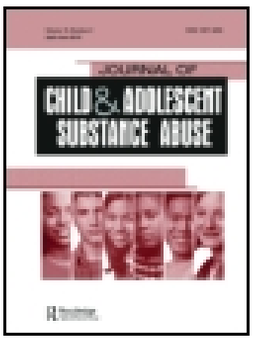

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Long-Term Outcome of a Brief Intervention to Address Adolescent Drug Abuse in a School Setting

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ABSTRACT

The present study used data from a randomized controlled trial on brief interventions with adolescents to identify distinct longitudinal patterns of substance use and identify predictors, as well as outcomes associated with those use patterns. Data were originally collected for the purpose of evaluating two brief intervention conditions with adolescents who had been identified in a school setting as abusing alcohol or other drugs (total sample, $N = 315$). Adolescents were randomly assigned to a two-session adolescent-only brief intervention (BI-A), a two-session adolescent-plus an additional parent session (BI-AP), or an assessment-only control session (CON). We located 74 participants to assess them at approximately 3.5 years post-intervention. Three distinct cluster patterns were identified, including a low decreasing, moderate increasing, and high decreasing pattern of use. The low decreasing cluster was associated with the BI-A condition, mono-substance use, and comorbid anxiety symptoms at baseline. The moderate increasing cluster was associated with the BI-AP condition, polysubstance use, and comorbid conduct disorder symptoms at baseline. No variables were found to be predictive of membership within the high decreasing cluster. There were also no differences found between clusters on adjustment outcomes in young adulthood. Overall findings from this study support the long-term efficacy of a brief intervention, without parent involvement, for adolescents experiencing mild to moderate substance abuse problems. Findings also highlight the importance of early intervention and the tailoring of interventions to meet the unique needs of adolescents.

KEYWORDS

adolescent; brief intervention; long-term outcome; substance abuse

Introduction

Adolescent substance use continues as one of the most serious health problems in the United States (Feinstein, Richter, & Foster, 2012). The use of alcohol and other drugs during adolescence interferes with normative developmental processes and increases risk for a host of adverse consequences, including substance use disorders, academic difficulties, physical, emotional, and mental health-related problems, as well as delinquency or involvement with the law (Brook, Stimmel, Zhang, & Brook, 2008; Englund et al., 2013). Moreover, the younger an individual is when he or she begins using drugs, the greater the risk of developing a substance use disorder later in adolescence and in later stages of life (e.g., Anthony & Petronis, 1995; Winters & Lee, 2008). Efforts have been made to address adolescent drug involvement before problems progress or increase in severity, and brief interventions are such an approach that have received widespread empirical attention (Marlatt & Witkiewitz, 2002; Monti, Colby, & O'Leary, 2001). Unlike more traditional programs, which are based on an abstinence model of treatment, brief interventions typically take a harm or risk reduction approach by recognizing that reducing drug use and avoiding use in risky situations are viable goals. Whereas abstinence may be the end result of an intervention, it is not considered necessary or essential for a successful intervention outcome.

At a general level, brief interventions are appealing in that they are brief (one to five sessions), cost-effective, can be easily taught to service providers, and delivered across a wide range of settings (Winters, 2016). Their attractiveness for adolescents is enhanced in that techniques and strategies within extant interventions have routinely been constructed around a developmental perspective and take into consideration factors such as adolescents' reactance to authority, susceptibility to peer influence and the use of addictive substances, as well as general likelihood of using alcohol and other substances in young adulthood (Carney & Myers, 2012; Monti et al., 2001; Winters, 2016).

Several reviews of the literature have concluded that brief interventions are effective in reducing substance use (Carney & Myers, 2012; Jensen et al., 2011; Tanner-Smith & Lipsey, 2015; Winters, 2016) and preventing or redirecting potentially hazardous drug use trajectories (Monti et al., 2001). Also, brief interventions have shown to be effective in reducing substance-related problems, such as alcohol-related

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injuries (Tait & Hulse, 2003; Tanner-Smith & Lipsey, 2015). Also, the existing brief intervention literature lacks attention on what variables moderate or mediate outcomes (Carney & Myers, 2012). Most extant brief intervention studies have focused exclusively on outcomes in relation to substance use and substance-related problems (Carney & Myers, 2012; Tanner-Smith & Lipsey, 2015). A more thorough understanding of what impacts outcomes will help the field to mature (e.g., provide insights to improve the efficiency and efficacy of this model). Thus, the present analysis included several predictor variables that have been consistently shown in the adolescent drug treatment outcome literature to be linked to long-term outcome (National Institute on Drug Abuse, 2014).

Despite growing empirical support for the efficacy of brief interventions with adolescents, there continues to be several unanswered research, including the effects of brief interventions when parents are involved, variables that moderate or mediate outcomes, and if positive outcomes are sustained over time (Carney & Myers, 2012). The present study aimed to extend findings on brief interventions with adolescents by analyzing long-term outcome (approximately 36 months) data from a longitudinal randomized controlled trial that evaluated the use of two brief intervention conditions with adolescents. The research program involved evaluating these programs for adolescents who had been identified in a school setting as abusing alcohol or other drugs. Adolescents and their parents were randomly assigned to receive either a two-session adolescent-only brief intervention, a two-session adolescent brief intervention with an added parent session, or an assessment-only control condition.

Each adolescent brief intervention session was characterized by motivational enhancement and cognitive-behavioral therapy components; exercises for these components include the decisional balance exercise, rating the readiness to change ruler, and problem solving. The parent session focused on strengthening parenting practices of support, discipline, and monitoring (see Winters, Fahnhorst, Botzet, Lee, & Lalone, 2012, for details). Data were gathered across four assessment points, including baseline, six-, 12-, and 36-month follow-up. At the six-month follow-up, adolescents in the two brief intervention conditions showed significantly better outcomes than those in the assessment-only control group, including lower levels of alcohol and cannabis use (days of use, abuse, and dependence symptoms), as well as drug-related consequences (Winters et al., 2012). Differences in outcomes were also observed between adolescents in the two brief intervention conditions. As indicated by Winters and colleagues (2012), "the additional one session with the parent was associated with enhanced outcome effects compared to those youth who received just the two adolescent sessions" (p. 8).

In a later publication on 12-month follow-up data, Winters, Lee, Botzet, Fahnhorst, and Nicholson (2014) found relatively similar results to findings at six-month follow-up, with participants in both the adolescent and parent condition evidencing superior outcomes compared to those in the assessment-only control group on cannabis use (use days, abuse, and dependence symptoms) and other drug-related consequences; no differences were observed in outcomes related to alcohol (use days, abuse, and dependence symptoms). Unlike six-month follow-up findings, no differences were found in the substance use outcomes of adolescents in the two brief intervention conditions. Overall findings provided support for the sustained positive effects of the two brief intervention conditions on adolescent substance use.

Using data from the randomized controlled study just described, this study had three primary objectives. The first objective was to identify distinct homogenous patterns of substance use over the 36-month follow-up period using a cluster analysis procedure. Given the extant literature, we hypothesized that three distinct cluster patterns of individuals would be identified: (a) a group with an increasing pattern of use; (b) a group with a decreasing pattern of use over time; and (c) a third group with minimal use or abstinence. The second objective was to identify predictive factors of these distinct cluster patterns of use. The primary predictor variable was the three-group condition that adolescents were assigned at the outset of the study (a two-session adolescent-only condition; a three-session condition with the same two adolescent-only sessions and an additional parent-only session; or an assessment-only control condition). It was hypothesized that adolescents in the two active brief intervention conditions would reveal better drug use outcomes than youths in the assessment-only control group. Other predictor variables were baseline measures of age of drug use onset, polysubstance use, psychiatric comorbidity, and parenting practices. More specifically, it was hypothesized that earlier age of drug use, more polysubstance use, more comorbidity, and poorer parenting practices would be associated with poorer outcome. The third objective was to identify between-substance use cluster differences on psychosocial outcomes measured at the last follow-up point—for which there is extant research linking substance use and psychosocial functioning (Center on Addiction and Substance Abuse at Columbia University, 2011): educational attainment, employment status, physical health, and legal involvement. It was hypothesized that lower levels of educational attainment, higher rates of unemployment, greater physical health problems, and more experience or involvement with law would be associated with poorer substance use outcomes.

Method

Participants

The present secondary data analysis was based on longitudinal data collected by the Center for Adolescent Substance Abuse Research (CASAR) at the University of Minnesota, between October 2005 and September 2011. A detailed description of the primary study participants and procedures is fully described elsewhere (Winters et al., 2012; Winters et al., 2014) and summarized here.

Data were originally collected for the purpose of evaluating two brief intervention conditions with adolescents (ages 13 to 19) who had been identified in a school setting as abusing alcohol or other drugs (Winters et al., 2012; Winters et al., 2014). A total of 315 subjects ($N = 315$; males = 52%; females = 48%) were included in the study, and most ($N = 283$) met *Diagnostic and Statistical Manual of Mental Disorders* (*DSM*-IV) criteria for an alcohol use disorder, cannabis use disorder, or both. Those ($N = 32$) who did not meet diagnostic criteria for a substance use disorder reported one or two symptoms of substance dependence. Subjects were randomly assigned to one of three conditions: a two-session adolescent-only brief intervention (BI-A); a two-session adolescent, plus an additional parent session with just the parent (BI-AP); or an assessment-only control session (CON). Data were collected using a comprehensive assessment battery across four points or waves, including baseline (wave 1), six months (wave 2), 12 months (wave 3), and approximately three years (wave 4 or 36-month) post-baseline follow-up.

And, of the 315 enrolled participants, 311 (99%) participated in at least wave 2 or wave 3 follow-up assessments, and 284 (90%) participated in both wave 2 and wave 3 assessments. The outcome results of these data have already been published (Winters et al., 2012; Winters et al., 2014). The focus of this article is the participants for whom wave 2 and 3 data were collected ($N = 284$) and for those assessed at wave 4 ($N = 74$; 23%). Characteristics of the study sample included the following: average age at baseline and at wave 4, 16.9 years ($SD = 1.1$; 15–19) and 20.8 years ($SD = 1.4$; 18–25), respectively; 56% women; and racial/ethnicity breakdown as follows: White, non-Hispanic, 79.7%; African-American, 6.8%; Hispanic, 6.8%; Native American, 2.7%; mixed race, 2.7%; and other, 1.4%. Intervention assignment was as follows: 32 in the adolescent-only BI group (BI-A; $N = 32$ [43.2%]), 30 in the adolescent plus parent BI group (BI-AP; $N = 30$ [40.5%]), and 12 in the assessment-only control group (CON; $N = 12$ [16.2%]).

Intervention groups

Both intervention groups (BI-A and BI-AP) were organized around the existing adolescent brief intervention literature, including motivational enhancement and cognitive-behavioral therapy techniques (Monti et al., 1999). The parent session in the BI-AP group was based on family therapy techniques (e.g., Liddle & Hogue, 2001). The two identical sessions for BI-A and BI-AP each sought to gather information about the student's history of substance use and related negative consequences; identify his or her stage of change; assess pros and cons of substance use; teach the youth about triggers of substance use; enhance the youth's skills to resist peer pressure and to make better decisions; and identify behavioral and attitudinal goals to promote health and well-being including the reduction or halting of drug use. Session 3 for BI-AP (just the parent) consisted of administering the same motivational enhancement strategies to the primary parent or guardian, with additional exercise aimed at improving parenting practices.

Measures

Overview of measuring substance use

Substance use was assessed at each wave using the Timeline Follow-Back interview procedure (TLFB; Sobell & Sobell, 1995). The TLFB has been found to be a reliable and valid self-report measure of substance use frequency. Subjects were asked at each assessment point to recall the number of days they had used alcohol, marijuana, and other illicit substances. At baseline, six-month, and 12-month follow-up, substance use was measured over the previous 90 days; at 36-month follow-up, it was measured over the previous year. For the purposes of the present study, all responses were standardized ($M = 50$, $SD = 10$) to provide an equivalent metric of substance use from baseline to 36-month follow-up.

Predictor variables

Five predictor variables—collected at baseline—were analyzed. All but two of these variables (i.e., group condition and parenting practices) were assessed with the Adolescent Diagnostic Interview (ADI; age of drug use onset, polysubstance use, and psychiatric comorbidity; Winters & Henly, 1993). The ADI is a structured interview designed to assess age of onset and history of drug use frequency (DUF), *DSM*-III-R and *DSM*-IV criteria for substance abuse and dependence, psychosocial stressors, and level of functioning, and screen for co-occurring behavioral disorders. The psychometric properties for these ADI sections are reported elsewhere. Briefly, these ADI components are associated with favorable test-retest reliability and several tests of concurrent validity (see Winters, Botzet, Anderson, Bellehumeur, & Egan, 2001; Winters, Latimer, & Stinchfield, 1999; Winters, Stinchfield, Fulkerson, & Henly, 1993).

Group condition. The intervention condition that subjects were randomly assigned at baseline was used as a predictor for the change trajectories. As previously noted, there were two intervention conditions (BI-A and BI-AP) and an assessment-only condition (for description of the groups, see Winters et al., 2012).

Age of onset. Age of drug use onset was measured on the ADI by one question that asked participants how old they were when they first used alcohol, marijuana, or any other illicit substance. For the present study, the earliest age of onset was dichotomized to differentiate between participants who first used substances *at or prior to the age of 15* and those who first used *at age 16 or older*.

Polysubstance use. Baseline ADI responses were recoded into a dichotomous variable, with yes (*polysubstance use*) or no (*monosubstance use*) categorization, delineating subjects who reported using multiple or only one category of

substances (alcohol, marijuana, or other illicit drugs) at baseline.

Co-occurring disorders. Based on screening items from the baseline ADI responses, the probable presence of these five co-occurring disorders was assessed: (a) depression, (b) mania, (c) attention deficit hyperactivity disorder (ADHD), (d) anxiety, and (e) conduct disorder. Subjects were asked to rate symptoms for each of the psychiatric disorders in a yes-or-no format. Responses to each disorder were summed (*yes* = 1; *no* = 0) to create five distinct interval-level variable measures of comorbidity (i.e., depression, mania, ADHD, anxiety, and conduct disorder). Total scores for each diagnostic category measure ranged from 0 to 6. This domain was also analyzed as an aggregate, interval-level variable, by summing scores on the five disorders previously listed, with the highest possible score being 30.

Parenting practices. All subjects were administered an abbreviated version of the child Alabama Parenting Questionnaire (APQ) at baseline (Elgar, Waschbusch, Dadds, & Sigvaldason, 2007; Shelton, Frick, & Wootton, 1996). Relative to the original 42-item, five-subscale questionnaire, the abbreviated version includes 28 items and three parenting subscales (parental monitoring, inconsistent discipline, and positive parenting). Subjects were asked to respond to items on a Likert scale ranging from 1 (*not at all*) to 3 (*more than a little*) based on interactions and experience with their parents over the previous six months. The 28-item responses were summed to create one composite interval-level variable as a measure of parenting practices. Three of the 28 items were reverse coded to allow for a summed total, ranging from 28 to 84, with higher scores indicative of more positive forms of parenting. The composite score has been "characterized by a single factor (eigenvalue = 6.3)" and found to be "associated with favorable internal consistency (alpha = .81)" (Winters et al., 2014, p. 466).

Psychosocial outcome variables

Four psychosocial outcome variables were analyzed. All were drawn from data collected at the 36-month follow-up point, using the Young Adult Follow-Up Interview (YAFUI; Winters, Realmuto, & August, 2002). The YAFUI is a structured interview that has been adapted from the ADI. As indicated by Winters and colleagues (2002), the YAFUI has been found to be associated with favorable inter-rater and test-retest reliability, as well as a wide range of validity data.

Educational attainment. Subjects were asked to rank their highest level of education on a 9-point Likert score, ranging from 1 (*less than high school degree*) to 9 (*graduate degree*). Responses were collapsed into three categories, including (a) less than a high school degree; (b) high school graduation or general equivalency diploma (GED); and (c) any postsecondary (some college; some vocational-tech; two-year degree; vocational-tech certificate or degree; four-year degree; graduate degree).

Employment status. Subjects were asked to mark their employment status from a list of seven categories for most or all of the period since they were last interviewed. The seven categories of responses were collapsed into three, including (a) unemployed; (b) part-time (student, work for pay, homemaker); and (c) full-time (student, work for pay, homemaker) employment. Subjects who marked more than one category of responses were classified under the category with the highest employment status, with responses ranging from low (*unemployed*) to high (*full-time*). Two part-time status responses were classified under full-time.

Physical health. Subjects were asked 11 yes-or-no questions about their physical health since the last time they were interviewed. Sample questions included: Did you have any kind of head injury or accident? Did you see a medical doctor at an outpatient clinic/office for an illness or injury? Were you hospitalized for a medical or physical problem? Responses were summed (*yes* = 1; *no* = 0) to create one interval-level variable as a measure of physical health, with scores ranging from 0 to 11.

Legal involvement. Subjects were asked 15 yes-or-no questions about their involvement with the law since the date at which they were last interviewed. Sample questions included: Have you been arrested? Have you been charged or convicted of a felony? Have you had a DUI/DWI? Responses were recoded into a dichotomous categorical variable with yes-or-no categorization, indicating whether the participant did (*yes* = 1) or did not have (*no* = 0) any involvement with the law since the date at which the person was last interviewed.

Data analysis

The present secondary analysis was longitudinal in nature, using a mixed between- and within-subjects design, with time as the repeated measures factor.

Patterns of substance use

The SPSS TwoStep Cluster Analysis procedure (Norusis, 2011) was used to identify longitudinal patterns of substance use from baseline to a 36-month follow-up. It was originally anticipated that the longitudinal patterns would be determined using expectation-maximization (EM) algorithm model-based clustering (Nagin & Odgers, 2010). After exploring the data, it was found that assumptions about the measurement scale for substance use frequency did not justify the EM approach, as frequency of use was not measured in a uniform way across all four waves of the study. The model-based EM approach was not used and instead was replaced by a conceptually similar clustering approach—the TwoStep clustering procedure. The TwoStep approach "extends the model-based distance measure to situations

that include both continuous and categorical variables" (SPSS, 2001, p. 2). An even more attractive feature of this clustering technique is that SPSS automatically computes the ideal number of clusters.

The SPSS TwoStep clustering procedure begins by breaking the total sample into micro-clusters containing highly similar cases based on a model-based statistical criterion (SPSS, 2001). Next, it groups these micro-clusters together, one at a time, to form groups with a maximum of eight cases in each. The algorithm then calculates an initial estimate for the ideal number of clusters based on a goodness-of-fit measure, and refines this estimate by finding the greatest change in the distance between various model sizes. It is important to note that although the TwoStep clustering approach automatically extrapolates, or computes, the ideal number of groups, this secondary researcher evaluated the cluster solution in light of previous findings within the research literature in order to ensure that the results represented meaningful strata.

Predictor variables

The second aim of this study was to identify predictors of cluster group membership. While intervention condition was the primary variable of interest, four other predictor variables were added in case the brief intervention was found to be insignificant. As such, the predictive values of five independent variables were analyzed for cluster membership, including (a) intervention condition (BI-A, BI-AP, CON), (b) polysubstance use, (c) age of drug use onset, (d) co-occurring disorders, and (e) parenting practices.

To assess the predictive value of *intervention condition*, participants were divided into the original groups they were assigned at baseline, which included three levels of between-group treatment factors: BI-A (adolescent only), BI-AP (adolescent + parent), and CON (assessment-only control). Treatment, or intervention condition, was considered the independent variable and substance use cluster was the dependent variable. Since both the independent and dependent variable were categorical, a chi-square test for independence was utilized.

A chi-square test for independence was also performed to examine the association, or predictive value, of *polysubstance use* (yes-or-no categorization) and *age of drug use onset* (≤ 15 *or* ≥ 16)—two categorical variables, each with two factor levels. A one-way analysis of variance (ANOVA) was used to assess the predictive value of *co-occurring disorders* and *parenting practices*. This approach compares means of three or more groups on one continuous level variable. Given the continuous nature of the co-occurring disorder and parenting practice scores, as well as the anticipated three-cluster solution, a one-way ANOVA was considered the most suitable statistical procedure to analyze the predictive value of these variables.

Psychosocial outcome variables

The third and final aim of this study was to assess group differences on the four psychosocial outcomes at 36-month follow-up. A chi-square test for independence was performed to analyze differences between the substance use clusters on *educational attainment* (high school degree; high school degree or GED; any postsecondary), *employment status* (full-time; part-time; unemployed), and *legal involvement* (yes; no)—three categorical variables. A one-way ANOVA was used to evaluate between cluster differences on *physical health*—a continuous interval-level variable.

Power and effect size

Statistical power was analyzed using a general power analysis software program, known as G*Power, to detect range of possible effect size for predictor and outcome variables (Faul, Erdfelder, Lang, & Buchner, 2007). The sample size of 74, combined with a repeated measure with four time points, yielded an estimated statistical power of .88 (88%) to detect a medium effect size and .51 (51%) to capture a large effect size, as defined by the Cohen's *d* statistic. The results suggested that the statistical power was most likely in the adequate range of detecting a meaningful effect size.

Missing data consideration

A listwise deletion approach was used to handle missing data relating to item nonresponse. Listwise deletion, also known as *complete case analysis*, excludes any case with missing values from the analysis (Graham, 2009). In order for this approach to be used, the data must be determined to be missing completely at random (MCAR). While it is difficult to determine the exact reason for missing data, a review of data within the present analysis supported randomness of the missing values.

Results

Preliminary analyses

Statistical tests on baseline variables were conducted to assess for attrition bias by comparing the sample of participants included within the present analysis ($N = 74$) to those not included ($N = 241$) due to attrition across one of the four waves of the primary study. Results revealed statistically significant between-group differences in baseline alcohol abuse, $t(313) = 1.972$, $p = .049$, and dependence symptoms, $t(313) = 2.306$, $p = .022$, with participants in the present analysis evidencing higher mean symptom counts of alcohol abuse ($M = 4.59$, $SD = 3.37$) and dependence ($M = 4.99$, $SD = 3.54$) than those not included within the present analysis (abuse, $M = 3.72$, $SD = 3.32$; dependence, $M = 3.87$, $SD = 3.67$). No significant between-group differences were observed on baseline symptoms for cannabis abuse, $t(313) = .053$, $p = .958$, and dependence, $t(313) = .765$, $p = .445$.

There was also no significant difference between groups in relation to gender composition, $X^2(1, N = 315) = 1.338$, $p = .247$. There was a significant difference in age, $t(313) = 4.75$, $p = .000$, with participants in the present analysis being on average one grade level above, or older ($M = 11.32$,

SD = .92), than those not included (*M* = 10.44, *SD* = 1.52). There was also a statistically significant difference observed in ethnicity (White versus other), with the present study sample including more participants from Caucasian/White backgrounds than the sample of participants not included within this secondary investigation, $X^2(1, N = 315) = 1.338$, $p = .247$.

Patterns of substance use

The TwoStep cluster analysis procedure generated a three-cluster solution, with a silhouette measure of cohesion and separation of 0.4; this measure suggested that the three-cluster solution was a fair-to-good estimate of the data structure (Norusis, 2011).

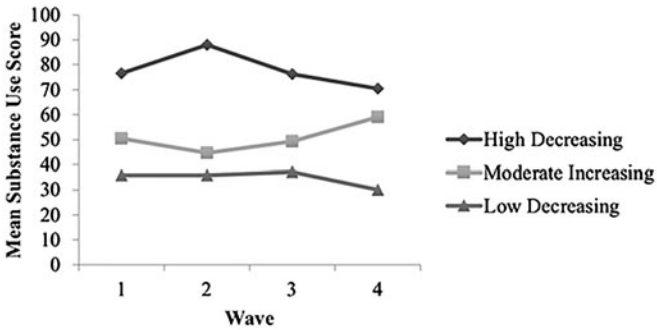

Figure 1. Patterns of substance use from baseline (wave 1) to 36-month follow-up (wave 4): Results of TwoStep cluster analysis.

The three substance use clusters, as depicted in Figure 1, evidenced distinct homogenous patterns of substance use from baseline to 36-month follow-up. Table 1 provides the mean standardized substance use scores for each cluster across the four waves. Cluster 1, labeled *low decreasing*, was comprised of 29 participants (*N* = 29) from the original total sample of 74 (*N* = 74). Participants within this cluster showed a longitudinal pattern of minimal or low severity use, with a decrease in use over time. Cluster 2, labeled *moderate increasing*, included a total of 30 participants (*N* = 30); those within this cluster evidenced an overarching pattern of moderate severity use with increases over time. Cluster 3, labeled *high decreasing*, included a total of 15 participants (*N* = 15); participants within this cluster evidenced a longitudinal pattern of high severity use, followed by gradual decreases in use over time. Table 2 provides an overview of participant characteristics by cluster.

Predictor variables

Group condition

There was no statistically significant relationship observed between intervention condition and the cluster patterns of substance use, $X^2(4, N = 74) = 8.234$, $p = .083$. Although the results were not significant at the alpha level of 0.05, the *p*-value was less than 0.10. The effect size value, as measured by Cramer's V, was suggestive of moderate practical significance (V = .236).

Table 1. Mean standardized substance use scores.

	Time			
Cluster	1	2	3	4
Low Decreasing[a]	35.84 (10.17)	35.86 (7.53)	37.19 (6.37)	30.09 (8.10)
Moderate Increasing[b]	50.39 (15.65)	44.65 (13.36)	49.23 (16.51)	59.03 (16.09)
High Decreasing[c]	76.58 (23.75)	88.03 (20.80)	76.32 (34.48)	70.44 (24.57)

Note. Scores have been standardized to a scale with a mean of 50 and standard deviation of 10. Standard deviations are in parentheses, *M*(*SD*).
[a]*N* = 29.
[b]*N* = 30.
[c]*N* = 15.

Table 2. Participant characteristics by cluster (%).

Characteristics	Low Decreasing[a]	Moderate Increasing[b]	High Decreasing[c]
Gender			
Male	31	53.3	53.3
Female	69	46.7	46.7
Ethnicity			
African-American	10.3	6.7	
Hispanic	10.3	6.7	
Native American		6.7	
Caucasian	79.3	73.3	93.3
Other		6.7	6.7
Intervention Condition			
BI-A	55.2	26.7	53.3
BI-AP	27.6	60	26.7
CON	8.5	13.3	20

Note. BI-A = brief intervention, two sessions adolescent only; BI-AP = brief intervention, two sessions adolescent, and one session parent; CON = assessment-only control group.
[a]*N* = 29.
[b]*N* = 30.
[c]*N* = 15.

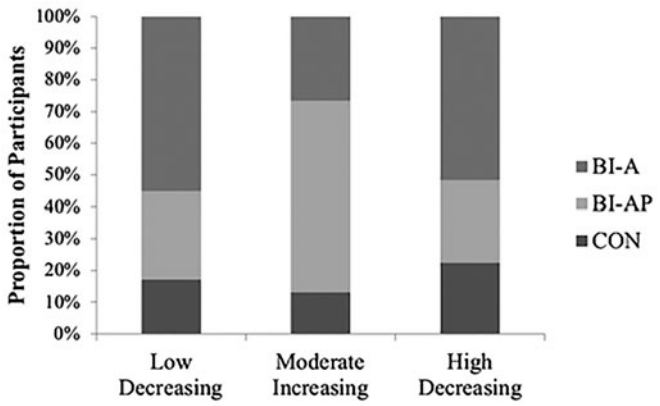

Figure 2. Proportion of participants from original intervention condition within each cluster. BI-A = brief intervention, two sessions adolescent only; BI-AP = brief intervention, two sessions adolescent, and one session parent; CON = assessment only control group.

A follow-up chi-square one-sample test was conducted to help determine whether there was significant variability in the distribution of participants within each cluster. A statistically significant finding was observed relative to the distribution of participants within the low decreasing, $X^2(2, N=29) = 6.68$, $p = .035$, and moderate increasing cluster, $X^2(2, N=30) = 10.4$, $p = .006$. As depicted in Figure 2, there were significantly more participants originally assigned to the BI-A condition in the low decreasing group and significantly more originally assigned to the BI-AP condition in the moderate increasing cluster, as compared to the other two intervention conditions. While there was also variability observed in the distribution of participants within the high decreasing cluster, this variability was not greater than what would have been expected simply by random chance, $X^2(2, N=15) = 2.8$, $p = .25$.

Age of onset

No significant difference was observed in the substance use patterns of participants who first used substances at or prior to the age of 15 and those who first used at age 16 or later, $X^2(2, N=74) = .425$, $p = .809$. The value of the effect size, as measured by the phi coefficient (□ = .076), was also suggestive of low practical significance.

Polysubstance use

There was no statistically significant relationship observed between cluster membership and polysubstance use at baseline, $X^2(2, N=74) = 5.48$, $p = .064$; however, a moderate effect size value was observed with a phi coefficient of .272 (□ = .272).

Within each cluster there were significantly more participants with poly- than mono-drug use (low decreasing, $X^2(1, N=29) = 11.18$, $p = .0008$; moderate increasing, $X^2(1, N=30) = 24.3$, $p < .0001$; high decreasing, $X^2(1, N=15) = 13.06$, $p = .0003$). Across the three clusters, the largest proportion of participants with mono-use fell within the low decreasing cluster, accounting for 17% ($N=5$) of the total cluster sample ($N=29$). For the moderate increasing ($N=30$) and high decreasing ($N=15$) clusters, mono-use accounted for three ($N=1$) and zero ($N=0$) percent of the cluster samples, respectively.

Co-occurring disorders

The analysis of variance showed no statistically significant difference between the three clusters on baseline symptom scores for the following five disorders: (a) *depression*, $F(2, 59) = .09$, $p = .914$, $\eta^2 = .003$; (b) *mania*, $F(2, 59) = .493$, $p = .614$, $\eta^2 = .016$; (c) *ADHD*, $F(2, 59) = .465$, $p = .63$, $\eta^2 = .016$; (d) *anxiety*, $F(2, 59) = 2.878$, $p = .064$, $\eta^2 = .089$; and (e) *conduct disorder*, $F(2, 59) = 1.901$, $p = .158$, $\eta^2 = .061$. While none of the results were significant at the alpha level of 0.05, two of the five disorders had a moderate effect size value, as measured by eta squared; specifically, anxiety ($\eta^2 = .089$) and conduct disorder ($\eta^2 = .061$). Co-occurring disorders was also analyzed as a single composite variable, using the one-way ANOVA approach, and found to be statistically insignificant, $F(2, 59) = .748$, $p = .478$, $\eta^2 = .025$. The results of these analyses suggested no significant difference between the three clusters on the five individual comorbid disorders or comorbidity as a whole. The reader is recommended to review these results with caution due to missing data for 12 ([16%]; low decreasing, $N=5$; moderate increasing, $N=4$; high decreasing, $N=3$) of the total 74 participants included within the data set.

Parenting practices

The analysis of variance showed no statistically significant difference in the parenting practice mean scores of participants among the three clusters, $F(2, 58) = 1.47$, $p = .238$ (low decreasing, $M=47.33$, $SD=13.14$; moderate increasing, $M=48.43$, $SD=12.29$; high decreasing, $M=41.86$, $SD=7.16$). The effect size value ($\eta^2 = .048$) was also suggestive of low practical significance. The reader is also advised to review these results with caution due to missing data values for 18 ([24%]; low decreasing, $N=5$; moderate increasing, $N=7$; high decreasing, $N=1$) of the 74 participants included within the total study sample.

Psychosocial outcome variables

None of these variables (educational attainment, employment status, physical health, and legal involvement) showed statistically significant differences among the three substance use clusters.

Discussion

The present study used long-term outcome data from a randomized controlled trial to evaluate the use of two brief intervention conditions with adolescents who had been identified in a school setting as abusing alcohol or other drugs. Only data from study participants with data across all four waves were analyzed. The study's significance is that long-term follow-up studies of brief interventions are rare. A TwoStep cluster analysis procedure produced three distinct cluster groupings, each with a homogenous pattern of

substance use from baseline to 36-month follow-up (increasing pattern of use, decreasing pattern of use, and minimal use or abstinence). These clusters suggest that for some youths, a limited, brief intervention may appear to have more favorable effects in the short term than is the case for longer-term effects. In this light some adolescents may require booster sessions or other aftercare services (Winters et al., 2018). This line of thinking is starting to gain momentum with respect to the value of types of aftercare and continuing care sessions for preventive interventions (Kaminer, Godley, Winters, & Bagot, in press).

Among the five predictive variables (age of drug use onset, polysubstance use, co-occurring disorders, parenting practices, and group condition), group condition was found to have a moderate effect on cluster membership. Subgroup analyses revealed statistically significant differences in the proportion of participants from the two intervention conditions (BI-A and BI-AP) within two of the three cluster groups. Within the low decreasing cluster, there were significantly more participants from the BI-A group than BI-AP or CON groups, and within the moderate increasing cluster, there were significantly more participants from the BI-AP group than BI-A or CON.

The results provided partial support for the hypothesis that participants who received the brief intervention experienced better long-term substance use outcomes compared to those in the assessment-only condition.

However, the results provide less support for the incremental long-term effects of a brief intervention when parents are involved. Those assigned to the BI-AP condition represented the largest proportion of participants within the moderate increasing cluster, which was the only cluster identified with a deteriorating pattern of use. This finding is inconsistent with the previously reported six-month outcome results (Winters et al., 2012) but consistent with the 12-month outcome finding (Winters et al., 2014). Participants in the BI-AP condition were hypothesized to reveal superior outcome by virtue of parents' gaining new parenting skills, or strengthening existing ones, which in turn would provide additional positive behavior change influences on the adolescent. Perhaps the positive, short-term effect (six months) of the parent is not sustainable with such a minimal dose of counseling (a single session).

Other analyses examined cluster membership and polysubstance use, age of drug use onset, parenting practices, and co-occurring disorders. There were no strong associations found in these analyses, although the co-occurring disorder variable merits more discussion. Whereas the aggregate variable for co-occurring disorders was not found to be statistically or clinically relevant, a meaningful difference was observed between clusters on symptoms of conduct disorder and anxiety. Subcluster analyses revealed that participants in the moderate increasing cluster had the highest average symptom count on conduct disorder and those within the low decreasing cluster had the highest average count on symptoms of anxiety. These associations are generally supported by extant research within the adolescent substance abuse literature demonstrating relationships between substance use and externalizing disorders (King, Iacono, & McGue, 2004) and internalizing disorders (Deas-Nesmith, Brady, & Campbell, 1998). However, regarding the latter, the evidence is mixed in that anxiety for some youths may serve as a protective factor for substance use (Colder et al., 2013).

We also examined differences between groups on various psychosocial outcome variables measured at the last follow-up point. Given results of previous studies, it was hypothesized that participants within the moderate increasing cluster would evidence poorer or worse outcomes than those within the high- and low-decreasing clusters—specifically, a lower level of educational attainment, higher rate of unemployment, greater physical health problems, and more experience or involvement with the legal system. Yet the four separate analyses indicated no significant or meaningful differences between groups on any of the four outcome variables. Although a relatively large amount of time had passed since the participants were first interviewed, perhaps an average age of about 21 years was not sufficient to identify any significant or meaningful differences between the groups. Young adults, similar to adolescents, are in the process of developing more of an adult-like identity and experimenting with different roles and ways of life. Few have yet made any serious commitments or decisions regarding their future. For the specific population used within the present study, few had even reached 21, the legal age for drinking in the state in which the study was conducted. If the groups had been compared at a later age, or stage of life, such as mid-to-late adulthood, it is hypothesized that a significant or meaningful difference would have been observed.

Conclusions and implications

In summary, results of this study clearly show that there are distinctive patterns of substance use from adolescence to young adulthood. Not all adolescents who are experiencing mild to moderate problems with substance use go on to develop a dependence disorder. In fact, results of this study suggest that only one subgroup of adolescents developed more severe problems with substance use over time. Of the majority that did not show this negative trajectory, a subset showed a gradual reduction in use from adolescence to young adulthood, and another subgroup maintained a relatively stable pattern of low decreasing use.

Results of the present study confirm the importance of intervening early in order to prevent the progression of adolescents' substance use. Whereas the study findings do not indicate superior longer-term outcomes for those youths whose parents were involved, we appreciate that in many instances parent involvement may be preferred (e.g., for younger teenagers). The study also highlights the importance of tailoring an intervention to meet the unique needs of adolescents. While a brief intervention seems to be effective for adolescents with mild to moderate substance use, it also seems less effective for those with more severe substance abuse problems. In fact, results of this study suggest that there are unique differences in the treatment needs of

adolescents who are abusing one versus two categories of substances, with those abusing multiple categories in need of more intensive treatment or interventions.

The results also suggest that tailoring interventions may promote effectiveness. For example, youths with a conduct disorder or an anxiety disorder may have different needs that are essential to consider when planning an intervention. For example, adolescents with a co-occurring disorder will benefit from personalizing content to address triggers and cravings specific to the youth's coexisting problem.

Overall, results of this study provide support for the positive effects of a brief intervention with adolescents. Given the brief, preventative, and cost-effective nature of these interventions, it is important that health care providers engage in regular screening and early intervention to address early use of substances during adolescence. Also, given that these interventions are easy to teach, policymakers should consider efforts to train educators and other providers in school settings (Winters, Leitten, Wagner, & O'Leary Tevyaw, 2007). As evidenced by the results of this study, schools are an effective setting to reach and deliver brief interventions to adolescents who are experiencing mild to moderate substance abuse problems.

Limitations

The previous findings need to be considered in light of methodological limitations. The most salient limitation is the study's small sample size that resulted from attrition. Many significant or meaningful findings may have been missed, and this issue also limited generalizability of the study findings. It is relevant to keep in mind that study participants ($N = 74$) were older in age and less diverse in terms of racial and ethnic background compared to those in the original BI study but not assessed at this last follow-up. Also, the alcohol findings need to be interpreted with caution given there were differences on baseline alcohol use variables between the attrition and contacted groups. However, the concern of a bias in the observed intervention effects is lessened given that the contacted group had a higher alcohol severity profile (significantly higher baseline scores on symptoms of alcohol abuse and dependence) than the attrition group at baseline. Thus, the study sample was not biased in the "less-severe" direction. It is also relevant to consider the statistical approach that was used to identify the distinctive patterns. Cluster analysis, while helpful in identifying subgroups of individuals, fails to effectively model the process of change and growth over the course of time. There are currently more sophisticated statistical procedures available to analyze longitudinal patterns. Group-based trajectory modeling is one such approach, which has been "designed to identify clusters of individuals, called trajectory groups, who have followed a similar developmental trajectory on an outcome of interest" (Nagin & Odgers, 2010, p. 111). This procedure has commonly been used within the adolescent substance abuse field to identify distinctive longitudinal patterns, or developmental pathways, of substance use following treatment for addictive disorders. But given the sample size, the cluster analysis is viewed as an acceptable approach. Also, the reporting on a 12-month period may be subject to poor recall, although this time period is a standard one in the field and has been shown to be associated with reliable information (Johnston & O'Malley, 1997; Maisto, Connors, & Allen, 1995).

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References

Anthony, J. C., & Petronis, K. R. (1995). Early-onset drug use and risk of later drug problems. *Drug and Alcohol Dependence*, *40*(1), 9–15.

Brook, J. S., Stimmel, M. A., Zhang, C., & Brook, D. A. (2008). The association between marijuana use and subsequent academic achievement and health problems: A longitudinal study. *The American Journal on Addictions*, *17*(2), 155–160. doi:10.1080/10550490701860930

Carney, T., & Myers, B. (2012). Effectiveness of early interventions for substance-using adolescents: Findings from a systematic review and meta-analysis. *Substance Abuse Treatment, Prevention, and Policy*, *7*(25), 1–15.

Center on Addiction and Substance Abuse at Columbia University (CASA). (2011). *Adolescent substance use: America's #1 public health problem.* Retrieved from http://www.casacolumbia.org/upload/2011/20110629adolescentsubstanceuse.pdf

Colder, C. R., Scalco, M., Trucco, E. M., Read, J. P., Lengua, L. J., Wieczorek, W. F., & Hawk, Jr. L. W. (2013). Prospective associations of internalizing and externalizing problems and their co-occurrence with early adolescent substance use. *Journal of Abnormal Child Psychology*, *41*, 667–677. doi:10.1007/s10802- 012-9701-0

Deas-Nesmith, D., Brady, K. T., & Campbell, S. (1998). Comorbid substance use and anxiety disorders in adolescents. *Journal of Psychopathology and Behavioral Assessment*, *20*(2), 139–148.

Elgar, F. J., Waschbusch, D. A., Dadds, M. R., & Sigvaldason, N. (2007). Development and validation of a short from of the Alabama Parenting Questionnaire. *Journal of Child and Family Studies*, *16*(2), 243–259. doi:10.1007/s10826-006-9082-5

Englund, M. M., Siebenbruner, J., Oliva, E. M., Egeland, B., Chung, C., & Long, J. D. (2013). The developmental significance of late adolescent substance use for early adult functioning. *Developmental Psychology*, *49*(8), 1554–1564. doi:10.1037/a0030229

Faul, F., Erdfelder, E., Lang, A., & Buchner, A. (2007). G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods*, *39*(2), 175–191.

Feinstein, E. C., Richter, L., & Foster, S. E. (2012). Addressing the critical health problem of adolescent substance use through heath care, research, and public policy. *Journal of Adolescent Health*, *50*(5), 431–436. doi:10.1016/j.jadohealth.2011.12.033

Graham, J. W. (2009). Missing data analysis: Making it work in the real world. *Annual Review of Psychology*, *60*(1), 549–576. Retrieved from http://www.stats.ox.ac.uk/∼snijders/Graham2009.pdf

Jensen, C. D., Cushing, C. C., Aylward, B. S., Craig, J. T., Sorell, D. M., & Steele, R, G. (2011). Effectiveness of motivational interviewing interventions for adolescent substance use behavior change: A meta-analytic review. *Journal of Counseling and Clinical Psychology*, *79*, 433–440. doi:10.1037/a0023992

Johnston, L. D., & O'Malley, P. M. (1997). The recanting of earlier reported drug use by young adults. *NIDA Research Monograph*, *167*, 59–80.

Kaminer, Y., Godley, M., Winters, K.C., & Bagot, K. (in press). From assessment reactivity through continuity of care: Defining goals and intervention outcomes. In Y. Kaminer and K.C. Winters (Eds.),

Clinical manual of adolescent addictive disorders (2nd ed.). Washington, DC: American Psychiatric Association.

King, S. M., Iacono, W. G., & McGue, M. (2004). Childhood externalizing and internalizing psychopathology in the prediction of early substance use. *Addiction*, *99*(12), 1548–1559. doi:10.1111/j.1360-0443.2004.00893.x

Liddle, H. A., & Hogue, A. (2001). Multidimensional family therapy for adolescent substance abuse. In E. F. Wagner & H. B. Waldron (Eds.), *Innovations in adolescent substance abuse interventions* (pp. 229–261). Amsterdam, Netherlands: Pergamon Press/Elsevier Science Inc.

Maisto, S. A., Connors, G. J., & Allen, J. P. (1995). Contrasting self-report screens for alcohol problems: A review. *Alcoholism: Clinical and Experimental Research*, *19*(6), 1510–1516. doi:10.1111/j.1530-0277.1995.tb01015.x

Marlatt, G. A., & Witkiewitz, K. (2002). Harm reduction approaches to alcohol use: Health promotion, prevention, and treatment. *Addictive Behaviors*, *27*(6), 867–886. doi:10.1016/S0306-4603(02)00294-0

Monti, P. M., Colby, S. M., Barnett, N. P., Spirito, A., Rohsenow, D. J., Myers, M., … Lewander, W. (1999). Brief intervention for harm reduction with alcohol-positive older adolescents in a hospital emergency department. *Journal of Consulting and Clinical Psychology*, *67*(6), 989–994. doi:10.1037/0022-006X.67.6.989

Monti, P. M., Colby, S. M., & O'Leary, T. A. (Eds.). (2001). *Adolescents, alcohol, and substance abuse: Reaching teens through brief interventions.* New York, NY: Guilford Press.

Nagin, D. S., & Odgers, C. L. (2010). Group-based trajectory modeling in clinical research. *Annual Review of Clinical Psychology*, *6*(1), 109–138. doi:10.1146/annurev.clinpsy.121208. 131413

National Institute on Drug Abuse. (2014). *Principles of adolescent substance use disorder treatment: A research-based guide*. Bethesda, MD: National Institute on Drug Abuse.

Norusis, M. J. (2011). Cluster analysis. In M. J. Norusis (Ed.), *IBM SPSS statistics 19 guide to data analysis* (pp. 375–404). Upper Saddle River, NJ: Prentice-Hall. Retrieved from http://www.norusis.com/pdf/SPC_v19.pdf

Shelton, K., Frick, P. J., & Wootton, J. (1996). Assessment of parenting practices in families of elementary school-age children. *Journal of Clinical Child Psychology*, *25*(3), 317–329.

Sobell, L. C., & Sobell, M. B. (1995). *Alcohol timeline followback users' manual*. Toronto, Canada: Addiction Research Foundation.

SPSS Inc. (2001). *The SPSS TwoStep cluster component: A scalable component enabling more efficient customer segmentation.* Chicago, IL: SPSS.

Tait, R. J., & Hulse, G. K. (2003). A systematic review of the effectiveness of brief interventions with substance using adolescents by type of drug. *Drug and Alcohol Review*, *22*(3), 337–346. doi:10.1080/0959523031000154481

Tanner-Smith, E. E., & Lipsey, M. W. (2015). Brief alcohol interventions for adolescents and young adults: A systematic review and meta-analysis. *Journal of Substance Abuse Treatment*, *51*, 1–18. doi:10.1016/j/jsat.2014.09.001

Winters, K. C. (2016). Brief interventions for adolescents. *Journal of Drug Abuse*, *2*(1), 1–3. Retrieved from http://drugabuse.imedpub.com/brief-interventions., & -For-Adolescents, pdf

Winters, K. C., Botzet, A., Anderson, N., Bellehumeur, T., & Egan, B. (2001). *Screening and assessment study*. Madison, WI: State of Wisconsin Department of Corrections, Division of Juvenile Corrections. Retrieved from http://uwphi.pophealth.wisc.edu/programs/evaluation-research/adis/winters-report.pdf

Winters, K. C., Botzet, A. M., Stinchfield, R., Gonzalez, R., Finch, A., Piehler, T., … Hemze, A. (2018). Adolescent substance abuse treatment: A review of evidence-based research. In C. Leukefeld, T. Gullotta & M. Staton Tindall (Eds.), *Adolescent substance abuse: Evidence-based approaches to prevention and treatment* (2nd ed., (pp. 141–171). New York, NY: Springer Science + Business Media.

Winters, K. C., Fahnhorst, T., Botzet, A., Lee, S., & Lalone, B. (2012). Brief intervention for drug-abusing adolescents in a school setting: Outcomes and mediating factors. *Journal of Substance Abuse Treatment*, *42*(3), 279–288.

Winters, K. C., & Henly, G. A. (1993). *Adolescent Diagnostic Interview schedule and manual.* Los Angeles, CA: Western Psychological Services.

Winters, K. C., Latimer, W. W., & Stinchfield, R. D. (1999). Validity of DSM-IV criteria for alcohol and marijuana use disorders in adolescents. *Journal of Studies on Alcohol*, *60*(3), 337–344.

Winters, K. C., & Lee, S. (2008). Likelihood of developing an alcohol and cannabis use disorder during youth: Association with recent use and age. *Drug and Alcohol Dependence*, *92*(1–3), 239–247. doi:10.1016/j.drugalcdep.2007.08.005

Winters, K. C., Lee, S., Botzet, A., Fahnhorst, T., & Nicholson, A. (2014). One-year outcomes of a brief intervention for drug abusing adolescents. *Psychology of Addictive Behaviors*, *28*(2), 464–474. doi:10.1037/a0035041

Winters, K. C., Leitten, W., Wagner, E., & O'Leary Tevyaw, T. (2007). Use of brief interventions in a middle and high school setting. *Journal of School Health*, *77*(4), 196–206. doi:10.1111/j.1746-1561.2007.00191.x

Winters, K. C., Realmuto, G., & August, G. J. (2002). *Young adult follow-up interview*. Minneapolis, MN: Department of Psychiatry, University of Minnesota.

Winters, K. C., Stinchfield, R. D., Fulkerson, J., & Henly, G. A. (1993). Measuring alcohol and cannabis use disorders in an adolescent clinical sample. *Psychology of Addictive Behaviors*, *7*(3), 185–196.