HHS Public Access

Author manuscript

Int J Ment Health Addict. Author manuscript.

A Scoping Review of Interventions for U.S. College Students' Harmful Cannabis Use and a Call for a College Cannabis Intervention Matrix

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Abstract

We aimed to identify interventions for college students' harmful cannabis use in the United States (U.S.) and determine whether (and what type of) additional randomized clinical trials (RCTs) are needed. We conducted a scoping review of RCTs of individual-focused cannabis interventions for U.S. college students. Database searches yielded 13 RCTs—seven interventions were effective. Effective interventions typically comprised one session, representing various modalities and intervention types (e.g., personalized feedback interventions [PFIs]; brief motivational interventions [BMIs]), and reduced frequency of cannabis use or consequences in the target population across variable follow-up periods. Single-session PFIs and BMIs that engage subgroups reporting cannabis-related consequences may be effective. There is a need for a tool like the College Alcohol Intervention Matrix, but focused on cannabis prevention, to increase the dissemination and uptake of effective, evidence-based strategies. Researchers are called on to fill gaps and strengthen content within a possible College Cannabis Intervention Matrix.

Keywords

cannabis; marijuana; prevention; young adult; university

With the legalization of cannabis use for non-medical (sometimes referred to as "recreational") purposes becoming more common in the United States (U.S.), the number of young people who believe regular cannabis use is harmful is decreasing (Gilson et al., 2023; National Institute on Drug Abuse [NIDA], 2019). At the same time, there is some evidence that cannabis-related problems are increasing in severity, including increased incidence of

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breathing problems, elevated heart rate (and associated risk for heart attack), exacerbated symptoms of mental illness, and cannabis use disorder (CUD; NIDA, 2019). In 2015, more than 11 million young people (aged 15–25 years) used cannabis in the past year (NIDA, 2019) and this number has continued to climb over the past 5 years, especially among college and university students (hereafter referred to as college students). Indeed, U.S. campuses are facing increased student cannabis use and related problems, with past year use recently reaching historic numbers: In 2020, 44% of college students reported cannabis use in the past year and 8% reported daily use, compared to 38% in the past year and 5% daily in 2015 (National Institutes of Health [NIH], 2021; Schulenberg et al., 2021). Similar increases have not been observed among high school students or young adults who are not in college (NIH, 2021).

Changes to legislation and availability have paralleled changes in frequency (Cerdá et al., 2012; Wall et al., 2011) and methods of cannabis use, as well as potency and concentration of products (Borodovsky et al., 2016; Firth et al., 2020). Use of high potency cannabis, generally defined as any cannabis product over 10% THC, is associated with a greater risk of psychosis, CUD, anxiety, and other unwanted cannabis-related outcomes (PRSC Cannabis Concentration Workgroup, 2020). Cannabis use is associated with more skipped classes, lower grade point averages, discontinuous enrollment, and lower likelihood of graduating on time (Arria et al., 2013; Arria et al., 2015; Suerken et al., 2016). Given the substantial efforts that campuses mount to support student mental health and student success (e.g., the Jed Foundation, Healthy Minds Network), the association between cannabis use and mental health is noteworthy, as is the association between cannabis use and academic outcomes. Thus, the need for effective prevention and intervention strategies exists, particularly in the context of changing climates with respect to cannabis products, legalization, and use.

Campuses are meeting the need for cannabis prevention and intervention with unknown degrees of fidelity and success. To date, cannabis interventions have largely been adapted from alcohol interventions, including the Cannabis eCHECKUP TO GO, formerly known as the “Marijuana eCHECKUP TO GO” or “eTOKE,” which was adapted from the Alcohol eCHECKUP TO GO (formerly “eCHUG”; San Diego State University Research Foundation, 2023), and Lee and colleagues’ (2013) individualized College Health for Alcohol and Marijuana Program (i.e., iCHAMP), which was adapted from the Brief Alcohol Screening and Intervention for College Students (i.e., BASICS; Dimeff et al., 1999). Though there is some evidence that brief interventions reduce symptoms of CUD and increase abstinence among young adults (but do not reduce frequency of use or consequences; Halladay et al., 2019), campuses seeking to engage in prevention and intervention related to cannabis need population-specific guidance for selection and implementation of evidence-based practices in their strategic planning processes.

Campuses historically faced a similar problem regarding alcohol interventions. In 1999, the National Advisory Council on Alcohol Abuse and Alcoholism within the National Institute on Alcohol Abuse and Alcoholism (NIAAA) created the Task Force on College Drinking whose charge included providing “recommendations to college and university presidents on the potential effectiveness of current strategies to reverse the culture of drinking on campus” (p. ix; NIAAA, 2002). Fulfilling this charge involved conducting comprehensive reviews of

the extant college drinking prevention and intervention literature (Larimer & Cronce, 2002; Toomey & Wagenaar, 2002), which culminated the 4-tiered system of recommendations included in the "Call to Action" report mailed to every college president (NIAAA, 2002). Strategies included in Tier 1 had been shown in at least two studies to significantly reduce alcohol-related behavioral outcomes (i.e., use and/or consequences) among students and the three approaches within Tier I were all focused on applications to individuals at elevated risk for experiencing alcohol-related consequences. Strategies in Tier 2 had been shown to be effective in the general population but had not yet been extensively evaluated among college students specifically; strategies in this tier were largely environmental in nature (e.g., enforcement of minimum legal drinking age laws). Strategies in Tier 3 were promising from a theoretical standpoint but had not been systematically evaluated. Tier 4 was reserved for strategies demonstrating a clear pattern of ineffectiveness in changing alcohol behavioral outcomes or producing iatrogenic effects. Subsequent research demonstrated partial adoption and implementation of some recommended strategies 6 years later (Nelson et al., 2010); however, there was a demonstrable need for more guidance to increase the adoption of evidence-based practices.

Alongside experts, NIAAA subsequently developed the College Alcohol Intervention Matrix (CollegeAIM; Cronce et al., 2018; NIAAA, 2019), which "is an easy-to-use and comprehensive booklet and website to help schools identify effective alcohol interventions" (NIAAA, 2019). CollegeAIM lists interventions by relative cost (lower, mid-range, higher) and relative efficacy based on empirical research (not effective, lower, moderate, higher). It consists of more than 60 individually- and environmentally-focused strategies that have been evaluated with regard to efficacy. Additional materials are available to support the use of CollegeAIM, including an interactive website with references, answers to frequently asked questions, and a strategy planning worksheet. For optimal outcomes, selecting and implementing a mix of individual and environmental strategies that fit the needs of a particular campus is recommended. To help campuses face the challenge of harmful cannabis use among their students, a similar tool describing individual and environmental strategies aimed at changing cannabis behaviors and associated harms may be useful. As was the case in the process of creating the CollegeAIM, the first step in fulfilling this charge is conducting a review of the existing individual-focused cannabis prevention and intervention literature.

We are aware of reviews of (1) *brief interventions* for cannabis use in *emerging adults* (Halladay et al., 2019)—in which 8 of 26 total reports recruited samples from universities or colleges—and (2) *alcohol and other drug interventions* for *mandated students* (Montemayor et al., 2022)—in which four of six total reports involved experimental studies. Finally, a review of Screening, Brief Intervention, and Referral to Treatment *(SBIRT)* for *multiple age groups* (Gette et al., 2023)—only included studies of three college samples (two studies did not comprise students from the U.S.; one study was not an RCT).

Purpose of the Current Study

Our aim was to identify the existing/available interventions for college students' harmful cannabis use in the U.S. and determine whether (and what type of) additional RCTs

are needed to develop a cannabis-focused college intervention matrix similar to the CollegeAIM. Building on prior work, the current review included reports of experimental tests of all types of individual-focused interventions (i.e., not just brief or mandated interventions) and reports on college students only (rather than all age groups or emerging adults broadly, or mandated college students specifically) given the high rates of cannabis use in this subpopulation of emerging adults (and not all are mandated).

Based on the limited number of studies involving college student samples included in a prior review (i.e., 8; Halladay et al., 2019) we opted to conduct a *scoping* review rather than a *systematic* review. The purpose of a systematic review is to confirm current practice when a substantial body of literature exists on a topic, sample sizes are large and representative, and effect sizes are obtainable (Munn et al., 2018; Peters et al., 2021; Tricco et al., 2018), at which point a meta-analysis may be possible. Conversely, the purpose of a scoping review is to determine and describe the volume of emerging evidence available on a topic when the field is not yet ready for a precise, systematic review.

Accordingly, we conducted a scoping review of randomized clinical trials (RCTs) of individual-focused cannabis interventions for U.S. college students with the goals of (a) compiling a comprehensive list of existing, rigorously tested evidence-based interventions targeting reductions in cannabis use and/or associated consequences, (b) documenting the stated efficacy or effectiveness of evidence-based interventions for reducing cannabis use and/or related consequences (including CUD), and (c) identifying areas in need of future research based on study participants (e.g., racial and ethnic composition of the samples), context (e.g., predominantly white institutions [PWIs] vs. minority-serving institutions [MSIs]), concept (e.g., outcome, intervention type), methods, and key findings.

Methods

The scoping review was guided by the JBI methodology for scoping reviews and the Preferred Reporting Items for Systematic Reviews and Meta-analyses for Scoping Reviews (PRISMA-ScR) reporting guidelines (Peters et al., 2020; Tricco et al., 2018). The protocol was registered on Open Science Framework (Hone et al., 2022). Our registered research question was: What are the existing/available interventions for college students' harmful cannabis use in the U.S. and are additional RCTs needed? A preliminary search of BioMed Central Systematic Reviews, Campbell Systematic Reviews, Cochrane Database of Systematic Reviews, JBI Evidence Synthesis, and PROSPERO: International Prospective Register of Systematic Reviews was conducted on January 13, 2022, using the base search terms "(cannabis OR marijuana) AND (student OR students) AND (intervention OR interventions)." No current or underway systematic reviews or scoping reviews on the proposed topic were identified.

Inclusion Criteria

This scoping review only included RCTs of interventions specifically addressing cannabis use that involved participants who were adolescents and young adults between the ages of 15 and 25 who were enrolled in an institution of higher education (i.e., 2-year community colleges, trade schools, and 4-year colleges/universities) in the U.S.

Search Strategy

The search strategy was iteratively developed by a research librarian (JMD) with input from the first (LH) and second (CB) authors. The original literature searches were conducted on February 10–11, 2022, in Embase (Elsevier), PsycINFO (EBSCOhost), Psychology and Behavioral Sciences Collection (EBSCOhost), PubMed, and Web of Science (Clarivate Analytics). Updated searches were conducted on March 5, 2024. The base search strategy was adapted for each included database using subject headings where available (see Appendix I). Both published and unpublished reports (e.g., conference abstracts, dissertations) were considered for inclusion. The search was restricted to articles published in 2006 or later because the earliest published report in a similar review (i.e., Halladay et al., 2019) was published in 2006 (i.e., Walker et al., 2006). The earliest published review in Montemayor et al. (2022) was also published in 2006 (i.e., White et al., 2006). Only reports published in English were eligible for inclusion given this is the only language with which the authorship team has fluency. In addition, a manual search of reference sections of all eligible reports was conducted independently by two reviewers (authors or research assistants; see acknowledgements). Any records identified through these searches, regardless of publication date, were considered for inclusion.

Record Selection

Following the search, all identified records (n = 1,016 original search; 331 updated search) were collated and uploaded into Covidence (Veritas Health Innovation, 2022) in preparation for screening. Of these, 315 in the original search and 91 in the updated search were duplicates and were automatically removed. Each record's title and abstract were screened by two independent reviewers (authors or research assistants) for assessment against inclusion criteria. Disagreements between the reviewers were resolved through discussion with the first author (LH).

Report Selection

Records considered possibly eligible based on title and abstract screening were retrieved and read in full. These reports were assessed in detail against the inclusion criteria by two independent reviewers (LH, CB, SC, or TR). Any disagreements that arose between the reviewers at this stage of the selection process were resolved through discussion with the third reviewer (LH, CB, SC, or TR) to consensus. Two independent reviewers (authors or research assistants) conducted independent manual searches of reference sections of all eligible reports, and records identified as possibly eligible were retrieved, screened, and included in the data extraction phase if relevant. The results of the search and inclusion process are reported in full in the PRISMA flow diagram (PRISMA, 2022; see Figure 1).

Data Extraction

Study data were extracted from reports considered eligible by two independent reviewers (LH, CB, SC, TR) using a modified JBI data extraction instrument (JBI, 2022) developed by the authors (LH, CB, and SC). The data extracted included specific details about study participants, concept, context, methods, and key findings relevant to the review questions. Because this was a scoping review, we did not extract effect sizes or evaluate risk of bias.

Any disagreements that arose between two reviewers were resolved through discussion with the third reviewer (LH, CB, SC, or TR) to consensus.

Results

Overview

After de-duplication, the database searches yielded 701 and 240 records in the original and updated searches, respectively, for title and abstract review, of which, 40 and 12 records in the original and updated searches, respectively, were considered possibly eligible. After full-text review, 14 and 4 reports in the original and updated searches, respectively, met full inclusion criteria and progressed to data extraction. Two additional potentially eligible records were identified by searching the bibliographies of the 18 total eligible reports, but both were excluded, resulting in 18 total reports for inclusion. One report (Palfai et al., 2016) was an extension of Palfai et al. (2014), while four reports (Fetterling et al., 2021; Prince et al., 2021; Walukevich-Dienst et al., 2019; Walukevich-Dienst et al., 2021) described the same study (i.e., reported ancillary, moderator analyses of the same RCT; Riggs et al., 2018) and therefore only data from the original RCT was extracted (see Figure 1). Sample sizes of the 13 studies in these 18 reports ranged from 63 to 341, with participants aged 17–25 and predominantly (60–87%) White, non-Hispanic (83–94%). All studies took place at 4-year institutions granting bachelor's degrees and were PWIs (see Table 1).

Intervention Information

Given the tremendous heterogeneity in how researchers classify interventions and use the terms brief motivational intervention (BMI), personalized feedback intervention (PFI), and personalized normative feedback (PNF), and because many BMIs use feedback that, if delivered without a facilitator would constitute a PFI, and many PFIs contain PNF, we chose to adhere to the definitions for BMIs versus PFIs published in the CollegeAIM (NIAAA, 2019). In short, BMIs (e.g., iCHAMP) are interventions facilitated by a human (in-person remotely or in-person on-site) who uses a motivational interviewing (MI) style to discuss personalized feedback. PFIs (e.g., Cannabis eCHECKUP TO GO) are interventions that only include personalized feedback with *no* facilitation by a human, and feedback must contain more than just norms (otherwise, it would be classified as PNF—an intervention that only includes personalized feedback on norms with *no* facilitation by a human). Feedback in a PFI may be delivered remotely (over the web or on paper via the mail) or on-site (electronically, via the web, or on paper).

The 13 eligible studies included four BMIs (Hwang, 2017; Lee et al., 2013; Murphy et al., 2024; Teeters et al., 2022) and nine PFIs (Buckner et al., 2020; Choi et al., 2023; Conner et al., 2024; Elliott & Carey, 2012; Elliott et al., 2014; Lee et al., 2010; Palfai et al., 2014; Riggs et al., 2018; Towe, 2012). Of the four BMIs, two (Hwang, 2017; Murphy et al., 2024) adapted or expanded BASICS, the feedback used in one BMI (Lee et al., 2013) was adapted from a previously evaluated PFI (Lee et al., 2010), and one comprised personalized feedback on impaired driving paired with MI-texts from a trained interventionist (Teeters et al., 2022; see Table 2). Five of the nine PFIs (Conner et al., 2024; Elliott & Carey, 2012; Elliott et al., 2014; Palfai et al., 2014; Riggs et al., 2018) comprised a version of the Cannabis

eCHECKUP TO GO. One comprised a PFI for Negative Affect and Cannabis (Buckner et al., 2020), one comprised a novel Personalized Feedback Report (Towe, 2012), one (Lee et al., 2010) was modeled after a motivational enhancement intervention used by Walker et al. (2006, 2011), and the final PFI (Choi et al., 2023) was modeled after the Personalized Feedback Program developed by Dick et al. (2022) to give students information about their genetically influenced externalizing and internalizing traits (a risk factor for substance use; see Table 2). Two BMIs were delivered in-person on-site (Hwang, 2017; Lee et al., 2013), one was delivered in-person on-site with digital remote boosters (Murphy et al., 2024), and one was fully digital and remote (Teeters et al., 2022). All PFIs were digital. Eight of the PFIs were delivered remotely, while one PFI (Palfai et al., 2014) was delivered both remotely and on-site at a student health center.

Six of the comparators were assessment only, three were active control, and one was a waitlist control. Three of the more recent interventions included both active control and assessment only conditions. Five interventions were categorized as selective prevention, that is, comprising a group that is at elevated risk for developing consequences/CUD or a high-risk pattern of use on the basis of group membership (e.g., first-year students, athletes). Seven interventions were categorized as indicated prevention, meaning the intervention was designed for individuals reporting cannabis-related consequences or a pattern of use associated with elevated risk for cannabis-related consequences (e.g., individuals engaged in current, heavy, recent, or frequent use of cannabis, and mandated students). Any studies recruiting students reporting at least weekly cannabis use (or cannabis use 4 or more times/month) were categorized as indicated prevention (Connor et al., 2021). One intervention (Elliott & Carey, 2012) involved those abstaining from cannabis use and, thus, was categorized as health promotion/universal prevention (i.e., for all people regardless of level of use or experience of harms). There were no interventions categorized as treatment (i.e., for individuals who met criteria for CUD). All interventions involved a single session, except for one that involved a Substance Free Activity Session immediately following a BASICS session (Murphy et al., 2024). All studies involved either one (seven studies), or two (six studies) follow-up assessments. The first follow-up assessment occurred at 2 weeks (one study), at 6 weeks (one study), at 1 month (seven studies), or at 3 months (four studies). All six studies with a second follow-up assessment had a second assessment that occurred at 3 (two study) or 6 (four studies) months (see Table 2).

BMI Outcomes

The first effective BMI—Lee and colleagues (2013)—recruited students enrolled at two campuses in the northwest (M_{age} = 20) who reported having used cannabis at least 5 times in the past month and assigned them to an in-person facilitated conversation with feedback adapted from Lee et al. (2010), or to an assessment-only condition, with outcomes assessed at 3- and 6-month follow-up. They tested the effects of the BMI on quantity and frequency of cannabis use and cannabis-related consequences, noting significant reductions in quantity and consequences (but not frequency) at the 3-month (but not the 6-month) follow-up assessment. Similarly, in a dissertation, Hwang (2017) compared cannabis outcomes (quantity, frequency, consequences) reported by students at a northeastern, public research university who were mandated to attend a cannabis intervention (M_{age} = 18).

Participants were assigned to either an in-person intervention adapted from BASICS or a waitlist control group. Hwang (2017) found that all mandated students, regardless of intervention or waitlist condition assignment, experienced reductions in quantity, frequency, and consequences at a 1-month follow-up (i.e., the BMI was effective within groups—there were improvements pre- to post-intervention but not significant beneficial differences with respect to the comparator condition)).

A third effective BMI—Murphy and colleagues (2024)—also involved BASICS and added a Substance Free Activity Session (SFAS) or Relaxation Training (RT). Murphy et al. (2024) recruited students at a southern public university (M_{age} = 20) who reported cannabis use on 5 or more days in the past month and randomized them to in-person, on-site BASICS plus SFAS, BASICS plus RT, or assessment-only conditions, with digital remote booster sessions, and assessed outcomes at 1-month and 6-month follow-up assessments. Murphy et al. (2024) reported significant reductions in cannabis consequences and cravings among students in both intervention conditions compared to the control condition at the 1-month follow-up assessment (however the authors note this pilot study was not adequately powered). Teeters et al. (2022) tested effects of a BMI on cannabis consequences (i.e., impaired driving and riding) among students (M_{age} = 21) who reported driving after cannabis use at least three times in the past three months. Teeters et al. (2022) randomized students to digital, remote cannabis impaired–driving personalized feedback plus MI-style interactive text messaging, personalized feedback only, or control conditions, and assessed outcomes at a 3-month follow-up assessment. After accounting for sex/gender, Teeters et al. (2022) found students in the cannabis impaired–driving personalized feedback plus MI-style interactive text messaging condition reported fewer cannabis consequences (i.e., impaired driving and riding) than students in the control condition (see Table 3).

PFI Outcomes

Of the nine PFIs, four were effective, one was partially effective, one was effective within groups (i.e., improvements pre- to post-intervention but not significant beneficial differences with respect to the comparator condition), and three were ineffective. Two of the three effective PFIs comprised the Cannabis eCHECKUP TO GO (Palfai et al., 2014; Riggs et al., 2018). College students in these investigations (M_{age} = 20) either attended a southwestern, public land-grant research university and reported typically using cannabis at least twice per week (Riggs et al., 2018) or attended a northeastern, private research university and reported at least monthly cannabis use over the past 90 days (Palfai et al., 2014). Palfai and colleagues (2014) tested the effects of Cannabis eCHECKUP TO GO on frequency of use, consequences, and CUD diagnoses when the assessment that generates the feedback and the viewing of the feedback were both completed on-site (in the campus Student Health Services center) or remotely (at a location of the student's choosing) in comparison to a control condition that received feedback on general health-related behaviors in a 2 × 2 design. By comparison, Riggs and colleagues (2018) tested the effects of Cannabis eCHECKUP TO GO plus protective behavioral strategies on frequency of use and consequences in comparison to a condition in which participants received behavioral strategies for stress management. While outcomes associated with the two Cannabis eCHECKUP TO GO conditions in the study by Palfai et al. (2014) were not significantly

different when compared to outcomes in the general health feedback conditions, comparison of outcomes for participants who completed Cannabis eCHECKUP TO GO on-site in Student Health Services revealed a statistically significant advantage over completion of Cannabis eCHECKUP TO GO remotely for cannabis-related consequences (but not frequency of use or CUD diagnoses) over a 3–6-month period. Riggs and colleagues' (2018) Cannabis eCHECKUP TO GO plus protective behavioral strategies intervention also reduced cannabis consequences (but not frequency of use) at a 6-week follow-up assessment.

The third effective PFI (Buckner et al., 2020) recruited students who attended a southern, public land-grant research university (M_{age} = 19) and reported any level of cannabis use in the past month. College students were assigned to receive a PFI for Negative Affect and Cannabis or to an assessment-only condition. Buckner and colleagues (2020) tested the effects of the PFI on cannabis use frequency only and demonstrated successful reductions in this outcome at a 2-week follow-up assessment for those in the intervention group in comparison to those in the control group. The fourth effective PFI (Choi et al., 2023) involved first-year students at a mid-Atlantic, public research university (M_{age} = 18) randomized to one of three intervention conditions or a control condition. The students in the intervention conditions completed the Personalized Feedback Program (PFP; Dick et al., 2022), received computer-delivered feedback patterned after the content of BASICS (Dimeff et al., 1999), or PFP plus BASICS feedback. Choi and colleagues (2023) tested for intervention effects on frequency of cannabis use at 1-month and 3-month follow-up assessments. The PFP group was associated with reduced likelihood of cannabis use at both follow-up assessments and outperformed the PFP plus BASICS feedback group at 3-month follow-up.

The partially effective PFI (Lee et al., 2010) included students attending a northwestern, public research university (M_{age} = 18) who reported any level of cannabis use in the past 3 months. Participants were assigned to a PFI adapted from feedback used in BASICS and the Teen Marijuana Check-Up or to an assessment only condition, with outcomes compared at 3- and 6-month follow-up assessments. Lee and colleagues (2010) tested the effects of the PFI on frequency and consequences of cannabis use, demonstrating reduced frequency (at 3- and 6-months) and consequences (at 6-months) among those reporting perceiving they had one or more family members who have or had a "drug problem that did or should have led to treatment" (p. 268). The PFI that was effective within groups (Towe, 2012) included college students (M_{age} = 19.6) who reported at least 6 days of cannabis use within the past 30 days. Participants were assigned to the PFI or an education only condition. Both groups demonstrated reduced frequency of use and consequences at a 1-month (but not at a 3-month) follow-up assessment.

The three ineffective PFIs all comprised the Cannabis eCHECKUP TO GO (Conner et al., 2024; Elliott & Carey, 2012; Elliott et al., 2014). Elliott and Carey (2012) and Elliott et al. (2014) tested the Cannabis eCHECKUP TO GO among college students at a northeastern, private research university. Elliott and Carey (2012) evaluated the potential effect of Cannabis eCHECKUP TO GO in comparison to assessment only on rates of initiation of cannabis use among those who reported no cannabis use in the past month at baseline

(M_{age} = 21), finding no significant group differences at a 1-month follow-up assessment. Elliott and colleagues (2014) evaluated the potential effect of Cannabis eCHECKUP TO GO in combination with either brief or extensive baseline assessment in comparison to assessment only in a 2 × 2 design among those who reported any level of cannabis use in the past month (M_{age} = 19), finding no significant group differences on frequency of cannabis use, cannabis-related consequences, or CUD symptoms at a 1-month follow-up assessment. Conner and colleagues (2024) tested the Cannabis eCHECKUP TO GO among college students at one university in the U.S. (alongside two universities in Canada) who reported past month cannabis use and interest in reducing (or engaging in safer) cannabis use. Conner et al. (2024) randomized students in the U.S. sample (M_{age} = 22) to the intervention or control group and found no group differences in use or consequences at a 1-month follow up assessment (see Table 3).

Discussion

Overview

Our scoping review yielded 13 independent RCTs testing interventions for preventing or reducing harmful cannabis use among U.S. college students. All seven effective interventions comprised samples of individuals at elevated risk for cannabis-related consequences, all typically involved a single session (Murphy et al. [2024] involved a two-part intervention), and all reduced consequences (five studies) and/or frequency (three studies) of use. One study also reduced quantity (Lee et al., 2013); and one study reduced craving (Murphy et al., 2024). Effective interventions involved a mix of modalities (i.e., four digital/remote; two in-person/on-site; one digital/on-site), and a mix of intervention types (i.e., three BMIs, four PFIs), and a mix of follow-up periods. Future RCTs should test less studied approaches, and intervention development and evaluation are needed to address gaps in previously studied approaches described here. In the meantime, single-session BMIs and PFIs that engage individuals reporting cannabis-related consequences or a pattern of use associated with elevated risk for cannabis-related consequences (e.g., current, recent, or frequent use; having violated campus cannabis-related policies) may be effective.

Limitations

Four of the five PFIs comprising a version of the Cannabis eCHECKUP TO GO were published between 2012 and 2018 when the Cannabis eCHECKUP TO GO was known as the “Marijuana eCHECKUP TO GO” or “eTOKE.” Elliott and Carey (2012), Elliott et al. (2014), and Riggs et al. (2018) cited use of the 2009 version of the “Marijuana eCHECKUP TO GO” and Palfai et al. (2014) cited use of the 2014 version of “Marijuana eCHECKUP TO GO.” It is unclear if or how the content of the intervention may have changed over time, across different versions. It will be important for researchers and clinicians alike to consider this limitation when considering commercially available products like Cannabis eCHECKUP TO GO.

Several identified studies did not meet inclusion criteria because they tested interventions that were not geared specifically towards cannabis use. For example, one study examined the effect of the Brief Behavioral Treatment for Insomnia (BBTI) on cannabis-related

problems and craving. Other RCTs examined, for example, the secondary effect of an alcohol intervention (Yurasek et al., 2015), or an image-based multiple-behavior intervention (Werch et al., 2008) on cannabis use. Thus, not all interventions that may be effective in reducing cannabis use and related consequences are reflected in the findings of this review.

Future Directions

Interventions designed to treat other psychopathology and symptoms (e.g., insomnia) or those that are more transdiagnostic in nature (e.g., multiple behavior intervention) may be useful for those students who engage in cannabis use. Indeed, this has been the case in the alcohol literature, whereby transdiagnostic interventions, such as cognitive behavioral therapy for insomnia, have been effective in reducing alcohol-related consequences among young adults (e.g., Miller et al., 2021). Future syntheses might consider evaluating the evidence for transdiagnostic treatments (or treatments intended for other high-risk behaviors or forms of psychopathology, like other substance use, insomnia, social anxiety, or attention deficit hyperactivity disorder) in reducing cannabis use among college students. Should there be consistent evidence for the efficacy of transdiagnostic treatments in the reduction of college student cannabis use and related harm, this could be one approach through which college student cannabis use is addressed. For example, if college students who screen positive for high-risk cannabis use are not willing to participate in a cannabis-focused intervention but are willing to participate in an alcohol, sleep, or general behavior change intervention, this may be one useful pathway for reducing cannabis use and risk.

This idea aligns with recent work examining college students' receptiveness to cannabis and alcohol prevention and treatment strategies, identifying that students who use both substances were more open to alcohol-focused approaches (Helle et al., 2024). Alcohol- and/or transdiagnostic-focused approaches may serve to open the door to discussing cannabis use and related concerns. The use of transdiagnostic interventions could also reduce costs and improve implementation efforts. Training counselors in higher education settings in a few transdiagnostic interventions, rather than separate interventions for different diagnoses, can save time and resources without compromising efficacy.

We aimed to identify areas in need of future research based on study participants (e.g., racial and ethnic identity composition of the samples), context (e.g., PWIs vs. MSIs), concept (e.g., outcome, intervention type), methods, and key findings. Of note, all samples were recruited from 4-year institutions granting bachelor's degrees. Nearly all of the college and universities were PWIs. One institution achieved MSI status in 2022 (the year after data collection in 2021 and the year prior to publication; Choi et al., 2023) and seems to comprise the most racially diverse sample included in this review (i.e., 46% White, 17% Black/African American, 19% Asian, 10% "Mixed Race"). Three studies did not publish the racial or ethnic identities of their samples; however, the available information suggests most participants were White (60–88%) and non-Hispanic (83–94%). Of course, cannabis-related harm is not exclusive to non-Hispanic White individuals. Indeed, experience inequities in cannabis-related consequences (e.g., disparate enforcement and legal consequences for cannabis use; inequitable access to healthcare and substance use treatment) due to systemic racism (Acevedo et al., 2018; Yearby, 2018). Moreover, mistrust of medical systems (and

medical research) due to historical and current experiences of racism likely present a specific barrier to seeking interventions for cannabis use, particularly for Black adults (Hall, Bhadra-Heintz et al., 2022; Hall, Jordan et al., 2022). Thus, future studies should engage people from underserved communities in cannabis intervention development and evaluation, take intentional steps to recruit college students who have been underrepresented in prior research, and ensure intervention development is occurring within and across different college contexts (e.g., Historically Black College and Universities; Hispanic Serving Institutions; Tribal Colleges and Universities) to guarantee interventions are accessible to all students and equitable in their beneficial outcomes.

BMIs included in this review were effective (i.e., associated with significant between- or within-groups effects) with respect to a mix of cannabis quantity, frequency, and consequences outcomes (and one was effective for craving as well). Though encouraging, BMIs can be resource-intensive to implement, especially for institutions with limited funding. Indeed, BMIs typically took place at public research universities that may have greater access to funding. Innovative solutions, such as implementation of train-the-trainer models, training teams of paraprofessionals and other stakeholders across a campus, connecting with statewide coalitions, and use of PFIs, which tend to require fewer resources, as a first-line intervention may all help scale up evidence-based cannabis interventions for college students.

The field may benefit from future RCTs testing novel PFIs or adaptations of existing PFIs because although four of the seven effective interventions were categorized as PFIs, all three ineffective interventions in this review (Conner et al., 2024; Elliott & Carey, 2012; Elliott et al., 2014) were also PFIs. In this scoping review, studies involving the Cannabis eCHECKUP TO GO yielded mixed results (i.e., two were effective, three were ineffective), suggesting the intervention may be more beneficial under certain conditions and/or that the effects of the intervention on consequences may be more evident at later timepoints (similar to alcohol interventions; Carey et al., 2007). The effective Cannabis eCHECKUP TO GO interventions reduced consequences among students in the intervention condition (compared to students in an active control condition) at 6 weeks (when delivered digitally remotely; Riggs et al., 2018) and at 3-months and 6-months follow-up (when delivered digitally on-site, but not digitally remotely; Palfai et al., 2014). Riggs et al. (2018) also adapted Cannabis eCHECKUP TO GO to incorporate protective behavioral strategies into the feedback. Ineffective interventions comprising the Cannabis eCHECKUP TO GO had an assessment only control, were delivered in 20–60 minutes (intervention duration was not reported for effective interventions), and had 1-month follow-up assessments (compared to either 6-week, or 3- and 6-month follow-up assessment for effective interventions). Thus, delivering Cannabis eCHECKUP TO GO on-site, in campus student health centers or similar locations, and evaluating effects on consequences over longer intervals (i.e., at least 3 months) may be most helpful.

Although our focus has been specifically on college students, future teams may consider extending beyond college students to the general population to evaluate the evidence for cannabis-focused interventions, particularly as the landscape around cannabis use is rapidly changing with policy (e.g., Hasin et al., 2021). Additionally, as the literature continues to

grow, there will soon be a need for systematic reviews and meta-analyses of interventions for college students' cannabis use (Munn et al., 2018). Indeed, between the original search in 2022, which yielded nine RCTs, and the updated search in 2024, four new studies were published. This is encouraging given the need for interventions for college students' harmful cannabis use. Future research should focus on effectiveness trials given many of the studies in this review could be classified as efficacy trials.

Considerations for Implementation Specialists

Campus personnel are tasked with adoption and implementation of prevention and treatment for myriad concerns presenting among their student body, regardless of the current state of evidence-based practices specific for a population. This can be a challenge for professionals, particularly when student needs are ever-changing and when responsibility for implementation of prevention strategies is spread across campus departments. Of relevance to the current review, there are notably fewer studies and approaches for cannabis prevention and treatment compared with alcohol; however, the need is still clearly prevalent, and providers need guidance for implementation. This review demonstrates there are efficacious brief intervention approaches and serves as a potential landing point for a selection of strategies in the planning process.

When selecting alcohol prevention strategies, campus committees often consider various factors including cost, effectiveness, length of intervention, staff needs, and so on (see CollegeAIM for examples of strategy characteristics and common barriers). Additionally, within the CollegeAIM, campuses are encouraged to consider a mix of strategies—these can include, though are not limited to, policies, consistent enforcement of those policies, prevention efforts, intervention, treatment (when needed), and recovery support. The same factors should be considered when selecting cannabis-focused interventions. As campuses plan to integrate evidence-based cannabis-focused interventions, it is critical to note that the available effective strategies are all brief (e.g., single-session) and are rooted in motivational enhancement principles similar to commonly used alcohol-focused interventions, but these should not be used to the exclusion of environmental strategies (e.g., consistent enforcement of policy) that can enhance the likelihood of students getting connected to effective interventions (as when students are mandated to attend an intervention after a substance-related policy violation). Given the groundwork laid in alcohol prevention research, it is possible that the adoption and implementation of cannabis-focused prevention and treatment approaches might be less arduous than implementing entirely new strategies (Kilmer et al., 2024).

Call to Action

One goal of this scoping review was to identify where we are as a field when it comes to cannabis interventions for U.S. college students, given there is no single set of guidelines regarding adoption and implementation for institutions of higher education. Campuses are facing unique challenges with respect to substance use given the changes in use, contexts related to the COVID-19 pandemic, and changing laws and policies around cannabis. Alcohol has been a focus of college prevention experts for years, and the research and research-to-practice work has resulted in the identification and dissemination of evidence-

based environmental and individual approaches to alcohol prevention relevant to college students (i.e., CollegeAIM).

As a starting point, much as the precedent with alcohol prevention, a “Call to Action” report that organizes suggestions in tiers of effectiveness and makes the call for more research (supported by commensurate funding opportunities to support that research) would undoubtedly strengthen campus efforts and responses. This review provides a foundation for a similar resource for cannabis use interventions, although further review is necessary to complete a more comprehensive matrix similar to that of CollegeAIM. For example, decisions regarding the inclusion of evidence outside of the U.S. (e.g., Fischer et al., 2012) will be a challenge for those involved. Moreover, further work is needed to establish important dimensions (e.g., relative cost, staffing needs, duration of effects across different follow-up windows) of existing interventions. Then, with continued advancements in evidence-based cannabis efforts for reducing use among college students, we can continue dissemination of the information to institutions of higher education, including research, resources, and tools to improve implementation of evidence-based approaches on campuses.

Author Note

This research and preparation of this manuscript was supported by grants and contracts L30AA027013 (PI: Hone), K08AA030301 (PI: Boness), K08AA028543 (PI: Helle) from the National Institute on Alcohol Abuse and Alcoholism, National Institutes of Health.

The authors would like to acknowledge the following University of Florida research assistants for their part in title and abstract screening for this scoping review: Claudia Morales,Ashley Kung, Julie Hua, Suleila Mesa, Rachel Crane, Valeria Oller, and Beatrice Leger.

Appendix I: Search Terms

Set Number	PubMed Search Terms
1	((student*[Title/Abstract] OR “young adult*”[Title/Abstract] OR “emerging adult*”[Title/Abstract] OR teen*[Title/Abstract] OR adolescen*[Title/Abstract] OR youth[Title/Abstract] OR youths[Title/Abstract] OR “Students”[Mesh] OR “Young Adult”[Mesh] OR “Adolescent”[Mesh]) AND (universit*[Title/Abstract] OR college[Title/Abstract] OR colleges[Title/Abstract] OR “higher education”[Title/Abstract] OR undergrad*[Title/Abstract] OR postgrad*[Title/Abstract] OR “post grad*”[Title/Abstract] OR postsecondary[Title/Abstract] OR “post secondary”[Title/Abstract] OR “post-secondary”[Title/Abstract] OR “Universities”[Mesh]))
2	((“Smoking Prevention”[MeSH Terms] OR “Harm Reduction”[MeSH Terms] OR “Risk Reduction Behavior”[MeSH Terms:noexp] OR “prescription drug misuse/prevention and control”[MeSH Terms] OR “prescription drug misuse/rehabilitation”[MeSH Terms] OR “prescription drug misuse/therapy”[MeSH Terms] OR “drug misuse/prevention and control”[MeSH Terms] OR “drug misuse/rehabilitation”[MeSH Terms] OR “drug misuse/therapy”[MeSH Terms] OR “substance related disorders/prevention and control”[MeSH Terms] OR “substance related disorders/rehabilitation”[MeSH Terms] OR “substance related disorders/therapy”[MeSH Terms] OR “marijuana abuse/prevention and control”[MeSH Terms] OR “marijuana abuse/rehabilitation”[MeSH Terms] OR “marijuana abuse/therapy”[MeSH Terms] OR “Crisis Intervention”[MeSH Terms] OR “Treatment Outcome”[Mesh:NoExp] OR “Psychotherapy”[Mesh]) OR ((intervention*[Title/Abstract] OR treat*[Title/Abstract] OR screen*[Title/Abstract] OR train*[Title/Abstract] OR program*[Title/Abstract] OR “short conversation*”[Title/Abstract] OR “motivational enhancement”[Title/Abstract] OR “motivational incentive*”[Title/Abstract] OR “contingency management”[Title/Abstract] OR “change motivation”[Title/Abstract] OR psychotherap*[Title/Abstract] OR “motivational interview*”[Title/Abstract] OR “personalized feedback”[Title/Abstract] OR “personalised feedback”[Title/Abstract] OR echeckuptogo[Title/Abstract] OR “e checkup”[Title/Abstract] OR “behavioral intervention*”[Title/Abstract] OR “behavioural intervention*”[Title/Abstract] OR “behavioral treatment*”[Title/Abstract] OR “behavioural treatment*”[Title/Abstract] OR “psychosocial intervention*”[Title/Abstract] OR “dialectical therap*”[Title/Abstract] OR mindfulness[Title/Abstract] OR “cognitive behavioral therap*”[Title/Abstract] OR “cognitive behavioural therap*”[Title/Abstract] OR “cognitive behavior therap*”[Title/Abstract] OR “cognitive behaviour therap*”[Title/Abstract] OR “cognition therap*”[Title/Abstract]

Set Number	PubMed Search Terms
	OR “cognitive therap*”[Title/Abstract] OR “cognitive reframing*”[Title/Abstract] OR “cognitive restructuring*”[Title/Abstract] OR “commitment therap*”[Title/Abstract] OR “acceptance therap*”[Title/Abstract] OR “conditioning therap*”[Title/Abstract] OR “behavior modification*”[Title/Abstract] OR “behaviour modification*”[Title/Abstract] OR “behavioral modification*”[Title/Abstract] OR “behavioural modification*”[Title/Abstract] OR “behavior change therap*”[Title/Abstract] OR “behaviour change therap*”[Title/Abstract] OR “behavioural change therap*”[Title/Abstract] OR “behavioral change therap*”[Title/Abstract] OR “cognitive remediation”[Title/Abstract] OR “behavior therap*”[Title/Abstract] OR “behaviour therap*”[Title/Abstract] OR “behavioral therap*”[Title/Abstract] OR “behavioural therap*”[Title/Abstract] OR “12 step”[Title/Abstract] OR “twelve step”[Title/Abstract] OR “prevention program*”[Title/Abstract] OR “normative reeducation”[Title/Abstract] OR “normative re-education”[Title/Abstract] OR “education program*”OR “re-education program*”[Title/Abstract] OR “reeducation program*”[Title/Abstract] OR “primary prevention”[Title/Abstract] OR “secondary prevention”[Title/Abstract] OR “tertiary prevention”[Title/Abstract] OR “universal prevention”[Title/Abstract] OR “targeted prevention”[Title/Abstract] OR “indicated prevention”[Title/Abstract] OR “motivational intervention*”[Title/Abstract] OR “motivational program*”[Title/Abstract] OR “skills training”[Title/Abstract] OR “brief advice”[Title/Abstract] OR “brief intervention*”[Title/Abstract]) AND (dependenc*[Title/Abstract] OR addict*[Title/Abstract] OR misus*[Title/Abstract] OR abus*[Title/Abstract] OR disorder*[Title/Abstract] OR illicit[Title/Abstract] OR habit*[Title/Abstract] OR rehabilitation[Title/Abstract] OR abstain*[Title/Abstract] OR abstinence[Title/Abstract] OR quit*[Title/Abstract] OR stop*[Title/Abstract] OR cessation[Title/Abstract] OR prevent*[Title/Abstract] OR use[Title/Abstract] OR uses[Title/Abstract] OR used[Title/Abstract] OR using[Title/Abstract]))
3	(cannabi*[Title/Abstract] OR tetrahydrocannabinol*[Title/Abstract] OR “tetrahydro cannabinol*”[Title/Abstract] OR “THC”[Title/Abstract] OR marijuana*[Title/Abstract] OR cardiolrx[Title/Abstract] OR epidiolex[Title/Abstract] OR nabidiolex[Title/Abstract] OR zygel[Title/Abstract] OR satvia[Title/Abstract] OR bhang[Title/Abstract] OR bhangs[Title/Abstract] OR ganja[Title/Abstract] OR ganjas[Title/Abstract] OR cannador[Title/Abstract] OR indica[Title/Abstract] OR charas[Title/Abstract] OR ganjah[Title/Abstract] OR hashish*[Title/Abstract] OR hash[Title/Abstract] OR hemp[Title/Abstract] OR marihuana*[Title/Abstract] OR cannabinoid*[Title/Abstract] OR “smoking blunt*”[Title/Abstract] OR “blunt smok*”[Title/Abstract] OR “blunts smok*”[Title/Abstract] OR “smoked blunt*”[Title/Abstract] OR “smoking joint*”[Title/Abstract] OR “joint smok*”[Title/Abstract] OR “joints smok*“[Title/Abstract] OR “smoked joint*”[Title/Abstract] OR “CUD”[Title/Abstract] OR dronabinol[Title/Abstract] OR “Cannabis”[Mesh] OR “Marijuana Abuse/prevention and control”[Mesh] OR “Marijuana Abuse/rehabilitation”[Mesh] OR “Dronabinol”[Mesh] OR “Cannabinoids”[Mesh] OR “Marijuana Use/prevention and control”[Mesh] OR “Medical Marijuana”[Mesh])
4	(“Psychology, Experimental”[Mesh] OR “Random Allocation”[Mesh] OR “Clinical Trials as Topic”[Mesh] OR “Clinical Studies as Topic”[Mesh:NoExp] OR “Clinical Trial” [Publication Type] OR “Clinical Study” [Publication Type:NoExp] OR “Clinical Trial Protocol” [Publication Type] OR experiment[Title/Abstract] OR experiments[Title/Abstract] OR experimental[Title/Abstract] OR RCT[Title/Abstract] OR RCTs[Title/Abstract] OR random*[Title/Abstract] OR controlled[Title/Abstract] OR control[Title/Abstract] OR controls[Title/Abstract] OR “repeated measure*”[Title/Abstract] OR “independent group*”[Title/Abstract] OR “independent measure*”[Title/Abstract] OR “within group*”[Title/Abstract] OR “within subjects”[Title/Abstract] OR “between group*”[Title/Abstract] OR “between subjects”[Title/Abstract] OR “factorial design”[Title/Abstract] OR “factorial experiment”[Title/Abstract] OR “double blind*”[Title/Abstract] OR “double-blind*”[Title/Abstract] OR “double masked”[Title/Abstract] OR “double-masked”[Title/Abstract] OR “clinical trial*”[Title/Abstract] OR “clinical study”[Title/Abstract] OR “clinical studies”[Title/Abstract])
5	#1 AND #2 AND #3 AND #4
6	#5, ((English[Filter]) AND (2006:2022[pdat]))

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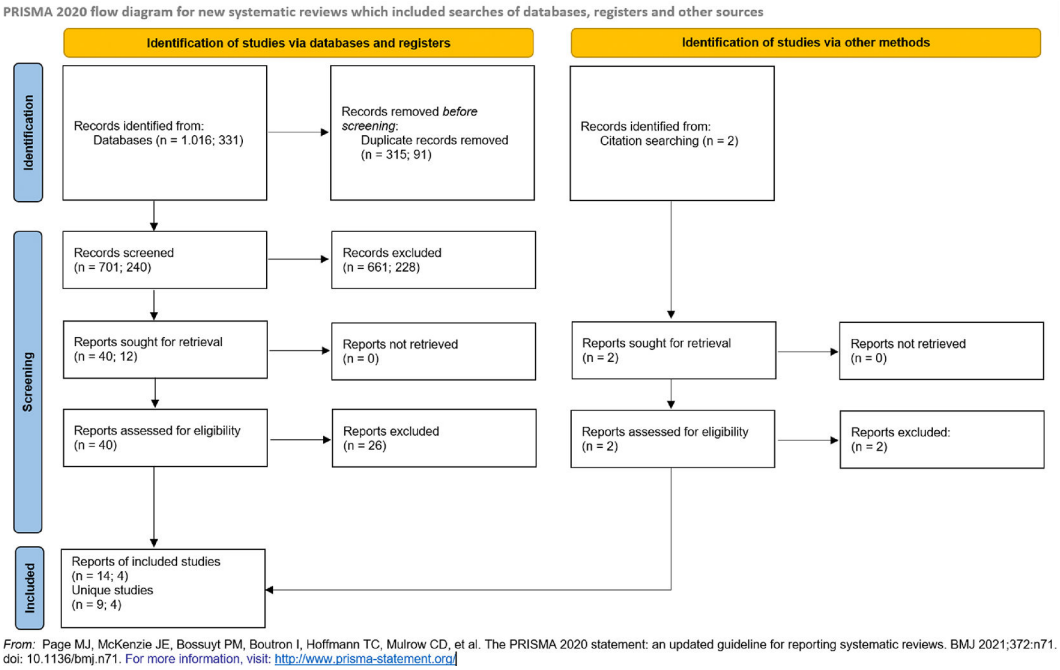

Figure 1.
From: Page et al. (2021). https://prisma-statement.org/prisma-2020-flow-diagram.

Table 1

Study Demographics

Authors	Year	N	Age			Gender		Racial and Ethnic Identities		Institution	
			Range		*M*	Men	Women	Racial	Ethnic	*n*	Type
Buckner et al.	2020	63	18	NR	19.1	10	53	NR	87.30% non-Hispanic	1	PWI: southern, public land-grant research university
Choi	2023	251	NR	NR	18.25	46	207	46% White 17% Black/African Am. 19% Asian 10% Mixed Race	7% Hispanic/Latino[b]	1	PWI/AANAPISI: mid-Atlantic, public research university
Connor	2024	254	NR	NR	21.9	184	70	NR	NR	1	PWI: southwestern, public land-grant research university
Elliott & Carey	2012	245	18	NR	20.5	66	179	NR[a]	NR	1	PWI: northeastern, private research university
Elliott et al.	2014	317	18	23	19.34	152	165	78% White	NR	1	PWI: northeastern, private research university
Hwang*	2017	167	18	23	19.03	128	39	63% Caucasian Am. 7% Asian Am. 10% African Am. 7% Multiple Ethnicities 2% Other	11% Hispanic/Latino[b]	1	PWI: northeastern, public research university
Lee et al.	2013	212	18	25	20	116	96	74.8% Caucasian 10.5% Asian/ Pacific Is. 14.7% Other	5.7% Hispanic/Latino(a)	2	PWI: northwestern public university; northwestern public state college
Lee et al.	2010	341	17	19	18.03	155	186	68.33% White 15.54% Asian 1.47% African Am. 0.88% Native Am. 0.59% Hawaiian/ Pacific Is. 7.04% Other/NR	6.16% Hispanic[b]	1	PWI: northwestern, public research university
Murphy	2024	132	NR	NR	19.94	61	71	67.4% White/European Am. 31.1% Black/African Am. 4.5% Am. Indian 1.5% Asian 1% Pacific Is.	3% Hispanic/Latino[b]	1	PWI: southern public university
Palfai et al.	2014	123	NR	NR	19.66	53	70	87% White 5.7% Asian 2.4% Black 1.6% Am. Indian/ Alaskan	17% Hispanic	1	PWI: northeastern, private research university
Riggs et al.	2018	298	NR	NR	19.97	152	146	85.59% Caucasian 2.36% Asian/Asian Am. 4.38% African Am. 0.67% Am. Indian 1.34% Hawaiian/ Pacific Is. 1.74% Multiracial 4.02% NR	88.75% non-Hispanic/ Latino 8.40% Hispanic/ Latino 2.36% NR	1	PWI: southwestern, public land-grant research university

Authors	Year	N	Age			Gender		Racial and Ethnic Identities		Institution	
			Range		*M*	Men	Women	Racial	Ethnic	*n*	Type
Teeters	2022	97	NR	NR	21.34	29	64	80.4 % Caucasian 7 % African Am. 2 % Asian 3 % Other 8 % Multiple	1 % Hispanic/ Latino[b]	1	PWI: mid-southern public university
Towe [*]	2012	82	NR	NR	19.6	43	39	87.8% Caucasian 2.4% Asian/Asian Am. 1.2% African Am. 1.2% Hawaiian/ Pacific Is. 7.4% Multiracial/ Other	6% Hispanic/Latino	1	PWI: mid-Atlantic, public land-grant research university

Note:

[a] Racial identity was not separated from gender.

[b] Ethnic identity was not separated from race.

[*] Dissertation.

Table 2

Intervention Information

Authors	Year	Intervention				Comparator	Prevention Focus	Intervention Sessions		Follow-ups	
		Name	Delivery		Type			#	Duration	#	Timing
Buckner et al.	2020	PFI-NAC	Digital	Remote	PFI	AO	Selective	1	NR	1	2 weeks
Choi et al.	2023	PFP adapted from Dick et al. (2022) combined with feedback from BASICS	Digital	Remote	PFI	AC/AO	Selective	1	NR	2	1 month; 3 months
Conner et al.	2024	Cannabis eCHECKUP TO GO	Digital	Remote	PFI	AO	Indicated	1	60 min	2	1 month
Elliott & Carey	2012	Cannabis eCHECKUP TO GO *	Digital	Remote	PFI	AO	Health promotion/ Universal	1	20 min	1	1 month
Elliott et al.	2014	Cannabis eCHECKUP TO GO *	Digital	Remote	PFI	AO	Selective	1	20–45 min	1	1 month
Hwang	2017	Adapted from BASICS	In-person	On-Site	BMI	Waitlist	Indicated	1	90 min	1	1 month
Lee et al.	2013	Feedback adapted from Lee et al. (2010)	In-person	On-Site	BMI	AO	Indicated	1	60 min	2	3 months; 6 months
Lee et al.	2010	Feedback adapted from BASICS and the Teen Marijuana Check-Up	Digital	Remote	PFI	AO	Selective	1	NR	2	3 months; 6 months
Murphy et al.	2024	Adapted from BASICS combined with a SFAS	In-person (Digital Boosters)	On-Site Remote (Boosters)	BMI	AC/AO	Indicated	2	50 min	2	1 month; 6 months
Palfai et al.	2014	Cannabis eCHECKUP TO GO *	Digital	On-Site & Remote	PFI	AC	Selective	1	NR	2	3 months; 6 months
Riggs et al.	2018	Adapted from Cannabis eCHECKUP TO GO *	Digital	Remote	PFI	AC	Indicated	1	NR	1	6 weeks
Teeters et al.	2022	PF-MIT	Digital	Remote	BMI	AC/AO	Indicated	1	57 min	1	3 months
Towe	2012	Personalized Feedback Report	Digital	Remote	PFI	AC	Indicated	1	NR	2	1 month; 3 months

Note: Intervention Name: BASICS = Brief Alcohol Screening and Intervention for College Students; NAC = Negative Affect and Cannabis; PFP = Personalized Feedback Program; SFAS = Substance Free Activity Session. Intervention Type: BMI = Brief Motivational Intervention; PFI = Personalized Feedback Intervention. Comparator (i.e., What do the participants who do not receive the intervention of interest do?): AC = Active Control; AO = Assessment Only; NR = Not reported.

* Known as “Marijuana eCHECKUP TO GO” or “e-TOKE” at time of publication. Prevention Focus: Any studies recruiting students reporting at least weekly cannabis use (or 4 or more times/month) was categorized as indicated prevention (Connor et al., 2021).

Table 3

Intervention Objectives and Outcomes

Authors	Year	Objectives	Outcomes	Measures	Analysis	Effectiveness
Buckner et al.	2020	"...the current study tested the utility of an online personalized feedback intervention (PFI) that integrates feedback regarding cannabis with strategies to manage negative affect (PFI-NAC)."	"After controlling for baseline negative affect and cannabis use frequency, social anxiety interacted with condition to predict follow-up cannabis use frequency. Specifically, among those with moderate or high levels of social anxiety, those in PFI-NAC reported less use at follow up than controls; this was not the case among those with lower social anxiety."	Frequency	Completer	Effective for Frequency
Choi et al.	2023	"We created an online Personalized Feedback Program (PFP) for college students that targets genetically influenced risk pathways for substance use and provides feedback on four risk domains (Sensation Seeking, Impulsivity, Extraversion, and Neuroticism) along with individualized recommendations and campus resources."	"There were significant reductions in cannabis use in the PFP group as compared to other groups. At the 30-day follow-up, individuals in the control group were three times more likely to endorse cannabis use than individuals in the PFP. Further, at the 3-month follow-up individuals in the control and BMI groups were also at least 3 times more likely to endorse cannabis use than the PFP group. In contrast to what we expected, individuals in the BMI+PFP group were more likely to endorse to cannabis use than the PFP only group."	Frequency	Completer	Effective for Frequency
Conner et al.	2024	"This study aims to evaluate the cross-site efficacy of the Cannabis eCHECKUP TO GO program, a web-based Personalized Normative Feedback and Protective Behavioral Strategies intervention for reducing cannabis use frequency and consequences in college students with willingness to change."	"The results showed no significant reductions in cannabis use or negative consequences of use. However, students who received personalized normative feedback experienced a significant reduction in descriptive norms related to cannabis use, to be more in line with actual use."	Frequency, Consequences	Intent-to-treat	Ineffective
Elliott & Carey	2012	"The purpose of this pilot study was to evaluate the efficacy of the Marijuana eCHECKUP TO GO (e-TOKE) for Universities & Colleges program in (a) correcting descriptive norms, (b) correcting injunctive norms, and (c) preventing initiation of marijuana use in a group of college-age abstainers."	"Participants receiving the e-TOKE program estimated lower descriptive norms than the control group ($p < .01$), and fewer believed friends disapproved of their choice to abstain ($p < .05$). However, rates of use/initiation did not differ between the two conditions ($p = .18$)."	Frequency (i.e., Initiation)	Intent-to-treat	Ineffective
Elliott et al.	2014	"The aim of the present study was to evaluate its [e-TOKE] short-term effectiveness in changing marijuana involvement and perceived norms in undergraduates."	"Individuals completing the e-TOKE program reported less extreme descriptive norms ($ps < 0.01$) but no decrease in marijuana use frequency, problems, abuse or dependence symptoms, or changes in injunctive norms ($ps > 0.10$)."	Frequency, CUD Diagnosis, Consequences	Intent-to-treat	Ineffective
Hwang	2017	"The goal of the present study was to explore the feasibility and evaluate the efficacy of an intervention adapted from an evidence-based, motivational and personalized feedback program for alcohol to include and address other substance use, particularly marijuana."	"Significant reductions in marijuana use frequency and quantity, as well as marijuana-related problems, were demonstrated at one-month follow-up for both conditions. Contrary to study hypotheses, there was no significant difference between those in the intervention condition and those on the wait list in terms of these reductions."	Quantity, Frequency, Consequences	Completer	Effective within Groups for Quantity, Frequency, and Consequences
Lee et al.	2013	"The present study evaluated the efficacy of an in-person brief motivational enhancement intervention for reducing marijuana use and related consequences among frequently using college students."	"Results indicated significant intervention effects on number of joints smoked in a typical week and a trend toward fewer marijuana-related consequences compared with the control group at 3-month follow-up."	Quantity, Frequency, Consequences	Intent-to-treat	Effective for Quantity (3 months) and Consequences (3 months)

Authors	Year	Objectives	Outcomes	Measures	Analysis	Effectiveness
Lee et al.	2010	"The current study was designed to evaluate a brief, web-based personalized feedback intervention for at-risk marijuana users transitioning to college."	"Results indicated that although there was no overall intervention effect, moderator analyses found promising effects for those with a family history of drug problems and, to a smaller extent, students who were higher in contemplation of changing marijuana use at baseline."	Frequency, Consequences	Intent-to-treat	Partially effective for Frequency (3/6 months) and Consequences (6 months)
Murphy et al.	2024	"This randomized pilot trial evaluated the efficacy of a brief motivational intervention (BMI) for cannabis supplemented by either a substance-free activity session (SFAS) or a relaxation training (RT) session for reducing cannabis use, problems, craving, and anxiety symptoms."	"Relative to assessment, both MI+SFAS and BMI+RT were associated with significant reductions in cannabis problems and craving at 1month follow-up, and significant reductions in anxiety at 6-month follow-up. Relative to AO, BMI + RT was associated with significant reductions in cannabis use at 1-month follow-up. There were no differences between BMI conditions."	Quantity, Frequency, Consequences, Craving	Intent-to-treat	Effective for Frequency, Consequences, and Craving (1 month)
Palfai et al.	2014	"This pilot study sought to test the feasibility of procedures to screen students for marijuana use in Student Health Services (SHS) and test the efficacy of a web-based intervention designed to reduce marijuana use and consequences."	"The intervention did not influence marijuana use frequency. However, there was evidence of a small overall intervention effect on marijuana-related consequences and a medium effect in stratified analyses in the on-site condition."	Frequency, CUD Diagnosis, Consequences	Completer	Effective for Consequences (when completed on-site in Student Health Services)
Riggs et al.	2018	"This study tested direct and moderated (by sex) program effects of an adapted version of the Marijuana eCHECKUPTO GO, a web-based marijuana use intervention providing university-specific personalized feedback (PF) with normative information and PBS to students attending a university in a state with legalized adult recreational marijuana."	"Marijuana eCHECKUPTO GO participants reported decreases in estimated use prevalence (i.e., descriptive norms), self-reported hours high per week, days high per week, periods high per week, and weeks high per month. Sex moderated intervention effects on the use of PBS such that females in the PF condition increased their use of PBS more than males."	Frequency, Consequences	Completer	Effective for Consequences
Teeters et al.	2022	"The current study examined the efficacy of an accessible, low-cost, mobile phone-based brief intervention aimed at reducing DACU and RWCD among college cannabis users in the context of a randomized three-group pilot trial."	"Generalized linear mixed models (GLMM) analyses indicated that after controlling for sex, cannabis users in the PF + MIT condition significantly reduced DACU and RWCD over time compared to those in the IC condition."	Quantity, Frequency, Consequences	Intent-to-treat	Effective for Consequences
Towe	2012	"The goal of this study was to evaluate the effectiveness of a brief web-based feedback intervention for marijuana users with problematic marijuana use."	"To date, the sample includes 82 participants. Both marijuana-related problems, $F(1, 32) = 7.06$, $p = .01$, and frequency of marijuana use, $F(1, 33) = 10.30$, $p = .003$, decreased between baseline and the one-month follow-up, but there were no significant interactions by condition. These reductions were not sustained at three-months. However, effect sizes across several outcome variables, including frequency of use and symptoms of dependence, were in the medium range."	Frequency, Consequences	Completer	Effective within Groups for Frequency (1 month) and Consequences (1 month)

Note: Effectiveness: Effective = Significant changes in outcome[s] in intervention group compared to control group; Effective within groups = Significant changes in outcome[s] for all participants, regardless of intervention or control group assignment; Partially effective = Significant changes in outcome[s] for certain demographics in intervention group (e.g., intervention only worked for men); Ineffective = No significant changes in outcome[s]. Measures: CUD = Cannabis Use Disorder.