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College students' receptiveness to intervention approaches for alcohol and cannabis use

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Abstract

Objective: Addressing high-risk alcohol and cannabis use represent major challenges to institutions of higher education. A range of evidence-based treatment approaches are available, but little is known concerning students' receptiveness to such approaches. Prior work identified that students were most open to individual therapy and self-help options for reducing alcohol use, but less open to medication. The current study examines student receptiveness to intervention approaches across a wider range of intervention approaches (e.g., remote/telehealth), and extends to evaluate cannabis intervention receptiveness.

Method: Undergraduate students reported on alcohol and cannabis use, motives for and reasons against use, and openness to an array of interventions for reducing alcohol and cannabis use.

Results: Informal options (self-help, talking with family/friends), individual therapy, and appointments with a primary care provider (PCP) were endorsed most frequently. Group therapy and medication were less commonly endorsed, though medication was endorsed at a higher prevalence than in prior studies. Women generally expressed higher receptiveness than men. Lower alcohol consumption was associated with increased receptiveness to some approaches. Students at high risk for alcohol and/or cannabis dependence were less receptive to many treatment options.

Conclusions: College students were open to a wide variety of approaches for reducing their alcohol and cannabis use. These results can inform selection, implementation, and availability of campus-wide services, especially as low-cost technological-based approaches are expanding. Further attention to existing services (e.g., PCP) for addressing alcohol and cannabis use may be considered, given students' receptiveness to such approaches.

Keywords

alcohol use; cannabis use; treatment receptiveness; intervention; college students

Introduction

Heavy alcohol consumption among college students is a pervasive public health problem (e.g., Arria & Jernigan, 2018). According to 2018 results from Monitoring the Future

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(MTF), 75% of college students reported past year alcohol use, which is characterized by both high rates of past two-week binge drinking (28%) and high intensity drinking (9.5%) (Schulenberg et al., 2019). Importantly, the prevalence of past year alcohol use disorder (AUD) among college students is estimated to be around 30% (Arterberry et al., 2019). Heavy drinking among college students is also associated with numerous negative consequences such as physical and sexual assault, unintentional injury and death, unprotected sex, social and interpersonal problems, and academic problems, such as low grade point average (GPA) (Arria & Jernigan, 2019; Merrill & Carey, 2016; Mundt & Zakletskaia, 2012; Piazza-Garner et al., 2016). High intensity drinking, particularly the 21st birthday celebrations and other special events (e.g., spring break) or holidays (e.g., Fourth of July), is also common among college students (Patrick & Azar, 2018; Rutledge et al., 2008). This pattern of drinking has been related to structural changes in the maturing brain (e.g., Boness et al., 2019), and may also increase future risk of alcohol dependence (Linden-Carmichael et al., 2017; Prince et al., 2019), suggesting this is a period of particular vulnerability.

College students also report high rates of past year cannabis use (42%) with nearly six percent of students reporting cannabis use on 20 or more occasions in the past 30 days (Schulenberg et al., 2019). The National Epidemiological Study on Alcohol and Related Conditions-III (NESARC-III) estimates that 8.6% of college students met criteria for a past year cannabis use disorder (CUD; Arterberry et al., 2019; Grant et al., 2015). Similar to alcohol, cannabis use is associated with several negative outcomes such as increased risk of motor vehicle collisions (e.g., Asbridge et al., 2012; Pearson et al., 2017) and increased risk of mental health problems including other substance use disorders (SUDs), and anxiety and mood disorders (e.g., Volkow et al., 2014). Further, GPA and overall academic achievement are negatively associated with cannabis use even among infrequent users (Buckner et al., 2010; Phillips et al., 2015; Suerken et al., 2016), and students with cannabis-related problems are more likely to drop out of college (Hunt et al., 2010). Given college students' brains are still developing, they may be particularly vulnerable to the negative impacts of cannabis use (e.g., altered functional connectivity). Indeed, research has demonstrated that cannabis use in adolescence and young adulthood may have long term implications such as declines in IQ and impaired memory and attention (Volkow et al., 2014). As such, there exists a clear need to consider approaches aimed at reducing alcohol and cannabis use among this population.

Treatment Seeking Behaviors

Despite the high prevalence of AUD and CUD, rates of consumption, and occurrence of negative outcomes, college students do not typically express high levels of interest in substance use behavior change (Epler et al., 2009a). Previous research has also suggested a low level of interest in treatment among college students who use alcohol and cannabis. For example, Buckner and colleagues (2010), in a large sample of undergraduate students, found that 85% had no interest in cannabis treatment. However, amongst those with more than one cannabis-related problem, 22.7% expressed at least some degree of interest in treatment (Buckner et al., 2010). Interest in alcohol treatment has not been comprehensively investigated among college students, but the research that does exist also suggests low levels

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of interest (e.g., Cellucci et al., 2006; Yu et al., 2003). In general, there appears to be a low level of interest in alcohol- and cannabis-related treatment among college students.

Low interest in treatment among college students is reflected in the similarly low rates of treatment utilization among this population (Buscemi et al., 2010). Within the NESARC-III sample (Grant et al., 2015), college students with a past year SUD (39.6% of college students assessed) were unlikely to engage in alcohol or drug treatment, with only 12.9% of those with a past year SUD reporting any treatment involvement (Arterberry et al., 2019). In another study, only 18.3% of heavy-drinking college students had ever engaged in alcohol-related help-seeking in the past (Buscemi et al., 2010). This is consistent with help-seeking among individuals with AUD in the general population (19%) (Oleski et al., 2010). In a subsample of college students meeting criteria for CUD (19.2%), Calderia and colleagues (2009) reported no previous help-seeking (for any type of treatment) since starting college. This is consistent with treatment-seeking rates among those with CUD in the general population which are estimated at less than 10% (e.g., Wu et al., 2017). Together, this points to a significant treatment gap among college students with alcohol and cannabis-related problems.

Receptiveness to Alcohol and Cannabis Focused Treatments

Delineating alcohol-and cannabis-focused intervention strategies to which students are receptive, or open to using, is a critical consideration when devising strategies to help students with their substance use. When college students are asked what types of treatment options they would be likely to use if they wanted to change their drinking, they tend to report individual therapy and informal resources such as web-based education, self-help books, self-help groups, and talking to friends or family (Buscemi et al., 2010; Calderia et al., 2009; Epler et al., 2009a). Given the rapid changes in both college student substance use patterns, changes in context and culture (e.g., legality of cannabis), and changes in evidence-based practices, these relatively dated results may not reflect current preferences and do not include more updated modes of intervention (e.g., technological-based interventions). As examples, the legalization of recreational cannabis in some states, the growth of “sober curious” movements (i.e., exploring periods of sobriety such as “dry January”, replacing all or some alcohol use with mocktails or other activities; Green, 2020; Warrington, 2018), and the increased use of technology and/or remote healthcare may impact students’ openness to and preferences for alcohol and/or cannabis interventions. Just as one example, we have seen a sharp increase in mobile health (mHealth) applications targeting alcohol and substance use over the past 10 years (e.g., Heron & Smyth, 2010; Kazemi et al., 2019). In addition to changing climates, which may impact preferences for treatment modalities, student preferences for cannabis-specific interventions have yet to be systematically assessed. Preferences are important to understand given we have seen increased cannabis use and frequency of use in areas where recreational cannabis use has been legalized (Bae & Kerr, 2019), and there is increased focus to cannabis prevention efforts across college campuses.

There have been two previous attempts to characterize college student receptiveness to alcohol interventions. Epler and colleagues (2009a) sampled 2,084 college students who had reported alcohol consumption within the past three months in order to evaluate receptiveness

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to various alcohol treatment options. When asked, hypothetically, about receptiveness to specific treatment options (i.e., “Which ones of the following would you consider if you were wanting to cut down on or stop drinking?”), college students reported the most receptivity to individual therapy (35%), and informal treatments such as self-help books (24%), self-help groups (19%), and self-help computer programs (10%). Receptivity to oral medication was 13%. Univariate analyses suggested the likelihood of receptivity towards certain treatment options varied as a function of consumption and other alcohol-related variables (e.g., motives, dependence), with higher consumption and frequency of heavy consumption predicting *less* receptiveness to some options (e.g., self-help groups, individual therapy).

Buscemi and colleagues (2010) assessed 197 college students to determine, hypothetically, how likely they would be to use various treatment options if they wanted to change their drinking (i.e., “Imagine that you wanted to change your drinking habits. How likely would you be to do the following?”). Students reported that if they wanted to change their drinking, they would be most open to talking to friends (13%) and relatives (10%), followed by searching the internet (4.3%), and speaking with religious clergy or attending an Alcoholics Anonymous meeting (3%). Other options such as individual therapy and talking to a doctor on campus were endorsed less than 3% of the time. Multivariate analyses suggested that likelihood of receptivity towards treatment options varied as a result of alcohol-related problems and normative discrepancy (i.e., how their drinking compares to other college students’ drinking) such that those with more alcohol-related problems and higher levels of normative discrepancy (i.e., believing they drank more than other college students) were less likely to report they would be receptive to engaging in the treatment types assessed. Taken together, findings from Epler et al. (2009a) and Buscemi et al. (2010) suggest that college students, especially those at high risk of alcohol-related problems, are not particularly receptive to treatment for their substance use, but that if they were to seek treatment, they would tend to prefer informal options.

Even though research suggests that college students are less receptive and rarely use alcohol and cannabis treatment services, there does exist a wealth of evidence for the impact of these interventions on college student substance use. For example, mandated treatment programs have been consistently shown to reduce alcohol (Carey et al., 2016) and cannabis use (Buckner et al., 2018) among students. Various studies have also demonstrated the effectiveness of non-mandated web- or computer-based as well as in-person interventions for reducing college students’ substance use (e.g., Cadigan et al., 2014; Walukevich-Dienst et al., 2020). The availability of effective interventions for reducing college student substance use further supports the need to understand intervention receptiveness among this population.

The Current Study

Although Buscemi et al. (2010) and Epler et al. (2009a) offer excellent starting places for understanding student receptiveness to substance use interventions, they may not be representative of current preferences and do not address receptiveness to cannabis-specific interventions. The current study aimed to provide an update on college student treatment

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receptiveness for alcohol and extend this previous work to cannabis interventions given the changing climate of substance use among college students. In addition, the current study extends earlier work by including a wider array of treatment options, such as teletherapy or telephone application services, and more informal options of receiving non-therapy support (e.g., talking with peer leaders). Similar to the two earlier studies, we also sought to examine sex differences in receptivity given known differences in willingness to seek mental health services (e.g., Wang et al., 2015).

Therefore, the current study had two primary aims which were explored separately among alcohol and cannabis: (1) investigate students' receptiveness to various intervention (i.e., prevention and treatment) approaches, including sex differences and (2) examine predictors of receptiveness to intervention options, including alcohol/cannabis use and dependence risk, motivations for use, readiness to change, and reasons for not using alcohol/cannabis.

Method

Participants

Four-hundred and ninety-four undergraduates responded to the study recruitment ad (college students who have used alcohol and/or cannabis), consented, and completed questionnaires. Participants were recruited through a participant pool open to students in introductory psychology courses, and were compensated for their participation with course credit. All procedures received Institutional Review Board approval. Data cleaning procedures removed 48 participants (2 for incomplete data; 46 for random responding suspected due to duration of completion and/or inconsistencies across items). Participants included in the analyses (n = 446) were 88% (n = 394) White, 9% (n = 38) Black, 5% (n = 24) Asian, 5% (n = 21) Hispanic, 1% (n = 6) Native Hawaiian/Other Pacific Islander, 1% (n = 5) American Indian/Alaska Native, 1% (n = 4) another race, and < 1% (n = 1) declined to report. The average age was 18.94 years (SD = 1.79; range = 18–42; 5 declined to report). Participants reported on sex (65% female) and gender (64% women, 35% men, <1% gender queer/gender non-conforming, < 1% other, and <1% declined to report).

Measures

Receptiveness

Hypothetical Treatment Seeking Behaviors.: Participants reported separately on their interest in quitting and/or cutting down on alcohol and cannabis use (dependent on which substance they endorsed using). Participants were asked to select all approaches (yes/no) that they would be open to if they were interested in changing their substance use behaviors, from the following four options: open to strategies for cutting down; strategies for stopping all together; neither; or other option(s).

Receptiveness to Intervention Options.: Receptiveness to specific intervention options was assessed separately for alcohol and cannabis. Participants completed intervention receptiveness ratings separately for each substance that they reported using (i.e., alcohol, cannabis). Consistent with Epler and colleagues (2009a), we asked participants to respond to the following hypothetical prompt for 23 separate intervention options: "For alcohol

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[cannabis], how much would you consider each of the following if you were wanting to quit or cut down on your drinking [cannabis/marijuana use] or associated consequences? If I were interested in quitting or cutting down on my drinking [cannabis/marijuana use], I would consider…". Each intervention option was presented separately for alcohol and cannabis use, and responses were on a 6-point Likert scale ranging from "strongly disagree" to "strongly agree." These included a wide array of help-seeking behaviors, such as talking with friends or family, self-help resources, smartphone applications, in-person individual therapy and groups, and medication. Intervention options included in the present study were selected based on a review of Epler and colleagues (2009a), more recent literature focused on technological interventions (e.g., Ashford et al., 2019), consultation with a prevention programming department on campus, and a focus group with undergraduate research assistants. Tables 1 and 2 describe all possible help-seeking behaviors for alcohol and cannabis, respectively. Compared to Epler and colleagues (2009a) and Buscemi and colleagues (2010), this list included a wider range of intervention options, including more technology-focused resources (e.g., phone apps, blogs, and online chats/groups) given the significant advancements in this area over the last ten years. The individual intervention options are also grouped into categories (e.g., all medication-related options in "medication" category; see Table 1).

Alcohol Measures

Alcohol Consumption and Risk of Dependence.: Participants reported on their alcohol use history (i.e., use in the past 12 months; use more than 12 months ago). A past-year heaviness of alcohol consumption composite was created with the following standardized variables: quantity and frequency of drinking, frequency of binge drinking (4+ for women, 5+ for men), frequency of drinking 12+ drinks in one day, quantity and frequency of the maximum number of drinks in single day. Frequency-based items were rated on a scale from (1) "1 to 2 times in the last year" to (10) "every day," and quantity items were open response.[1] It should be noted that only a subset of participants were asked to report on their alcohol consumption (quantity and frequency) because these items were added after some data had already been collected. Sample sizes are reflected in Table 1.

Participants also completed the Alcohol Use Disorders Identification Test (AUDIT; Saunders et al., 1993). The AUDIT is a 10-item self-report instrument used to assess past year consumption and harmful drinking. Higher scores are associated with a greater likelihood of alcohol dependence (Babor et al., 2001). The AUDIT has consistently demonstrated favorable psychometric properties (e.g., validity, sensitivity and specificity) for use with college students (e.g., Fleming et al., 1991; Kokotalio et al., 2004). The AUDIT total score ($\omega = 0.78$)[2] as well as low-risk (scores of 0–7) and hazardous/high-risk (scores of 8+)

[1]This "heaviness" composite is considered appropriate for the purpose of the current study because (a) heavy use over time is the most parsimonious construct for explaining the neurobiological changes and contextualizing the varied social and physical consequences that occur in individuals who use substances (Grant et al., 2009; Rehm & Roerecke, 2013; Rehm et al., 2013); (b) heaviness of consumption shows a strong monotonic relationship with the DSM–5 criterion count and this association is more robust than alternative correlates (e.g., general functioning, psychiatric comorbidity; see Dawson et al., 2010; Lane & Sher, 2015; Saha et al., 2007); and (c) factor scores derived from comparable past 12-month consumption composites are heritable, influenced by genetic factors associated with heavy drinking, and stable across time (Agrawal et al., 2011).

[2]We calculated McDonald's omega (Hayes & Coutts, 2020), as opposed to Cronbach's alpha for internal consistency given that omega tends to be a more accurate estimate of reliability (e.g., McNeish, 2018).

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were used in the present study. AUDIT total and risk category scores were computed if participants had complete data on the AUDIT items. Two versions of the AUDIT were administered (past-year and prior-to-past year), depending on the timeframe of use reported. Only past-year AUDIT scores are included in the present study.

Drinking Motives.: Reasons for drinking were assessed with the Drinking Motives Questionnaire – Revised (DMQ-R; Cooper, 1994). Participants were asked how often they drink for 20 different reasons which are partitioned into: Enhancement ($\omega = 0.87$; e.g., to enjoy the feeling), Conformity ($\omega = 0.89$; e.g., to fit in), Coping ($\omega = 0.86$; e.g., to forget worries), and Social ($\omega = 0.92$; e.g., to be more social) motives. Participants were instructed to respond using a 6-point Likert scale ranging from "never" to "almost always." The DMQ-R shows excellent validity and test-retest reliability among undergraduate students (e.g., Grant et al., 2007).

Reasons for Abstaining or Limiting Drinking (RALD).: We assessed 10 reasons for limiting or abstaining from alcohol consumption adapted from Epler et al. (2009b). Three subscales (Conviction [$\omega = 0.34$; e.g., against religion], Loss of Control [$\omega = 0.65$; e.g., become obnoxious when I drink], Adverse Consequences [$\omega = 0.53$; e.g., could interfere with responsibilities]) were calculated by taking the mean of respective items. Participants indicated the extent to which they agreed with each statement using a 4-point Likert scale ranging from "strongly disagree" to "strongly agree."

Readiness to Change Alcohol Use.: Readiness to change alcohol behavior was assessed with the 12-item Readiness to Change Questionnaire (RCQ; Heather & Rollnick, 1993), which evaluates the transtheoretical model of behavior change (Prochaska & DiClemente, 1983). Each item was rated on a 5-point Likert scale ranging from 0 (strongly disagree) to 4 (strongly agree). A sum score was calculated for participants who had responses for 10 or more items (all others were "missing"). The continuous scoring method and current study internal consistency ($\omega = 0.84$) are consistent with previous investigations (e.g., Budd & Rollnick, 1996). For supplemental analyses, the RCQ Quick Method scoring protocol (Heather & Rollnick, 1993) was used to designate a stage of change (i.e., Precontemplation, Contemplation, and Action) for each participant. This scoring method, which is often used in clinical practice, retains original item scoring on a 5-point Likert scale ranging from −2 (strongly disagree) to 2 (strongly agree) and results in subscale scores for the three stages. Stages of change were assigned based on the highest score for a stage, and only in cases in which the highest score was non-zero and positive (to reflect positive endorsement of that stage). In cases of a tie between stages, the stage that was more advanced toward change was selected. Additional details on the scoring method can be found in the RCQ manual (Heather & Rollnick, 1993).

Cannabis Measures

Cannabis Consumption and Risk of Dependence.: Participants reported on their cannabis use history (i.e., use in the past 12 months; use more than 12 months ago). Past-year frequency of use, rated from less than once per year (1) to more than once per day (12) was included as an indicator of cannabis use (as with alcohol use, only a subset of

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participants were asked to report on cannabis use frequency due to measures being added after data collection had begun; see Table 2 for sample sizes). To assess for risk of past year cannabis dependence, we also administered the Cannabis Use Disorders Identification Test - Revised (CUDIT-R; Adamson et al., 2010), an 8-item self-report instrument. Higher scores are associated with a greater likelihood of dependence. The CUDIT-R has favorable psychometric properties when used with college students (Schultz et al., 2019). For the present study, the CUDIT total score ($\omega = 0.85$), and low (scores of 0–7) and hazardous use/high (scores of 8+) risk groups were calculated. CUDIT total and risk category scores were computed if participants had complete data on the CUDIT items. Two versions of the CUDIT were administered (past-year and prior-to-past year), depending on the timeframe of use reported. Only past-year CUDIT scores are included in the present study.

Cannabis Use Motives.: Reasons for using cannabis were assessed with the Marijuana Motives Measure (MMM; Simons et al., 1998). This measure asks participants to indicate, using a 5-point Likert scale (1 = almost never/never to 5 = almost always/always), how often they use cannabis for 25 different reasons and includes five subscales, computed by taking the mean of the respective items: Enhancement ($\omega = 0.91$; e.g., like the feeling), Conformity ($\omega = 0.87$; e.g., to fit in), Expansion ($\omega = 0.95$; e.g., to expand awareness/openness), Coping ($\omega = 0.90$; e.g., to forget worries), and Social ($\omega = 0.90$; e.g., to be more social) motives. This measure was developed and validated using a college student sample (Simons et al., 1998).

Reasons for Abstaining or Limiting Cannabis Use.: Seventeen items (adapted from Terry-McElrath et al., 2008) were assessed and three subscales were computed by computing the mean of their respective items: Negative Consequences ($\omega = 0.93$; e.g., concerned about getting in trouble, physical/psychological damage), Interest and Practicality ($\omega = 0.70$; e.g., too expensive, not available), and Personal Beliefs and Peer Influences ($\omega = 0.84$; e.g., friends don't use, against personal beliefs). Participants indicated the extent to which they agreed with each statement using a 4-point Likert scale ranging from "strongly disagree" to "strongly agree."

Readiness to Change Cannabis Use.: Readiness to change was assessed with the 12-item RCQ (Heather & Rollnick, 1993), specific to cannabis use behaviors. As with the RCQ administered for alcohol behavior change, a sum score was calculated for the primary analyses ($\omega = 0.86$) and the Quick Method scoring protocol (Heather & Rollnick, 1993) was used to designate stages of change for the supplemental analyses (see RCQ section under Alcohol Measures for additional information).

Procedure

Recruitment and completion of all measures were accomplished remotely via an online survey platform. All participants reported on their demographic information and reasons for limiting use or not using alcohol and cannabis. Participants who endorsed lifetime alcohol use completed the AUDIT, alcohol consumption items, motivations for drinking (DMQ-R), readiness to change alcohol behaviors (RCQ), hypothetical options for changing alcohol use behaviors, and receptiveness to various alcohol-focused intervention options. Participants

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who endorsed lifetime cannabis use completed the CUDIT, cannabis consumption items, motivation for cannabis use items (MMM), readiness to change cannabis use (RCQ), hypothetical options for changing cannabis use behaviors, and receptiveness to various cannabis-focused interventions.

Data Analytic Procedure

SAS9.4 (SAS Institute, 2013) was used for all analyses. Logistic regressions were calculated with complete data, and univariate analyses used the same subset of participants as the respective multivariate analysis. The multivariate analyses included all predictors (e.g., Table 3) in one model, whereas the univariate analyses included only one predictor per model to examine the isolated relationship between the predictor and outcome (i.e., receptiveness to intervention), outside of the context of the other predictors. For the logistic regressions, intervention categories were recoded as either being receptive ("1"; if one or more of the individual interventions in that category were rated ≥ 4) or not receptive ("0"; if all of the individual interventions were rated ≤ 3). It should be noted that interpretation of the logistic regression ORs may vary given differing scales across predictors (e.g., AUDIT and RCQ sum scores are on different scales). Across other analyses, the intervention ratings for each intervention approach were recoded in three ways (as represented in Tables 1 and 2): (1) dichotomized receptiveness to an intervention option as "yes" (i.e., 1) if any of the "agree" options (Likert scale options ≥ 4) were selected, and "no" if any of the disagree options were selected (≤ 3); (2) the mean of the 6-point Likert scale; (3) the mean of the 6-point Likert scale for those that were 'receptive' (i.e., answered ≥ 4) for that intervention category.

In addition to the primary analyses, supplemental analyses were conducted to examine the same research aims among a subset of participants that were currently in the contemplation or action stages of change (n = 84 for alcohol [32% contemplation, 68% action]; n = 64 for cannabis [27% contemplation, 73% action]; see Supplemental Tables 1–4), in the event that the larger sample was not actually contemplating change. These results are discussed briefly in the following section(s) and all tables are provided in Supplemental Materials. It is important to bear in mind the relatively small sample size for these analyses and interpret results with caution. All results are presented in Supplemental Materials (Tables 1–4).

Results

Substance Use

Alcohol—Four hundred and thirty eight students endorsed lifetime alcohol use and 430 students (97% of all women in the study, 95% of all men in the study) reported past year alcohol use. On average, men and women first drank alcohol around 16 years of age. The average past-year AUDIT score was higher for men than women (Table 1).

Cannabis—Lifetime cannabis used was endorsed by 317 students and past-year cannabis used was endorsed by 276 students (58% of all women in the study, 69% of all men in the study). The average age of first cannabis use was slightly later than for alcohol, but as with age of first alcohol use, there were no significant differences between women and men.

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Similar to alcohol, risk for cannabis dependence (CUDIT) was higher for men than women (Table 2).

Aim 1: Receptiveness to Intervention Options

Alcohol—Participants who endorsed any alcohol use (n = 438) were presented with items about receptiveness to intervention options for alcohol, which asked about options they would be open to if they were interested in changing their alcohol use habits. Over 70% of students reported that, if, hypothetically, they wanted to reduce their drinking, they would be interested in strategies to cut down, with fewer students reporting interest in strategies to stop drinking all together (17%).[3] Compared to women, men were more open to strategies to stop drinking completely (Table 1). Among students that endorsed "other" options, these were described by students as strategies to drink more responsibly, cut down on number of drinks, and/or improve self-control, as well as "just stopping", implying that no strategies would be needed.

When asked to imagine a hypothetical situation whereby they wanted to reduce their alcohol use, nearly 75% of students were receptive to at least one type of self-help resource, and over 60% were receptive to individual/group therapy and/or informal workshops or harm reduction approaches (Table 1). Over 90% were receptive to discussing alcohol use in the context of family/peer interactions as a way to address their drinking. Less than 30% were open to some medication; however, over 50% were receptive to an appointment with their primary care provider (PCP).[4] Where sex differences were present, women reported higher receptiveness to each intervention option (Table 1). For each individual treatment listed (e.g., medication by injection), we also isolated participants who were "receptive" (scores of ≥4), to examine the average receptiveness within this group. Among these participants, the average level of agreement was "slightly agree" to "strongly agree".

Cannabis—Among students who reported any cannabis use (n = 317), around 50% reported that they would be open to strategies to cut down if they were interested in changing their cannabis use, and fewer students (27%) reported interest in quitting all together (Table 2).[5] Among students that that endorsed "other", this was primarily described as "just stopping" (implying no strategies). When asked to imagine a hypothetical situation whereby they wanted to reduce their cannabis use, over 50% of students were open to at least one type of self-help resource, individual/group therapy, and/or family/peer interactions. Approximately 14 (medication by injection) to 21% (medication on days when I might use cannabis) of students were open to the three possible medication-related options for reducing cannabis use, though 40% indicated that they would be open to talking with their PCP.[6] There were a few significant sex differences, in which women were more

[3]Those in the contemplation/action stage subsample (n = 84) open to strategies to reduce (80%) and abstain (18%) from drinking were similar to the results for the overall sample (Supplemental Table 1).
[4]The proportion of students receptive to the intervention categories and individual approaches for alcohol are similar across the entire sample (Table 1) and those currently in the contemplation or action stage (Supplemental Table 1).
[5]Among students in the in the contemplation/action stages (n = 64), a greater proportion (38%) reported interest in strategies to abstain if they were interested in changing their cannabis use behaviors (Supplemental Table 2).
[6]When looking at the students in contemplation/action stages of change, there were very few differences in terms of the proportion of students receptive to the various intervention approaches, with the exception of slightly more (approximately 10%) students open to remote/telehealth and medication approaches (Supplemental Table 2) compared to the entire sample (Table 2).

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receptive to possible intervention options. Among participants who were "receptive" (scores of ≥4) to each individual treatment type, the average receptiveness ranged between "slightly agree" and "agree" (Table 2).

Aim 2: Predictors of Treatment Receptiveness

Alcohol—In general, heavier alcohol consumption was associated with decreased odds of being receptive to various treatment approaches in the multivariate (range ORs = 0.81 [family/peer interactions] to 0.89 [remote/telehealth]) and univariate models (range ORs = 0.90 [remote/telehealth] to 0.94 [self-help]) (see Table 3; Supplemental Figure 1). Similarly, students in the hazardous/high risk AUDIT group were less receptive to most intervention options compared to those in the low risk AUDIT group (Table 4). Increased conformity motives were associated with higher odds of receptiveness to treatment across many options in the multivariate (range ORs = 1.38[medication] to 1.55[self-help]) and univariate models (range ORs = 1.25[medical provider] to 1.53[self-help]). Other predictors (e.g., increased loss of control as a reason for abstaining or limiting drinking) were significant predictors of endorsing nearly all intervention categories in the univariate models; however, for the most part, these findings were not retained the multivariate models (see Table 3; Supplemental Figure 1). Readiness to change, reasons for abstaining or limiting drinking (i.e., adverse consequences, convictions), and coping motives were not significant predictors of any intervention categories across the multivariate and univariate models. The fit statistics across intervention types demonstrated that the predictors had good fit in some cases (e.g., peer/family interactions) and weaker prediction in other areas (e.g., medical provider visit). See Table 3 for overall model fit statistics (i.e., Likelihood ratio chi-square and c-statistic).

Predictors of Alcohol-Focused Treatment Receptiveness among Students in Contemplation and Action Stages of Change.: Compared with the overall sample, consumption remained a significant predictor of decreased receptiveness for several treatment types and conformity motives were significant predictors of increased receptiveness for remote/telehealth (Supplemental Table 3). Social motives for drinking were associated with increased receptiveness to individual/group therapy and harm reduction/informal workshop approaches among those in stages of change, whereas it was not significantly associated with receptiveness in the entire sample. On the other hand, conformity motives were associated with increased receptiveness to remote/telehealth and medication approaches, but this association was not significant among the contemplative/action subset of students.

Cannabis—Higher frequency of cannabis use was associated with decreased odds of endorsing many intervention options, though this largely was the case for the univariate (range ORs = 0.84[informal workshops/harm reduction] to 0.92[individual/group therapy]), rather than multivariate analyses, in which frequency was only a significant predictor for self-help approaches (OR = 0.83; 95% CI = 0.73–0.95; see Table 5; Supplemental Figure 2). Students in the hazardous/high risk CUDIT group were less receptive to many intervention options, as compared to those in the low risk CUDIT group (Table 6). Higher conformity motives were associated with increased receptiveness to medication (univariate OR = 1.72; 95% CI = 1.17–2.51) and decreased receptiveness to informal workshop approaches

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(multivariate OR = 0.54; 95% CI = 0.33–0.88). Higher expansion motives were associated with increased likelihood of receptiveness to meeting with a medical provider/PCP (OR = 1.56; 95% CI = 1.13–2.16) and partaking in family/friend-based approaches (OR = 1.38; 95% CI = 1.02–1.88; see Table 5; Supplemental Figure 2). Additionally, higher scores on reasons for limiting or abstaining cannabis use were associated with increased likelihood of receptiveness across all intervention categories; however, this was primarily the case when the predictors were in the univariate models, rather than multivariate models (Table 5). Social motives and readiness to change were not significant predictors of any intervention type. Fit statistics indicated models for certain intervention types (e.g., informal workshops/harm reduction, remote/telehealth), the predictors collectively had an overall stronger prediction of outcomes relative to others with weaker prediction (e.g., self-help; see Table 5 for c-statistic and overall model likelihood chi-square test).

Predictors of Cannabis-Focused Treatment Receptiveness among Students in Contemplation and Action Stages of Change.: Frequency of use remained a relevant predictor of decreased receptiveness for several treatment types and reasons against cannabis use were predictive of increased receptiveness (univariate models) for a number of intervention types (e.g., self-help, remote/telehealth, harm reduction, medical provider) among the students in contemplation and action stages of change (Supplemental Table 4). Compared with the overall sample, slight differences emerged, such that higher coping and social motives were associated with increased receptiveness to medication options for cannabis use, whereas neither of the predictors were significant in the entire sample. Additionally, reasons against cannabis use were no longer significant predictors of receptiveness to medication approaches and individual/group therapy, as they were in the models including all students.

Discussion

Prior research with college students indicates (a) low levels of interest in changing their substance use and pursuing treatment options, (b) that most preferred alcohol-related treatments are individual therapy and/or more informal options (e.g., self-help, talking with friends), and (c) that actual treatment utilization is rather low. Given the rapidly evolving climate (e.g., technological, legal) and changes in college student substance use, the results of the current study provide a needed update on students' receptiveness to intervention options for alcohol, and offer, for the first time, data on receptiveness to intervention options for cannabis use.

Within the current study, students tended to prefer informal options (e.g., talking with family or friends), self-help approaches, and individual therapy. In general, students tended not to prefer medication-based options. A majority of students who drink alcohol were open to using harm reduction approaches, such as ride-share or safe-ride options. Heaviness of alcohol consumption was associated with decreased odds of openness to certain intervention categories (e.g., remote/telehealth, individual therapy), and readiness to change was not significantly related to receptiveness. Where sex differences were present, women were always more receptive than men. These results are largely consistent with prior examinations of receptiveness to alcohol-focused treatment options (e.g., Epler et al., 2009a). Although

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we did investigate the same set of research questions among a subset of students in the contemplation and action stages of change (described in results and supplemental materials), those analyses will not be central focus of this discussion given the small sample size of the subset. In general, the results were largely similar across the entire sample and the subset, even though a majority of the students in the entire sample were not in the contemplation/action stages of change for alcohol and/or cannabis use.

Notably, higher conformity motives for drinking were associated with increased odds of receptiveness, across a number of categories (e.g., self-help, remote/telehealth, medication). This may be due, in part, to personality traits relevant to conformity motives and treatment engagement, such as neuroticism (e.g., self-consciousness; Hopwood et al., 2008; Stewart & Devine, 2000). However, these associations need to be investigated in future work. Theoretically, one would think that approaches associated with both prevention efforts and relapse prevention targeting social pressure (e.g., drink refusal training; Witkiewitz et al., 2012) or moderation drinking strategies (e.g., Marlatt & Witkiewitz, 2002) might be most appropriate for these subgroups.

There were a few key differences compared to prior studies' findings on alcohol-focused treatments (i.e., Buscemi et al., 2010; Epler et al., 2009a). Specifically, we found that a greater proportion of students were open to self-help groups, individual and group therapy, and medication in the present study. Interestingly, although receptiveness to medication options was relatively low, the percentages doubled compared to Epler et al. (2009a), perhaps suggesting secular changes in the perceived appropriateness of medication assisted treatment for addiction-related behaviors despite medications continuing to be a vastly underutilized treatment option (Kranzler & Soyka, 2018). Further, the present study included additional options that were not assessed in prior studies on intervention receptiveness, such as remote/teletherapy, harm reduction approaches, and PCP visits. There were intervention approaches within each category that were endorsed by at least half of the participants suggesting that students are open to various types of interventions and thus, the availability of a range of strategies (e.g., individual approaches, medical approaches) for students may be ideal.

Similar to alcohol-focused interventions, students tended to prefer self-help options, individual therapy, and informal approaches, such as talking with friends/family and visiting social networking sites or forums for addressing their cannabis use. Approximately the same proportion of students who were receptive to medication options for alcohol were also open to medication for cannabis use, should such options become available; at present there are no medications with FDA-approved indications for cannabis use disorder although gabapentin, buspirone, and other medications have shown some potential utility (NIDA, 2020).

To our knowledge, there have been no prior systematic investigations of preferences or openness to cannabis-related intervention options among college students; therefore, direct comparisons cannot be made. However, it is interesting to note that for a variety of intervention options, nearly one third of students would be open to trying them. Regression analyses indicated that frequency of cannabis use was associated with decreased receptiveness to many intervention categories; however, this finding was primarily

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present in univariate, rather than multivariate models, indicating that when accounting for other relevant predictors, the frequency of cannabis use alone does not explain a significant amount of variance in receptiveness. Reasons for limiting cannabis use (e.g., negative consequences) were associated with increased odds of being receptive to a given intervention across several intervention categories, but again, these findings were largely present in univariate analyses only. As with alcohol, readiness to change was not associated with intervention receptiveness in this sample, perhaps suggesting that stages of change are not necessarily reflective of how open a student may be to consider certain approaches, such that they may feel similarly about a given approach whether they are contemplating change or already in the middle of making a change.

The percentage of students receptive to a given approach are similar across many alcohol and cannabis intervention options (e.g., group therapy),[7] suggesting that students, as a demographic group, may be open (or not) to certain approaches, independent of the substance of focus. However, for some intervention approaches, the proportion of students receptive to trying the intervention was different based on substance. For example, 81–90% of drinkers were open to talking with family/friends if they wanted to change alcohol use, but only 34–37% of cannabis-users were open to talking with family/friends if they wanted to change their cannabis use. Such discrepancies could be due to differences in the acceptability of alcohol versus cannabis use (e.g., due to legality or social norms) or perceptions of risk of dependence in alcohol versus cannabis, for example.

Implications

Students are relatively receptive to a wide range of intervention options for both alcohol and cannabis reduction. Compared with work conducted a decade ago, it appears as though receptiveness to interventions as a whole is increasing, perhaps as a function of cultural changes associated with the “sober curious” movement coupled with stable or slightly decreasing rates of consumption in young adults (e.g., Grucza et al., 2018). With an increasing number of intervention options becoming available, there is also a chance for increased likelihood of helping students that may wish to make a change with their substance use. Further, although medication receptiveness was relatively low, this still expands the number of available options, enhancing the chance that we may be able to intervene with a greater number of students. It also potentially expands the range of providers capable of administering substance use treatments. Additionally, the finding that a large number of students would be open to seeing a PCP about their substance use, potentially due to the reduced stigma of seeing a medical doctor versus a mental health professional, suggests that this may be a useful place to concentrate on interventions for college students (e.g., PCP education and/or mental health integration). Because of stigma-related concerns, student health providers could use other common problems of young adults such as those related to sleeping difficulties as an “on ramp” to interventions with this group (e.g., Fucito et al, 2017).

[7]Receptiveness to alcohol- and cannabis-focused interventions are not directly comparable given that the samples are different subsets of participants (i.e., those that used alcohol and those that used cannabis), with some participants overlapping.

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Given a major focus of the Epler and colleagues (2009a) study was to examine receptiveness to medication for reducing alcohol use, we want to comment further on the medication receptiveness prevalence rates observed in the current study. Although we noted a significant increase in receptiveness compared to the Epler study, our results are consistent with more recent rates. For example, Leeman and colleagues (2013) found that approximately 20% of college students with past year alcohol use were interested in a clinical trial including naltrexone and counseling for drinking reduction. Although our study looked at medication only, our receptiveness rates for medication were still similar to Leeman and colleagues for alcohol (29%) and cannabis (27%). This slight discrepancy may suggest there are some individuals who are interested in medication only. However, in the current sample, *post hoc* analyses demonstrated that those receptive to any type of medication intervention (for alcohol and/or cannabis) were more open to each of the other treatment options compared to those that were not receptive to medication. This may reflect a general "openness" to intervention factor. Also, of note, there were very few individuals who were only open to medication options, and no other treatment categories ($n = 0$ for alcohol and $n = 2$ for cannabis). However, there were cases in which students would be open to medication to address alcohol and/or cannabis use but indicated they would not be open to other specific treatment modalities (e.g., individual/group therapy). With the large proportion of students reporting receptiveness to meeting with their PCP, this may pave the way for discussions about medication and/or other intervention options and perhaps indicates there are other viable options (e.g., using a stepped care approach) for individuals who do not respond well to a first course of treatment with a given treatment modality. Together, these findings provide a more recent update on receptiveness to medications for reducing alcohol and cannabis use and suggest that medication (with or without counseling) options may be worth discussing with college students interested in changing their substance use.

There were a number of differences in receptiveness to intervention approaches when comparing high and low dependence risk groups. Students in the lower risk groups were consistently more receptive to intervention options. These results may suggest that low-risk students are appropriate candidates for prevention efforts aiming to address substance use prior to risky use (e.g., primary prevention), or in early, at-risk stages (e.g., secondary prevention), especially given that low-risk users in this sample were the most open to trying various intervention strategies, including harm reduction approaches. High-risk students, who are likely to need more intensive interventions, are among the least receptive to individual and remote/telehealth options (for alcohol), and many self-help options, consistent with previous findings (e.g., Davies et al., 2019). The overall differences in receptiveness by risk observed within the current study is consistent with existing literature (e.g., Buscemi et al., 2010). Prevention and intervention specialists may wish to consider strategies to address this important gap in an effort to reach both those that are low- and high-risk.

As technology advances and remote options continue to increase, there may be additional opportunities to reach students that may have otherwise not been possible. Indeed, approximately half of the sample was open to some sort of remote or telehealth option, regardless of substance. Not only is this relevant with the technological advances in the past decade but may be particularly helpful given the changing climate with COVID-19 and

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modality changes across universities as some move to a more remote learning environment. However, as highlighted by Ashford and colleagues (2019), it is important to note that even with the higher receptiveness or use, the efficacy of certain technological modes of intervention (e.g., smartphone applications, online chats/forums) are still to be determined.

With the high receptiveness to informal options, including talking with family and friends, more work should focus on the development of community/lay person-based programs to help refer students to services, as exists with other presenting concerns. For example, there exist programs that teach the lay community how to help and refer a friend in need of services or crisis support related to suicide (e.g., Question-Persuade-Refer training). Given the very high receptiveness to discussing alcohol use with family and friends, programs that focus on non-judgmental processes that family, friends, and peers can adopt may be useful, particularly across college campuses (e.g., Dennhardt & Murphy, 2013).

Finally, it is important to comment on the readiness to change findings. Although it is reasonable to expect intervention receptiveness may differ based on current stage of change, readiness to change did not predict hypothetical receptiveness to intervention options for alcohol or cannabis within this sample of college students. The results suggest that factors other than readiness to change (e.g., risk level, consumption or frequency variables) may be more relevant to receptiveness to certain intervention options as opposed to current state of change. The possibility that attitudes toward specific treatment options might be “in place” prior to when an individual might think of availing themselves to alternative approaches suggests that information about various treatments could be disseminated as part of general educational efforts surrounding substance use. Whether or not the results would replicate in a non-hypothetical situation is an area for future research.

Limitations and Future Directions

This study provides useful new data regarding student perspectives and receptiveness to intervention approaches; however, it is not without limitations. Perhaps the major limitation was that the current study was based on data from a single, large public university thus, limiting the generalizability to other student bodies and/or college communities with different demographics (e.g., 2-year or private colleges). Although this is the same campus studied by Epler et al. (2019) and thus provides useful cross-temporal comparisons, the generalization to the entire population of college students must be considered an open question. Second, some analyses were limited by sample size given only a subset of participants were presented with items regarding their quantity and frequency of use. Finally, students were asked to report on their receptiveness to various intervention options in a hypothetical situation whereby they wished to cut down or stop using the substance. Therefore, it is challenging to know to what extent these results are actually reflective of receptiveness among students who are currently seeking out support and/or interventions. Students may feel differently if they were actively seeking out support to limit their use (as opposed to imagining a hypothetical situation), and alternatively, certain options may be more or less appealing if a student was not currently trying to change their substance use. For example, would students be open to certain options (e.g., campus-supported ride share programs) regardless of interest in changing behaviors or would this be more appealing to

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those currently trying to change their behavior? However, we do know from the present study that readiness to change, according to the transtheoretical model of behavior change, is not a particularly important factor in predicting receptiveness to hypothetical substance-focused interventions among a general (not necessarily treatment seeking) sample of college students.

It would be advantageous to investigate receptiveness among specific subsets of students. First, a sample of students who are "at risk," but not necessarily seeking treatment (for various reasons, whether it be low motivation, unaware of available resources, lack of access, etc.) would be an ideal sample to target. This could be accomplished via assessments within primary settings that are not specific to alcohol/substance use (e.g., general student health center; academic orientation programs). Second, assessing receptiveness among students with alcohol or cannabis related sanctions (via campus conduct and/or local law enforcement given they may be unlikely to be treatment-seeking otherwise) would be beneficial, particularly if their choice of intervention was independent of sanctions. This type of investigation could provide rich data regarding receptiveness in a situation in which autonomy is often low, but could be introduced via providing intervention options. Investigating these questions more closely are important for future research, as this can guide the development and/or implementation of campus programs for prevention and intervention, to meet the needs of students across various stages of change.

Related to intervention options, the current study was not exhaustive in terms of possible prevention and treatment options; thus, future research should include a wider variety of options, specifically approaches that may span a broader continuum of prevention to more intensive treatment (e.g., residential approaches). Additionally, future research may benefit from examining more specific options within the categories presented. For example, assessing receptiveness to AA groups (a type of self-help group) may have benefits in that it would identify openness to more specific programming. The current study included harm-reduction and environmental approaches (e.g., safe-ride program); however, there were fewer environmental, as opposed to individual, strategies assessed in the present study. The College Alcohol Intervention Matrix (CollegeAIM; Cronce et al., 2018; NIAAA, 2019) is a tool for institutions of higher education to use when selecting interventions to implement on their campuses. CollegeAIM lists a number of environmental strategies that may also be useful to investigate from a student receptiveness point of view. Given that the best approach to college drinking prevention includes a mix of individual and environmental strategies (Cronce et al., 2018), and that interest in "cutting down" on use was endorsed more than stopping use all together, future work should focus on student openness to harm reduction and environmental approaches.

Alcohol and cannabis co-use (i.e., concurrent use, simultaneous use, and both) is a focus of recent investigations demonstrating especially negative outcomes among this group of users. For example, concurrent and simultaneous users tend to have significantly lower GPAs (Meda et al., 2017) and more academic problems (Jackson et al., 2020) compared to students who solely use alcohol or cannabis. Hence, both single and dual use of alcohol and cannabis are significant concerns among college students. Due to the lack of existing interventions focused specifically on the co-use of alcohol and cannabis, we were unable to assess

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receptiveness to such interventions. Future research should focus on (a) developing effective co-use interventions, especially those geared towards college students and (b) understanding students' receptiveness to such interventions (and in comparison to interventions targeting one substance).

Conclusion

College students who drink alcohol and/or use cannabis tend to be receptive to intervention approaches that are informal (e.g., self-help; talking with friends) and/or individual in nature (e.g., individual therapy, visit with physician) to address the substance of focus. Women and students at low risk for alcohol or cannabis dependence are more receptive to various options. Though not as many students are receptive to medication, the proportion of students that are open to medication has increased substantially in the last decade. Higher education alcohol and substance use prevention and intervention specialists should consider student receptiveness when considering strategy selection and implementation approaches.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Public Health Statements:

College students tend to be receptive to informal interventions to address risky alcohol and cannabis use.

College students at higher risk for alcohol and/or cannabis dependence are less receptive to intervention options.

On average, women express higher receptiveness to alcohol and cannabis interventions than men.

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Table 1.

Students' Alcohol Consumption, and Receptiveness to Various Treatment Options, by Sex

	TOTAL (*N* = 396)							MEN (*n* = 140)							WOMEN (*n* = 256)							Sex differences	
Alcohol Use[a]	**n**	**%**	**M**	**SD**	**-**	**-**	**miss**[d]	**n**	**%**	**M**	**SD**	**-**	**-**	**miss**[d]	**n**	**%**	**M**	**SD**	**-**	**-**	**miss**[d]	***t***	***df***
Age at first use	-	-	16.05	1.76	-	-	3	-	-	15.90	2.36	-	-	2	-	-	16.13	1.32	-	-	1	−1.04	184.52
Alcohol Composite (standardized composite)	-	-	0.54	4.31	-	-	56	-	-	2.43	4.78	-	-	13	-	-	−0.59	3.56	-	-	43	**6.16** ***	209.6
Past year: Frequency of drinking[b]	-	-	5.39	1.81	-	-	0	-	-	5.60	1.83	-	-	0	-	-	5.28	1.79	-	-	0	1.68	394
Past year: Drinking quantity	-	-	4.30	2.17	-	-	3	-	-	5.43	2.65	-	-	0	-	-	3.67	1.54	-	-	3	**7.21** ***	191.86
Past year: Largest quantity of drinks in one day	-	-	8.72	5.17	-	-	1	-	-	11.49	6.28	-	-	0	-	-	7.20	3.65	-	-	1	**7.43** ***	191.58
Past year: Frequency of largest number of drinks in one day[b]	-	-	2.12	1.53	-	-	0	-	-	2.24	1.72	-	-	0	-	-	2.05	1.42	-	-	0	1.04	242.63
Past year: Frequency of binge drinking (4/5 drinks in 2 hours)[b]	-	-	3.97	2.23	-	-	5	-	-	4.42	2.25	-	-	3	-	-	3.73	2.18	-	-	2	**2.94** **	389
Past year: Frequency of 12+ drinks in day[b]	-	-	1.73	1.42	-	-	54	-	-	2.31	1.84	-	-	13	-	-	1.38	0.96	-	-	41	**5.27** ***	167.28
AUDIT Total Score[c]	-	-	7.71	5.05	-	-	6	-	-	9.12	5.70	-	-	4	-	-	6.97	4.52	-	-	2	**3.95** ***	242.73

	TOTAL (*N* = 438)							MEN (*n* = 152)							WOMEN (*n* = 286)							Sex differences[h]	
	n	**%**	**M**	**SD**	**M**	**SD**	**miss**[d]	**n**	**%**	**M**	**SD**	**M**	**SD**	**miss**[d]	**n**	**%**	**M**	**SD**	**M**	**SD**	**miss**[d]	χ^2	***df***

Interest in Changing Drinking [e]																							
If wanted to change drinking, I'd be open to (select all):	-	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	-	0		
Strategies to help cut down	330	75%	-	-	-	-	-	110	72%	-	-	-	-	-	220	77%	-	-	-	-	-	0.61	1
Strategies to stop drinking all together	75	17%	-	-	-	-	-	35	23%	-	-	-	-	-	40	14%	-	-	-	-	-	**6.31** *	1
Another option	11	3%	-	-	-	-	-	6	4%	-	-	-	-	-	5	2%	-	-	-	-	-	2.07	1
None of these	45	10%	-	-	-	-	-	13	9%	-	-	-	-	-	32	11%	-	-	-	-	-	0.64	1
			All students[g]		**Receptive students**[g]					**All students**[g]		**Receptive students**[g]					**All students**		**Students**				
Receptiveness to Treatment Options[e,f]	**n**	**%**	**M**	**SD**	**M**	**SD**	**miss**[d]	**n**	**%**	**M**	**SD**	**M**	**SD**	**miss**[d]	**n**	**%**	**M**	**SD**	**M**	**SD**	**miss**[d]	***t***	***df***[i]
Self-help	322	74%	-	-	-	-	0	101	66%	-	-	-	-	0	221	77%	-	-	-	-	0	-	-
self-help book	134	31%	2.54	1.53	4.59	0.70	0	40	26%	2.32	1.49	4.53	0.68	0	94	33%	2.66	1.54	4.62	0.70	0	**−2.22** *	436
self-help blog/ informational website	185	42%	2.83	1.63	4.56	0.67	1	56	37%	2.56	1.60	4.48	0.63	0	129	45%	2.98	1.63	4.60	0.68	1	**−2.56** *	435
computer-based self-help program (guided/ developed by mental health professional)	169	39%	2.81	1.58	5.59	0.68	0	50	33%	2.53	1.50	4.42	0.61	0	119	42%	2.96	1.61	4.66	0.69	0	**−2.74** **	436
self-help group	198	46%	3.01	1.62	4.61	0.65	4	64	43%	2.83	1.60	4.52	0.59	2	134	47%	3.11	1.62	4.65	0.67	2	−1.70	432
smartphone applications	205	47%	3.08	1.71	4.73	0.74	0	51	34%	2.61	1.61	4.65	0.69	0	154	54%	3.34	1.71	4.75	0.75	0	**−4.31** ***	436

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Remote/ Telehealth Options	238	54%	-	-	-	-	0	63	41%	-	-	-	-	0	175	61%	-	-	-	-	0	-	-
text messaging therapy services	155	36%	2.70	1.59	4.60	0.69	3	39	26%	2.34	1.40	4.38	0.67	0	116	41%	2.90	1.65	4.67	0.68	3	**−3.74** ***	353.06
remote/ teletherapy	128	29%	2.57	1.56	4.73	0.71	1	35	23%	2.28	1.37	-	-	0	93	33%	2.73	1.64	4.84	0.70	1	**−3.03** **	358.61
personalized feedback via online format (education and PFI)	162	37%	2.75	1.61	4.60	0.74	1	46	30%	2.42	1.46	4.37	0.61	0	116	41%	2.92	1.66	4.70	0.77	1	**−3.12** **	435
Individual Therapy/ Group Approaches (in-person)	276	63%	-	-	-	-	0	82	54%	-	-	4.43	0.65	0	194	68%	-	-	-	-	0	-	-
on-campus groups with therapist	126	29%	2.55	1.49	4.61	0.67	1	41	27%	2.49	1.46	4.56	0.67	0	85	30%	2.59	1.51	4.63	0.67	1	−0.68	435
on-campus individual therapy	215	49%	3.18	1.72	4.76	0.70	3	67	44%	2.97	1.70	4.7	0.72	1	148	52%	3.29	1.72	4.79	0.69	2	−1.80	433
off-campus groups with therapist	145	34%	2.69	1.51	4.57	0.66	6	51	34%	2.62	1.46	4.41	0.61	1	94	33%	2.72	1.54	4.66	0.68	5	−0.63	430
off-campus individual therapy	234	53%	3.41	1.71	4.85	0.72	0	69	45%	3.10	1.69	4.72	0.66	0	165	59%	3.57	1.70	4.88	0.74	4	**−2.79** **	436
Informal Workshops/ Harm Reduction	288	66%	-	-	-	-	0	85	56%	-	-	-	-	0	203	71%	-	-	-	-	0	-	-
on-campus workshop about reducing risky alcohol use	124	28%	2.49	1.47	4.53	0.71	0	46	30%	2.51	1.48	4.46	0.66	0	78	27%	2.49	1.47	4.58	0.75	0	0.14	436
ride share program	262	60%	3.66	1.78	4.97	0.78	0	76	50%	3.24	1.71	4.76	0.76	0	186	65%	3.88	1.78	5.05	0.77	0	**−3.66** ***	436

through campus																						
Medication	125	29%	-	-	-	-	3	31	20%	-	-	-	-	0	94	33%	-	-	-	-	3	-	-
medication by injection	56	13%	1.79	1.21	4.52	0.66	3	21	14%	1.76	1.24	4.48	0.68	0	35	12%	1.80	1.20	4.54	0.66	3	−0.37	433
medication on days where I drink	103	24%	2.18	1.43	4.46	0.62	3	39	26%	1.94	1.25	4.32	0.78	0	78	28%	2.30	1.50	4.50	0.66	3	**−2.69** **	361.29
daily medication	57	13%	1.84	1.23	4.56	0.63	4	20	13%	1.77	1.23	4.55	0.6	0	37	13%	1.88	1.23	4.57	0.64	4	−0.89	432
Medical Provider Appointment																						
appointment with primary care/family doctor	230	53%	3.28	1.69	4.73	0.72	1	76	50%	3.14	1.66	4.63	0.71	0	154	54%	3.35	1.71	4.78	0.73	1	−1.25	435
Peer/ Family Interactions	412	94%	-	-	-	-	1	141	93%	-	-	-	-	1	271	95%	-	-	-	-	0	-	-
talk with my friends	395	90%	4.95	1.24	5.28	0.70	1	133	88%	4.94	1.34	5.35	0.74	0	262	92%	4.96	1.18	5.25	0.69	0	−0.14	435
talk with my family	352	81%	4.54	1.51	5.19	0.75	1	124	82%	4.63	1.50	5.22	0.81	0	228	80%	4.50	1.51	5.16	0.71	0	0.87	435
social networking sites/forums (peer-to-peer)	129	30%	2.43	1.53	4.56	0.67	1	50	33%	2.40	1.55	4.42	0.64	0	79	28%	2.44	1.52	4.65	0.68	0	−0.24	435
talk with my RA	55	13%	1.87	1.16	4.45	0.60	2	25	17%	1.91	1.24	4.36	0.57	1	30	11%	1.85	1.12	4.53	0.63	1	0.5	434
talk with peer support leader in a club/ organization	119	27%	2.38	1.50	4.57	0.63	2	43	28%	2.33	1.46	4.4	0.62	1	76	27%	2.41	1.52	4.67	0.62	1	−0.50	435

Note.

[a] A subset of participants answered these items (given late addition of measures). All participants in this subset endorsed current or past alcohol use.

[b] Response scale ranges from 1–2 times in the past year (1) to every day (10).

[c] *N* = 424 (total); *N* = 146 (men); *N* = 278 (women). AUDIT sum scores calculated for those with past year alcohol use and no missing AUDIT items.

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[d] Missing column reflects missing datapoints due to participants electing to skip that item. Denominators for percentages account for this.

[e] Items administered to all participants that endorsed current or past alcohol use.

[f] Frequency represents scores of 'somewhat' to 'strongly' agree and Mean represents average of full response scale (i.e., 1–6).

[g] "All Students" = *M, SD* for all students that reported alcohol use. "Receptive Students" = *M, SD* among those that were receptive (i.e., scoring ≥4 on receptiveness scale).

[h] Sex differences reflect differences between the "all students" for men and women.

[i] Degrees of freedom (*df*) account for test of equality of variances (using Satterthwaite when equality of variances assumption is violated); therefore, some *df* include fractional values.

* $p < 0.05$

** $p < 0.01$

*** $p < 0.001$

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Table 2.

Students' Cannabis Consumption, and Receptiveness to Various Treatment Options, by Sex

	TOTAL (*N* = 290)							MEN (*n* = 108)							WOMEN (*n* = 182)							Sex differences	
Cannabis Use[a]	**n**	**%**	**M**	**SD**	**-**	**-**	**miss**[c]	**n**	**%**	**M**	**SD**	**-**	**-**	**miss**[c]	**n**	**%**	**M**	**SD**	**-**	**-**	**miss**[c]	***t***	***df***
Age at first use	-	-	16.43	1.56	-	-	2	-	-	16.24	1.75	-	-	2	-	-	16.54	1.44	-	-	0	−1.53	186.46
Past-year Frequency of Use	-	-	5.31	3.56	-	-	3	-	-	6.77	3.86	-	-	2	-	-	4.45	3.07	-	-	1	**5.30** ***	182.59
CUDIT Total Score[b]	-	-	6.95	5.96	-	-	9	-	-	8.79	6.33	-	-	5	-	-	5.78	5.41	-	-	4	**4.14** ***	265
	TOTAL (*N* = 317)							**MEN (*n* = 118)**							**WOMEN (*n* = 199)**							**Sex differences**[g]	
Interest in Changing Use[c]																						χ^2	***df***
If wanted to change my cannabis use, I'd be open to (select all):							0							0							0		
Strategies to help cut down	162	51%	-	-	-	-	-	60	51%	-	-	-	-	-	102	51%	-	-	-	-	-	0.05	1
Strategies to stop using all together	87	27%	-	-	-	-	-	30	25%	-	-	-	-	-	57	29%	-	-	-	-	-	0.29	1
Another option	8	3%	-	-	-	-	-	3	3%	-	-	-	-	-	5	3%	-	-	-	-	-	0.001	1
None of these	115	36%	-	-	-	-	-	47	40%	-	-	-	-	-	68	34%	-	-	-	-	-	1.26	1
			All students[f]		**Receptive students**[f]					**All students**[f]		**Receptive students**[f]					**All students**[f]		**Receptive students**[f]				
Receptiveness to Treatment Options[d,e]	**n**	**%**	**M**	**SD**	**M**	**SD**	**miss**[c]	**n**	**%**	**M**	**SD**	**M**	**SD**	**miss**[c]	**n**	**%**	**M**	**SD**	**M**	**SD**	**miss**[c]	***t***	***df***
Self-help	178	56%	-	-	-	-	1	54	46%	-	-	-	-	1	124	62%	-	-	-	-	0		
self-help book	95	30%	2.44	1.66	4.76	0.77	1	34	29%	2.36	1.71	4.79	0.84	1	61	31%	2.48	1.64	4.74	0.73	0	−0.64	314

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self-help blog/ informational website	119	38%	2.63	1.73	4.69	0.73	2	41	35%	2.41	1.69	4.62	0.78	2	80	40%	2.75	1.75	4.73	0.71	0	−1.68	313
computer-based self-help program (guided/ developed professional)by mental health	111	35%	2.57	1.69	4.68	0.72	1	31	26%	2.29	1.62	4.74	0.73	1	80	40%	2.73	1.71	4.65	0.71	0	**−2.27** *	314
smartphone applications	116	37%	2.67	1.68	4.67	0.74	2	31	26%	2.31	1.59	4.68	0.79	1	85	43%	2.89	1.70	4.67	0.73	1	**−3.00** **	313
self-help group	103	33%	2.59	1.67	4.77	0.72	3	32	28%	2.44	1.65	4.81	0.78	2	71	36%	2.68	1.69	4.75	0.69	1	−1.21	312
Remote/ Telehealth Options	136	43%	-	-	-	-	1	38	32%	-	-	-	-	1	98	49%	-	-	-	-	0		
text messaging therapy services	93	29%	2.40	1.63	4.69	0.72	1	25	21%	2.10	1.47	4.60	0.76	1	68	34%	2.57	1.69	4.72	0.71	0	**−2.50** *	314
remote/ teletherapy	78	25%	2.32	1.55	4.73	0.73	3	25	21%	2.14	1.47	4.64	0.81	1	53	27%	2.44	1.59	4.77	0.70	2	−1.66	312
personalized feedback via online format (education and PFI)	91	29%	2.44	1.63	4.76	0.78	2	30	26%	2.24	1.54	4.57	0.77	1	61	31%	2.57	1.68	4.85	0.77	1	−1.72	313
Individual Therapy/ Group Approaches (in-person)	170	54%	-	-	-	-	3	56	48%	-	-	-	-	2	114	58%	-	-	-	-	1		
on-campus groups with therapist	76	24%	2.34	1.59	4.86	0.74	4	29	25%	2.38	1.61	4.86	0.74	3	47	24%	2.31	1.58	4.85	0.75	1	0.4	311
on-campus individual therapy	121	39%	2.84	1.80	4.93	0.71	4	41	35%	2.78	1.80	4.98	0.76	2	80	41%	2.88	1.81	4.90	0.69	2	−0.48	311
off-campus groups with therapist	89	29%	2.48	1.63	4.79	0.73	5	28	25%	2.36	1.57	4.75	0.75	4	61	31%	2.55	1.66	4.80	0.73	1	−1.00	310

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off-campus individual therapy	144	46%	3.06	1.80	4.85	0.72	4	48	41%	2.84	1.80	4.77	0.81	2	96	49%	3.19	1.80	4.89	0.67	2	−1.69	311
Informal Workshops/ Harm Reduction	132	42%	-	-	-	-	1	40	34%	-	-	-	-	1	92	46%	-	-	-	-	0		
on-campus workshop about reducing risky cannabis use	66	21%	2.22	1.49	4.77	0.72	2	27	23%	2.25	1.55	4.74	0.76	2	39	20%	2.20	1.46	4.79	0.70	0	0.28	313
ride share program through campus	123	39%	2.81	1.84	4.93	0.80	1	34	29%	2.43	1.73	4.85	0.86	1	89	45%	3.04	1.87	4.97	0.78	0	**−2.90** **	314
Medication	84	27%	-	-			4	27	23%	-	-			1	57	29%	-	-	-	-	2		
medication by injection	43	14%	1.75	1.34	4.79	0.77	4	15	13%	1.65	1.29	4.73	0.70	2	28	14%	1.81	1.36	4.82	0.82	2	−1.03	311
medication on days when I might use cannabis	65	21%	2.02	1.54	4.75	0.77	6	22	19%	1.94	1.54	4.82	0.80	3	43	22%	2.07	1.54	4.72	0.77	3	−0.70	309
daily medication	53	17%	1.92	1.47	4.89	0.75	4	20	17%	1.88	1.54	5.00	0.73	2	33	17%	1.94	1.44	4.82	0.77	2	−0.38	311
Medical Provider Appointment					-	-						-	-										
appointment with primary care/family doctor	125	40%	2.84	1.74	4.77	0.74	3	46	40%	2.86	1.79	4.85	0.82	2	79	40%	2.82	1.71	4.72	0.70	1	0.19	312
Peer/Family Interactions	159	50%	-	-	-	-	1	56	48%	-	-	-	-	1	103	52%	-	-	-	-	0		
talk with my friends	117	37%	2.7	1.68	4.69	0.71	2	37	32%	2.48	1.66	4.68	0.78	1	80	40%	2.84	1.68	4.7	0.68	1	−1.84	313
talk with my family	107	34%	2.66	1.66	4.75	0.7	2	35	30%	2.45	1.65	4.71	0.79	1	72	36%	2.78	1.65	4.76	0.66	1	−1.69	313
social networking sites/forums (peer-to-peer)	127	40%	2.82	1.72	4.74	0.69	1	41	35%	2.67	1.73	4.78	0.76	1	86	43%	2.91	1.72	4.73	0.66	0	−1.21	314

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talk with my RA	39	12%	1.83	1.29	4.79	0.76	2	17	15%	1.91	1.34	4.7	0.85	1	22	11%	1.77	1.26	4.86	0.71	1	0.95	313
talk with peer support leader in a club/ organization	52	17%	2.03	1.42	4.85	0.72	4	21	18%	2.09	1.47	4.86	0.85	1	31	16%	1.99	1.4	4.84	0.64	3	0.57	311

Note.

[a] A subset of participants answered these items (given late addition of measures). All participants in this subset endorsed current or past cannabis use.

[b] $N = 267$ (total); $N = 104$ (men); $N = 163$ (women). CUDIT sum scores calculated for those with past year cannabis use and no missing CUDIT items.

[c] Missing column reflects missing datapoints due to participants electing to skip that item. Denominators for percentages account for this.

[d] Items administered to all participants that endorsed current or past cannabis use.

[e] Frequency represents scores of ‘somewhat’ to ‘strongly’ agree and Mean represents average of full response scale (i.e., 1–6).

[f] “All Students” = *M, SD* for all students that reported cannabis use. “Receptive Students” = *M, SD* among those that were receptive (i.e., scoring ≥4 on receptiveness scale).

[g] Sex differences reflect differences between the “all students” for men and women.

$^{*}p < 0.05$

$^{**}p < 0.01$

$^{***}p < 0.001$

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Table 3.

Multivariate and Univariate Logistic Regressions: Variables influencing Receptiveness to Intervention Options for Alcohol Use

	Self-help				Remote/Telehealth				Individual Therapy/Group Approaches (in-person)				Informal Workshops/Harm Reduction				Medication				Medical Provider Visit				Peer/Family Interactions			
	Multivariate		Univariate		Multivariate		Univariate		Multivariate		Univariate		Multivariate		Univariate		Multivariate		Univariate		Multivariate		Univariate		Multivariate		Univariate	
Predictor Variable[a]	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**
Sex	1.34	0.76–2.36	1.46	0.90–2.39	1.65	0.99–2.77	**1.99** **	1.26–3.13	1.38	0.82–2.33	**1.67** *	1.06–2.64	1.40	0.83–2.37	**1.60** *	1.01–2.54	**1.98** *	1.09–3.61	**2.00** *	1.17–3.40	1.07	0.65–1.78	1.11	0.71–1.74	1.07	0.36–3.12	1.47	0.62–3.52
Alcohol Use																												
AUDIT	1.01	0.94–1.09	0.98	0.94–1.03	1.01	0.94–1.08	0.96	0.92–1.00	**1.08** *	1.00–1.16	0.99	0.95–1.03	1.06	0.99–1.14	0.99	0.95–1.03	0.97	0.89–1.05	0.97	0.93–1.02	0.98	0.92–1.05	0.99	0.95–1.03	1.07	0.95–1.21	0.98	0.90–1.06
alcohol consumption composite (std)	0.92	0.84–1.01	**0.94** *	0.88–0.99	**0.89** **	0.81–0.97	**0.90** ***	0.85–0.95	**0.86** ***	0.79–0.94	**0.92** **	0.87–0.97	**0.89** *	0.82–0.94	**0.93** **	0.88–0.98	0.96	0.87–1.05	**0.93** *	0.87–0.99	0.99	0.91–1.08	0.98	0.93–1.03	**0.81** *	0.69–0.95	**0.91** *	0.82–0.99
Drinking Motives																												
Social	0.98	0.73–1.33	1.1	0.91–1.34	0.82	0.61–1.09	0.95	0.80–1.13	1.09	0.82–1.46	1.16	0.97–1.39	1.11	0.83–1.48	1.14	0.95–1.37	0.89	0.64–1.24	1.03	0.85–1.25	1.01	0.77–1.33	1.13	0.95–1.35	1.42	0.83–2.42	**1.92** ***	1.37–2.69
Coping	1.05	0.80–1.39	1.22	0.99–1.51	0.88	0.68–1.14	1.01	0.84–1.21	0.87	0.67–1.13	1.05	0.87–1.27	0.90	0.69–1.17	1.05	0.87–1.27	1.17	0.88–1.56	1.21	0.99–1.48	0.90	0.70–1.16	1.08	0.90–1.30	0.84	0.45–1.55	1.51	1.00–2.30
Enhancement	1.04	0.76–1.43	1.07	0.87–1.30	1.29	0.96–1.74	0.99	0.83–1.19	1.17	0.86–1.58	1.13	0.94–1.36	1.11	0.82–1.50	1.10	0.92–1.33	1.03	0.74–1.45	1.00	0.82–1.22	1.13	0.85–1.51	1.13	0.94–1.35	**2.10** *	1.11–3.99	**2.08** ***	1.42–3.04
Conformity	**1.55** **	1.12–2.14	**1.53** **	1.18–1.99	**1.44** **	1.10–1.90	**1.27** *	1.03–1.55	1.18	0.89–1.56	1.2	0.97–1.48	1.18	0.89–1.56	1.19	0.96–1.47	**1.38** *	1.04–1.84	**1.38** **	1.11–1.71	1.24	0.95–1.61	**1.25** *	1.02–1.54	0.90	0.49–1.63	1.37	0.85–2.20
Reasons for Limiting Drinking																												
Convictions	0.90	0.54–1.53	1.09	0.68–1.76	0.81	0.50–1.30	1.08	0.71–1.66	0.82	0.51–1.33	0.96	0.62–1.48	1.08	0.67–1.76	1.19	0.76–1.87	1.20	0.72–1.97	1.43	0.91–2.25	0.68	0.43–1.08	0.83	0.54–1.26	1.50	0.50–4.47	1.23	0.50–3.05
Loss of Control	1.25	0.78–2.00	**1.56** *	1.07–2.29	1.17	0.77–1.79	**1.51** *	1.08–2.11	1.17	0.76–1.80	**1.44** *	1.02–2.04	1.21	0.79–1.86	1.41	0.99–2.00	1.03	0.65–1.63	**1.60** *	1.11–2.31	**1.56** *	1.03–2.35	**1.56** **	1.11–2.18	0.88	0.37–2.10	1.54	0.77–3.09
Adverse Consequences	0.80	0.54–1.19	1.05	0.74–1.48	0.92	0.64–1.33	1.11	0.81–1.51	1.11	0.77–1.61	1.38	1.00–1.90	0.90	0.62–1.30	1.13	0.82–1.56	1.13	0.75–1.68	1.33	0.93–1.89	0.90	0.63–1.28	1.11	0.81–1.52	1.15	0.56–2.35	1.74	0.94–3.23
Readiness to Change	1.00	0.96–1.03	1.01	0.98–1.04	1.02	0.98–1.05	1.01	0.99–1.04	0.98	0.95–1.02	0.99	0.97–1.02	0.98	0.95–1.02	0.99	0.97–1.02	1.03	0.9–91.07	1.03	1.00–1.06	1.00	0.97–1.03	1.01	0.98–1.03	0.99	0.93–1.07	1.00	0.94–1.05
Model Fit																												
Mutlivariate chi-sq	**22.29** *	-	-	-	**34.30** ***	-	-	-	**27.99** **	-	-	-	19.28	-	-	-	**27.72** **	-	-	-	13.92	-	-	-	**29.17** **	-	-	-

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	Self-help				Remote/Telehealth				Individual Therapy/Group Approaches (in-person)				Informal Workshops/Harm Reduction				Medication				Medical Provider Visit				Peer/Family Interactions			
	Multivariate		Univariate		Multivariate		Univariate		Multivariate		Univariate		Multivariate		Univariate		Multivariate		Univariate		Multivariate		Univariate		Multivariate		Univariate	
Predictor Variable[a]	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**
c-statistic	0.661	-	-	-	0.674	-	-	-	0.676	-	-	-	0.639	-	-	-	0.676	-	-	-	0.622	-	-	-	0.790	-	-	-

Note. N = 330 (with the exception of “Medication”, “Medical Provider”, and “Peer/Family Interactions” where *N* = 329). Only observations with values for each variable in the model were included. OR = Odds Ratio; 95% CI represents 95% Wald Confidence Limits; Multivariate chi-square is Likelihood Ratio.

[a]Predictor variables may be on different scales (see Method section); thus, the interpretation of odds may have different interpretations based on the predictor of interest.

* $p < 0.05$

** $p < 0.01$

*** $p < 0.001$

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Table 4.

Students receptiveness to treatment, by AUDIT Risk Groups[a]

	AUDIT Low (*n* = 235)				AUDIT Hazardous/High (*n* = 189)				Group differences	
Receptiveness to Intervention Options	***N***	***%***	***M***	***SD***	***N***	***%***	***M***	***SD***	t/χ^2	***df*** [b]
Self-help	182	77%	-	-	130	69%	-	-	**4.05***	1
self-help book	80	34%	2.71	1.57	50	26%	2.31	1.43	**2.67***	422
self-help blog/informational website	107	46%	2.98	1.63	72	38%	2.63	1.60	**2.20***	421
computer-based self-help program (guided/developed by mental health professional)	100	43%	3.00	1.64	63	33%	2.52	1.47	**3.14***	422
self-help group	114	49%	3.13	1.63	80	43%	2.90	1.60	1.45	420
smartphone applications	128	54%	3.34	1.70	72	38%	2.79	1.68	**3.30*****	422
Remote/Telehealth Options	144	61%	-	-	88	47%	-	-	**9.15***	1
text messaging therapy services	86	37%	2.83	1.58	63	33%	2.51	1.57	**2.10***	419
remote/teletherapy	75	32%	2.71	1.62	49	26%	2.39	1.46	**2.17***	421
personalized feedback via online format (education and PFI)	101	43%	2.98	1.64	57	30%	2.46	1.50	**3.36*****	421
Individual Therapy/Group Approaches (in-person)	158	67%	-	-	111	59%	-	-	3.27	1
on-campus groups with therapist	71	30%	2.64	1.50	51	27%	2.45	1.46	1.29	421
on-campus individual therapy	126	54%	3.36	1.67	82	44%	2.96	1.77	**2.38***	419
off-campus groups with therapist	80	35%	2.77	1.53	61	33%	2.60	1.48	1.13	416
off-campus individual therapy	138	59%	3.58	1.65	89	47%	3.20	1.76	**2.33***	422
Informal Workshops/Harm Reduction	167	71%	-	-	112	59%	-	-	**6.49***	1
on-campus workshop about reducing risky alcohol use	72	31%	2.62	1.52	46	24%	2.30	1.39	**2.20***	422
ride share program through campus	154	66%	3.90	1.77	103	54%	3.41	1.76	**2.84***	422
Medication	75	32%	-	-	45	24%	-	-	3.48	1
medication by injection	34	15%	1.87	1.29	21	11%	1.69	1.11	1.58	417.6
medication on days where I drink	62	27%	2.28	1.47	38	20%	2.05	1.39	1.61	419
daily medication	32	14%	1.89	1.24	22	12%	1.76	1.18	1.07	418
Medical Provider Appointment									0.83	1
appointment with primary care/family doctor	128	55%	3.38	1.72	95	50%	3.17	1.67	1.22	421
Peer/Family Interactions	223	95%	-	-	175	93%	-	-	1.37	1
talk with my friends	215	92%	4.94	1.22	167	88%	4.97	1.26	−0.24	421
talk with my family	195	83%	4.60	1.41	146	77%	4.50	1.62	0.67	374.42

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	AUDIT Low (*n* = 235)				AUDIT Hazardous/High (*n* = 189)				Group differences	
Receptiveness to Intervention Options	***N***	***%***	***M***	***SD***	***N***	***%***	***M***	***SD***	t/χ^2	***df*** [b]
social networking sites/forums (peer-to-peer)	73	31%	2.56	1.53	54	29%	2.29	1.54	1.79	421
talk with my RA	36	15%	1.99	1.25	17	9%	1.72	1.03	**2.45***	419.81
talk with peer support leader in a club/organization	67	29%	2.49	1.50	48	25%	2.25	1.49	1.67	420

Note.

[a]Consists of participants that reported past year alcohol use. AUDIT Risk groups include dichotomous representation of Low (0–7), Hazardous/harmful (8–15) and High (16+) Risk groups where Hazardous and High Risk groups are combined.

[b]Degrees of freedom (*df*) account for test of equality of variances (using Satterthwaite when equality of variances assumption is violated); therefore, some *df* include fractional values.

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Table 5.

Multivariate and Univariate Logistic Regressions: Variables influencing Receptiveness to Intervention Options for Cannabis Use

	Self-help				Remote/Telehealth				Individual Therapy/Group Approaches (in-person)				Informal Workshops/Harm Reduction				Medication				Medical Provider Visit				Peer/Family Interactions			
	Multivariate		Univariate		Multivariate		Univariate		Multivariate		Univariate		Multivariate		Univariate		Multivariate		Univariate		Multivariate		Univariate		Multivariate		Univariate	
Predictor Variable[a]	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**
Sex	1.56	0.85–2.86	**1.83** *	1.09–3.09	**2.11** *	1.10–4.02	**2.02** *	1.18–3.47	1.59	0.87–2.91	1.56	0.92–2.62	1.29	0.68–2.45	**1.98** *	1.16–3.39	1.15	0.57–2.30	1.35	0.75–2.45	0.88	0.47–1.67	1.05	0.62–1.79	1.23	0.67–2.26	1.55	0.92–2.60
Cannabis Use																												
CUDIT	1.00	0.92–1.08	0.96	0.92–1.01	1.02	0.95–1.11	1.00	0.96–1.04	0.98	0.91–1.06	0.98	0.94–1.02	0.99	0.91–1.08	**0.94** *	0.89–0.98	0.94	0.86–1.03	0.98	0.93–1.03	0.94	0.87–1.02	0.96	0.92–1.00	1.01	0.93–1.09	0.97	0.93–1.02
Freq of past year cannabis use	**0.83** **	0.73–0.95	**0.85** ***	0.78–0.92	0.91	0.79–1.04	**0.89** **	0.83–0.96	0.95	0.83–1.07	**0.92** *	0.86–1.00	0.88	0.77–1.01	**0.84** ***	0.78–0.91	1.03	0.89–1.19	0.93	0.86–1.01	1.02	0.90–1.17	**0.90** **	0.83–0.97	0.92	0.80–1.04	**0.89** **	0.82–0.96
Cannabis Use Motives																												
Enhancement	0.90	0.65–1.25	**0.78** *	0.64–0.96	0.86	0.61–1.22	0.82	0.67–1.00	1.18	0.85–1.63	0.96	0.78–1.18	1.01	0.71–1.43	0.83	0.68–1.02	0.84	0.57–1.24	0.84	0.67–1.05	0.81	0.58–1.13	**0.76** **	0.62–0.93	1.17	0.84–1.62	0.94	0.77–1.15
Conformity	1.00	0.63–1.60	1.23	0.85–1.78	0.89	0.56–1.40	1.30	0.91–1.87	0.73	0.47–1.15	0.91	0.64–1.31	**0.54** *	0.33–0.88	0.81	0.56–1.18	1.34	0.85–2.12	**1.72** **	1.17–2.51	0.96	0.61–1.51	1.17	0.82–1.69	1.02	0.65–1.61	1.36	0.93–1.97
Expansion	1.31	0.97–1.78	1.07	0.87–1.32	1.32	0.97–1.81	1.15	0.93–1.41	1.20	0.89–1.63	1.07	0.87–1.32	1.26	0.92–1.72	1.02	0.83–1.26	1.05	0.74–1.48	1.11	0.88–1.39	**1.56** **	1.13–2.16	1.11	0.90–1.37	**1.38** *	1.02–1.88	1.23	0.99–1.52
Coping	0.88	0.62–1.25	0.86	0.69–1.08	0.91	0.63–1.30	0.96	0.77–1.21	**0.66** *	0.47–0.95	0.83	0.66–1.04	1.07	0.74–1.55	0.88	0.70–1.10	1.33	0.89–1.98	1.10	0.86–1.40	0.78	0.54–1.14	0.79	0.63–1.00	0.87	0.61–1.24	0.94	0.75–1.17
Social	1.18	0.82–1.72	0.99	0.78–1.26	1.24	0.83–1.83	1.1	0.86–1.41	1.36	0.94–1.97	1.1	0.86–1.41	1.36	0.91–2.03	0.96	0.76–1.23	1.22	0.79–1.89	1.16	0.89–1.52	1.04	0.70–1.56	0.91	0.71–1.17	1.15	0.79–1.67	1.13	0.88–1.43
Reasons for Limiting Cannabis Use																												
Negative Consequences	1.17	0.63–2.18	**1.82** ***	1.29–2.56	1.67	0.88–3.16	**2.22** ***	1.57–3.14	1.24	0.67–2.31	**1.52** *	1.10–2.11	0.87	0.46–1.64	**1.87** ***	1.34–2.62	1.95	0.97–3.92	**2.12** ***	1.48–3.05	**2.30** *	1.21–4.37	**2.12** ***	1.50–2.99	1.33	0.71–2.47	**2.02** ***	1.43–2.86
Interest and Practicality	1.12	0.72–1.73	**1.62** ***	1.22–2.16	1.40	0.89–2.21	**1.81** ***	1.35–2.43	1.28	0.83–1.98	**1.45** **	1.10–1.92	**2.37** ***	1.47–3.81	**2.48** ***	1.79–3.42	1.03	0.62–1.70	**1.60** **	1.17–2.20	1.26	0.80–1.97	**1.71** ***	1.28–2.30	1.40	0.90–2.18	**1.85** ***	1.38–2.48
Personal Beliefs/Peer Influences	0.90	0.47–1.70	**1.68** **	1.16–2.44	0.77	0.41–1.46	**1.81** **	1.27–2.61	0.95	0.51–1.77	**1.44** *	1.01–2.07	1.23	0.64–2.36	**2.06** ***	1.42–2.98	1.04	0.54–2.01	**1.96** ***	1.35–2.85	0.60	0.32–1.12	**1.70** **	1.19–2.42	1.19	0.63–2.25	**2.00** ***	1.36–2.93
Readiness to Change	1.03	0.99–1.07	1.00	0.98–1.03	1.03	0.99–1.07	1.02	0.99–1.05	1.04	1.00–1.08	1.01	0.98–1.03	1.01	0.97–1.05	0.98	0.95–1.01	1.01	0.96–1.05	1.01	0.98–1.04	1.02	0.98–1.06	1.00	0.98–1.03	0.99	0.95–1.03	0.99	0.96–1.01
Model Fit																												

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Predictor Variable[a]	Self-help				Remote/Telehealth				Individual Therapy/Group Approaches (in-person)				Informal Workshops/Harm Reduction				Medication				Medical Provider Visit				Peer/Family Interactions			
	Multivariate		Univariate		Multivariate		Univariate		Multivariate		Univariate		Multivariate		Univariate		Multivariate		Univariate		Multivariate		Univariate		Multivariate		Univariate	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Mutlivariate chi-sq	**32.65** **	-	-	-	**40.70** ***	-	-	-	**23.93** *	-	-	-	**51.61** ***	-	-	-	**27.47** **	-	-	-	**34.01** ***	-	-	-	**34.89** ***	-	-	-
c-statistic	0.694	-	-	-	0.735	-	-	-	0.669	-	-	-	0.755	-	-	-	0.705	-	-	-	0.716	-	-	-	0.707	-	-	-

Note. $N = 242$ (with the exception of "Individual/Group", "Medication", and "Medical Provider Visit" where $N = 241$). Only observations with values for each variable in the model were included. OR = Odds Ratio; 95% CI represents 95% Wald Confidence Limits; Multivariate chi-square is Likelihood Ratio.

[a]Predictor variables may be on different scales (see Method section); thus, the interpretation of odds may have different interpretations based on the predictor of interest.

* $p < 0.05$

** $p < 0.01$

*** $p < 0.001$

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Table 6.

Students receptiveness to treatment, by CUDIT Risk Groups[a]

	CUDIT Low (*n* = 176)				CUDIT Hazardous/High (*n* = 91)				Group differences	
	N	%	*M*	*SD*	N	%	*M*	*SD*	t/χ^2	*df*[b]
Receptiveness to Treatment Options										
Self-help	104	59%	-	-	42	46%	-	-	**4.26***	1
self-help book	56	32%	2.56	1.73	21	23%	2.10	1.50	**2.16***	264
self-help blog/informational website	70	40%	2.74	1.77	29	32%	2.37	1.69	1.63	263
computer-based self-help program (guided/developed by mental health professional)	66	38%	2.71	1.76	20	22%	2.07	1.40	**3.27****	220.6
self-help group	63	36%	2.77	1.74	24	26%	2.25	1.56	**2.38***	263
smartphone applications	70	40%	2.83	1.77	23	25%	2.27	1.51	**2.53***	263
Remote/Telehealth Options	76	43%	-	-	35	38%	-	-	0.61	1
text messaging therapy services	54	31%	2.53	1.71	22	24%	2.09	1.42	**2.12***	264
remote/teletherapy	47	27%	2.43	1.61	16	18%	2.07	1.36	1.83	262
personalized feedback via online format (education and PFI)	53	30%	2.54	1.71	21	23%	2.14	1.41	**2.01***	215.22
Individual Therapy/Group Approaches (in-person)	100	57%	-	-	44	48%	-	-	2.00	1
on-campus groups with therapist	47	27%	2.52	1.70	20	22%	2.12	1.48	1.91	263
on-campus individual therapy	74	43%	3.04	1.86	27	30%	2.51	1.73	**2.27***	262
off-campus groups with therapist	57	33%	2.69	1.71	17	19%	2.12	1.48	**3.15****	213.85
off-campus individual therapy	83	48%	3.20	1.79	36	40%	2.51	1.73	1.87	262
Informal Workshops/Harm Reduction	87	50%	-	-	27	30%	-	-	**9.82****	1
on-campus workshop about reducing risky cannabis use	42	24%	2.40	1.58	14	15%	1.93	1.31	**2.54***	214.48
ride share program through campus	82	47%	3.10	1.90	23	25%	2.33	1.66	**3.26****	264
Medication	52	30%	-	-	19	21%	-	-	2.47	1
medication by injection	30	17%	1.91	1.49	7	8%	1.42	0.97	**3.24****	250.76
medication on days where I might use cannabis	44	26%	2.20	1.65	11	12%	1.67	1.27	**2.90****	227.05
daily medication	31	18%	2.03	1.54	13	14%	1.70	1.34	1.7	263
Medical Provider Appointment			-	-			-	-	**5.76***	1
appointment with primary care/family doctor	76	44%	3.05	1.79	26	29%	2.38	1.62	**2.94****	263
Peer/Family Interactions	96	55%	-	-	43	47%	-	-	1.39	1
talk with my friends	72	41%	2.91	1.74	27	30%	2.35	1.55	**2.59****	263

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	CUDIT Low (*n* = 176)				CUDIT Hazardous/High (*n* = 91)				Group differences	
	N	**%**	***M***	***SD***	**N**	**%**	***M***	***SD***	t/χ^2	*df* [b]
talk with my family	65	37%	2.85	1.70	25	27%	2.35	1.58	**2.32***	263
social networking sites/forums (peer-to-peer)	78	45%	3.05	1.75	30	33%	2.45	1.63	**2.69****	264
talk with my RA	26	15%	1.95	1.40	9	10%	1.62	1.11	**2.15***	221.73
talk with peer support leader in a club/organization	31	18%	2.14	1.47	15	16%	1.86	1.38	1.54	262

Note.

[a]Consists of students that reported past year cannabis use. CUDIT-R Risk groups include dichotomous representation of Low (0–7), Hazardous (8–11) and High (12+) Risk groups where Hazardous and High Risk groups are combined.

[b]Degrees of freedom (*df*) account for test of equality of variances (using Satterthwaite when equality of variances assumption is violated); therefore, some *df* include fractional values.

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