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Interplay of Psychosocial Factors and the Long-Term Course of Adolescents with a Substance Use Disorder

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Abstract

This paper examines the association of psychosocial factors and long-term drug use behaviors (year-5.5) among adolescents with a substance dependence disorder. One group received treatment with a 12-Step approach ($n = 159$) and one group was on a waiting list ($n = 62$). Four psychosocial factors (deviant behavior, peer drug environment, psychological disturbance and family estrangement), as measured by a standardized self-report questionnaire, were examined as predictors across three time points (year-1, year-4 and year-5.5). Improved outcome across time was significantly associated with decreases in deviant behavior, peer drug environment and family estrangement. However, psychological disturbance was not associated with outcome. Also, we did not find an effect on outcome as a function of age, gender and race. Youth that received treatment, as opposed to the waiting list youth, generally revealed a more favorable outcome across time. Treatment implications of the study findings are discussed.

Keywords

Adolescents; substance use disorders; treatment; long-term follow-up

INTRODUCTION

During the past two decades in the United States, a more developmental approach has taken hold when treating adolescents with a substance use disorder (SUD) (1). Also, the recovery from a SUD has been viewed within a developmental perspective in light of the influence from

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risk and protective factors, including genetic and environmental influences, along with treatment (including aftercare) experiences (2,3). Whereas some general treatment factors have been associated with treatment recovery for youth (4), there has been less work with respect to elucidating the risk and protective factors that reliably impact recovery (5). Identifying such factors that have a role in the recovery from a SUD can inform the development of treatments and of relapse prevention strategies so that pathways leading away from drug involvement can be maximized (5).

The present analyses builds on these two prior publications by exploring in more depth the nature and extent of the influence of psychosocial factors on long-term outcome among teenagers with a SUD, some of whom received a 12-Step treatment. We will focus on four psychosocial factors that we have measured at multiple times prospectively (year-1, year-4 and year-5.5) and for which there are strong theoretical and empirical justifications for expecting their impact on the course of drug use behaviors among youth. These factors are: deviant behavior, peer drug environment, psychological disturbance and family estrangement. To provide a proper context for the study aims, we provide a brief overview of the adolescent literature on the course of SUDs and the risk literature relevant to these four target psychosocial factors.

Course of SUDs Among Youth

Studies of the course of adolescent SUDs are critical to understanding etiology and to informing strategies in order to maximize a positive course. From an epidemiological standpoint, adolescent drug use may reflect experimentation that occurs as a normative developmental transition (6). But initiation of drug use during the teenage years has been associated with greater risk for developing a SUD compared to adult initiation (7,8). Many adolescent drug users particularly those with less severe drug problems, tend to mature out of problem drinking (9), whereas others show a more chronic course as the young person enters young adulthood (10,11). Multiple developmental trajectories of adolescent-onset drug use and problems exist (12,13); these trajectories identify several paths, some of which reflect persistent or continuous problems whereas other paths reflect problems that are more intermittent (14).

A related area of research pertains to the study of the course of drug involvement among youth who received treatment for a SUD by applying statistical clustering methods to longitudinal data (e.g., latent class growth modeling). The goals of these analyses are to identify the most common distinct trajectories, which differ in pattern of change in substance involvement over time, and to determine predictors and psychosocial outcomes associated with these longitudinal patterns of substance use. Once the prevalent trajectories have been identified, youths are assigned to the trajectory most similar to their own pattern of substance use over time.

Several longitudinal studies of adolescents have shown a remarkable degree of similarity in the trajectories of drug involvement following treatment as youth transition into young adulthood. These cross-study similarities have emerged despite regional differences in study location, type of substance examined (e.g., alcohol, marijuana, other drugs), and how substance involvement was defined (e.g., frequency of use, substance use problems). The post-treatment trajectories most commonly identified include these four groups: stable abstinence, infrequent use, gradually decreasing substance involvement ("slow improvers"), and persistent high substance involvement (10–12,15,16).

There is also a growing literature that has linked pre-treatment psychosocial factors and post-treatment outcome (e.g., 15–17). We provide a targeted overview below of four factors that have received attention in the clinical and epidemiological drug abuse literature and that are a

focus of the present study: deviant behaviors, peer drug use, psychological disturbance and family estrangement.

Deviant Behavior

Deviant behaviors, such as delinquency, violence, and vandalism, are strong positive predictors of substance use among teenagers (18–22). The onset of delinquent activity and other conduct problems tends to precede the onset of drug use (23–25). Prospective longitudinal research has shown that delinquency is a very significant positive predictor of continued drug-related problems (16,22,26,27). These findings are consistent with developmental theories that argue antisocial behavior provides an important pathway leading to the development of substance abuse and dependence (14,28). Prospective research reveals that antisocial behaviors in late childhood and the initiation of substance use in early adolescence predict later substance involvement (29,30). The relevance of CD and ODD for understanding adolescent SUD is reinforced by observations that elevated rates of these disorders have been reported among adolescents with SUD in community and clinical samples (31,32). However, complicating the understanding between temperament and SUD are findings indicating that substance use and SUD increase antisocial behaviors (33).

Peer Drug Environment

Adolescents who report having drug-using friends indicate higher levels of substance use compared to those who deny having drug-using friends (34), and peer attitudes about substance use and peer attachment have also been linked to adolescent drug involvement (35,36). The influence of peers on drug use is likely complex (37). The relationship between an adolescent's alcohol use and peers' alcohol use overtime has been found to be reciprocally influential (38), and peer and personal drug use may be associated as a result of underlying socialization and environmental influences, such as the shared propensity toward delinquency and role of drug use in friendship selection (i.e., already drug-using individuals may tend to select friends with similar habits) (37).

Psychological Disturbance

Psychological disturbance and its related disorders (i.e., anxiety disorders and mood disorders) may be another pathway leading to SUD (39). Among adolescents with SUD, elevated rates of negative affect disorders and related symptoms have been reported, with higher rates among females than among male SUD adolescents (40). Also, depressed mood has been shown to positively predict drug use (19,41,42) as well as drug use problems (43,44) among teenagers. These findings are consistent with both the self-medication hypothesis (45,46), which advances that individuals use substances to alleviate symptoms of dysphoria and or anxiety, and with developmental theories suggesting that negative affect provides another important etiologic pathway leading to the development of SUDs (32,14). However, some investigators have failed to find effects of adolescent depressed or anxious mood on drug use behaviors (47), particularly when controlling for delinquency and related confounding factors (e.g., 48), and negative affect may be produced by use of alcohol or other substances (49).

Family Estrangement

There are several constructs associated with family estrangement that have been linked to adolescent drug liability, including poor parental monitoring (e.g., 50–53), family conflict (e.g., 54), poor communication and parenting style (e.g., 55,56), impoverished family economic status (e.g., 57), and parental substance use (58).

Family connectedness and attachment, the opposite of family estrangement, has also been linked to adolescent risk for drug abuse (e.g., 59,60). The mechanisms by which a close

attachment by the parent to the child serves to prevent drug use include the increased knowledge by the parent as to the child's whereabouts when they are away from home and with whom they spend their free time, the facilitation of parental monitoring, and greater willingness of the child to seek out advice and emotional support from the parents. Perceptions of lack of parent support and poor quality of parent-child relationships predict adolescent alcohol or drug initiation (61) and mediate the relationship between difficult temperament and adolescent alcohol use disorders (62).

METHODS

Participants

A summary of participant characteristics as a function of the two study groups (Treatment and Waiting List) is provided in Table 1, and we describe them separately below.

Treatment group—Consecutive adolescent admissions at a Minnesota Model, 12-step-based program were approached by research staff during an 8-month period (1996–1997) during their treatment intake to ask for their participation. All lived in the 7-county Minneapolis metropolitan area. Inclusion criteria, which were determined by research staff, required that the individuals were 12–18-years-old, met DSM IV criteria (63) for at least one current psychoactive substance dependence disorder, and showed no evidence of acute psychotic disorder, developmental disability, acute intoxication and withdrawal symptoms. One-hundred-seventy-nine admissions initially agreed to participate (71% of those eligible). All participants in this group reported meeting dependence criteria for at least one substance (alcohol and cannabis dependence disorders, 72% and 86%, respectively). Also, all Treatment group subjects reported at least monthly use of at least one substance during the prior year.

Participants received either residential or outpatient treatment on the basis of clinical assignment by the facility staff at the conclusion of their intake evaluation. Five cases were temporarily transferred from the setting to which they were originally assigned to the other setting. However, these cases returned to their original setting after no more than two days and so they maintained their initial setting status. Also, members of the Treatment group differed as to whether treatment was completed or not. Treatment completers ($n = 124$; 78%) received the full course of primary drug treatment, defined by an approved discharge by the client's primary physician. All treatment completers participated in therapy for at least the full course of either residential-based (approximately 30 days) or outpatient-based (approximately 35 sessions), and a few participated for even longer. Treatment noncompleters ($n = 35$; 22%) left the program prior to staff approval; circumstances included elopement, discharge against staff advice and expulsion due to violation of program rules. The majority of these noncompleters (81%) left treatment within the first week (residential) or by the fifth session (outpatient), and none of the other noncompleters participated in more than 50% of expected treatment length. It is important to keep in mind that some residential subjects received outpatient treatment and vice versa.

Waiting list group—This sample originally consisted of 66 participants recruited during the same time period from two drug evaluation facilities not affiliated with the treatment program noted above. The two evaluation centers were chosen by virtue of the expectation that they would yield clients who were similar to treatment subjects on age, gender, ethnicity, SES and clinical characteristics. As shown in Table 1, all Waiting List participants reported meeting dependence criteria for at least one substance (alcohol and cannabis dependence disorders, 74% and 85%, respectively), and similar to the Treatment group, they reported prior year use of any substance at least on a monthly basis. Waiting List youth received a referral for drug treatment by intake staff (indicating the clinical decision that their condition required it) and

expressed a desire for care, but because of inadequate or no insurance funding, were placed and maintained on a waiting list to receive public funds for treatment. Only two Waiting List cases received treatment at any time during the follow-up period (each case received a short-term outpatient experience).

Comparison of groups—The Treatment and Waiting List groups did not differ on demographic variables (% male, % white, mean age at intake and SES at intake), nor did they differ on clinical variables measured at intake (% still in school, % with prior adjudication in the juvenile criminal justice system, and rates of item endorsement for diagnoses of ADHD, Conduct Disorder, Oppositional Defiant Disorder, Depression and Anxiety Disorders).

Sample sizes for analysis—Complete data at intake, year-1, year-4 and year-5.5 were collected for 89% of Treatment ($n = 159$) and 94% of Waiting List ($n = 62$) subjects. There were thus, no significant between groups differences in percentage of subjects with data for all eligible time points ($X^2 = 3.7, p > .10$). All analyses were based on subjects with complete data.

Treatment description

The 12-Step adolescent drug program consisted of residential and nonresidential units that were fully staffed by administrators, psychiatrists, psychologists, nurses, chemical dependency counselors, school teachers, and additional support staff. As a Minnesota Model program, it teaches the principles of the Twelve Steps of Alcoholics Anonymous (AA) using individual and group therapy, reading assignments, and psycho-educational lectures from alumni. The treatment goal is abstinence from all drugs and alcohol. All clients were involved in a range of treatment components that typically span four consecutive weeks for residential clients and 30 sessions over six consecutive weeks, for outpatient clients. Treatment components included group therapy and individual counseling, family therapy, lectures about the Twelve-Steps of AA, a series of AA-based reading and writing assignments, school study sessions and occupational and recreational therapy.

Measures

Drug involvement—Drug involvement measures were administered at all time-points (intake, year-1, year-4 and year-5) for Treatment and Waiting List subjects. Two sets of measures were administered, both of which had a prior 12 months time frame: drug use frequency (DUF) and substance use disorder (SUD). Follow-up ratings for treatment completers referred to the time period since discharge; for treatment noncompleters, the time period since discharge; and for the Waiting List, the time period since the intake assessment.

The DUF variable involved assessing 12 major drug categories using a 5-point scale (5 = about daily; 4 = about weekly; 3 = about monthly; 2 = about less than monthly; 1 = abstinence). The descriptions of the drugs are identical to the items from the national senior high school surveys (64). These DUF items have shown high internal consistency (alphas = .82–.93) and favorable one-week test-retest stability ($r = .86$ –.91) in drug clinic-referred samples (65). We also asked about prior year frequency regarding drugs in general using the same 5-point scale in order to assess frequency of general use across substances. Thus, the individual was rating highest level of frequency of drug use across all drugs.

Parents were also administered a DUF that asked if they had any knowledge of their child's alcohol or drug use during the follow-up period. Urine drug screens were collected at each follow-up to test for the presence of alcohol, THC at 20 mg/ml, amphetamines, opiates, barbiturates, cocaine, and benzodiazepines. The laboratory used a two-step process in which

any positive finding by immunoassay (or gas chromatography for alcohol) is verified by a second testing of gas chromatography/mass spectrometry (GC/MS).

As a means of validating the self report, at each follow-up all subjects completed a revised DUF that asked if use had occurred during a time period that corresponding to the time frame of the urinalysis (e.g., use of alcohol during the prior ten hours, any use of cannabis as recent as two days ago, daily use of cannabis within the prior six weeks).

Prior year SUD were measured according to DSM-IV criteria (63) with the Adolescent Diagnostic Interview, a highly structured interview with favorable psychometric properties (66). All Treatment and Waiting List subjects had at least one substance dependence diagnosis at intake.

As noted earlier, all Treatment subjects at baseline reported either “about weekly” or “about daily” aggregate use of substances (typically alcohol, marijuana, or both) during the prior year. Also, all Treatment subjects met DSMIV criteria (63) for a dependence disorder for at least one substance. To measure improvement over time, we created separate bi-variate categorizations of drug use frequency (DUF) and diagnostic status (SUD) at each time point. For DUF we created a composite drug use frequency variable that reflected an aggregate frequency of use across all substances. Subjects were categorized as *improved* if they were abstinent or reported no more than “about monthly” use across all substances. Subjects were categorized as *not improved* if they reported more frequent use of substances than monthly, specifically “about weekly” or “about daily” use across all substances. Similarly, improvement on substance use disorder (SUD) criteria was also measured at each follow-up point using the same metric as above: *improved* = no substance use diagnosis present or only a substance abuse disorder present; *not improved* = any substance dependence diagnosis is present. This categorization reflects both an absolute measure (reflecting behavior at the respective follow-up time point) as well as a relative measure (reflecting behavior compared to that at intake).

Psychosocial factors—The four target psychosocial factors used in the analysis are measures drawn from the Personal Experience Inventory (PEI; 67). The PEI is a multi-scale questionnaire of 278 items that address multiple areas pertaining to drug use involvement and psychosocial factors believed to either underlie or result from drug involvement. The questionnaire consists of two main parts (Problem Severity and Psychosocial) that consist of scales, plus additional content that measures response distortion tendencies and drug use frequency. Each of the target psychosocial measures consists of approximately eight items (range 4–12 items), structured with either a 3-point (never/once or twice/sometimes) or 4-point response option format (strongly agree/agree/disagree/strongly disagree). As described in Henly and Winters (68), scale development procedures were largely based on Jackson’s (69) procedure that combines rational and empirical procedures. Briefly, 20 *a priori* scales identified from the extant literature were reduced to 12 scales after discarding redundant scales and retaining those that had acceptable levels of reliability ($\alpha > .70$) and independence (proportion of unique, reliable variance $> .25$). Redundant scales were discarded, and items were pruned from their respective scales if they had a high correlation with the Mario we-Crowne Desirability Scale (70). The definition of each variable is provided below.

Deviant Behavior (DB; 10 items; $\alpha = .72-.80$)—High scores on this scale suggest actual participation in unlawful, delinquent, or oppositional behavior.

Peer Drug Environment (PDE; 8 items; $\alpha = .81-.85$)—The items defining this scale indicate involvement with drugs by one’s peers. (The original PEI refers to this scale as Peer Chemical Environment.)

Psychological Disturbance (PD; 10 items; $\alpha = .79-.81$)—Items from this scale are associated with psychological problems and distress, such as difficulties with mood, thinking, and physical concerns.

Family Estrangement (FE; 9 items; $\alpha = .81-.86$)—This scale reflects lack of family solidarity and closeness, and presence of parent-child conflict.

Procedure

Prospective subjects and their parent/guardian were told during recruitment that the study would examine youth functioning as a result of prior drug abuse and that participation was independent of referral and treatment decisions at the facility. All testing was conducted by trained research staff. Intake measures were administered as part of the evaluation appointment. Client and parent follow-up measures were administered either in person or over the telephone for long-distance clients ($n = 18$ cases with at least one follow-up by telephone).

Statistical Analysis

We examined the relationship between four time-varying psychosocial predictors (PD, DB, PCE, FE) and two primary outcome variables. The two outcome variables were improvement in DUF (1 vs. 0) and improvement in SUD (1 vs. 0), both measured at year-1, year-4 and year-5.5.

Analyses were conducted to incorporate the structure of within-individual correlations (i.e., repeatedly measured outcome) by using the generalized estimating equations (GEE; 71). The GEE method appropriately models dependencies in repeated categorical data (72). In the analyses, age, race, gender, treatment condition (time-invariant covariates), and linear time (time-varying) were included to control for their effects on the outcome. We also included four interaction effects between the predictors and treatment condition in the model to examine if the associations between predictors and outcomes differ across the two intervention conditions. All analyses were done using PROC GENMOD in SAS (73).

RESULTS

Intake Refusers

Some Treatment ($n = 17$) and Waiting List ($n = 4$) subjects refused to participate in the study. We combined all refusers ($n = 21$) and then compared their intake characteristics from archival data to the combined group of participants for which we had data for all assessment points (i.e., Treatment and Waiting List participants; $n = 121$). The only significant findings observed on a range of demographic and clinical variables were that the refusers reported significantly higher rates of previous mental health treatment and significantly higher rates of parental history of substance abuse compared to the combined participant group (both $p < .05$).

Validity of Self-Report

We performed analyses of correspondence between self reports and urine testing across all follow-up assessments. We found unadjusted percent-exact agreements of 91 % between urinalysis and adjusted DUF score. We also calculated kappa coefficients to adjust for prevalence rates and the result was quite encouraging ($\kappa = .82$). In three cases, the self-report did not disclose cannabis use when the urinalysis was positive, and in one instance the self-report disclosed cannabis use in the presence of a negative urine test. Furthermore, client-parent agreement rates were also quite high; overall percent agreement on abstinence vs. non-abstinence status was 85% in the Treatment group and 89% in the Waiting List group.

Preliminary Analysis

Table 2 presents the means and standard deviations (or percentages) of the predictor and outcome variables for the Treatment and Waiting-List groups. Results from simple *t*-tests on the continuous predictor variables and chi-square tests on the categorical outcome variables are also presented in Table 2. Overall, the Treatment group had significantly more improvers on DUF and SUD at each time point, except at year-4 on substance use disorder whereas the Waiting List group showed temporarily more improvers compared to the treatment group (see also Figure 1 and Figure 2).

Improvement in Drug Use Frequency (DUF)

Summary of the mixed model analysis on improvement in DUF is presented in Table 3. There were no significant main effects of age, gender and race, yet significant main effects were found of treatment condition and time on the ($\log_e$) odds of showing improvement in DUF outcome. The significant group effect indicated that the Waiting List group had significantly fewer improvers on DUF compared to the Treatment group at year-1 with all other variables held constant. The significant time main effect indicated that participants in the Treatment group showed reduction in the ($\log$) odds of being a DUF improver over time while all other variables held constant (this pattern was true for the Waiting List group as well).

Significant main effects of DB, PC and FE were detected on DUF outcome. This indicated that there were significant associations between the predictor variables and the ($\log_e$) odds of showing improvement in DUF over time. Inspection of the estimates revealed that lower scores on the predicted variables were related to a higher likelihood of being a DUF improver over time.

Interaction effects of PC $\times$ group (marginally) and FE $\times$ group were significant on DUF. Examination of the estimates showed that the strength of associations between PC and DUF outcome and FE and DUF outcome were weaker for the Waiting List group compared to the Treatment group. In the Waiting List group, compared to the scores being stable on the PC and FE over time, there was a dramatic drop in the odds of being an improver over time (see Figure 1).

Improvement in Substance Use Disorder (SUD)

No significant main effect of age, race, group condition or time on the ($\log_e$) odds of showing improvement in SUD outcome was detected (Table 4). There were significant main effects of DB, PC and FE on SUD outcome. This showed that there were significant associations between the predictor variables and the ($\log_e$) odds of showing improvement in SDU outcome over the follow-up period. Inspection of the estimates revealed that lower scores on the predicted variables were related to higher likelihood of being an improver over time.

Interaction effect of FE $\times$ group was significant on the SUD outcome variable. Examination of the estimate showed that the strength of association between FE and outcome was weaker for the Waiting List group compared to the Treatment group (see Figure 2).

DISCUSSION

Four main findings from the study are noteworthy. The first is that those receiving treatment were more likely to show favorable status on both DUF and SUD outcome measures compared to the Waiting List group, except at year-4 whereas the Waiting List group showed temporarily more SUD improvers compared to the Treatment group. Also, the rate of improvement for both groups generally declined across the follow-up period for SUD and DUF outcome, particularly so for the DUF variable. At year-1, the DUF improvement rate was 49.7% (Treatment) and

38.7% (Waiting List), and at year-5.5, the rate was 34.6% (Treatment) and 4.8% (Waiting List). For SUD, the year-1 improvement rate was 44.0% (Treatment) and 37.1% (Waiting List), and at year-5.5, the rate was 42.8% (Treatment) and 25.8% (Waiting List). Also, whereas we found outcome effects as a function of group, we did not find outcome effects for age, gender and race.

A second finding was that abstinence across all three time points (up to year-5.5) was rare. Abstinence at each of the follow-up time points occurred among only 6% of those in the Treatment group and was 0% among those in the Waiting List group. A post hoc analysis indicated that the most common drug used across all time periods was alcohol (all chi-square significant at $p < .01$ at year-1, year-4 and year-5).

A third major study finding pertains to the examination of the interplay between psychosocial factors and outcome. Among the four study psychosocial factors, three revealed a significant association with DUF and SUD improvement across time—Deviant Behavior, Peer Drug Environment and Family Estrangement. For all of these factors, improvement in outcome was associated with lower scores on these risk factors. Only Psychological Distress failed to have a significant association with outcome. Our data also revealed some interaction effects. The one consistent pattern was that the effect of FE on DUF and SUD outcome (i.e., lower score on FE associated with improved outcome) was stronger in the Treatment group rather than the Waiting List group. This finding suggests that youth in the Treatment group, which received family therapy as part of their 12-Step treatment experience, benefited from this family-based treatment effect. Nonetheless, when both the findings from the main effect and interaction analyses are considered, the study confirms that psychosocial risk influence not only influence the onset and maintenance of drug use behaviors among non-clinical populations (e.g., 36), but also influence the long-term course among clinic-populations of youth. Both the fields of developmental psychopathology and adolescent drug treatment have stressed the importance of identifying dimensional variations in adolescent disorders that may have etiological or clinical relevance (74,75). But the extant developmental literature largely consists of studies documenting the role of psychosocial factors on short-term outcome among adolescent drug abusers (15,17). The present study is unique in that the importance of psychosocial factors has been extended with respect to long-term outcome among youth drug abusers.

Finally, there are treatment implications to consider based on the study results. Keeping in mind that we restricted the data analysis to a limited number of psychosocial factors, our study is consistent with other studies suggesting that youth with externalizing disorders (deviant behavior), that continue to affiliate with drug-using peers, and that have non-cohesive families are more likely to show a poorer course following treatment (e.g., 76–78). Thus, relapse prevention strategies aimed at correcting risk associated with delinquency, peer drug use and family estrangement command attention in treatment.

Limitations

There are several noteworthy study limitations. The study did not involve random assignment. Despite the Waiting List and Treatment groups not differing on any intake variables, caution should be exercised when interpreting the differences between these groups. The present study is based on youth who received treatment in the mid-to-late 1990s, and our results may not apply to youth who receive treatment in more contemporary times. An unmeasured factor that may have impacted the association of psychosocial factors and outcomes was time in controlled environments during follow-up. Three cases reported some incarceration (2 in the Treatment group and 1 in the Waiting List group), and all of these youth were in juvenile detention centers for no more than 2 days. Nonetheless, other unmeasured situations that led to time in controlled environments may have impacted our findings, especially if there were differential experiences by group. Population characteristics of the groups may limit the generalizability of the

findings. The two groups were very largely white and adolescents in the Treatment sample who refused to participate in the study reported significantly higher rates of previous mental health treatment and parental history of drug abuse than those youth that agreed to participate. A related problem is that the Treatment subjects experienced only one form of treatment, the 12-Step model. Also, our statistical analysis did not include the influence of aftercare involvement, which could have impacted the influence of psychosocial factors on outcome.

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FIGURE 1.

Percentages of youths who showed improvement in drug use frequency, by group condition. Treatment group $n = 159$, Waiting List group (control) $n = 62$.

FIGURE 2.
Percentages of youths who showed improvement in substance use disorder, by group condition.
Treatment group $n = 159$, Waiting List group (control) $n = 62$.

TABLE 1

Subject Characteristics at Intake as a Function of the Two Study Groups

Variable	Treatment	Waiting List
n	159	62
% Male ¹	58	56
% White ¹	86	84
Mean age ¹	15.7	15.9
Socioeconomic Status ^{1, 2}	48	47
% previous drug treatment ¹	26	28
% at least 1 dependence diagnosis ¹	100	100
% 2+ dependence diagnosis ¹	82	77
% past year, monthly substance use ¹	100	100
Mean scores at intake ¹		
Deviant Behavior	17.1	17.2
Peer Drug Environ.	15.3	15.5
Psychological Disturb.	21.2	20.9
Family Estrangement	19.2	19.0

Notes.¹The groups do not differ on these variables²Socioeconomic status based on Hollingshead (79); range 17–66; higher scores are better.

TABLE 2

Means and Standard Deviations (or Percentages) of Predictor Variables and Outcome Variables for the Treatment and Waiting-List Control Groups

	Treatment (<i>n</i> = 159)		Waiting List (<i>n</i> = 62)	
	M	SD	M	SD
Deviant Behavior				
Year-1	16.75	3.52	16.60	3.69
Year-4	15.70	3.74	16.48	3.33
Year-5	15.96	4.29	17.50*	3.37
Psychological Disturb.				
Year-1	14.67	2.86	14.61	1.45
Year-4	14.74	2.95	14.60	1.66
Year-5	14.65	2.77	14.61	1.45
Peer Drug Environment				
Year-1	19.43	4.88	20.34	3.78
Year-4	18.69	3.72	19.10	3.40
Year-5	19.58	2.96	19.05	2.41
Family Estrangement				
Year-1	18.59	3.18	18.48	3.67
Year-4	18.34	3.36	17.81	2.25
Year-5	18.26	3.36	17.84	2.21
Improvement in Drug Use Frequency (%)				
Year-1	54		39*	
Year-4	45		8***	
Year-5	35		5***	
Improvement in Substance Use Disorder (%)				
Year-1	47		21***	
Year-4	21		34*	
Year-5	47		26**	

Bold identifies a significant between-group differences.

*
 $p < .05$.

**
 $p < .01$.

 $p < .001$.

TABLE 3
GEE Parameter Estimates Predicting Improvement in Drug Use Frequency

Variable	Estimate	SE	Z
Intercept	12.90	2.42	5.32 ***
Age	0.06	0.12	0.51
Race	0.22	0.39	0.56
Gender	0.07	0.28	0.24
Group Condition	-13.59	3.38	4.03 ***
Time	-0.51	0.06	8.56 ***
Deviant Behavior	-0.29	0.04	7.09 ***
Psychological Disturbance	0.02	0.05	0.47
Peer Drug Environment	-0.12	0.04	3.11 **
Family Estrangement	-0.34	0.05	6.23 ***
Deviant Behavior X Group	0.07	0.09	0.85
Psych Disturbance X Group	0.27	0.18	1.50
Peer Drug Envir. X Group	0.13	0.07	1.92
Family Estrangement X Group	0.23	0.11	2.10 *

Bold identifies a significant effect.

*
 $p < .05$.

**
 $p < .01$.

 $p < .001$.

TABLE 4
GEE Parameter Estimates Predicting Improvement in Substance Use Disorder

Variable	Estimate	SE	Z
Age	0.13	0.10	1.30
Race	0.29	0.32	0.90
Gender	-0.17	0.25	0.67
Group Condition	-5.11	3.67	1.39
Time	-0.11	0.06	1.68
Deviant Behavior	-0.43	0.05	7.99 ***
Psychological Disturbance	0.02	0.05	0.40
Peer Drug Environment	-0.08	0.03	2.46 **
Family Estrangement	-0.25	0.05	5.42 ***
Deviant Behavior X Group	-0.12	0.12	1.01
Psych Disturbance X Group	0.04	0.16	0.24
Peer Drug Envir. X Group	-0.04	0.09	0.46
Family Estrangement X Group	0.38	0.11	3.55 ***

Bold identifies a significant effect.

*
 $p < .05$.

**
 $p < .01$.

 $p < .001$.