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Computer and Therapist Based Brief Interventions among Cannabis-using Adolescents presenting to Primary Care: One Year Outcomes*

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Abstract

Aims—This paper describes outcomes from a randomized controlled trial examining the efficacy of brief interventions delivered by a computer (CBI) or therapist (TBI) among adolescents in urban primary care clinics.

Methods—Patients (ages 12–18) self-administered a computer survey. Adolescents reporting past year cannabis use completed a baseline survey and were randomized to control, CBI or TBI, with primary (cannabis use, cannabis related consequences-CC) and secondary outcomes [alcohol use, other drug use (illicit and non-medical prescription drugs), and driving under the influence of cannabis (DUI)] assessed at 3, 6, and 12 months.

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The final manuscript has been reviewed and approved by all authors. All co-authors contributed to conducting this research. Dr. Blow was the principal investigator on the grant that funded this work, together with Dr. Walton initiated the development of this paper. Dr. Walton wrote an initial draft of the manuscript with assistance in writing from Drs. Barry, Bohnert, and Resko. Dr. Walton, Barry, Zimmerman, Chermack, Booth, and Zucker were co-investigators on the grant that funded this work; they developed the interventions tested in the study and provided critical feedback on the manuscript development. Drs. Booth and Bohnert developed the analyses plan and assisted with analyses and refinement of the results section and tables. All authors reviewed/edited the manuscript multiple times, approving this final version of the manuscript.

Conflict of Interest

The authors do not have any conflicts of interest to declare.

Results—1416 adolescents were surveyed; 328 reported past year cannabis use and were randomized. Comparisons of the CBI relative to control showed that at 3 months the group by time interaction (GxT) was significant for other drug use and CC, but not for cannabis use, alcohol use, or DUI; at 6 months, the GxT interaction was significant for other drug use but not for cannabis use, alcohol use, or CC. For analyses comparing the TBI to control, at 3 months the GxT interaction was significant for DUI, but not significant for cannabis use, alcohol use, or CC; at 6 months, the GxT interaction was not significant for any variable. No significant intervention effects were observed at 12 months.

Conclusion—Among adolescent cannabis users presenting to primary care, a CBI decreased cannabis related problems and other drug use and a TBI decreased cannabis DUI in the short-term. Additional boosters may be necessary to enhance these reductions over time.

Keywords

Cannabis; Adolescent; Primary Care; Computer; Brief Intervention

1. INTRODUCTION

In the U.S., cannabis is the most common drug used during adolescence, with 12.5% of eighth, 28.8% of tenth, and 36.4% of twelfth graders reporting past year use (Johnston et al., 2012). Earlier age of cannabis use increases the severity of psychosocial and substance use problems (Brook et al., 2002; Lynskey et al., 2003). Studies have demonstrated the typical progression of substance use throughout adolescence involves the use of ‘licit’ substances (alcohol and/or tobacco), followed by cannabis use, and then other drug use (Chun et al., 2010; McCabe et al., 2007; Ellickson et al., 2003; Lynskey et al., 2006; Nash et al., 2005; Mayet et al., 2012; Tarter et al., 2006; Wagner and Anthony, 2002). For minority youth, this progression may begin with cannabis use (Epstein et al., 2001; Fergusson et al., 2008; Hall and Lynskey, 2005). Also concerning is non-medical use of prescription drugs such as opioids or sedatives (United Nations Office on Drugs and Crime, 2011).

A medical care visit provides an opportunity for substance use screening, brief interventions (BI) based on motivational interviewing (Miller and Rollnick, 2012; Monti et al., 2001), and referral to treatment (SBIRT; Substance Abuse and Mental Health Services Administration, 2008) among youth. In the U.S. in 2012, there were 73.9 million visits to primary care offices among youth (ages 15–24; United States National Center for Health Statistics, 2008). Prior studies examining the efficacy of a therapist BI for alcohol or other drug use among adolescents in primary care have been inconclusive due to lack of control groups, small samples, or short-term follow-ups (Haller et al., 2009; Knight et al., 2005; Stern et al., 2007; Mason et al., 2011). For example, a primary care based BI (Project Chat; n=42) showed reductions in cannabis use, but not alcohol use, at 3-months (D’Amico et al., 2008).

In other settings, BI’s for cannabis have shown promise. Among college students a BI reduced alcohol, cannabis and other drug use at 3 months, with greatest effects among heaviest users (McCambridge and Strang, 2004); however, findings were not maintained at 12 months (McCambridge and Strang, 2005). Among emergency department (ED) samples of adolescents, a peer-delivered BI with booster session was effective at preventing cannabis use and “days high” at 12 months (Bernstein et al., 2009). Another ED study found a referral for alcohol or drug use linked adolescents with treatment and decreased substance related ED visits at 12 months (Tait et al., 2004, 2005).

Computer-delivered BIs have the advantage of greater reach and increased costeffectiveness while minimizing potential barriers (e.g., staff time, training) (Ondersma et al., 2011). Among college students, computerized BI’s are effective in reducing alcohol consumption

in the short term (Khadjesari et al., 2011; Kypri et al., 2004, 2008); however, a meta-analysis concluded that therapist interventions were more effective than computer interventions (Carey et al., 2012). Among adolescents in the ED, findings for computerized alcohol BIs have been mixed (Maio et al., 2005; Walton et al., 2010). The efficacy of computerized BI's for cannabis use among youth is unknown.

This report describes outcomes from a randomized controlled trial (RCT) of a BI (delivered by therapist or computer), compared to a control condition, among adolescent cannabis users presenting to urban federally-qualified community health clinics. The Health Resources and Services Administration Bureau of Primary Health Care established these clinics to increase access to quality primary and preventive health care services in medically underserved U.S. communities. Hypotheses were that the BI's would be more effective than the control on reducing primary and secondary outcomes at 3, 6, and 12 months. The primary outcome of interest was cannabis use and cannabis-related consequences (CC); secondary outcomes included alcohol, other drug use (illicit and non-medical prescription drugs), and driving under the influence of cannabis (cannabis DUI). Exploratory analyses compared the BI conditions.

2. METHOD

2.1 Design

A consecutive sample of adolescents ages 12 to 18 presenting to seven federally-qualified community health clinics in urban areas in the Midwest (April 2007 - December 2009) self-administered a computerized screening survey (Phase 1) as part of a RCT (Project Chill). Participants not reporting cannabis use were enrolled in a prevention study (not reported here). Participants reporting past-year cannabis use self-administered a baseline survey (Phase 2), were randomly assigned to condition (TBI, CBI, or control), with 3, 6, and 12 month follow-ups. The study was conducted in compliance with the University of Michigan's Institutional Review Board (IRB) for Human Subjects guidelines. A Certificate of Confidentiality was obtained from NIH.

2.2 Participants

Research staff obtained appointment logs and staffed clinics on days containing higher volumes of adolescents, approaching patients in waiting or treatment rooms (Phase 1). Written informed assent/consent for Phase 1 was obtained from adolescents ages 12 to 17 and their parents; consent was obtained from youth who were 18 years old. Participants self-administered a 10-minute computerized screening survey with audio via headphones (\$1.00 gift). Participants reporting past year cannabis use provided written informed assent/consent for Phase 2, self-administered a 25 minute baseline computer survey (\$20 remuneration), and provided a urine sample for drug testing (UDS; \$5 remuneration). Participants were randomly assigned using a computerized algorithm to the TBI, CBI, or control condition. Following the BI, participants self-administered a post-test. Participants self-administered computerized follow-ups in community locations (i.e., clinic, restaurants, home) with \$25, \$30, and \$35 remuneration respectively, and \$5 for a UDS. Follow-up staff was blind to condition assignment.

2.3 Measures

2.3.1 Screening/Baseline and Follow-ups—Demographic items included age, gender, race, grades in school, and drop-out of school (Sieving et al., 2001; Harris et al., 2003).

Past 3 month frequency of *cannabis* and *other drug use* was assessed using Add Health items (Sieving et al., 2001; Harris et al., 2003): cannabis, inhalants, cocaine, heroin, other

hallucinogens (e.g., LSD, PCP, mushrooms or ecstasy) and non-medical use (on your own without a doctor telling you to take them) of painkillers/opioids (e.g., Codeine, OxyContin, Vicodin, Darvocet, Percodan); stimulants (e.g., Ritalin); and, sedatives (e.g., Xanax, Valium). Response choices were: never = 0; 1–2 days = 1; once a month or less = 2; 2–3 days per month = 3; 1–2 days per week = 4; 3–5 days per week = 5; and every day or almost every day = 6. Past three month *alcohol frequency* was assessed with a question from the Alcohol Use Disorder Test (Saunders et al., 1993); based on feedback from pilot testing, we substituted the response options for question 3 (never, less than monthly, monthly, weekly, daily).

The number of *cannabis related consequences (CC)* in the past 3 months consisted of 23 items from the adapted version (Vandrey et al., 2005) of the Rutgers Alcohol Problems Index (White and Labouvie, 1989) and 5-items from the Severity of Dependence Scale (Martin et al., 2006): interpersonal (e.g., had a fight, argument or bad feelings with a friend), intrapersonal (e.g., missed out on other things because you spent too much money on cannabis), and substance use disorder symptoms (e.g., kept smoking when you promised yourself not to) ($\alpha = 0.95$).

A single item assessed *driving under the influence of cannabis (cannabis DUI)* in the past 3 months: never, 1–2 times, 3–5 times, 6–9 times, 10 or more times.

2.3.2 Baseline/Post-test—Two items were averaged to assess *perceived risk* of occasional and regular cannabis use (Johnston et al., 2004) (correlation = 0.54). Response choices were: no = 0, slight = 1, moderate = 2, and risk = 3. *Self-efficacy* to avoid cannabis use (when hanging out at a friend's house whose parents aren't home, home alone and feeling sad or bored, at a party where most people are using) was averaged (Ellickson et al., 1990; $\alpha = 0.86$; 5-point Likert scale, “not at all sure” (1) to “completely sure” (5) I could say no]. *Intention* to use cannabis in the next three months was assessed with a single item (5-point Likert scale, “strongly disagree (1) to “strongly agree”(4); (Ellickson et al., 1990).

Participants rated the BI *likeability* (i.e., 5-point Likert scale, “really didn't like it” to “liked it a lot”) and *helpfulness* of sections (e.g., “how use fits in with others”, “reasons to change”, “role plays”, and “resources” (i.e., 5-point Likert scale, “not at all helpful” to “extremely helpful”).

2.4 BIs

The BIs incorporated MI (Miller and Rollnick, 2002; Monti et al., 2001; Baer and Peterson, 2002), including tailored, parallel content: 1) goals/values; 2) feedback for cannabis, alcohol and other drug use, including consequences and DUI; 3) decisional balance exercise about cannabis; 4) tricky situations (e.g., role plays) including refusal skills for cannabis and other drug use, safe ways to get home/prevent driving high/drunken, dealing with peer pressure for delinquency (e.g., stealing a car/joy riding), coping with negative affect such as boredom, anger or sadness, and consequences (i.e., problem identification, getting help); and 5) the control brochure.

2.4.1 TBI—Research therapists who were trained in MI conducted the TBI, which was facilitated by a computer which displayed screens to prompt content. The therapist used an elicit-provide-elicited framework when reviewing tailored feedback, using summaries and open-ended questions to evoke change talk. For example, for those who did not want to stop using, therapists focused on reducing use and avoiding consequences. During role plays, therapists elicited tools to reduce use and avoid consequences. Using an approach similar to Project MATCH (Carroll et al., 1998; Kadden et al., 1995; Sampl and Kadden, 2001), to ensure fidelity BI's were audiotaped and reviewed during individual/group supervision by

post-doctoral fellows, supervised by investigators. A subset of tapes (25%, n=29) were randomly selected for coding by a single rater for Content Adherence (CA; 15-items, $\alpha=0.95$; developed for this study) and Therapist Competence (GROMIT; 18 items; $\alpha=0.87$; Moyers, 2004). Items were rated on a 7-point Likert scale (1 “Very Poor” to 7 “Expert Mastery”), with 4 considered an acceptable level of performance. Mean scores were: CA=4.3 (SD=0.33, range 3–6) and GROMIT=4.6 (SD=0.59, range 3–5); no sessions received an overall rating of 3 or less, although the last 2 items on the CA had means ~ 3 , likely due to rushing to complete BIs as patients were discharged.¹

2.4.2 CBI—The CBI was a stand-alone interactive animated program, with touch screens. Research staff started the CBI, handed the tablet to participants, and showed them how to adjust the audio. A selected *virtual buddy* guided participants through the program and provided audio feedback (via headphones). For example, during the decisional balance exercise, the participant selected reasons to stay away from cannabis and the buddy provided affirmations and summaries. During the role-plays, participants watched animated situations and then were asked to make a behavioral choice. If a participant chose a negative option (e.g., smoking cannabis), they were asked to consider the consequences in relation to their goals. Once a positive choice was made, the animation resumed, modeling this selection. The tailored role-plays included six characters and showed the progression in medical, social, and legal consequences for characters that did and did not use cannabis over time. At the end, the computer instructed participants to return the tablet to staff.

2.4.3 Control—Participants in the control were handed a tri-fold brochure containing warning signs of cannabis problems, resources (substance use treatment, suicide hotlines, employment services, leisure activities), and cannabis information websites. This “enhanced usual care” control (clinics did not routinely provide this information) was chosen for ethical reasons.

2.5 Data analysis

Data were analyzed using SAS Version 9.2 (SAS Institute, Inc., Cary, NC). Those completing follow-ups were compared to drop-outs on baseline demographic and substance use variables. Paired analyses (Wilcoxon signed rank test) were used to examine changes over time for the BIs. Generalized estimating equations (GEEs) were used to predict outcomes for TBI vs. control and CBI vs. control at 3, 6, and 12 months (either negative binomial or Poisson based on distribution) using an *intent to treat* approach, including those who did not receive assigned BIs (n=19) and drop-outs (by using available pairs to estimate working correlation parameters for the entire sample). The study was powered to detect differences between the BIs and the control; to achieve 80% power, n=95 per group were needed to detect a 15% difference in outcomes between BIs and control. Effect size estimates between active BIs were expected to be lower, with a sample size of 199 needed to detect a 10% difference in outcomes (80% power); thus, comparisons of the TBI and CBI are considered exploratory. Cohen’s effect sizes (Hedges and Olkin, 1985) were calculated, with 0.10 viewed as clinically meaningful (Gottfredson and Wilson, 2003).

3. RESULTS

3.1 Participants

In total, 1416 adolescents were screened (14.9%, n=248 refused; Figure 1). Males were more likely to refuse than females (18.0%, 12.9%, respectively; $X^2(1)=8.18$ $p<.01$) and

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Caucasians were more likely to refuse than African-Americans and other races (21.9% versus 12.8% and 15.6%, respectively; $X^2(2) = 14.72$, $p < 0.001$). Among those screened, 366 (25.8%) participants reported past year cannabis use; 328 (89.6%) of eligible cannabis users were enrolled in the RCT. Comparisons of those completing the baseline with those who refused showed no gender differences (male 3.6%, female 3.7%); however, Caucasians were more likely to refuse than African-Americans and other races (6.0% 3.9% vs. 1.3% respectively; $X^2(2) = 6.86$; $p < .05$). Most youth ($n = 309/328$; 94.2%) received their assigned condition during the primary care visit ($n = 302$); 2.3% ($n = 7$) returned within two weeks. There were no significant differences at baseline by condition (Table 1).

Comparisons of those completing each follow-up with drop-outs showed that the only significant demographic variable was race at 3 and 6 months; African-Americans were less likely to drop-out than other races. At 3-months, those lost to follow-up did not significantly differ from those who completed follow-up on any baseline substance use variable. As compared to completers, at 6-months drop-outs reported significantly more baseline CC ($Z = 3.21$; $p < .01$) as compared to completers and at 12-months, drop-outs reported significantly greater baseline other drug use ($Z = 2.94$; $p < .01$), alcohol use ($Z = 2.11$; $p < .05$), and CC ($Z = 3.21$; $p < .01$). Attrition was not significantly different by condition: 3 month ($X^2(2) = 0.953$; $p > .05$), 6 month ($X^2(2) = 0.321$; $p > .05$), and 12 month ($X^2(2) = 0.472$; $p > .05$).

Among those ($n = 284/328$, 86.7%) who provided UDS at baseline, concordance was 100% with self-report (past 3 months). At 3 months (84.3% provided UDS; 236/279), agreement was 96.1%, with 11 discordant cases who self-reported no cannabis use but had a positive UDS for cannabis (4 - TBI, 5 - CBI, 2 - Control). At 6 months (84.6% provided UDS; 236/278), cannabis agreement was 96.8% with 9 discordant cases (3- TBI, 2 - CBI, and 4 - Control). At 12 months (83.6% provided UDS; 230/275), cannabis agreement was 98.5%, with 4 discordant cases (1 - TBI, 1 - CBI, and 2 - Control). The primary reason for not providing a UDS was because of relocation/phone interviews ($n = 23$ at 3; $n = 32$ at 6; $n = 31$ at 12 months). Given low rates of discordance and fairly equal distribution across groups, we used self-report data for further analyses.

3.2 Post-test

At post-test, 77.4% rated the BIs as “liked” or “liked a lot”, with no significant differences between BIs ($X^2(1) = 0.329$; $p > .05$). Most participants, 82.6%, rated at least one section of the intervention “very or extremely helpful”. The most well-liked sections were reviewing the reasons to change cannabis use and role-plays. Significant increases in perceived risk and in self-efficacy, and decreases in behavioral intention were found for both BIs (Table 2).

3.3 3, 6, and 12 Months

3.3.1 Paired Comparisons—All conditions showed significant decreases in the frequency of cannabis use over time (Table 3). The number of CC significantly decreased in the CBI condition at 3 and 6 months, while the therapist condition showed significant decreases at 6 and 12 months; no significant decreases were observed in the control condition. Other drug use significantly decreased at 3 and 6 months for both CBI and TBI, whereas the control condition did not change. No significant decreases were found in frequency of alcohol use in any condition. Frequency of cannabis DUI significantly decreased in the TBI condition at 3-months; no changes were observed for the CBI and control conditions.

3.3.2 GEE Models—GEE models showed that group by time (GxT) interactions for the CBI and TBI on cannabis use were not significant at any time point (Table 4); significant

time effects were noted, with all groups showing declines in cannabis use frequency. For CC, there was a significant GxT interaction for the CBI at 3 months, but not at 6 and 12 months; the GxT interaction was not significant for the TBI at any time point. Regarding the frequency of other drug use, the GxT interaction was significant for the CBI at 3 and 6 months, but not at 12 months; the GxT interaction was not significant for the TBI at any time point. For alcohol use, the GxT interaction was not significant for the CBI or TBI at any time point. For cannabis DUI, the GxT interaction was not significant for the CBI at any time point; there was a significant GxT effect for the TBI at 3 months, but not at 6 or 12 months. Finally, GEE models comparing the TBI and CBI showed no significant GxT effects at any follow-up, with the exception that the GxT effect was significant for alcohol use at 12-month, favoring the CBI ($p < .05$; data not presented).

4. DISCUSSION

The development of SBIRT approaches for cannabis use among adolescents is an important public health priority. Rates of cannabis use among adolescents presenting to urban primary care clinics were consistent with national rates (Johnston et al., 2012). Although the BIs were well-received and effective at altering precursors of behavior change at post-test, compared to the control, the BIs did not reduce cannabis use, which decreased over time from 2–3 times per month to less than monthly for all conditions. It is not clear if these changes in the control group reflect the assessment, which combined with a health care visit and receiving a brochure may reduce use. Inconsistencies between findings in this study and the prior literature examining BI's for cannabis among adolescents (D'Amico et al., 2008; Bernstein et al., 2009) may reflect variations in inclusion criteria related to problem severity. Our study included adolescents using any cannabis in the past year; the aforementioned studies used more recent and frequent cannabis use levels and/or consequences. Alternatively, it may be more intensive interventions may be needed to address cannabis use among adolescents.

Nonetheless, the CBI had clinically significant short-term effects on cannabis consequences, with a moderate effect size (0.33), as well as frequency of other drug use, with smaller effect sizes (0.17 at 3 months, 0.14 at 6 months) as compared to the control. This finding for cannabis consequences, but not use, is consistent with other ED-based BI studies for alcohol (Havard et al., 2008; Walton et al., 2010). Albeit modest, the positive findings for the CBI on frequency of other drug use (including illicit and non-medical prescription drug use) are promising given recent concern over the increase in the non-medical use of prescription drugs (Johnston et al., 2012) and risk for overdose (McCabe et al., 2012; Schille et al., 2009). From a harm reduction standpoint, these findings for the CBI on reducing consequences associated with cannabis use, even in the short term, may be particularly meaningful given the feasibility of future translation. Future studies are needed to examine critical components of computer BIs. For example, a recent meta-analysis of therapist and computer BIs for alcohol use among college students has noted large variations in content, degree of tailoring, and generally lower problem severity of samples, which could influence efficacy (Carey et al., 2012).

The therapist BI reduced the frequency of cannabis DUI (with moderate effect sizes of 0.33), but did not significantly decrease frequency of cannabis use, cannabis consequences, or other drug use relative to the control. Given the potential injury risk from driving when high, these findings may be significant from a public health standpoint. It may be that it was easier for therapists to elicit change talk for such behavior that has clear, potential negative consequences. Alternatively, a recent study argues that peers may be better suited to provide BIs for cannabis to youth than adults (Bernstein et al., 2009). Our findings are inconsistent with conclusions from a meta-analysis of alcohol interventions among college students,

showing greater effect sizes that last longer for therapist BIs as compared to computer BIs (Carey et al., 2012), perhaps reflecting the differences in samples (age, socioeconomic status), intervention focus (alcohol, cannabis), and problem severity (any use, greater consumption/consequences). Additional studies are needed to identify key components of BIs. For example, our study included a decisional balance exercise which has been associated with poorer outcomes (Carey et al., 2012).

Given that only a few studies have compared computer or therapist delivered BIs for cannabis among adolescents, their relative efficacy is unknown. Although direct comparisons may have been underpowered in our study, only one significant difference was found between the therapist and computer BIs, which is consistent with prior research on BI's in the ED (Barnett et al., 2007). Instead, the question of relative efficacy of computer versus therapist BIs may be better answered by meta-analyses, which to date are lacking for cannabis or other drug use. However, as mentioned above a recent meta-analysis of alcohol interventions for college students suggests that therapist BIs perform better than computer BIs (Carey et al., 2012).

It is also important to note that substance use trajectories are heterogeneous from adolescence to emerging adulthood: none/low level, early onset chronic, developmentally limited, and late onset users (Brook et al., 2011). Cannabis was the most commonly reported substance used among the developmentally limited group (Jackson et al., 2008). These fluctuations in substance use over adolescent development may obscure detection of subgroups in which BIs are effective given limited sample sizes and follow-up periods.

BIs effects were not sustained over 12 months, which is consistent with prior work among college students, suggesting that boosters may be needed (McCambridge and Strang, 2005). An ED-based BI study for cannabis included a telephone booster and found reductions in use at 12-months (Bernstein et al., 2009). The American Medical Association's *Guidelines for Adolescent Preventive Services* (GAPS) suggests that adolescents should be asked about their use of alcohol, tobacco, and other drugs (American Medical Association, 1997) every time they seek medical services.

4.1 Limitations

Findings require replication to determine generalizability. Steps taken to increase the validity of self-report included provision of UDS, self-administration on computers, "blinding" of staff to condition assignment, and assurances of confidentiality (Brener et al., 2003; Dennis et al., 2002). Youth presenting without a parent/guardian were excluded due to IRB restrictions. Intervention fidelity is a potential concern; however, strategies were used to standardize and assess delivery. Attrition is another limitation, with analyses showing that African-Americans were less likely to drop-out than other races. Although at 6 and 12 months drop-outs reported greater use of some substances at baseline, no evidence of differential attrition by condition were observed, follow-up rates were good (exceeding 80%), and sophisticated analytic techniques were used. The use of an ordinal measure as the primary outcome for marijuana use may have limited sensitivity to detect effects. Future studies should use daily assessments, such as the timeline follow-back calendar, which may be more sensitive to detecting use patterns over time; a 1-month assessment could identify shorter term effects. Finally, the therapist was facilitated by a computer to standard fidelity, as recommended by recent consensus panel (Cunningham et al., 2009); however, it could be that the computer distracted therapists and 'watered down' the BI experience.

4.2 Conclusions

Findings were mixed, with no effects of a computer or therapist BI on cannabis use; however, data support the short-term efficacy of the CBI in decreasing the number of cannabis related consequences and the frequency of other drug use, and the TBI in decreasing the frequency of cannabis DUI. Findings dissipated by 12-months suggesting that additional boosters may be needed. Computer BIs are especially promising for financially limited primary care settings located in socioeconomically disadvantaged areas.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Figure 1.
Study Enrollment

Table 1

Baseline Demographic and Substance Use Characteristics by Group.

Background Characteristics	Total (n=328)	TBI (n=118)	CBI (n=100)	Control (n=110)
	% / M (SD)	% / M (SD)	% / M (SD)	% / M (SD)
Demographics				
Male	33.5%	36.4%	33.0%	30.9%
African-American	60.7%	65.3%	61.0%	55.5%
Hispanic ethnicity	11.0%	6.8%	16.2%	10.9%
Age	16.3 (1.6)	16.3 (1.4)	16.4 (1.6)	16.2 (1.7)
Failing grades	25.9%	26.3%	28.0%	23.6%
Dropped out of school	5.8%	4.2%	6.0%	7.2%
Drug Use in Past 3 Months				
Cannabis Use	100%	100%	100%	100%
Frequency	3.2 (1.9)	3.1 (1.9)	3.1 (1.9)	3.2 (1.9)
Cannabis Consequences	93.2%	91.5%	95.0%	93.6%
Number	14.2 (15.2)	14.2 (15.2)	14.3 (15.5)	13.9 (15.0)
Other Drug Use	21.3%	15.3%	23.0%	26.4%
Frequency	0.8 (2.4)	0.5 (1.3)	0.9 (3.0)	1.2 (2.7)
Alcohol Use	53.1%	48.3%	53.0%	58.2%
Frequency	0.9 (1.0)	0.7 (0.9)	0.9 (1.1)	1.0 (1.1)
Cannabis DUI	21.0%	21.2%	24.0%	18.2%
Frequency	0.4 (0.9)	0.4 (0.9)	0.5 (1.1)	0.3 (0.7)

Note: M=Mean; SD=Standard Deviation

Table 2

Pre-test and Post-test Changes in TBI and CBI on Perceived Risk, Self-efficacy, and Intention to Use.

Follow-up	Therapist (n=118)	Computer (n=100)
Perceived Risk		
Baseline Mean (SD)	1.56 (1.02)	1.50 (0.97)
Post-Test Mean (SD)	1.72 (0.95)	2.09 (0.88)
Difference in Mean (SD)	0.16 (0.81)	0.59 (1.02)
% Change in Mean	10.3% **	39.3% ***
Self-Efficacy		
Baseline Mean (SD)	3.43 (1.46)	3.50 (1.40)
Post-Test Mean (SD)	3.67 (1.46)	3.85 (1.40)
Difference in Mean	0.24 (1.26)	0.35 (1.31)
% Change in Mean	7.0% **	10.0% **
Intention to Use		
Baseline Mean (SD)	2.41 (1.07)	2.36 (1.22)
Post-Test Mean (SD)	2.13 (0.90)	1.95 (0.89)
Difference in Mean	0.28 (0.89)	0.41 (1.00)
% Change in Mean	11.6% ***	17.4% ***

**
p 0.01

p 0.001

Note: Higher scores on perceived risk indicate greater risk perception; higher scores on self-efficacy indicated greater confidence would not use; higher scores on intention to use indicated greater likelihood of use.

Table 3

Descriptive Data and Results of Wilcoxon Signed-Rank Test examining changes in Outcomes by Condition (BI versus control) over time.

Variable	Baseline M (SD)	3 Months M (SD)	B-3M %Change	6 Months M (SD)	B-6M %Change	12 Months M (SD)	B-12M %Change
Frequency of Cannabis Use							
Computer	3.06 (1.90)	2.05 (2.25)	-33.0**	1.96 (2.05)	-35.9**	2.04 (2.20)	-32.7**
Therapist	3.14 (1.86)	2.37 (2.13)	-24.5**	2.40 (2.11)	-23.6**	2.63 (2.20)	-19.1*
Control	3.25 (1.87)	2.09 (2.06)	-35.7**	2.04 (2.10)	-37.2**	2.14 (2.21)	-31.1**
Number of Cannabis Consequences							
Computer	14.3 (15.5)	11.5 (15.0)	-19.7**	10.5 (13.6)	-26.6**	12.7 (13.8)	-6.7
Therapist	14.2 (15.3)	12.5 (12.5)	-11.7	11.3 (12.9)	-20.4*	11.1 (13.0)	-21.8*
Control	14.0 (15.0)	13.6 (15.1)	-2.6	11.0 (13.6)	-20.9	11.5 (14.4)	-17.9
Frequency of Other Drug Use							
Computer	0.86 (3.01)	0.16 (0.62)	-81.4*	0.11 (0.45)	-87.2*	0.48 (2.13)	-44.2
Therapist	0.47 (1.29)	0.26 (0.92)	-44.7*	0.26 (0.93)	-44.7*	0.38 (1.70)	-19.1
Control	1.16 (2.71)	1.18 (4.13)	1.7	1.19 (4.64)	2.6	0.64 (2.12)	-39.7
Frequency of Alcohol Use							
Computer	0.91 (1.09)	0.63 (0.99)	-30.8	0.68 (0.93)	-25.3	0.58 (0.82)	-36.2
Therapist	0.75 (0.92)	0.72 (0.86)	-4.0	0.71 (0.97)	-5.3	0.88 (0.99)	17.3
Control	0.98 (1.12)	0.83 (1.09)	-15.3	0.98 (1.18)	0.0	0.79 (0.96)	-19.4
Frequency of Cannabis DUI							
Computer	0.48 (1.06)	0.37 (0.94)	-22.9	0.46 (1.05)	-4.2	0.45 (0.99)	-6.2
Therapist	0.40 (0.93)	0.20 (0.65)	-50.0*	0.26 (0.79)	-35.0	0.33 (0.90)	-17.5
Control	0.26 (0.66)	0.32 (0.83)	23.1	0.37 (0.90)	42.3	0.25 (0.85)	-3.8

* p 0.05

** p 0.01

*** p 0.001

Note: B=Baseline; 3M=3 Month follow-up; 6M= 6 Month follow-up; 12M = 12 Month follow-up; M = mean; SD= standard deviation.

Results from Generalized Estimating Equation Analyses comparing Intervention Conditions versus control on Outcomes at 3, 6, and 12 months.

Table 4

Variable	3M Estimate (SE)	3M P value	6M Estimate (SE)	6M P value	12M Estimate (SE)	12M P value
Frequency of Cannabis Use						
Time	0.45 (0.10)	<0.01	-0.51 (0.11)	<0.01	-0.35 (0.11)	<0.01
Computer Group by Time	-0.08 (0.15)	0.57	0.08 (0.16)	0.62	-0.03 (0.16)	0.85
Therapist Group by Time	-0.18 (0.13)	0.16	0.25 (0.14)	0.08	0.15 (0.14)	0.28
Number of Cannabis Consequences						
Time	0.01 (0.21)	0.86	-0.12 (0.12)	0.30	-0.28 (0.11)	0.01
Computer Group by Time	-0.24 (0.12)	<0.05	-0.15 (0.16)	0.37	0.08 (0.17)	0.62
Therapist Group by Time	-0.18 (0.12)	0.15	-0.08 (0.15)	0.60	-0.07 (0.15)	0.62
Frequency of Other Drug Use						
Time	-0.07 (0.33)	0.79	-0.12 (0.32)	0.72	-0.40 (0.26)	0.13
Computer Group by Time	1.82 (0.68)	<0.01	-1.41 (0.52)	<0.01	0.21 (0.48)	0.66
Therapist Group by Time	0.61 (0.39)	0.12	-0.48 (0.42)	0.255	0.33 (0.51)	0.52
Frequency of Alcohol Use						
Time	-0.16 (0.13)	0.21	0.01 (0.14)	0.99	-1.14 (0.13)	<0.01
Computer Group* Time	-0.19 (0.20)	0.34	-0.25 (0.20)	0.22	-0.16 (0.20)	0.44
Therapist Group* Time	0.16 (0.19)	0.39	-0.02 (0.19)	0.94	0.37 (0.19)	0.05
Frequency of Cannabis DUI						
Time	-0.22	0.24	0.27 (0.31)	0.40	0.12 (0.34)	0.72
Computer Group by Time	0.55 (0.35)	0.11	-0.34 (0.37)	0.36	-0.17 (0.44)	0.70
Therapist Group by Time	0.87 (0.33)	<0.01	-0.68 (0.41)	0.10	-0.32 (0.41)	0.44

Note: SE=Standard Error