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One-Year Outcomes and Mediators of a Brief Intervention for Drug Abusing Adolescents

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Abstract

Two manually-guided brief interventions were evaluated with a randomized controlled trial. Adolescents (aged 13-17 years) suspected of abusing alcohol and other drugs and their parent were randomly assigned to receive either a 2-session adolescent only (BI-A), 2-session adolescent and additional parent session (BI-AP), or assessment only control condition (CON). Adolescents were identified in a school setting and the intervention was delivered by trained counselors. Outcome analyses ($N=284$; 90% of those enrolled) of relative change (from intake to 12-months) and absolute status (at 12-months) revealed a general pattern of reductions in drug use behaviors, particularly with the cannabis outcome measures, in both active conditions (BI-A and BI-AP). Students in the control condition showed worse outcome compared to the BI-A and BI-AP groups. Among the four mediating variables measured at 6-months, use of additional services, motivation to change and parenting practices had significant influences on 12-month outcome; problem solving skills approached significance as a mediator. The potential value of a brief intervention for drug abusing adolescents is discussed.

Keywords

Adolescence; drug abuse; brief intervention

Alcohol and other drug use by adolescents is still a significant public health issue. Drug use tends to escalate during adolescence and is the highest in young adulthood years (Arnett, 2006). From a developmental perspective, this pattern may be influenced by several factors, including the challenges that come with new roles and differences in exposure to family and peer influences (Schulenberg & Maggs, 2002), behavioral and mental disorders that onset during adolescence (Brown et al., 2008), and neuro-development factors that may alter drug sensitivity for the adolescent (Masten, Faden, Zucker, & Spear, 2008).

There is a growing interest that brief interventions (BIs) are a beneficial approach to treating adolescents with problems associated with alcohol and other drug use. Often characterized by motivational interviewing (MI) techniques, BIs are becoming an evidenced-based option in the continuum of response options in the adolescent drug treatment area (Wachtel & Stanford, 2010; Winters, Botzet, Fahnhorst & Koskey, 2009). Most BI's do not exceed 4 or

5 sessions (Erickson, Gerstle, & Feldstein, 2005), although it is not clear as to the optimal number of sessions (Kulesza, Apperson, Larimer, & Copeland, 2010; Wutzke, Conigrave, Saunders & Hall, 2002).

BIs for adolescents are being used to engage youth to participate in more intensive treatment, as a substitute for more extended treatment for persons seeking assistance but placed on waiting lists, to facilitate referrals for additional specialized treatment, and as stand-alone treatment options (Tait & Hulse, 2003). Their application for adolescents has occurred in pediatric clinics (e.g., Levy, Winters, & Knight, 2010), emergency departments (e.g., Walton, Chermack, Shope, Bingham, Zimmerman, Blow, & Cunningham, 2010), juvenile detention systems (e.g., Dembo, Briones-Robinson, Ungaro, Barrett, Gullede, Winters, et al., in press) and school assistance programs (e.g., Wagner, Tubman & Gil, 2004), and group formats have been shown to be effective (e.g., D'Amico, Osilla, & Hunter, 2010). Given their relative cost-efficiency and ease of implementation by a wide-range of professionals, BIs may have a high utility value in health service delivery systems (Babor, McRee, Kassebaum, Grimaldi, Ahmed, & Bray, 2007).

Furthermore, empirical support is growing for their efficacy. Several published reviews and meta-analyses of BIs have focused on college student or adult populations (e.g., Carey, Scott-Sheldon, Carey, & DeMartini, 2007; Lundahl, Kunz, Brownell, Tollefson, & Burke, 2010). We located 7 published meta-analyses or literature reviews of BIs for adolescents (Erickson et al., 2005; Grenard, Ames, Pentz & Sussman, 2006; Jensen, Cushing, Aylward, Craig, Sorell, & Steele, 2011; Macgowan, & Engle, 2010; Tait & Hulse, 2003; Tanner-Smith, Wilson & Lipsey, 2012; Wachtel & Staniford, 2010), and the authors know of an in-progress meta-analysis that will include 23 studies on BIs with adolescents (Emily Tanner-Smith, personal communication). These meta-analyses concur that, despite some exceptions (see McCambridge & Strang, 2004; Walker, Roffman, Stephens, Berghuis & Kim, 2006; Walker, Stephens, Roffman, Demarce, Lozano, Towe, & Berg, 2011), the efficacy of BI's is generally encouraging. Of note is that BI's have significantly outperformed control or comparison conditions, which include education (e.g., Ögel & Coskun, 2011) and assessment-only conditions (e.g., Conrod, Castellanos-Ryan, & Mackie, 2011; Goti, Diaz, Serrano, Gonzalez, Calvo, Gual, & Castro, 2010; Winters, Fahnhorst, Botzet, Lee, & Lalone, 2012).

Progress is being made in teasing out the pathways through which brief interventions are exerting their effects. The *adult* BI literature suggests that motivation to change, self-efficacy and counselor empathy promote change (Burke, Arkowitz, & Menchola, 2003; Hettema et al., 2005). The broad *youth* drug treatment research literature has identified a handful of variables that are associated with change, including peer drug use, parenting practices, and co-existing mental disorders (Deas & Thomas, 2001; Dennis et al., 2004; Dufur, Parcel & McKune, 2012; Winters et al., 2009). The *adolescent and young adult* BI literature suggests that therapist fidelity to intervention components (Jensen et al., 2011) and use of MI are associated with positive effects (Jensen et al., 2011; Wachtel & Staniford, 2010). Also, personalized normative feedback on substance use has been noted as a common mechanisms of change in the meta-analysis of binge-drinking college students (Carey et al., 2007), and the value of this feature appears to hold regardless of whether the feedback is

presented in person or not (Larimer & Crouse, 2007). In an earlier publication of the present BI program, improvement in problem solving efficacy and use of additional community resources were identified as significant mechanism of positive outcome (Winters et al., 2012).

Our research group has undertaken an adolescent brief intervention research program with a focus on examining 2 versions of a BI. One is a 2-session adolescent only condition and the other is a 3-session version that includes the same two adolescent sessions and an additional session with the parent. Our prior research has involved RCT investigations of their relative efficacy compared to an assessment only condition. We found at 6-months post-intervention that the 3-session BI condition (2 sessions with the adolescent and 1 session with the parent condition; BI-AP) has been shown to be superior compared to the 2-session version (2 sessions only with the adolescent; BI-A) and to an assessment only control group (CON) (Winters & Leitten, 2007; Winters et al., 2012). The focus of the present paper is to report the 12-month outcomes for this sample of adolescents. We expect both intervention groups (BI-A and BI-AP) to reveal superior outcomes with respect to drug use at the 12-month follow-up period compared to the assessment-only (CON) group, and that the BI-AP group will show better drug use outcomes compared to the BI-A group, based on the beneficial influence of parent involvement in treatment for adolescent drug abuse (e.g., Waldron, 1997). Regarding the issue of mediating factors, the study design included measures of these possible mediating factors: stage of change, problem solving skill, parenting practices, and use of additional community resources. Selection of three of these mediating variables (stage of change, problem solving skill, and parenting practices) was guided by both the extant literature on adolescent drug treatment (e.g., Deas & Thomas, 2001) and brief interventions (e.g., Jensen et al., 2011). The variable pertaining to utilization of additional services was added to the design given our hypothesis that one effect of the BI-AP group was to increase parents' initiative to seek further counseling subsequent to the intervention. The analysis of 6-month outcome data showed a mediating effect from problem solving and use of additional community resources (Winters et al., 2012). We will examine if 12-month outcome is influenced by any of these mediating factors.

This work extends the adolescent brief intervention literature by virtue of several study features: the target population focuses on mild-to-moderate cases; outcome data are longer-term and include both alcohol and cannabis use; and mechanisms of change are examined.

Method

Participants

Participants in the present analysis were the 284 students from a metro-area public school system who were identified by school counselors as a possible alcohol or other drug user, who were enrolled in the study, and for whom we had 12-month follow-up data (31 enrolled cases, or 9.8%, were lost to follow-up at 12-months). Most students ($n=280$) met DSM-IV (American Psychiatric Association, 1994) diagnostic criteria for a prior year substance use disorder (SUD) (primarily alcohol or cannabis use disorder; see Table 1). The 4 students who did not meet criteria for a SUD reported either 1 or 2 dependence criteria for at least one substance, and these "diagnostic orphans" (Chung, Martin, Armstrong, & Labouvie,

2002) were classified as meeting abuse criteria given that such cases have drug use frequency patterns that appear more similar to abuse compared to dependence cases (Pollock & Martin, 1999). Demographics for the total sample were as follows: 49.6% male, 71.8% were white, 12.3% had received prior drug treatment, and the mean age was 16.1 years. Statistical tests on background characteristics, including all measures of drug use involvement and consequences, revealed no significant differences between the study groups.

Measures

Adolescent Diagnostic Interview (ADI)—The Substance Use Disorder module of the ADI was administered to assess DSM-IV criteria for abuse and dependence disorders (Winters & Henly, 1993). Participants were asked questions pertaining to abuse and dependence criteria if he or she had used any substance five or more times. There are extensive test-retest reliability and validity psychometric data on the ADI (Winters & Henly, 1993; Winters, Stinchfield, Fulkerson, & Henly, 1993).

Timeline Followback (TLFB)—The TLFB (Sobell & Sobell, 1996) procedure was used to assess the number of alcohol use days, cannabis use days, and other illicit drug use days for the prior 90 days. The TLFB has been shown to be reliable and valid with adolescents (Winters, 2003).

Personal Consequences Scale (PCS)—As a self-report measure of negative social and legal consequences of alcohol and other drug involvement, the PCS is an 11-item scale from the Personal Experience Inventory ($\alpha = .92$; test-retest = .87) (Henly & Winters, 1988). Each item has a four-point response option (strongly disagree/disagree/agree/strongly agree), and the score range is 11-44. Prior 6-months was assessed.

Stages of Change (SOCRATES)—The SOCRATES (Miller & Tonigan, 1996) is designed to assess problem recognition and readiness for change in alcohol and other drug abusers. We used the short (19-item) version, and made these adjustments to the instrument: 1) the prefix for all items were reworded to ask about alcohol and other drugs; and 2) the response options were formatted as two-point (true/false; score range 19-38). Total scale score was used in the data analysis. There are data indicating that the predictive validity of the scale's Taking Steps scale is superior to the Recognition scale (Maisto, Chung, Cornelius & Martin, 2003; Maisto et al., 2011a, 2011b). However, in order to maintain consistency with the 6-month outcome findings previously reported (Winters et al., 2011), we once again used total score in the mediation analysis.

Problem Solving Inventory (PSI)—Problem solving behaviors were measured with the 25-item, uni-dimensional scale, the Problem Solving Inventory (PSI; Latimer, Winters, D'Zurilla, & Nichols, 2005). The PSI measures the ability to solve everyday problems, including coping with substance use relapse situations ($\alpha = .93$; test-retest = .86). Problem solving skills (e.g., generating several behavioral options; seeking social supports) have been shown to be related to recovery among youth receiving intensive treatment for a substance dependence disorder (Brown, Meyers, Mott & Vik, 1994).

Alabama Parenting Questionnaire (APQ)—The child version of the APQ (Shelton, Frick & Wooten, 1996) is a 42-item questionnaire that measures positive and negative parenting styles related to parenting practices to the child. The APQ contains 5 subscales (Dadds, Maujean & Fraser, 2003; Essau, Sasagawa, & Frick, 2006). We used a 28-item version that consists of the items for these three subscales: parental monitoring, inconsistent discipline, and positive parenting. Total score on these subscales was used in the mediation analysis. Based on data from our study, this composite is associated with favorable internal consistency (alpha, .81), and is characterized by a single factor (eigenvalue, 6.3).

Treatment Services Review (TSR)—The TSR is a structured interview that incorporates responses from the parent in order to record the adolescent's participation in drug treatment or related mental health services. The TSR has high test-retest reliability for services received during the prior 6 months and one-year (all kappas greater than .80) (Winters & Stinchfield, 2000). For this study we scored the TSR as a dichotomous variable (0 = no additional services; 1 = additional services).

Timeframes—All measures were administered at intake and also at the 12-month follow-up point. The timeframes at intake were the following: ADI diagnostic data, prior one year; TLFB, prior 90 days; PCS, PSI, SOCRATES and APQ, prior 6-months. The timeframes at the 12-month follow-up were the following: ADI diagnostic data, prior 6-months; TLFB, prior 90 days; PCS, PSI, SOCRATES, APQ and TSR, prior 6-months.

Procedure

Subject recruitment—Over a 26-month period, students between the ages of 13 and 17 at participating public school systems in the Twin Cities metro area and who were identified by school counselors as possible drug users, were potentially eligible for inclusion in the research study. Identification of a student often occurred if he or she was caught using drugs, was caught with drugs in his or her possession, or was referred to a counselor by a teacher due to concerns that the student may be using drugs. If in the counselor's judgment the student did not have a serious mental health problem, and if there was no need for the counselor to report the family to social services because of physical or sexual abuse or suicidality, then a recommendation was made to the parents that their son or daughter receive a referral for an assessment by the research staff to determine study eligibility. Study eligibility required that the student (a) be between 13 and 17 years of age, (b) scored equal to or greater than a score of 26 (a cut point indicating at least a mild drug abuse problem) on a drug abuse screening questionnaire, the *Personal Experience Screening Questionnaire* (PESQ; Winters, 1992), (c) not currently receiving treatment in another drug treatment program (9 screened out due to receiving current drug treatment), (d) not report during the research assessment the presence of an acute psychiatric problem or medical condition [(e.g., suicidal, mental retardation (no cases were screened out for this reason)], and (e) agreed to participate along with the parent (26 students declined participation). None of the participating schools provide an in-school intervention or treatment services; thus, our intervention was unique to the school system.

If the student met study inclusion criteria, and consent (parent) and assent (student) forms were signed, subjects were subsequently enrolled in the study. During Phase I of the study, eligible students/parents were randomly assigned (via an urn randomization procedure) within school to one of the two active conditions (BI-A or BI-AP). Upon reaching the target number of participants in the two active conditions ($n=136$, BI-A; $n=123$, BI-AP), we then moved to a Phase II recruitment procedure whereby, schools offered to eligible students/parents an opportunity to participate in an assessment-only program. During this phase we had to cut short our recruitment period to accommodate the need to conduct the full complement of outcome assessments within the grant period. Thus, we recruited 56 controls (CON). The rationale for the Phase I and Phase II recruitment procedure is that prior pilot work with the schools indicated a large decline rate by parents when faced with the possibility of being assigned to an assessment-only condition. As noted above, the youth background characteristics between the three groups did not differ. Also, we experienced very low attrition at the 12-month follow-up data point across the three groups ($n=8$, 6, and 3, respectively). Attrition cases did not differ from active cases on any intake drug involvement variables (PESQ scale score, drug use frequency, diagnostic variables).

Assessments and interventions were typically conducted in the school at the end of the school day; the parent session (BI-AP) was conducted at the school, a neutral setting (e.g., library) or at the parent's home. Three students in the BI-AP group completed only one of two adolescent sessions (although the parent session was completed in all of these cases), and two parents in the BI-AP group did not complete their single session (although the adolescent completed his/her sessions). These 5 participants were retained in the data analysis. All other BI-A and BI-AP participants completed their intervention sessions.

Assessments—Experienced research assistants, who were blind to treatment condition, completed the intake and follow-up assessments. The student was administered the ADI, TLFB, PCS, PSI, SOCRATES and APQ at intake and at follow-up; the parent was administered a parent version of the ADI and APQ at intake, and the TSR at follow-up. Students and parents were compensated via Target gift cards of \$20 after the intake assessment and \$40 after completing each follow-up assessment. Only assessments were compensated.

Brief intervention. The adolescent intervention sessions were developed from existing adolescent and young adult programs organized around motivational interviewing (MI) approach (e.g., express empathy; rolling with resistance; supporting self-efficacy; Miller & Rollnick, 1991) and cognitive-behavioral therapy (CBT) techniques (Breslin, Li, Sdao-Jarvie, Tupker, & Ittig-Deland, 2002; Monti, Colby, Barnett, Spirito, Rohsenow, et al., 1999). The parent session also included an MI approach and its content was based on family therapy techniques (e.g., Liddle & Hogue, 2001). The first version of the intervention was field tested with six students at the participating schools and feedback from the therapist and clients were used to refine the manual (Winters & Leitten, 2001). A subsequent pilot study (Winters & Leitten, 2007) led to additional refinements of the manual. The final 3-session version of the program is best characterized as a brief intervention with a mix of MI, CBT and family therapy components.

Each session consisted of 60-minute individual-based counseling that was delivered by an interventionist. Sessions 1 and 2, separated by 7-10 days, were identical for the BI-A and BI-AP conditions. Each Session 1 focused on eliciting information about the students' alcohol and other drug use and related consequences, assessing their stage of change (Prochaska, DiClemente, & Norcross, 1992), examining the pros and cons of their use via the decisional balance exercise (Miller & Rollnick, 1991), completing a Readiness Ruler, discussing the triggers of the youth's drug use, and discussing what behavioral and cognitive changes the student would like to select and pursue. Students were allowed to negotiate goals with the counselor; at minimum goals associated with drug use reduction were discussed and drug abstinence was encouraged. Session 2 focused on the students' progress in achieving the goals, discussing and practicing three problem solving strategies to deal with social pressures to use drugs, re-assessing the Readiness Ruler, and negotiating long-term goals. All drugs used by the person were addressed and the client was encouraged to achieve reduction or abstinence for all drugs. Session 3 (for BI-AP) involved delivering the same MI interviewing style to the primary parent or guardian. The content was informed by an integrative behavioral and family therapy approach (Liddle & Hogue, 2001; Waldron, 1997), and addressed these topics: their son or daughter's substance use problem; parent monitoring and supervision to promote progress towards their child's intervention goals; and healthy drug use behaviors and attitudes by the parent.

During program development we considered including a component to the brief intervention that involved challenging the client's perceived norms regarding adolescent drug use. Many of the consultants to the project advised against using this component. Despite this feature being a common element in interventions for college student problem drinkers (Larimer & Cronce, 2002), its use in BIs for adolescent drug-abusers has been questioned (Levy, Winters, & Knight, 2010). Thus, we chose to not include this content in the intervention.

Assignment of cases to therapists was based on a "crossed" design (i.e., the therapists equally administered both treatments), as recommended by Crits-Christoph and Mintz (1991). Both therapists had previous experience in delivering structured treatment to substance abusers in a school setting. Treatment fidelity was monitored through regular supervision meetings with the senior author (KCW), and audio tapes of all sessions were independently rated by two research assistants using session adherence checklists. Inter-rater disagreements, which were rare, were resolved by the senior author. The adherence data indicated that the therapists covered 98% of the key components of the intervention sessions across all three conditions (99%, 97%, 97%, respectively).

Data Analytic Strategy

Six-month outcome data with this study have been reported in a prior publication (Winters et al., 2012), thus this paper will focus on 12-month outcome findings. All analyses were based on the intent-to-treat design. Drug use outcome variables were based on categorical (abstinence vs. non-abstinence of drug use; absence vs. presence of abuse/dependence symptoms) and continuous (TLFB; number of abuse/dependence symptoms; PCS) measures. Except for the drug use consequences scale (PCS), the other continuous variables had highly skewed distributions, so these variables were conditioned. For the TLFB

variables, we made these transformations: no use = 1; 1-2 times of use = 2; 3-5 times of use = 3; 6-9 times of use = 4; 10+ times of use = 5. Separate counts of symptoms associated with abuse and dependence disorders were made separately for alcohol and cannabis. For the count of abuse symptoms these recodings were made: none = 1; 1-2 = 2; 3-5 = 3; 6-9 = 4; 10+ = 5. For the dependence symptoms, these recodings were made: none = 1; 1-2 = 2; 3-5 = 3; 6+ = 4. For the outcome analyses, chi-squares were computed for the categorical data, and ANOVA and RMANOVA for the continuous variables.

For the mediation analysis, a SPSS macro developed by Preacher and Hayes (2008) was used to test the indirect effect of intervention on drug use outcome. Bootstrapping procedures were used to calculate confidence intervals for estimates of the indirect effects (Shrout & Bolger, 2002). Bootstrapping, a nonparametric resampling procedure, does not assume normality of the sampling distribution and thus, suited for mediation analyses with small samples (Preacher and Hayes, 2004). We report the biased corrected confidence intervals (BC 95% CI) from 5,000 bootstrap samples. If the 95% CI does not contain zero, it indicates that the mediation is significant.

Results

Drug Use and Consequences at One-Year

Categorical outcomes—Shown in Table 2 are 1) rates of abstinence for alcohol and cannabis use (prior 90 days) and 2) proportion reporting no symptoms of alcohol and cannabis abuse or dependence (prior 6-months). Significant chi-square results were obtained for alcohol and cannabis abstinence rates (alcohol X^2 ($df=2$), 8.5, $p < .01$; cannabis X^2 ($df=2$), 11.1, $p < .01$). The pattern of results indicated comparable high rates for the BI-A and BI-AP groups (range 30.6% – 56.4%) and lower rates for the CON group (6.3% alcohol, 12.5% marijuana). The chi-square results for the absence of abuse and dependence symptoms was significant only for cannabis dependence (X^2 ($df=2$), 8.1, $p < .05$), with rates as follows: (62.0%, BI-A; 60.3%, BI-AP; 25.0%, CON).

Continuous outcomes—Twelve-month number of use days, the count of the number of abuse and dependence symptoms and PCS scores were first analyzed by ANOVA (group), using intake PESQ score as a covariate (see Table 3). No group differences were found for any of the alcohol continuous variables. However, significant between group differences were found for all cannabis variables (use days, abuse and dependence symptoms) [range of F (2, 296) = 3.8 – 7.2, all $p < .05$] and the PCS variable [F (2, 296) = 4.9, $p < .01$]. The effect sizes for these significant results (eta squared) ranged from .04 – .08 (medium to large). All post hoc (Student-Newman-Keuls; SNK) tests indicated this pattern: BI-A, BI-AP < CON ($p < .05$).

Prospective Analyses

We computed a repeated measures analysis of variance (Group x Time), using intake PESQ score as a covariate, on all continuous variables (see Table 3). A significant Time (intake to 12-month outcome) effect was found for all variables [range of F = 7.1 – 103.3, all p 's < .01; range of effect sizes (eta squared), .03 – .34 (small to medium)]. These results indicated a

decrease in drug use behaviors from intake to 12-month follow-up. A significant Time x Group interaction was found for cannabis use, cannabis dependence and PCS [range of $F = 3.2 - 3.6$, all p 's $< .05$; range of effect sizes (eta squared), .03 - .04 (small to medium)]. These significant interaction results showed that BI-A and BI-AP groups showed roughly equivalent decreases in scores whereas the scores for the CON group showed a slight decrease (cannabis abuse symptoms) or were relatively stable cannabis dependence symptoms).

Mediation Analyses

Mediation analyses were conducted to test the effects of mediators on the relationship between treatment condition and drug use outcome. The mediation variables, which were measured at the 6-month follow-up point, were the following: motivation to change (source youth), problem solving (source youth), total score on the APQ (source youth), and additional services (source parent). Because the additional services variable was highly skewed, logarithmic transformation was applied. The outcome variable was the non-weighted sum of the transformed score on the prior 90 days TLFB for alcohol and cannabis use days reported at 12-month follow-up. Given that the sample size was not large enough to conduct multiple mediational analyses, we chose this outcome measure given that the distribution of this composite closely approximates a normal distribution for the study groups, and reduction of alcohol and cannabis use was a primary focus of change for the intervention. Table 4 provides a summary of the variables involved in the mediation analysis. Models 1 and 2 address youth mediators (Stages of Change and Problem Solving) presumed to be affected by both the BI-A and BI-AP groups, whereas Models 3 and 4 pertain to parent mediators (Parenting and Additional Services) presumed to be affected by only the BI-AP group.

Figure 1 shows the mediation model and includes how the total effect of intervention (path c) can be apportioned into its indirect effect on drug use at 12 month through a mediator assessed at 6 month ($a \times b$) and its direct effect on drug use ($c' = c - ab$) (for more details see Preacher & Hayes, 2008). Path a represents the effect of intervention on the mediator, whereas path b represents the effect of the mediator on drug use controlling for the intervention effect.

Unstandardized regression coefficients of each path for the four proposed mediation models are presented in Table 5. Intervention condition(s) compared to the comparison group(s) had significant effects on the 6-month mediators (path a) and the 12-month drug use (path c), except for Model 2 where the intervention conditions (BI-A & BI-AP vs. Control) had no significant impact on problem solving. All four mediators had significant relations with drug use at 12 months after controlling for the intervention effect (path b). Evidence for mediation (i.e., indirect effect) was found for Models 1, 3 and 4, where the bootstrap bias-corrected 95% confidence intervals did not contain zero (Table 6). The results indicated that positive changes in motivation to change, parenting and additional services measured at 6 month follow-up mediated the relationship between intervention condition and drug use days at 12 month follow-up, and problem solving approached a mediation effect (a path not significant yet b and c' paths were significant). Of the three significant mediation models,

direct effect of intervention on drug use days controlling for mediation (path c' , Table 5) remained significant for Models 1 (motivation to change) and 4 (additional services) but not Model 3 (parenting), suggesting that motivation to change and additional services may have partially mediated the intervention effect on drug use outcome, whereas parenting may have fully mediated the relationship.

Moderators of Outcome

Exploratory moderator analyses were conducted to examine the moderating effects of the following variables on the relation between treatment conditions and outcomes: gender, age, race, baseline drug use severity (abuse diagnosis only or at least one dependence diagnosis) and the 2 counselors who delivered the intervention. An interaction term between a moderator and treatment condition was created (e.g., treatment $\times$ gender) and tested in a separate analysis. No significant interactions of these moderator variables with the two active treatment conditions were found on any of the outcome measures.

Discussion

The present 12-month outcome findings generally replicate our earlier 6-month outcome findings (Winters et al., 2012), as well as offering a slightly different picture of what mediates change over an extended period. We found that many positive gains of the intervention persisted over time. Compared to the assessment-only group, both active conditions were associated with significant improvements over time with respect to the cannabis use behaviors and the drug consequences scale. However, in contrast to our earlier report, we did not find that youth in the parent, BI-AP group showed more consistent intervention effects compared to the condition in which only the adolescent client received services (BI-A). Also, there was some reduction in substance use among controls, suggesting that these individuals exhibited reactivity to the research assessment experience, an effect that has been reported in other BI studies (McCambridge & Strang, 2004).

The present study supports the view that the BI approach, as well as motivational interviewing techniques, may be an appropriate solution for drug abusing adolescents. Although the literature evaluating the effectiveness of BIs and MI for adolescent populations is emerging, the results from the present study support the view that clinicians should consider using these approaches to help adolescents make substance use behavior changes. Also, the present study's findings are consistent with other studies that have focused on drug-using youth at low end of the severity continuum (D'Amico & Fromme, 2000, 2002; Grenard, Ames, Wiers, Thush, Stacy & Sussman, 2006). Whereas our BI model is based on the expectation that it is best applied to youth with a mild-to-moderate level of drug involvement, we did not find any effect of baseline drug use problem severity on outcome. Thus, a BI may be useful for adolescents within a broad range of drug involvement. Future research on BIs would benefit from further studying the complexity of drug involvement by teenagers, including extent and patterns of dependence symptoms, as well as the possible link of comorbid conditions and psychosocial characteristics on outcome.

There are two additional noteworthy trends in the data. The pattern of results suggests that the BI program had its largest effect on cannabis use and not alcohol. This finding is not

attributable to differences in baseline use levels; the number of use days for each drug was equivalent for both drugs within each intervention group. The negligible longer-term intervention effects with respect to alcohol use might be related to teenagers' tendency to minimize the risks of alcohol use compared to other drugs. Also, the 12-month findings on abstinence bring to light the potential limitations of BIs. The abstinence rates of alcohol and cannabis across the two active conditions at the 12-month outcome data point ranged 31% to 56%, although these rates did exceed those for the control group (6% and 13%). Nonetheless, a realistic perspective regarding the impact of a brief counseling experience, as well as MI, on teenage drug use is that it may have a greater role in reducing drug use than stopping it altogether (Walker et al., 2011).

In terms of mechanisms of change, we replicated a prior finding at 6-months outcome (Winters et al., 2012) in that extended outcome was mediated by utilization of additional counseling services. Also, we found that motivation to change and parenting practices mediated outcome. Thus, the present study suggests that a brief intervention that focuses on recognizing the need to change behaviors, positive parenting practices and encouragement for the youth or family to seek additional services contributes to beneficial drug use outcomes. The general nature of the study does not permit us to identify specific mechanisms associated with these mediators, but the motivational interviewing and CBT components of the intervention may have influenced the youth motivation. Also the mediating role of both utilization of additional services and parenting on outcome suggests that the parent involvement in the BI-AP group provides a positive boost to reduced adolescent drug use. The favorable impact of including parents in the intervention is consistent with the general adolescent drug treatment outcome literature (e.g., Henderson, Rowe, Dakof, Hawes, & Liddle, 2009; Tanner-Smith et al., 2012) and parent involvement has also been found in the brief intervention format. Spirito and colleagues (Spirito, Sindelar-Manning, Colby, Barnett, Lewander, et al., 2011) observed somewhat better outcomes in terms of reduced high-volume drinking in the group that had a family session added to the brief motivational interview compared to condition that had just brief motivational interview. However, the impact of additional service utilization is dependent upon the availability of local services for the family to access. This variable may not have exerted influence on outcome if the study had been conducted in a region without relatively numerous health services available for adolescents and families.

It is noteworthy that while statistically significant, the mediation effect sizes for use of additional services, motivation to change and parenting are modest, particularly when compared it to the effect sizes associated with the outcome data. This point supports the notion that other factors are influencing outcome.

Contrary to the 6-month follow-up report (Winters et al., 2012), the 6-month measure of problem solving (PSI) did not mediate 12-month outcome. However, the pattern of correlations within group between the 6-month PSI and the 12-month outcome variable used in the mediation analysis suggest that problem solving skills had some role with outcome in the expected direction (BI-A, $r = -.55, p < .001$; BI-AP, $r = -.47, p < .001$; and CON, $r = .27, p = .11$).

Several areas of future research are suggested by this study. More work is needed to see to what extent different forms of BIs are related to outcome. Such features include individual vs. group administration, use of booster sessions, setting (e.g. primary care clinic, juvenile detention center), and the role of parent involvement. Regarding the later issue, some success has been observed with home-based prevention programs delivered by parents (e.g., Griffin, Samuolis, & Williams, 2011); the present research team is studying a version of a BI in which the parent is trained to be the interventionist and administers the program in the home (Winters, in press). Also, the generalizability of the use of BIs will be enhanced when more diverse samples are used in research studies and greater methodological or stronger research designs are utilized, (e.g., use of BIs with a stepped care approach). A related area for future research is the notion of adapting the BI content based on pre-intervention characteristics; Conrad and colleagues (Conrod, Castellanos & Mackie, 2008) found that an intervention was the most effective for youth with a sensation seeking personality profile. Our research suggests that the intervention program could be personalized based on pre-intervention problem solving skills (youth) and parenting practices (parent). For example, youth with more severe problem solving deficits may benefit from an expanded version of BI-A that focuses more heavily on problem solving skills, whereas youth with less deficits may only need the 2-session version of BI-A.

There are several study limitations to consider. The sample sizes are not large, and our adolescent and parent participants are predominately white, middle class and suburban. There was some attrition (10%) at the 12-month follow-up data point, although the attrition group did not differ from the follow-up group on any intake drug use problem severity variables. The findings might not apply in non-school settings; participants were enrolled based on the student having been identified by the school as having a drug problem, a context that may differ from other settings (Winters, Leitten, Wagner, & O'Leary Tevyaw, 2007). Also, the follow-up period extended to 12-months post intervention and thus we do not know if brief counseling can sustain significant longer-term outcomes; there are some indications that the effects of BI do not extend long-term (e.g., Wutzke et al., 2002). Other limitations include the non-traditional setting in which the BI-AP session was conducted (school, library, or parent's home) may have impacted outcome for this condition; the number of sessions between groups was not equated (although they were for youth); and students were not randomized to one of the three conditions in identical contexts (the assessment only control group was recruited later than the two intervention groups). Also the outcome and mediation variables were based on self-report. One cannot rule out that the self-report data may reflect inaccuracies.

In sum, our research adds to the literature in several ways: We compared two variants of an indicated brief intervention; relatively long term (12-months) post-intervention outcome data on alcohol and cannabis use behaviors were reported; and we examined possible mediators of change. The study findings indicated a general pattern of reductions in drug use behaviors at 12-months post-intervention, particularly with the cannabis outcome measures, in two conditions of a brief intervention. Among four mediating variables measured at 6-months, motivation to change, use of additional services, and parenting practices had significant influences on 12-month outcome, and problem solving skills approached significance as a mediator. The study adds to the growing literature that supports the potential value of this

approach as an indicated preventive intervention for mild-to-moderate drug abusing adolescents.

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(1) **(2)**

Figure 1. Mediation model for intervention effect on drug use days at 12 months: (1) total effect (c) and (2) direct effect (c') and indirect effect (ab).

Table 1**Participant Characteristics (N=284)¹**

Variable	Group		
	BI-A	BI-AP	Control
N	122	114	48
% Male	45.1	56.1	45.9
% White	69.7	77.2	64.6
% Cultural Minority ²	30.39	22.8	35.4
Mean age, intake	16.1	15.7	16.4
SD age	1.5	1.3	1.4
% Alcohol Abuse/Orphan diagnosis ³	35.2	37.7	38.9
% Alcohol Dependence diagnosis	34.3	28.2	44.4
% Cannabis Abuse/Orphan diagnosis ³	16.4	16.2	22.2
% Cannabis Dependence diagnosis	57.8	63.2	53.7
% Other Abuse/Orphan diagnosis ³	11.7	9.4	11.1
% Other Dependence diagnosis ⁴	13.3	13.7	14.8
% with prior drug treatment	10.2	7.7	11.3
% additional services at 12-months ⁵	9.8	18.4	4.2
<i>Personal Experience Screening Questionnaire</i> score; M (SD) ⁶	39.4 (9.8)	38.1 (9.9)	38.6 (9.3)
<i>SOCRATES</i> ; M (SD) ⁷	8.2 (4.8)	8.9 (4.0)	6.2 (4.6)
<i>Problem Solving Inventory</i> ; M (SD) ⁷	17.8 (4.0)	18.5 (3.7)	17.2 (3.9)
<i>Alabama Parenting Questionnaire</i> ; M (SD) ⁷	45.2 (13.1)	50.7 (15.5)	46.7 (12.8)
<i>Utilization of Additional Services</i> ; M (SD) ⁷	0.7 (1.3)	1.1 (1.2)	0.2 (0.7)

Notes. All diagnoses refer to prior year. BI-A = brief intervention, 2 sessions adolescent only; BI-AP = brief intervention, 2 sessions adolescent, and 1 session parent; Control = assessment only control group. Prior treatment of student assessed from parent and could include any type of drug treatment, including participation in self-help groups. The groups did not differ on any background characteristics.

¹Total sample enrolled was 315; 284 is the sample size with 12-month outcome data.

²Breakdown of cultural minority group for total sample as follows: Asian, 3.2%; African American, 11.3%; Hispanic, 6.3%; Native American, 4.9%; Other/Mixed, 2.5%.

³Includes diagnostic orphans (see text for definition). Breakdown by diagnosis: 6 assigned to alcohol abuse; 7 assigned to cannabis abuse; 3 assigned to other drug abuse.

⁴Most common other drug was amphetamines.

⁵Based on TSR parent report at the 12-month follow-up, percent of families that received some additional services for their son or daughter during the prior 6 months.

⁶Cronbach's coefficient alpha = .93. Range: 18-72. Cut score equal to or greater than 26 required for study inclusion.

⁷Data on these mediating variables pertains at the six-month follow-up.

Table 2

Absolute Outcome Findings (12-months Follow-Up) by Group

Group	% abstinent for 90 days at 12 mths., alcohol	% abstinent for 90 days at 12 mths., cannabis	% at 12 months with no alcohol abuse symptoms	% at 12 months with no alcohol dependence symptoms	% at 12 months with no cannabis abuse symptoms	% at 12 months with no cannabis dependence symptoms
BI-A	30.6	42.6	71.3	56.5	59.3	62.0
BI -AP	42.3	56.4	62.8	57.9	53.2	60.3
Control	6.3	12.5	66.7	56.3	43.8	25.0
X^2 ($df = 2$)	8.5 **	11.1 **	1.5	0.1	1.7	8.1 *
effect size ¹	.20	.23	---	---	---	.20

Notes. Time frame for abstinence measures, prior 90 days; time frame for abuse and dependence symptoms, prior 6 months. BI-A = brief intervention, 2 sessions adolescent only; BI-AP = brief intervention, 2 sessions adolescent, and 1 session parent; Control = assessment only control group.

¹ Effect size = Contingency Coefficient.

**
 $p < .01$

*
 $p < .05$

Table 3

Relative Outcome Findings (Intake to 12-months Follow-Up) by Group

Variable	BI-A		BI-AP		Control		Group $\times$ Time ^f	SNK post-hoc significant results for 12-month outcomes ($p < .05$)
	M	SD	M	SD	M	SD		
# alcohol use days-intake	2.5	1.4	2.6	1.4	3.1	1.4		
# alcohol use days-12 months	2.4	0.5	2.4	0.5	2.5	0.5	ns	
# cannabis use days-intake	3.0	1.7	3.5	1.7	3.8	1.7		
# cannabis use days-12 months	2.7	1.8	2.4	1.9	3.7	1.6	.04	BI-AP, BI-A < CON
# alcohol abuse symptoms-intake	2.5	1.2	2.5	1.2	3.3	0.8		
# alcohol abuse symptoms-12 months	1.5	1.5	1.5	1.5	1.7	1.7	ns	
# alcohol dependence symptoms-intake	2.7	1.1	2.6	0.9	3.2	1.2		
# alcohol dependence symptoms-12 months	1.7	1.4	1.7	1.5	1.9	1.7	ns	
# cannabis abuse sym.-intake	2.9	1.4	2.9	1.3	3.5	1.0		
# cannabis abuse sym.-12 months	1.7	0.9	1.7	0.9	2.3	1.1	ns	
# cannabis dep. sym.-intake	2.5	1.1	2.8	1.2	3.0	0.9		
# cannabis dep. sym.-12 months	1.7	0.9	1.8	0.9	2.7	1.3	.03	BI-A, BI-AP < CON
PCS-intake	15.9	5.3	15.0	4.1	15.5	3.5		
PCS-12 months	12.4	2.5	12.6	2.6	14.7	3.8	.04	BI-AP, BI-A < CON

Notes. SNK = Student Newman Keuls post hoc comparisons for 12-month outcome. All Time effects were significant ($p < .01$). The variables pertaining to alcohol and cannabis use days refer to the prior 90 days; the variables for abuse and dependence symptoms and the PCS (Personal Consequences Scale) refer to prior 6 months. Use days and count of abuse and dependence symptoms transformed; see text for details. PCS range, 11-44. BI-A = brief intervention, 2 sessions adolescent only; BI-AP = brief intervention, 2 sessions adolescent, and 1 session parent; Control = assessment only control group.

^f Eta squared for the Group $\times$ Time (12 month) interaction, with PESQ as covariate.

Table 4

Variables Included in the Four Mediation Analysis Models

	Predictor	Mediator	Criterion
Model 1	(BI-A & BI-AP) vs. Control	Stages of Change	Drug use days
Model 2	(BI-A & BI-AP) vs. Control	Problem Solving	Drug use days
Model 3	BI-AP vs. (BI-A & Control)	Parenting	Drug use days
Model 4	BI-AP vs. (BI-A & Control)	Additional Services	Drug use days

Notes. BI-A = brief intervention, 2 sessions adolescent only; BI-AP = brief intervention, 2 sessions adolescent, and 1 session parent; Control = assessment only control group. Models 1 and 2 address youth mediators (stages of change and problem solving) presumed to be affected by both the BI-A and BI-AP groups; Models 3 and 4 pertain to parent mediators (parenting and additional services) presumed to be affected by only the BI-AP group.

Table 5

Path coefficients for the mediation models

Model	<i>a</i> path Coeff. (SE)	<i>b</i> path Coeff. (SE)	Total effect <i>c</i> path Coeff. (SE)	Direct effect <i>c'</i> path Coeff. (SE)	<i>R</i> ²
Model 1	2.63 (.81) **	−0.07 (.03) *	−1.72 (.35) ***	−1.54 (.36) ***	.12 ***
Model 2	0.06 (.68)	−0.23 (.03) ***	−1.71 (.35) ***	−1.70 (.32) ***	.26 ***
Model 3	6.19 (2.70) *	−0.02 (.01) **	−0.68 (.29) *	−0.54 (.29)	.06 ***
Model 4	0.22 (.04) ***	−0.94 (.44) *	−0.84 (.28) **	−0.64 (.30) *	.06 **

Notes. Coeff = coefficient; SE = standard error. For path information (*a-c'*) see Figure 1.

Model 1 mediator = stages of change; Model 2 mediator = problem solving; Model 3 mediator = parenting; Model 4 mediator = additional services.

*
 $p < .05$

**
 $p < .01$

 $p < .001$.

Table 6

Indirect Effect of Intervention on Drug Use Outcome at 12 month

Model (mediator)	Point Estimate	SE	Bootstrap BC 95% CI	
			Lower	Upper
Model 1 (stages of change)	−0.180	0.095	−0.431	−0.035
Model 2 (problem solving)	−0.013	0.152	−0.309	0.284
Model 3 (parenting)	−0.137	0.075	−0.321	−0.033
Model 4 (additional service)	−0.204	0.104	−0.441	−0.011

Note. BC 95% CI = bias corrected 95% confidence interval, SE = standard error.