Mitra, 2020; Schulenberg & Maggs, 2002), and may lead to stress, anxiety, and depression (Schulenberg & Maggs, 2002). Institutional culture along with alcohol use as a rite of passage in college can lead to greater binge drinking (Presley et al., 2002; Schulenberg & Maggs, 2002; Weitzman et al., 2003; White et al., 2008) and potentially marijuana use. During this transition, students engage in binge/high intensity drinking (Patrick, Terry-McElrath, et al., 2016), use alcohol in social situations (Dierker et al., 2008), and initiate marijuana use (Suerken et al., 2014). Associations between mental health and substance use are mixed, where some studies find greater substance use is associated with more mental health concerns (e.g., Merrill & Carey, 2016) and some do not (e.g., Perera et al., 2011). Yet, there is a gap in the literature examining whether first semester experiences such as wellbeing (e.g., belonging, safety, homesickness), social integration (e.g., close friendships, social experience, and social enjoyment), and academic life (e.g., academic experience, academic enjoyment, and academic challenges) are associated with depression, anxiety, stress, and substance use.

The few studies examining first year college student experiences focus primarily on belonging, safety, homesickness, and academic stress. Students feeling less belonging (Dutcher et al., 2022; Gopalan & Brady, 2020), unsafe (Maffini, 2018), homesick (Thurber & Walton, 2012), or academic stress (Newcomb-Anjo et al., 2017) may report more depression, anxiety, or perceived stress. Those feeling less belonging or more homesickness are less likely to finish college (O'Keeffe, 2013; Thurber & Walton, 2012). Feeling a sense of belonging is lower among those identifying as a racial/ethnic minority (Strayhorn, 2018), while racial/ethnic minority status and identifying as female are associated with feeling unsafe on campus (Kelly & Torres, 2006; Maffini & Dillard, 2022). Social support may mitigate these risks by helping students cope with academic stress (Dwyer & Cummings, 2001). Greater belonging is associated with retention, better mental health, and use of campus services (Dutcher et al., 2022), but may be related to greater binge drinking (Berger et al., 2022). According to the transition catalyst model, risk-taking and substance use may be factors in the developmental transition in young adulthood, where the role of alcohol potentially facilitates socializing and making new friends when entering new environments (Schulenberg & Maggs, 2002). General wellbeing such as belonging, safety, and homesickness may lead to more mental health concerns, but there is a gap in the literature regarding first semester social life (close friendships, social experience, and social enjoyment) and academic life (academic experience, academic enjoyment, and academic challenges) experiences as risk factors for mental health concerns and substance use.

We leveraged data from a randomized controlled trial examining the efficacy of an adaptive prevention intervention (API) designed to reduce risky alcohol use in college students (Patrick, Boatman, et al., 2020; Patrick et al., 2021) to examine the relationships among first semester college experiences, substance use, and mental health. Our research questions (RQs) were: RQ1) Are there differences in first semester college experiences based on demographics (i.e., biological sex, race/ethnicity, and sexual orientation)? RQ2) How do first semester college experiences relate to substance use and mental health? RQ3) Do demographics or substance use moderate the relationship between first semester college experiences and mental health?

2. Methods

2.1. Participants and procedures

Incoming students at a predominantly white Midwestern university were recruited for an API designed to reduce risky alcohol use (Patrick, Boatman, et al., 2020; Patrick et al., 2021). Approximately 1,500 incoming first-year students were invited to participate using the Registrar's list. Of those invited, 891 consented and were randomized to either an assessment-only control (n = 300) or intervention condition (n = 591). Participants completed baseline surveys in August 2019 and Follow-up 1 surveys at the end of first semester (December 2019). This study was approved by an institutional review board.

Follow-up 1 was used for the current analyses when participants were asked about first semester college experiences. Of the 891 participants recruited at baseline, 781 (87.7 %) provided follow-up 1 data. There were no differences in demographics between baseline participants and those lost to follow-up. The sample had an average age of 18.52 (SD = 0.68). Based on university enrollment reports from 2019 to 2020, sample demographics were similar to the university they were sampled from: sample (vs. university enrollment) – 62.9 % female (vs. 53 %), 0.1 % American Indian (vs. 2 %), 10.5 % Asian (vs. 9 %), 3.6 % Black/African American (vs. 5 %), 1.7 % Hispanic (vs. 4 %), 79.3 % non-Hispanic white (vs. 63 %), and 4.8 % were other race/multiracial (vs. 7 % unknown). The study included first-year students ages 18 to 21 and no transfer students, late registrants, or older students, which explains some of the minor differences in demographic distribution. In the study sample, additional options included, 0.6 % Non-binary (0.6 %) and Transgender (1.4 %),. For sexual orientation, participants identified as

0.9 % asexual, 8.6 % bisexual, 3.8 % gay/lesbian, 85.1 % heterosexual, and 1.6 % preferred to self-identify another way.

2.2. Measures

2.2.1. Substance use

To assess *marijuana use frequency* and *alcohol use frequency*, participants were asked on how many occasions in the last 30 days they engaged in use. To assess *alcohol quantity*, participants were asked during an average week in the last 30 days how many alcoholic drinks they consumed. *Binge drinking* was assessed by asking how many times they had five or more drinks in a sitting in the past two weeks.

2.2.2. Mental health

Anxiety was assessed using the seven item Generalized Anxiety Disorder-7 (GAD-7) (Spitzer et al., 2006) and depression was assessed using eight of the nine items on the Patient Health Questionnaire-9 (PHQ-9) (Kroenke & Spitzer, 2002). Response options were 0 "Not at all" to 3 "Nearly every day." Items were summed for a total score for each measure, and both showed good reliability (anxiety: $\alpha = 0.97$; depression: $\alpha = 0.95$). Perceived stress was assessed using the 10-item Perceived Stress Scale (PSS; Cohen et al., 1983). Response options were 0 "Never" to 4 "Very often." Items were summed for a total score and showed good reliability ($\alpha = 0.85$).

2.2.3. First semester college experiences

General wellbeing (belonging, safety, homesickness), social life (close friendships, social experience, and social enjoyment), and academic life (academic experience, academic enjoyment, and academic challenges) experiences were assessed with modified items from the University of Kentucky Survey of First-Year Students (University of Kentucky Student Surveys, 2014). *Belonging*, *safety*, *homesickness*, and *close friendships* were assessed with "In regard[s] to your first semester at college, how much do you agree or disagree with the following statements?" followed by "I feel I belong at [name of university]," "I feel a sense of safety on my campus," "I have felt homesick," and "I have developed close friendships". Response options were 1 "Strongly disagree" to 5 "Strongly agree." *General academic experience* was assessed with "As you reflect back on your first semester academically, was it…" with response options 1 "A lot easier than you thought" to 5 "A lot harder than you thought." *Academic enjoyment* was assessed with "Reflecting back on your first semester, how much did you enjoy your academic experience?" with response options 1 "Not at all" to 5 "Very much." *Academic challenges* were assessed with "How academically challenging was your first semester of college?" with response options 1 "Not at all challenging" to 5 "Very challenging." *General social experiences* were assessed with "As you reflect back on your first semester socially, was it" with response options 1 "A lot easier than you thought" to 5 "A lot harder than you thought." *Social enjoyment* was assessed with "Reflecting back on your first semester, how much did you enjoy your social experience?" with response options 0 "Not at all" to 3 "Very much.".

2.2.4. Intervention condition

Intervention condition was coded as: 0 = assessment-only control and 1 = API.

2.2.5. Demographics

Biological *sex* assigned at birth was coded as female or male. *Race/ethnicity* was assessed by asking participants to check all that apply with responses coded as binary (0 = non-Hispanic white, 1 = Black, Indigenous, and People of Color [BIPOC]) due to limited sample sizes for some categories. Due to small sample sizes, sexual orientation was coded as binary (0 = heterosexual, 1 = sexual minority identity).

2.3. Analytic strategy

Analyses were conducted in SAS v.9.4. Regression models were estimated for each college experience including general wellbeing, social, and academic experiences examining associations with demographics, substance use (marijuana frequency, alcohol frequency and quantity, and binge frequency), and mental health concerns (anxiety, depression, and perceived stress). Nineteen (n = 762; 2.4 %) observations were excluded due to missing data on study variables. All analyses controlled for intervention condition.

For RQ1, we examined the associations of biological sex, race/ethnicity, and sexual orientation with college experiences. For RQ2, we regressed each college experience onto each substance use and mental health concern. For bivariate models, college experiences were entered into each model separately to examine relations with substance use and mental health. In multivariate models, college experiences were entered into each model separately to examine associations with substance use and mental health controlling for demographics.

For RQ3, moderation analyses were estimated using the *%process%* macro (Hayes, 2022). College experiences and substance use variables were mean-centered. Race/ethnicity, sex, and sexual orientation were examined as moderators of the relation between college experiences and substance use as well as mental health. Each college experience and substance were entered into models separately to examine whether substance use moderated the relation between college experience and mental health controlling for demographics. Conditional effects were estimated to probe interaction effects.

3. Results

Approximately 31.8 % of the sample reported not using alcohol or marijuana in the past 30-days, 55.7 % reported minimal anxiety, 49.7 % reported minimal depression, and 48.8 % reported low perceived stress. On average, past 30-day marijuana frequency was 0.53 (*SD* = 1.17), past 30-day alcohol frequency was 1.64 (*SD* = 1.24), past 30-day alcohol quantity was 2.99 (*SD* = 4.41), and past 2-week binge frequency was 0.48 (*SD* = 0.89) (see Table 1). Average anxiety scores were 5.14 (*SD* = 4.77), depression scores were 5.67 (*SD* = 4.97), and perceived stress was 15.05 (6.83).

3.1. Demographics associated with first semester college experiences

Identifying as BIPOC (vs. non-Hispanic white) was associated with feelings of less belonging, less safety, not developing close friendships, a harder academic experience, and less academic enjoyment (see Table 2). Identifying as BIPOC (vs. non-Hispanic white) was associated with less homesickness. Female (vs. male) was associated with feelings of less safety, while male was associated with more homesickness. Identifying as a sexual minority (vs. heterosexual) was associated with feelings of less belonging. All other associations between demographics and college experiences were not significant.

3.2. First semester college experiences and substance use and mental health

3.2.1. Results are presented in Tables 3 and 4

After controlling for demographics, results were similar to bivariate models unless specified otherwise.

General wellbeing. More belonging was associated with greater alcohol use. More safety was associated with greater alcohol quantity and binge frequency, but these findings were no longer significant after controlling for demographics. More belonging and safety were associated with fewer mental health symptoms (i.e., anxiety, depression, perceived stress). Homesickness was not significantly associated with substance use, but more homesickness was associated with more mental health symptoms.

Table 1
Demographics and Descriptive Statistics.

	N(%)/M (SD)	Range/Text Response
Total Sample N = 781		
Biological Sex Assigned at Birth		
Male	290 (37.1 %)	
Female	491 (62.9 %)	
Gender Indentity		
Male	290 (37.1 %)	
Female	491 (62.9 %)	
Non-binary/Third gender	5 (0.6 %)	
Prefer to self-identify	4 (0.5 %)	No pronoun preference, "Questioning", "Gender Questioning", "Female and Non-binary"
Transgender		
No	763 (97.7 %)	
Yes	11 (1.4 %)	
Prefer not to answer	6 (0.8 %)	
Race/Ethnicity		
Non-Hispanic white	619 (79.3 %)	
Black, Indigenous, and People of Color	162 (20.7 %)	
Sexual orientation		
Heterosexual	665 (85.1)	
Sexual Minority Identity	116 (14.9)	
College Experiences **General Wellbeing**		
Sense of Belonging	4.14 (1.01)	1 (strongly disagree) − 5 (strongly agree)
Feeling Safe	3.94 (0.96)	1 (strongly disagree) − 5 (strongly agree)
Homesick	3.14 (1.31)	1 (strongly disagree) − 5 (strongly agree)
Social Life		
Close Friendships	4.05 (1.16)	1 (strongly disagree) − 5 (strongly agree)
Social Experience	3.00 (1.27)	1 (a lot easier than you thought) − 5 (a lot harder than you thought)
Social Enjoyment	2.30 (0.86)	0 (not at all) − 3 (very much)
Academic Life		
Academic Experience	3.27 (1.11)	1 (a lot easier than you thought) − 5 (a lot harder than you thought)
Academic Enjoyment	1.91 (0.77)	0 (not at all) − 3 (very much)
Academic Challenges	1.68 (0.71)	0 (not at all challenging) − 3 (very challenging)
Substance use		
Past 30-day Marijuana Frequency	0.53 (1.17)	0 (0 occasions) – 6 (40 or more occasions)

(continued on next page)

Table 1 (*continued*)

	N(%)/M (SD)	Range/Text Response
Past 30-day Alcohol Frequency	1.34 (1.24)	0 (0 days) – 6 (All 30 days)
Past 30-day Alcohol Quantity	2.99 (4.41)	0——30
Past 2-week Binge Frequency	0.48 (0.89)	0 (None) – 5 (10 or more times)
Mental Health		
Anxiety	5.14 (4.77)	
Depression	5.67 (4.97)	
Perceived Stress	15.05 (6.83)	

Table 2

Race/ethnicity, biological sex, sexual orientation associated with college experiences.

	Race/ethnicity (ref = white)	Biological sex (ref = male)	Sexual Orientation (ref = heterosexual)
Outcomes	β (SE)	β (SE)	β (SE)
General wellbeing			
Belonging (n = 780)	−0.17(0.09)***	−0.03 (0.08)	−0.11 (0.10)**
Safety (n = 780)	−0.12 (0.09)**	−0.23 (0.07)***	−0.07 (0.10)
Homesick (n = 780)	−0.14 (0.12)***	0.15 (0.10)***	−0.05 (0.13)
Social			
Close Friendships (n = 780)	−0.11 (0.10)**	0.03 (0.09)	−0.09 (0.12)
Social experience (n = 778)	0.01 (0.12)	0.07 (0.09)	0.08 (0.13)
Social enjoyment (n = 778)	−0.08 (0.08)	0.004 (0.06)	−0.06 (0.09)
Academic			
Academic experience (n = 780)	0.14(0.10)***	−0.03 (0.08)	−0.04 (0.11)
Academic enjoyment (n = 779)	−0.16 (0.07)***	0.02 (0.06)	0.01 (0.08)
Academic challenges (n = 779)	0.06 (0.06)	0.01 (0.05)	−0.01 (0.07)

Note: *** p < .001; ** p < .01; Due to multiple comparisons, p < .01 used as cutoff; SE = Standard Error.

3.2.2. Social life

Developing close friendships was associated with greater substance use (i.e., marijuana frequency, alcohol frequency, alcohol quantity, binge frequency) and fewer mental health symptoms. A harder social experience was associated with lower alcohol use and more mental health symptoms. More social enjoyment was associated with greater alcohol use.

3.2.3. Academic life

Academic experience, enjoyment, and challenges were not significantly associated with substance use. A more academically challenging semester and a harder academic experience were associated more mental health symptoms. More academic enjoyment was associated with fewer mental health symptoms.

3.3. Moderation analyses

3.3.1. General wellbeing and social life

Neither demographics nor substance use moderated the relationship between general wellbeing and mental health or social experiences and mental health.

3.3.2. Academic life

Alcohol use frequency moderated the relation between academic challenges and perceived stress (overall model: $\Delta F (7, 760) = 19.25, p < .001, \Delta R^2 = .15$; interaction: $\beta = 0.78, p = .003$; Fig. 1), anxiety (overall model: $\Delta F (7, 759) = 13.41, p < .001, \Delta R^2 = .11$; interaction: $\beta = 0.72, p < .001$; Fig. 2), and depression (overall model: $\Delta F (7, 758) = 15.41, p < .001, \Delta R^2 = .13$; interaction: $\beta = 0.68, p < .001$; Fig. 3). There was a stronger association between academic challenges and mental health with more frequent alcohol use. At high levels of alcohol use frequency (1 *SD* above the mean), academic challenges were positively associated with perceived stress ($\beta = 2.82, p < .001$), anxiety ($\beta = 2.08, p < .001$), and depression ($\beta = 1.93, p < .001$. At low levels of alcohol use frequency (1 SD below the mean), academic challenges were not significantly associated with perceived stress ($\beta = 0.89, p = .043$), anxiety ($\beta = 0.31, p = .330$), or depression ($\beta = 0.25, p = .448$).

Alcohol quantity moderated the relation between academic challenges and perceived stress (overall model: $\Delta F (7, 759) = 19.40, p < .001, \Delta R^2 = .15$; interaction: $\beta = 0.22, p = .002$; Fig. 4) and anxiety (overall model: $\Delta F (7, 758) = 12.53, p < .001, \Delta R^2 = .10$; interaction: $\beta = 0.15, p = .002$; Fig. 5). There was a stronger association between academic challenges and mental health with greater quantity of alcohol use. At high levels of alcohol use quantity, academic challenges were positively and more strongly associated with perceived stress ($\beta = 2.78, p < .001$) than at low levels of alcohol use quantity ($\beta = 1.15, p = .003$). At high levels of alcohol use quantity, academic challenges were positively associated with anxiety ($\beta = 1.83, p < .001$), while at low levels of alcohol use quantity academic challenges were not significantly associated with anxiety ($\beta = 0.69, p = .012$).

3.4. Ad hoc analyses

Ad hoc analyses were conducted using the same approach described above to examine the moderating role of intervention condition between college experiences and substance use and mental health. In these models, the main effect of intervention was not significant for any outcome. Intervention condition moderated the association between feelings of belonging and mental health: depression (overall model: $\Delta F (6, 763) = 30.38, p < .001, \Delta R^2 = .19$; interaction: $\beta = -1.25, p < .001$) and perceived stress (overall model: $\Delta F (6, 764) = 36.67, p < .001, \Delta R^2 = .22$; interaction: $\beta = -1.35, p = .003$). For the intervention condition, greater feelings of belonging were more protective, with belonging having a stronger negative association with depression (Fig. 6: $\beta = -1.99, p < .001$) and perceived stress (Fig. 7: $\beta = -2.74, p < .001$) for those in the intervention than control condition (depression: $\beta = -0.74, p = .003$; perceived stress: $\beta = -1.40, p < .001$). No other significant interaction effects were found.

4. Discussion

Few studies have examined whether first semester of college experiences are associated with substance use and mental health. First semester general wellbeing, social life, and academic life experiences varied by demographic characteristics and are associated with substance use and mental health, where alcohol use moderated the relation between college experiences and mental health. By understanding the impact of college experiences on first year students, universities can implement early prevention and intervention programs to create inclusive, safer environments that reduce substance use and mental health concerns.

Table 3
Bivariate associations between substance use, mental health, and college experience.

	Marijuana (n = 765)	Alcohol Frequency (n = 773)	Alcohol Quantity (n = 771)	Binge Frequency (n = 771)	Anxiety (n = 770)	Depression (n = 770)	Perceived Stress (n = 771)
	β (SE)	β (SE)	β (SE)	β (SE)	β (SE)	β (SE)	β (SE)
General wellbeing							
Belonging	0.05 (0.04)	0.19 (0.04)***	0.17 (0.16)***	0.14 (0.03)***	−0.28 (0.16)***	−0.34 (0.17)***	−0.37 (0.24)***
Safety	−0.01 (0.04)	0.08 (0.05)	0.12 (0.16)***	0.11(0.03)**	−0.33 (0.17)***	−0.28 (0.18)***	−0.35 (0.24)***
Homesick	0.06 (0.03)	0.01 (0.03)	−004 (0.12)	−0.05 (0.02)	0.16 (0.13)***	0.15 (0.13)***	0.14 (0.19)***
Social							
Close Friendships	0.10 (0.04)**	0.23 (0.04)***	0.22 (0.13)***	0.18 (0.03)***	−0.20 (0.15)***	−0.23 (0.15)***	−0.25 (0.21)***
Social experience	0.03 (0.03)	−0.16 (0.03)***	−0.17 (0.12)***	−0.13 (0.02)***	0.22 (0.13)***	0.22 (0.14)***	0.23 (0.19)***
Social enjoyment	0.09 (0.05)	0.26 (0.05)***	0.24 (0.18)***	0.20 (0.04)***	−0.25 (0.20)***	−0.26 (0.20)***	−0.28 (0.28)***
Academic							
Academic experience	0.02 (0.04)	−0.05 (0.04)	−0.01 (0.14)	−0.03 (0.03)	0.12 (0.15)***	0.14 (0.16)***	0.22 (0.22)***
Academic enjoyment	0.003 (0.06)	0.07 (0.06)	0.03 (0.21)	0.01 (0.04)	−0.15 (0.22)***	−0.21 (0.23)***	−0.31 (0.31)***
Academic challenges	0.03 (0.06)	0.00002 (0.06)	0.01 (0.22)	0.01 (0.04)	0.17 (0.24)***	0.16 (0.25)***	0.20 (0.34)***

Note: *** p < .001; ** p < .01; Due to multiple comparisons, p < .01 used as cutoff; sample size for social experience/soc enjoyment Marijuana = 764, Alcohol Frequency = 772, Depression = 769; SE = Standard Error.

Table 4
Multivariate associations between substance use, mental health, and college experience.

	Marijuana (n = 765)	Alcohol Frequency (n = 773)	Alcohol Quantity (n = 771)	Binge Frequency (n = 771)	Anxiety (n = 770)	Depression (n = 770)	Perceived Stress (n = 771)
	β (SE)	β (SE)	β (SE)	β (SE)	β (SE)	β (SE)	β (SE)
General wellbeing							
Belonging	0.05 (0.04)	0.16 (0.04)***	0.15 (0.16)***	0.12 (0.03)***	−0.26 (0.16)***	−0.31 (0.16)***	−0.33 (0.22)***
Safety	−0.01 (0.05)	0.07 (0.05)	0.08 (0.17)	0.07 (0.03)	−0.29 (0.17)***	−0.23 (0.18)***	−0.29 (0.24)***
Homesick	0.06 (0.03)	−0.02 (0.03)	−0.05 (0.12)	−0.05 (0.02)	0.14 (0.13)***	0.15 (0.13)***	0.15 (0.18)***
Social							
Close Friendships	0.10 (0.04)**	0.21 (0.04)***	0.21 (0.13)***	0.17 (0.03)***	−0.20 (0.14)***	−0.21 (0.15)***	−0.23 (0.20)***
Social experience	0.02 (0.03)	−0.15 (0.03)***	−0.16 (0.12)***	−0.12 (0.02)***	0.19 (0.13)***	0.19 (0.13)***	0.21 (0.18)***
Social enjoyment	0.09 (0.05)**	0.25 (0.05)***	0.23 (0.18)***	0.19 (0.04)***	−0.24 (0.19)***	−0.25 (0.20)***	−0.26 (0.26)***
Academic							
Academic experience	0.04 (0.04)	−0.02 (0.04)	−0.003 (0.14)	−0.02 (0.03)	0.13 (0.15)***	0.14 (0.16)***	0.21 (0.21)***
Academic enjoyment	−0.01 (0.06)	0.05 (0.06)	0.01 (0.21)	−0.004 (0.04)	−0.15 (0.22)***	−0.21 (0.22)***	−0.30 (0.29)***
Academic challenges	0.04 (0.06)	0.01 (0.06)	0.01 (0.22)	0.02 (0.04)	0.17 (0.23)***	0.15 (0.24)***	0.19 (0.32)***

Note: *** p < .001; ** p < .01; Due to multiple comparisons, p < .01 used as cutoff; sample size for social experience/soc enjoyment Marijuana = 764, Alcohol Frequency = 772, Depression = 769; SE = Standard Error; Controlling for race/ethnicity, biological sex, sexual orientation, and intervention condition.

Developing close friendships was related to more alcohol and marijuana use, while feeling a sense of belonging, easier social experiences, and more social enjoyment were related to greater alcohol use and binge drinking and fewer mental health symptoms. Notably, a harder social experience was associated with using *less* alcohol and *less* binge drinking. Substance use occurs most commonly in social contexts (Stanesby et al., 2019) to increase social facilitation (Patrick et al., 2019; Patrick & Schulenberg, 2011) and reduce social anxiety (Walukevich-Dienst et al., 2022). As first semester college students transition to a new environment

and are exposed to new stressors and social groups, substance use might be a means for meeting new people and developing new relationships (Duckworth et al., 2021; Schulenberg & Maggs, 2002). Although intervention programs such as the Brief Alcohol Screening and Intervention for College Students (BASICS; Dimeff et al., 1999) can be implemented to reduce risky alcohol and marijuana use, these findings reflect the challenge of determining when and how to intervene on risky substance use, especially when it is associated with an easier transition to college.

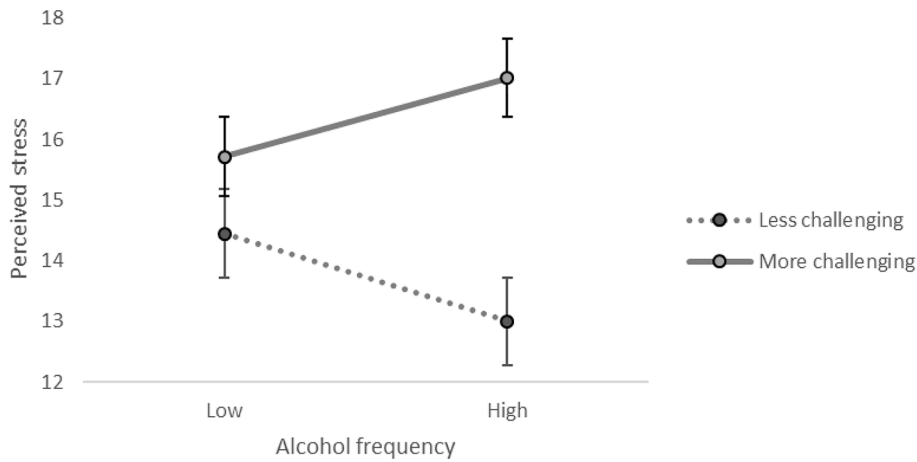Consistent with prior studies, those identifying as BIPOC or sexual

Fig. 1. Moderation of academic challenges on perceived stress by alcohol frequency.
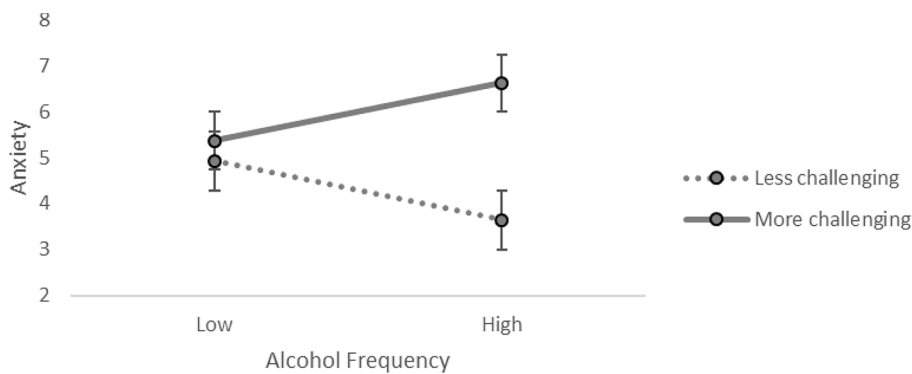

Fig. 2. Moderation of academic challenges on anxiety by alcohol frequency.
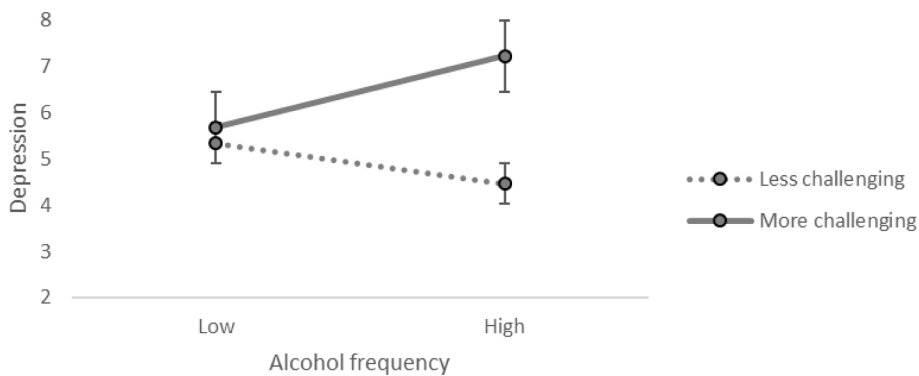

Fig. 3. Moderation of academic challenges on depression by alcohol frequency.

minority reported feeling less belonging (Gopalan & Brady, 2020; Johnson et al., 2007; Strayhorn, 2018). This study extends prior research by finding that racial/ethnic minorities may not develop close friendships, experience less academic enjoyment, and have a harder academic experience their first semester. Although BIPOC students may experience less homesickness, as results showed, this is likely not enough to quell the onslaught of wellbeing, social, and academic stressors that impact their adjustment to campus. Students from racial/ethnic minority backgrounds attending predominately white institutions may benefit from focused interventions (Murphy et al., 2020; Walton & Cohen, 2007, 2011) that leverage the experiences of older students to increase feelings of belonging, retention, and academic success among younger racial/ethnic minority students and encouraging participation

in student organizations that support their identity (e.g. LGBT + organizations, Black Student Union) (Garvey et al., 2018; Vaccaro & Newman, 2016).

Consistent with other studies, BIPOC status and identifying as female were associated with feeling less safe on campus (Kelly & Torres, 2006; Maffini & Dillard, 2022) and feeling less safety was associated with more mental health symptoms. Culturally affirming counseling services, representative faculty and staff, and clear policies to protect the safety of students from minoritized racial/ethnic backgrounds is paramount to increase belonging and safety (Garvey et al., 2018; Quaye et al., 2014; Stewart & Bridges, 2011). Notably, males (vs. females) experienced greater levels of homesickness. Incoming students who are homesick or experiencing mental health concerns may need early support from
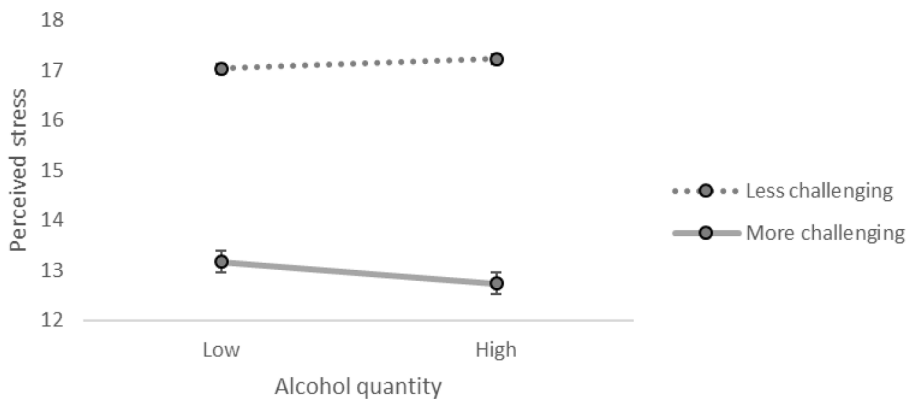
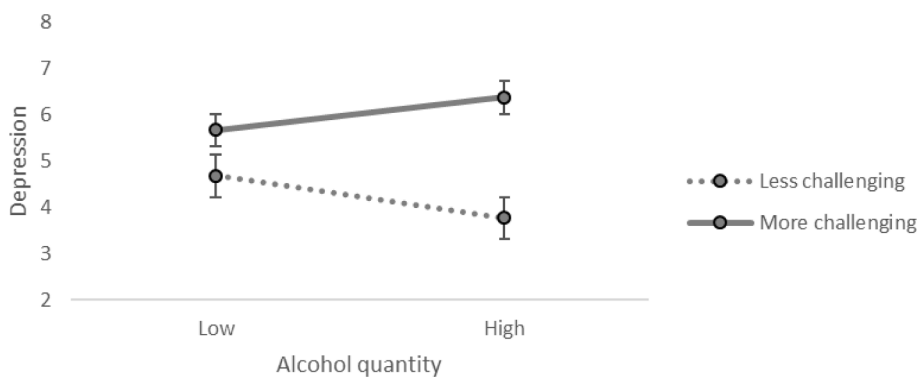**Fig. 4.** Moderation of academic challenges on perceived stress by alcohol quantity.

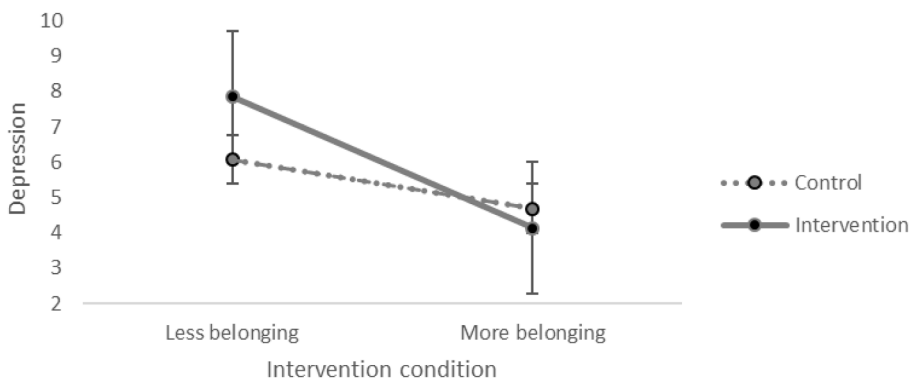**Fig. 5.** Moderation of academic challenges on depression by alcohol quantity.

Fig. 6. Moderation of feelings of belonging on depression by intervention condition.
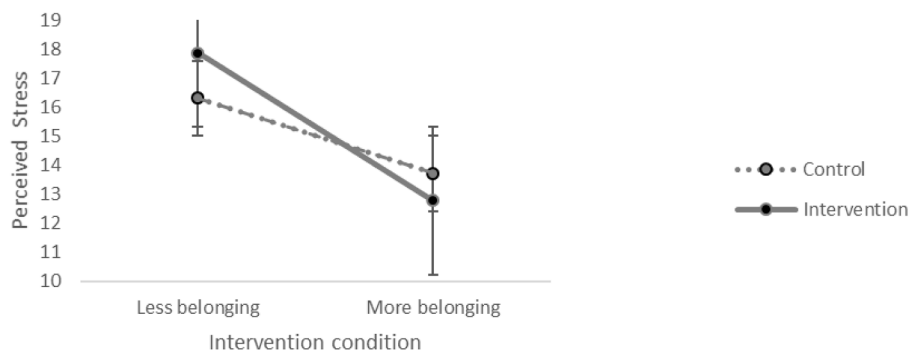

Fig. 7. Moderation of feeling of belonging on perceived stress by intervention condition.

university resources such as counseling centers and residence hall staff (Claborn & Kane, 2012).

Moderation analyses indicated that incoming students who faced more academic challenges and drank more reported worse mental health. Although universities incorporate prevention programs such as Alcohol 101+ (Donohue et al., 2004) to reduce risky alcohol use that can occur during this transitional period, designing programs to screen for academic concerns and alcohol use at the same time may produce more positive student outcomes by intervening before they interfere with the student's mental health. The intervention condition had a protective association between belonging and mental health. Future research should examine the impact interventions have during the transition to college on sense of belonging and mental health, even when they are not the main target of the program.

4.1. Limitations and Future directions

This study had limitations. The sample was primarily non-Hispanic white, heterosexual, U.S. citizens from one predominantly white Midwestern university, which limits generalizability. This study focused on biological sex instead of a more nuanced examination of gender identities and may not have captured mental health vulnerabilities of minority gender identities. Future work should examine these relationships in more diverse samples, including those for more nuanced categorizations of gender, race, sexual orientation, and students from other countries, as these students may experience more homesickness and feel less safe on campus due to discrimination (Poyrazli & Lopez, 2007). Future studies should explore similar research questions in more diverse student samples, as BIPOC students' first year experiences may differ upon the racial/ethnic composition of a university/college (i.e. HBCU v. HWCU). Parental/family support and residence were not examined in this study and could be incorporated in future studies.

4.2. Conclusion

Many first semester students adjust to campus without engaging in substance use (~32 % did not report alcohol or marijuana use in the past 30-days) and do not experience mental health concerns (~34 % reported only minimal anxiety, depression, and perceived stress). Many students need support from university resources, but may perceive too many barriers to access them (Eisenberg et al., 2012; Peterson et al., 2023). Although substance use seems to have a positive association with developing relationships for some students, some use substances when experiencing academic challenges and harder social experiences or more mental health concerns. Prevention programs that identify first-year college students who are not adjusting to campus life, experience mental health concerns, and engage in riskier substance use are critical.

Declaration of competing interest/Competing interests: The authors declare they have no financial interests. Dr. Arterberry is on the board of directors of Source Research Foundation and receives no compensation as member of the board of directors.

Consent to participate: Informed consent was obtained from all individual participants included in the study.

Ethics approval

A University of Michigan Institutional Review Board approved this study. The study was performed in accordance with the ethical standards as laid down in the 1964 Declaration of Helsinki.

CRediT authorship contribution statement

Brooke J. Arterberry: Writing – review & editing, Writing – original draft, Methodology, Formal analysis, Conceptualization. **Sarah J. Peterson:** Writing – review & editing, Writing – original draft, Conceptualization. **Megan E. Patrick:** Writing – review & editing, Funding acquisition, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

Acknowledgements

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