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Web-based Screening and Brief Intervention for Student Marijuana Use in a University Health Center: Pilot Study to Examine the Implementation of eCHECKUP TO GO in Different Contexts

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Abstract

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. Students were asked to participate in voluntary screening of health behaviors upon arrival at SHS. One hundred and twenty-three students who used marijuana at least monthly completed assessments and were randomized to one of four intervention conditions in a 2 (Intervention: Marijuana eCHECKUP TO GO vs. Control) × 2 (Site

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All authors have contributed to the research and manuscript preparation.

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Kypros Kypri contributed to project design and manuscript preparation

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Conflict of Interest

There are no conflicts of interest to declare

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of Intervention: On-site vs. Off-site) between-groups design. Follow-up assessments were conducted online at 3 and 6 months. Latent growth modeling was used to provide effect size estimates for the influence of intervention on outcomes. One thousand and eighty undergraduate students completed screening. 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. Analyses of psychological variables showed that the intervention significantly reduced perceived norms regarding peer marijuana use. These findings demonstrate that it is feasible to identify marijuana users in SHS and deliver an automated web-based intervention to these students in different contexts. Effect size estimates suggest that the intervention has some promise as a means of correcting misperceptions of marijuana use norms and reducing marijuana-related consequences. Future work should test the efficacy of this intervention in a full scale randomized controlled trial.

Keywords

cannabis; computer; prevention; college student; student health

Marijuana use is a significant risk to health and well-being for university students. Students who use marijuana are more likely to experience a variety of consequences that compromise their academic performance, physical health, and relationships (Caldeira, Arria, O'Grady, Vincent, & Wish, 2008). Despite the availability of efficacious treatments for cannabis use disorders (Budney, Moore, Rocha, & Higgins, 2006; Stephens, Roffman, & Curtin, 2000), few students identify their marijuana use as problematic let alone seek treatment (Stephens, Roffman, Fearer, Williams, & Burke, 2007). Drawing from the success of efforts to address hazardous drinking outside of substance use disorder specialty treatment settings such as primary care (e.g., Fleming et al., 2010), screening and brief intervention (SBI) has been proposed to address other substance use in health care settings (Amaro et al., 2010; Babor et al., 2007; Denering & Spear, 2012). Although there have been some promising findings reported in the literature (e.g., Bernstein et al., 2009; Humeniuk et al., 2008; Walton et al., 2013), the efficacy of SBI for reducing marijuana use in health care settings is largely understudied (Saitz et al., 2010). Indeed, with some exceptions (Lee et al., 2010; Lee et al., 2013), there has been limited research that has examined the effects of screening and brief intervention on marijuana use and consequences among college students specifically.

Efforts to deliver interventions in SHS face a number of potential barriers, including insufficient staff resources, and concerns that students may be reluctant to discuss behaviors that are illegal and may have implications for their status at the university. Fortunately, developments in health technology have expanded the range of methods available for implementing SBI in a manner that preserves anonymity and reduces demand on staff resources (Kypri & Lee, 2009). There have been increased efforts to develop web-based marijuana intervention approaches that may be easily utilized in a confidential manner, although relatively few of these have been empirically evaluated (see Tait, Spijkerman, & Riper, 2013). Drawing from the success of electronic screening and brief intervention (eSBI) for alcohol use among college students (Carey, Scott-Sheldon, Elliot, Garey, & Carey, 2012), investigators have begun to examine the utility of brief web-based marijuana

interventions for adolescents and young adults (e.g., Cunningham & van Mierlo, 2009; Lee et al., 2010; Walton et al., 2013). Similar to alcohol eSBIs, these marijuana interventions have been based, in part, on the view that marijuana-related behavior change among this age group may be facilitated by providing corrective normative feedback about peer marijuana use and personalized feedback about use to enhance motivation to change (Walters, Lee, & Walker, 2012; White et al., 2006). Despite the parallels regarding psychological mechanisms underlying alcohol and marijuana use patterns (e.g., Walker, Neighbors, Rodrigues, Stephens, & Roffman, 2011), there has been little evidence from randomized controlled trials that web-based feedback interventions may reduce marijuana use and related consequences among college students identified by screening (Lee et al., 2010). Lee et al (2010) examined the efficacy of a web-based feedback approach for incoming first year students who reported any marijuana use in the prior 3 months. Although this study identified some potentially important moderators of a feedback-based intervention for marijuana users (i.e., family history, readiness to change), there was no main effect of the intervention on use or consequences. It is currently not known if such an intervention approach may be effective for students who smoke marijuana across the range of college years, nor whether such an approach may be integrated with screening in opportunistic contexts such as SHS.

Given that a large proportion of students are seen in SHS in a given year, this setting provides an opportunistic context to screen and deliver brief interventions for marijuana use to a large segment of the student population in a context in which students expect to be asked questions about health-related behaviors. In addition to cost savings in terms of personnel, one of the main advantages of web-based interventions is that they may be completed at any time and in any location. This increased access may allow students identified by screening to receive an intervention at a time of their choosing instead of refusing participation due to travel or scheduling requirements. This suggests a distinct advantage of off-site options to increase dissemination. One of the disadvantages of off-site options, however, is the inability to control environmental factors. Although these may be minimized with explicit instructions about how and when to complete interventions, it is generally not known what environmental factors may influence responses, or what other competing demands may divide participant attention. On-site completion of SBI allows for greater control of these factors and may provide a means to better monitor involvement and enhance participant engagement. In addition, there may be specific advantages of asking patients to complete assessments and receive interventions in the medical setting. Student Health Services is a setting in which students are focused on their health and health consequences of their behavior which may represent a “teachable moment” for addressing alcohol and other substance use (e.g., Mitka, 1998).

The primary goals of this pilot study were to: (1) assess the feasibility and acceptability of an electronic screening and brief intervention approach for marijuana users presenting to SHS, (2) estimate the effect sizes of the intervention for reducing marijuana use and consequences, and (3) examine whether feasibility and impact of the intervention vary by site. Undergraduate students who presented to a SHS clinic were invited to complete a “60 second health behaviors survey” on a wireless tablet and randomly selected for a subsequent invitation to participate in a study of health behaviors. Those who were regular marijuana

users (i.e., use at least monthly) were asked to complete assessments and receive health-related feedback either on-site or off-site. Students were randomized to receive either the Marijuana eCHECKUP TO GO intervention or a control intervention that consisted of feedback on general health-related behaviors. Screening, enrollment, completion, and follow-up rates were examined to provide pilot data on indices of feasibility, while satisfaction ratings were taken to assess acceptability of the intervention approach. Effect size point estimates were examined to provide pilot data for the question of whether those in the intervention group experienced less frequent marijuana use and fewer marijuana-related consequences over the 6-month follow-up period compared to those in the control condition.

Methods

Participants

Participants were undergraduates who presented to SHS and reported using marijuana at least monthly over the past 90 days. The study was approved by the Boston University Institutional Review Board and written informed consent was obtained for study participation.

Independent Variables

There were two independent variables in this study, site (on-site vs. off-site) and intervention condition (Marijuana eCHECKUP TO GO vs. control). The site variable referred to the location in which participants completed baseline assessment and intervention procedures if they were deemed eligible through screening. Participants in the on-site condition completed procedures in room at the health center while or those in the off-site condition completed in a place of their choosing. Marijuana eCHECKUP TO GO is a commercially available intervention that is used widely in universities and colleges in the US and Canada (San Diego State Research Foundation, 2014). Following an assessment section, students were provided with detailed personalized feedback about their marijuana use including costs, norms, risks, consequences, and alternative activities. Those in the control condition were given minimal general health feedback regarding recommended guidelines for sleep, exercise, and nutrition.

Measures

Screening measure—A 9-item screening instrument was used to help determine eligibility for study participation, along with stratification information, which included gender, year of university, and frequency of marijuana use in the past 90-days. The marijuana frequency question was from the NIDA-modified version of the Alcohol, Smoking, and Substance Involvement Test (ASSIST) (NIDA, 2009; Humeniuk et al., 2008). Students also completed health questions about typical hours of sleep, frequency of exercise, eating habits and smoking in the past 30-days that have been used in national health risk surveys (Harris, Golbeck, Cately, Conway, & Williams, 2009). In addition, students indicated whether they consumed alcohol using the frequency of use question on the Alcohol Use Disorders Identification Test (AUDIT) (Babor, De La Fuente, Saunders, & Grant, 1992).

NIDA-modified ASSIST-Marijuana—In addition to the question on frequency described above, participants who were enrolled in the study completed the marijuana items from the NIDA-modified ASSIST (NIDA, 2009) to assess eligibility. The ASSIST has been validated in primary care populations. The ASSIST marijuana items are questions about use, problems, and dependence symptoms in the previous 3 months. Summary scores provide an indication of level of substance use risk (i.e., low, medium high). Coefficient alpha for the ASSIST was .62 in the current sample. Because the efficacy of this approach was not known, those whose marijuana-specific ASSIST scores indicated a high likelihood of substance dependence (i.e., marijuana ASSIST ≥ 27) were not enrolled in the trial. Similar criteria were used to exclude students from the trial at the 3-month outcome.

Frequency of Marijuana Use-90 days—Number of marijuana use days in the past 90 days was asked with the following question, “During the past 90 days, on how many days did you use any kind of marijuana, blunts, or hashish?” This question has been adapted for use among adolescents and young adults (Lee et al., 2013). The item was accompanied by a 3 month calendar starting from the present date to provide anchors.

Marijuana-related Consequences—The Marijuana Problems Scale (Stephens, Roffman, & Simpson, 1994; Stephens et al., 2000) was used to assess marijuana related negative consequences. This 19-item measure assesses the extent to which individuals have experienced no (0), minor (1), or major (2) problems related to their marijuana use in a variety of domains (e.g., interpersonal, physical, cognitive, legal, financial) over the past 90 days. Following Stephens et al. (2007), we computed number of items endorsed as the final problem score which ranged from 0-19. Coefficient alpha was .81 for this measure

Readiness to Change Questionnaire (RTCQ)—This 12-item measure modified for marijuana use (Stephens et al., 2007) was employed to assess the level of motivation to change marijuana use. The RTCQ has good internal consistency and test-retest reliability and has been used both as a measure of stage of change as well as a continuous measure of motivation (Budd & Rollnick, 1996; Stephens et al., 2007). In the current sample, one item in the pre-contemplation scale (“[it is a] waste of time thinking about [my marijuana] use”) was removed because it did not load with the other scale items. Coefficient alphas for the subscales at baseline were as follows; Pre-contemplation = .66, Contemplation = .87, Action = .82. The continuous measure of motivation to change used in this study was computed by subtracting the mean Precontemplation score from the sum of the Contemplation and Action scores (Budd & Rollnick, 1996).

Perceived Marijuana Norms—This measure is modified from those used to assess perceptions of alcohol use among college students (Baer, Stacy, & Larimer, 1991; Lewis & Clemens, 2008). Gender and university specific questions to assess descriptive norms of marijuana use were presented to students, “What percent of [male/female] students at the University have smoked marijuana in the past month?” and “What percent of [male/female] students at the University have not smoked marijuana in the past 3 months?” This item was reverse scored (i.e., to recode the item as percent who have smoked) and the mean rating

(0-100) was used as the composite measure of norms in analyses. Coefficient alpha for the composite measure was .85.

Student Satisfaction Ratings—To assess satisfaction with the intervention, students completed a series of items at the end of the 6 month follow-up assessment. Satisfaction with the intervention was assessed by using the Client Satisfaction Questionnaire-8 (Larsen, Attikisson, Hargreaves, & Nguyen, 1979) and modifying the scale content to be relevant to the study. Items were modified to reflect the fact that students were not seeking treatment nor were they anticipating a specific intervention. Students rated their experiences with the intervention on 5-Likert type items (ease of use, interest, satisfaction, utility, applicability) from “not at all” (1) to “moderately” (3) to “very” (5). Coefficient alpha for this measure was .81

Procedures

Screening took place during academic semesters in 2012 on one to two afternoons per week. Research assistants were present at the clinic during high volume hours (e.g., late morning and the afternoon). Students who visited SHS were asked by the research assistant if they would be willing to complete a one minute screening questionnaire on undergraduate student health behaviors using an iPad. Screening was voluntary and was offered to the student upon entering the waiting room or shortly after being seated. Those who identified themselves as undergraduates and agreed to participate were presented with the 9-item screening measure (described above). Those who reported at least “monthly” marijuana use in the past 90 days were identified as potentially eligible for the study. The flow of participants through the trial is presented in Figure 1. To ensure that participation in the study did not indicate marijuana use to other students in the waiting room and to collect data from a comparison group of students who did not smoke marijuana monthly, we also enrolled randomly selected students who did not endorse at least monthly marijuana smoking for a separate study (not discussed further here). Upon completion of the screening instrument, students were notified of their study eligibility on the iPad and were instructed to alert the research assistant who would further explain the nature and purpose of the study. Following consent and registration procedures (e.g., choosing a username and password), students were randomized to complete assessments either on-site (i.e., in SHS) or off-site. Students were randomized in a two-step process and were considered eligible for the intervention trial only after completing baseline assessment. Those with an ASSIST score of 27 were not eligible for the intervention trial. Instead, they were provided with information about their score and encouraged to seek help using clinical resources available at the university. Those who were eligible following baseline were randomized to intervention condition (Marijuana eCHECKUP TO GO vs. control). This randomization procedure was used to study the impact of employing study procedures in different settings while increasing the ability to maintain similar subject characteristics between intervention groups at baseline. Students were contacted with subsequent reminder e-mails as necessary, and were compensated \$25 for their participation in baseline assessment procedures. Participants were asked to complete follow-up assessments at 3 and 6 months following baseline. E-mails that included a link to the intervention site were sent to students to

announce and remind students of the follow-up. Students were compensated \$25 for the 3-month assessments and \$50 for the 6-month assessments.

Data Analysis

Data were analyzed using Mplus (7.0), a latent variable software program (Muthén & Muthén, 2012). Because the data were not normally distributed, we used the robust maximum likelihood estimator (MLR). In addition, the MLR was used to accommodate missing data in all models. The main objective of this pilot trial was to assess feasibility and acceptability of this intervention, and provide effect size estimates for the influence of Marijuana eCHECKUP TO GO on the frequency of marijuana use and consequences over time. The statistical significance of parameter estimates was also evaluated for each analysis. Conditional latent growth models (LGMs), in which the Slope was regressed on the intervention covariate and intercept, were used in all analyses. Intervention condition was coded as an indicator variable [0,1] with 1 representing the active intervention condition. Latent growth models (Muthén & Curran, 1997) were specified to examine the influence of intervention on frequency of marijuana use and marijuana-related negative consequences. Stratified analyses by site (on-site versus off-site) were conducted to provide information about whether effect sizes varied by context. Prior to fitting conditional models with the intervention condition covariate, unconditional latent growth models were fit in each set of analyses to establish an acceptable (e.g., good-fitting) temporal model, as well as to serve as a baseline for computing the effect sizes. Slope factor loadings were specified respectively as follows for baseline (T1), 3 months (T2), and 6 months (T3): 0, * (i.e., freely estimated), and 1 (as temporal change was not expected to be linear). The specification centers the intercept on the baseline time-point and the mean of the Slope factor provides estimates of the amount of change over the 6-month period.

Results

Screening, Enrollment, and Participation

As shown in Figure 1, we were able to enlist 1080 undergraduate students to complete screening. Of those who completed screening, 33.4% reported marijuana use at least once in the past 90 days and 19.5% of the screened sample indicated that they had smoked marijuana at least monthly. Based on completed baseline screening and assessment eligibility for the trial was determined and participants were randomized to intervention conditions. Of the 138 students who were randomized to site, 5 off-site participants did not begin the assessment, which was significantly different by site condition $X^2(1, N = 138) = 5.04, p < .05$, and 10 participants were excluded due to ASSIST scores ≥ 27 . Six students were withdrawn from the trial following the 3 month outcome point due to ASSIST scores ≥ 27 (2 from the Marijuana eCHECKUP TO GO condition and 4 from the control condition) which was not significantly different by intervention group, $X^2(1, N = 110) = .78, p > .10$. All analyses were conducted with participants who completed randomization to intervention condition ($n = 123$). There were no significant differences between intervention groups in terms of follow-up completion.

Baseline Descriptive Statistics

Mean number of days using marijuana in the past 90 days was 34.87 (SD = 28.80). Students reported a mean number of 4.15 (SD = 3.83) consequences and reported a mean ASSIST score of 11.99 (SD = 6.61). Eighty-seven percent of the sample participants identified their race as White (2.4% Black, 1.6% American Indian/Alaskan, 5.7% Asian) and 17% of the sample identified as Hispanic. Descriptive statistics for gender, age, marijuana variables, norms, and readiness-to-change are presented in Table 1 by site and intervention conditions. There were no significant differences between intervention groups on baseline categorical variables as assessed by chi-squared analyses and t-tests for continuous variables.

Intervention Effect Size Analyses

Number of days using marijuana in past 90-days—Analysis of frequency of marijuana use provided little evidence of change over the study period (baseline, 3-month, 6-month). As shown in Table 2, the frequency of marijuana use changed little over time for either intervention group. Indeed, unconditional latent growth models indicated both non-significant change for the group as a whole and provided little evidence for individual differences in change over the 6-month period.

Similar results were obtained in stratified analyses that were conducted by each site variable. Latent growth models conducted on those who received the baseline assessment and intervention within the health center (on-site) failed to converge, indicating lack of variability in marijuana use patterns over time while the off-site model showed only a small effect of intervention $f^2 = .015$, [B = 1.25 (.66), $p = .06$], using Cohen's (1988) general guidelines for f^2 (i.e., .02, .15, and .35 as estimates of small, medium and large effects, respectively).

Marijuana-related negative consequences—Analyses of the influence of intervention on marijuana-related consequences provided somewhat stronger support for the SBI approach. Mean number of marijuana-related consequences were as follows: Control Baseline = 4.51 (SD = 3.72), 3 month = 3.43 (SD = 3.74), 6 month = 2.97 (SD = 1.72); Intervention Baseline = 3.74 (SD = 3.89), 3 month = 2.19 (SD = 3.00), 6 month = 2.12 (SD = 2.51). Conditional latent growth models were conducted to examine the effect of the intervention on change in marijuana-related consequences over time (baseline, 3 months, 6 months). The effect size estimate for the influence of the intervention on marijuana-related consequences suggested a small intervention effect (based on the Slope factor using statistical conventions described above), however, this was not statistically significant $f^2 = .04$, [B = .66 (.53) $p > .05$]. Again, stratified analyses were conducted on the site variable (on-site versus off-site). Marijuana-related consequences by condition are presented separately for the on-site and off-site groups (see Figures 2a and 2b). Latent growth models conducted on those who received the baseline assessment and intervention within the health center (on-site) suggested a medium effect of the Marijuana eCHECKUP TO GO intervention on marijuana consequences. The intervention effect size estimate for the on-site subsample was $f^2 = .12$, [B = 1.25 (.66), $p = .06$], while those in the off-site subsample showed little influence of intervention on consequences, $f^2 = .004$, [B = .23 (.71), $p > .05$].

Psychological process variables

Based on hypothesized mediators of the Marijuana eCHECKUP TO GO intervention, we explored the influence of the intervention on two cognitive-motivational processes: marijuana norms and readiness-to-change. Given the small sample size for the pilot trial and the above findings we did not test for mediation. However, to begin to elucidate potential mediators of the intervention, we estimated the effect sizes of the intervention on these processes over time. These variables were assessed at baseline, 3 and 6 months. As with previous analyses, LGMs were used to provide effect size estimates. For analyses of composite norms, the effect of intervention on the Slope factor was statistically significant, $f^2 = .11$, $[B = 7.45 (3.34), p < .05]$. Individuals who completed the intervention reported significantly lower estimates of peer marijuana use over time with reduced estimates reported at the 3 month outcome largely maintained at 6 months. Mean composite ratings on the on the 0-100 scale were as follows: Control Baseline = 62.44 (SD = 21.25), 3 month = 60.25 (SD = 19.99), 6 month = 57.45 (SD = 20.37); Intervention Baseline = 57.93 (SD = 18.54), 3 month = 47.83 (SD = 22.06), 6 month = 47.24 (SD = 22.42). The intervention had little effect on change in overall readiness-to-change scores $f^2 = .01$, $[B = .15 (.442), p = ns]$. In short, these results suggest that Marijuana eCHECKUP TO GO significantly reduced student estimates of peer marijuana use but had no influence on overall ratings of readiness-to-change.

Student Satisfaction

Overall, the 5 items of the student satisfaction scale yielded an alpha of .77. The mean rating for the Marijuana eCHECKUP TO GO intervention was 3.53 (SD = .47) with over 75% of responses for each scale rated as “moderately” or greater indicating that the intervention was generally acceptable for students.

Discussion

The current study was designed to examine the feasibility of conducting an SBI trial for marijuana use among students who present to SHS, explore the impact of conducting assessments and the intervention at different sites, and provide preliminary effect size estimates to guide the design of a large-scale efficacy trial. Results demonstrated that the implementation of this type of intervention study for undergraduates presenting to SHS is feasible and well-accepted by students. The use of an anonymous brief preliminary screening instrument which embedded marijuana use among other health related questions was easily implemented in this setting. Over 1,000 students agreed to complete the screener during the pilot phase and students did not appear hesitant to report their marijuana use in this setting. Indeed, over 30% of the screened sample reported some marijuana use in the past 3 months, with almost 20% of students screened reporting “at least monthly” use in accord with study criteria. Although such rates of use appear to be higher than national averages (Johnston, O’Malley, Bachman, & Schulenberg, 2013), they are consistent with previous studies of this university population (Wright & Palfai, 2012). Of those who screened positive and were invited to participate in the trial, a large proportion accepted (50%) and a larger proportion of those completed study procedures (90%). Finally, satisfaction with the experience was generally high among students, providing further

support for the potential value of this SBI approach. These findings illustrate the high frequency of use and demonstrate the ability to engage these students in a trial.

Preliminary effect size estimates from this pilot study did not provide evidence of intervention effects on frequency of marijuana use. However, effects of the intervention on marijuana-related negative consequences were more promising. Consistent with previous work on brief alcohol and substance-related interventions on consequences (Monti et al., 1999; Stein et al., 2011), the web intervention appeared to show stronger evidence for change in marijuana-related consequences over time. Reductions in consequences in the absence of change in number of days used may be a function of changes in contexts of use, frequency of use within the days that students smoked, or more effective use of coping strategies while under the influence. These issues should be explored in subsequent work. The intervention showed medium ($f^2 = .12$) effects compared to controls in the on-site condition in particular. This finding, taken with the fact that students were more likely to complete baseline measures if assigned to on-site administration, provides preliminary evidence to suggest that on-site web-based interventions for marijuana may be preferable. Despite the clear benefits of providing more convenient options for completing the intervention, asking participants to complete the intervention on-site may have benefits with respect to completion and efficacy. These results can be used to inform the design of a full-scale efficacy trial.

To provide some preliminary information about the influence of the intervention on putative mechanisms of change, we tested the effects of intervention group on perceived norms and readiness-to-change. These analyses suggested that the intervention was indeed associated with a significant reduction in perceived norms about marijuana use as hypothesized, though it did not result in increased readiness-to-change. Consistent with previous work using the Marijuana eCHECKUP TO GO program with non-smoking undergraduates (Elliot & Carey, 2012), the web-based feedback was able to promote change in descriptive norms for marijuana use among peers. Given that the intervention appeared to have little effect on frequency of marijuana use, these results suggest that successfully changing perceptions of marijuana use norms, by itself, may not be sufficient to promote change in behavior for students in this setting. Future work may benefit from exploring other mediators and examining how perceived norms may act in concert with other factors to enhance change.

The study did have limitations. The screening process was not integrated into the standard health center procedures. Consequently, only those who volunteered to complete screening were included in this study, which may reduce the generalizability of these findings as a method of universal screening and brief intervention. Other potential limitations to generalizability stem from the fact that the study was conducted in a single health center in a private university and that the large majority of study participants were White. The timing of post-intervention assessments may not have been adequate to capture changes in key mediators such as readiness-to-change. The intervention may have influenced key psychological variables either immediately after or shortly after the intervention that were not captured by assessment at the 3-month time period. Consideration of additional time points to assess mediators, such as shortly after the intervention (e.g., McNally, Palfai, & Kahler, 2005), should be considered in future work. Finally, given that the internal reliability

for the ASSIST screening measure and the Pre-contemplation subscale of the RTCQ were not high, consideration of alternative assessment measures may be considered for this population to screen for cannabis use disorders (e.g., the Cannabis Use Disorders Identification Test-Revised; Adamson et al., 2010) and measure motivation to change (e.g., the Stages of Readiness and Treatment Eagerness Scale; Miller & Tonigan, 2006) respectively.

One of the strengths of this study was that participants were enrolled in the study to examine student health behaviors including marijuana use, rather than as a treatment for marijuana use. Thus, the sample is likely to be more representative of the larger population of students who smoke marijuana, many of whom will never seek treatment. Other strengths were the minimal study contact with research staff and absence of interventionist contact. Follow-up procedures were also conducted online. These features enhance the external validity of this approach and make it more readily integrated into practice. Such an emphasis on minimizing contact with research staff may have reduced completion rates or potentially reduced effect sizes (Newman, Szkodny, Llera, & Przeworski, 2011). The potential utility of including some brief interventionist contact following completion of the web intervention may be important to explore in future work and is more consistent with the original use of Marijuana eCHECKUP TO GO which included discussion of results following the web-intervention. One must be cautious in interpreting effect sizes from subgroup analyses due to the imprecision of parameter estimates with small samples. In sum, the current study provides evidence for the feasibility of delivering SBI in student health settings and the potential value of Marijuana eCHECKUP TO GO for reducing marijuana-related negative consequences when delivered on-site. These findings suggest that there would be value in conducting a full-scale trial of the intervention using on-site contexts and exploring the utility of adjuncts to the single session web-based format to reduce marijuana use and consequences among students

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Highlights

Tested a web-based SBI for college marijuana users presenting to a student health center

Results showed that it was feasible to screen and deliver the intervention in this context

The intervention resulted in significant changes in marijuana norms

Effect sizes suggest that the intervention delivered on-site may reduce consequences

Figure 1.
Participant Flow Through the Trial

Figure 2.

a. Influence of Marijuana Intervention on Number of Marijuana-Related Consequences Among On-site Participants

b. Influence of Marijuana Intervention on Number of Marijuana-Related Consequences Among Off-site Participants

Table 1

Descriptive Baseline Characteristics by Site and Intervention Condition (n = 123)

<u>Variable</u>	<u>On-site</u>		<u>Off-site</u>	
	<u>Control</u>	<u>echeckuptogo</u>	<u>Control</u>	<u>echeckuptogo</u>
Gender (% male)	42%	44%	46%	38%
Age	20.33 (1.27)	19.33 (1.14)	19.62 (1.20)	19.35 (1.20)
MJ-FRQ ^a	40.39 (27.65)	30.78 (29.83)	38.54 (30.52)	29.91 (28.03)
MJ-CNSQ ^b	4.81 (3.54)	4.37 (4.60)	4.12 (4.07)	3.23 (3.26)
ASSIST-MJ ^c	13.56 (6.66)	10.93 (7.08)	11.73 (5.46)	10.94 (6.49)
RTC-Total ^d	1.99 (2.33)	0.73 (2.38)	1.30 (2.60)	1.15 (2.02)
Norms-Comp ^e	65.97 (20.35)	58.98 (17.96)	57.55 (22.32)	57.08 (19.47)

^aNumber of days using marijuana in the past 90 days^bNumber of marijuana-related negative consequences in the past 90 days^cNIDA-modified Alcohol, Smoking, and Substance Involvement Test (ASSIST)- Marijuana section^dReadiness-to-Change-Questionnaire Total Score^eMarijuana Norms-Composite of % of gender-specific peers using marijuana

Table 2

Mean (SD) Number of Days Smoking Marijuana in the Past 90-Days by Condition

	Baseline	3-Month	6-Month
Control	39.61 (28.43)	38.25 (32.04)	37.09 (32.37)
Onsite	40.39 (27.26)	39.35 (32.42)	37.54 (33.84)
Offsite	38.54 (29.90)	36.97 (31.59)	37.54 (31.09)
Intervention	30.29 (28.35)	30.25 (30.25)	29.29 (29.71)
Onsite	30.78 (29.27)	37.51 (32.51)	32.34 (33.72)
Offsite	29.91 (27.62)	25.09 (26.88)	26.67 (25.44)