

Regular article

Impact of psychiatric comorbidity on treatment of adolescent drug abusers

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Received 4 April 2003; received in revised form 21 August 2003; accepted 9 October 2003

Abstract

Comorbidity of substance abuse disorders (SUD) and psychiatric disorders is one of the most important areas of investigation in contemporary drug abuse treatment research. This study examined the impact of psychiatric comorbidity on the treatment of 182 adolescent drug abusers in a randomized clinical trial comparing family and individual cognitive-behavioral therapy. Three distinct groups of adolescent substance abusers were compared: (1) Exclusive Substance Abusers (SUD only); (2) Externalizers (SUD + externalizing disorder); and (3) Mixed Substance Abusers (SUD + externalizing and internalizing disorder). The purpose of this study was to determine whether adolescents in these comorbid groups differed in clinical presentation and treatment response. More severe comorbidity was associated with greater family dysfunction and being female and younger at intake. An examination of substance use trajectories over time indicated that the Mixed group initially responded to treatment but returned to intake levels of substance use by 1 year post-discharge. © 2004 Elsevier Inc. All rights reserved.

Keywords: Adolescents; Comorbidity; Drug abuse; Treatment outcome; Families

1. Introduction

Comorbidity of substance abuse and psychiatric disorders has become one of the most pressing issues in developing and testing effective interventions for drug abuse (Horton, 1997; Onken, Blaine, Genser, & Horton, 1997). Much of the interest in comorbidity was sparked by the results of two large-scale epidemiological studies of community samples, the Epidemiologic Catchment Area Study (Robins & Regier, 1991) and the National Comorbidity Study (Kessler et al., 1994). These studies indicated that 40–50% of non-treated individuals with a substance use disorder also meet criteria for a psychiatric disorder (Kessler et al., 1996; Regier et al., 1990). Studies of clinically referred samples also reveal high rates (50% to 90%) of comorbidity of substance use disorders and

psychiatric problems among adult (Flynn, Craddock, Luckey, Hubbard, & Duntzman, 1996; Grant, 1997) and adolescent substance abusers (Bukstein, Glancy, & Kaminer, 1992; Reebye, Moretti, & Lessard, 1995; Rounds-Bryant, Kristiansen, & Hubbard, 1999). Despite increased empirical and clinical interest in comorbidity in recent years, the traditional split between the drug abuse and mental health fields has impeded progress in this area (Onken et al., 1997). Yet ignoring the reality of comorbidity in clinical samples (i.e., excluding cases with comorbid psychiatric problems from studies) may lead researchers to overestimate the effects of therapy (Greenberg, 1997) and limits the relevance of treatment research to clinicians (Horton, 1997). Although we now know that psychiatric comorbidity is “the usual, rather than the unusual, state of affairs” among drug abusers (Leshner, 1997, p. 692), we know very little about how to address this pervasive clinical problem.

Adolescent substance abusers with comorbid disorders have earlier onset of substance use, greater frequency of use, and more chronic use than those without comorbid disorders

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(Clark & Neighbors, 1996; Greenbaum, Prange, Friedman, & Silver, 1991; Horner & Scheibe, 1997; Miller-Johnson, Lochman, Coie, Terry, & Hyman, 1998; Rohde, Lewinsohn, & Seeley, 1996). Among teenagers, comorbidity generally is directly linked to higher levels of both alcohol and marijuana use, and conduct disorder (CD) specifically predicts linear increases in alcohol use over development (White, Xie, Thompson, Loeber, & Stouthamer-Loeber, 2001). Complicating treatment with these youth is their greater severity of family, school, and legal problems (Grella, Hser, Joshi, & Rounds-Bryant, 2001).

Early treatment studies with substance abusing adults established that psychiatric comorbidity is related to high relapse rates, diminished response to medications, and poor treatment outcomes (Horton, 1997; McLellan, Luborsky, Woody, O'Brien, & Druley, 1983; Rounsaville, Dolinsky, Babor, & Meyer, 1987). In one study, investigators found that across drug treatment programs, the best predictor of drug use at followup was psychiatric severity at admission to treatment (McLellan, Luborsky, O'Brien, Barr, & Evans, 1986). Adult drug abusers with comorbid antisocial personality disorder have particularly poor outcomes (Rounsaville et al., 1987; Woody, McLellan, Luborsky, & O'Brien, 1985). Psychiatric comorbidity severity not only predicts short-term treatment outcomes (6 to 7 months) but also predicts long-term outcomes as much as 2 to 3 years after intake (Kranzler, Del Boca, & Rounsaville, 1996; Rounsaville, Kosten, Weissman, & Kleber, 1986), suggesting that psychiatric comorbidity is related to chronic drug use problems in adults.

Only recently have researchers begun to examine the impact of comorbidity on treatment outcomes of adolescent substance abusers, yet evidence is building to suggest that adolescent substance abuse in combination with psychiatric disorders is a more challenging clinical phenomenon than either problem alone (Grella et al., 2001; Kaminer, 1999; Rohde, Clarke, Lewinsohn, Seeley, & Kaufman, 2001). It is also twice as costly to treat on average as substance abuse or mental health problems in isolation (King, Gaines, Lambert, Summerfelt, & Bickman, 2000). The strong association between antisocial behavior and drug use severity seen in adults (e.g., Morgenstern, Langenbucher, Labouvie, & Miller, 1997) has also been demonstrated with adolescents (Loeber, Stouthamer-Loeber, & White, 1999; Molina, Smith, & Pelham, 1999), particularly among juvenile offenders (Dembo, Schmeidler, Pacheco, Cooper, & Williams, 1997; Milin, Halikas, Meller, & Morse, 1991). Adolescent substance abusers with CD have more severe drug use problems and poorer outcomes than those with internalizing disorders (Crowley, Mikulich, MacDonald, Young, & Zerbe, 1998; Kaminer, Tarter, Bukstein, & Kabene, 1992; Randall, Henggeler, Pickrel, & Brondino, 1999). Youth with comorbid externalizing disorders and substance abuse are at high risk to drop out of treatment (Kaminer et al., 1992; Wise, Cuffe, & Fischer, 2001), have poor long-term treatment outcomes (Crowley et al., 1998; Stewart & Brown, 1994), and develop antisocial personality

disorder at high rates in young adulthood (Myers, Stewart, & Brown, 1998). Evidence also suggests that depression and anxiety predict poorer treatment response among adolescent drug abusers in inpatient treatment (Dobkin, Chabot, Maliantovitch, & Craig, 1998). In addition, adolescent substance abusers with both externalizing and internalizing problems present for treatment with more substance use, poorer family relationships, and more parental psychopathology than those without psychiatric comorbidity (Riggs, Baker, Mikulich, Young, & Crowley, 1995; Rowe, Liddle, & Dakof, 2001). Adolescents with comorbid substance abuse and mental health problems constitute a unique clinical population at very high risk for continued problems into adulthood (Myers et al., 1998), yet few empirically based guidelines for effective treatment exist (Crowley & Riggs, 1995).

Empirical evidence and clinical experience converge to suggest that effective interventions for youth with comorbid substance abuse and psychiatric disorders must provide an integrative conceptualization and systematic approach for addressing these multiple problems (Riggs & Whitmore, 1999; Rounds-Bryant et al., 1999). Family-based approaches, which target change in the multiple systems implicated in the development and maintenance of both drug use and psychiatric problems, are among the most effective treatments for adolescent substance abusers with comorbid CD (Bukstein, 2000; Liddle, 2002a; Liddle et al., 2001). Family-based treatments for adolescent drug abusers have not only been shown to reduce drug use, but have also demonstrated reduced comorbid psychiatric symptoms (Azrin, Donohue, Besalel, Kogan, & Acerno, 1994; Friedman, 1989; Liddle et al., 2001). Cognitive-behavioral treatment has also been shown to improve drug use and psychiatric symptoms in adolescents with comorbid diagnoses (Kaminer, Burleson, Blitz, Sussman, & Rounsaville, 1998), although as noted above, youth with comorbid problems have slower rates of recovery (Rohde et al., 2001). Although there is empirical support for the efficacy of both family-based treatments and cognitive-behavioral approaches for adolescents with comorbid diagnoses, no study has examined trajectories of change in these treatments for different comorbid groups. Further, findings implicating comorbidity in poorer drug treatment response for adolescents have generally not been extended to state-of-the-art therapeutic interventions. The considerable complexity of comorbid adolescent substance abuse and psychiatric disorders calls for innovative methods and statistical techniques to identify these youths' trajectories following treatment.

To summarize, while there has been speculation about the unique treatment needs of adolescents with comorbid substance abuse and psychiatric problems, and these youth appear to be a distinct subgroup (Crowley & Riggs, 1995; Kaminer, 1991), more research is needed to understand the treatment needs and outcomes of these teens. Understanding the pretreatment differences and treatment responses of

adolescents with different comorbid problems will guide clinicians in devising specialized treatment strategies, plans, and goals for these youth (Clarkin & Kendall, 1992). The current study addressed three questions relevant in informing the design of effective interventions for substance abusing adolescents with different types of comorbid mental health problems:

- (1) Is psychiatric comorbidity related to severity of substance use and related problems for adolescents at intake to drug treatment?
- (2) Is psychiatric comorbidity related to treatment response for adolescent drug abusers?
- (3) Do adolescents with varying patterns of comorbidity respond differentially to specific treatment approaches?

2. Materials and methods

2.1. Participants

A total of 182 adolescents and their families referred to drug treatment at the research clinic of the Center for Research on Adolescent Drug Abuse (Temple Teen Care; TTC), an inner-city treatment center, provided the study sample. Average age was 15 (range: 12–17; $SD = 1.26$) and 82% were male. The sample was 74% African-American, 17% Caucasian, and 9% Hispanic. The average yearly family income of the sample was \$12,000 (range: \$1,000 to \$55,000; $SD = \$4,600$). Seventy percent of youth resided in single-parent homes. All adolescents met criteria for a substance use disorder based on positive endorsement by either adolescent or parent reports on the Diagnostic Interview for Children (DISC; Costello, Edelbrock, Kalas, Kessler, & Klaric, 1982; Fisher et al., 1991). Five percent had an alcohol abuse diagnosis, 21% had alcohol dependence, 16% had marijuana abuse, 90% had marijuana dependence, 2% had other substance abuse, and 16% had other substance dependence. Further, 88% had at least one comorbid psychiatric disorder. Only 31% of youth reported passing grades in school at intake to treatment.

2.2. Design

Temple Teen Care constituted the research clinic of the Temple University site of the Center for Research on Adolescent Drug Abuse. Clients were referred to TTC through the juvenile justice system (48%), state department of child services (36%), schools (11%), and other sources such as community organizations and family members (5%). Adolescents were included in the study if they were between the ages of 12 to 17, referred for outpatient drug treatment, had a parent or guardian willing to participate in treatment, and had a substance use diagnosis according to

either parent or youth report. Exclusion criteria included severe developmental delays, active suicidal or psychotic symptoms, and substance abuse problems requiring inpatient detoxification.

After an initial telephone screen by the clinic director, adolescents and their parents were asked to take part in a two-part assessment at the TTC clinic. Clients and their parents completed an informed consent form that described the nature of the services they would be receiving at TTC and aspects of the research study including the benefits of participating, which primarily comprised free weekly therapy sessions. Adolescents and their parents who agreed to participate in the study were then asked to complete a series of self-report instruments concerning demographic information, current problems and symptoms, family relationships, and parenting factors. Youth were randomly assigned to either Multidimensional Family Therapy (MDFT) or Individual Cognitive-Behavioral Therapy (CBT) at the completion of the intake assessment. Adolescents and their parents completed the same assessment battery at discharge from treatment and again at 6 and 12 months post-discharge. All procedures, forms, and measures were approved by the Temple University Institutional Review Board.

2.3. Specification of the treatments

The therapy provided to youth in both conditions was office-based and conducted once per week up to 24 sessions (10 sessions on average). Both treatments were manualized (MDFT; Liddle, 2002b; CBT; Turner, 1992) and therapists demonstrated acceptable levels of adherence to the prescribed treatment interventions (see Hogue et al., 1998). The 12 therapists who delivered the treatment, six in each condition, were 50% female, and 50% European American/50% African American. Four family therapists had masters degrees and two had doctorates. Three CBT therapists had masters degrees and three had doctorates.

2.3.1. Individual cognitive behavioral treatment

The Cognitive Behavioral Treatment model for multi-problem, adolescent substance abusers is based on a broadly defined cognitive-behavioral framework (Turner, 1992, 1993). Treatment is divided into three stages. The first stage, treatment planning and engagement, focuses on identifying and prioritizing adolescent problems and constructing the treatment contract. The middle stage of treatment begins an intensive cognitive-behavioral treatment program focused on increasing coping competence and reducing problematic behaviors. Typical therapeutic modules include: contingency contracting, self-monitoring, problem solving training, communication skills training, increasing prosocial activities, and homework assignments. Adolescents are taught to increase behavioral self-control over substance use. The final stage of therapy focuses on termination issues and relapse prevention with the goal of enhancing long-term self-management skills.

2.3.2. Multidimensional family therapy

Multidimensional family therapy is a multicomponent, developmentally-based treatment for adolescent drug abuse and related behavior problems (Liddle, 2002b). Multidimensional family therapy identifies several pathways to change within the multiple systems involved in maintaining dysfunctional interactions in families of adolescent drug users. Interventions target individual family members, various family subsystems, and extrafamilial systems. The *adolescent* module focuses on the individual adolescent within the family and in social systems, principally peer groups. Normative developmental functioning issues such as identity formation, renegotiation of the adolescent-parent relationship, problem-solving skills, and consequences of drug use receive attention in individual and family sessions (Liddle, Dakof, & Diamond, 1991). Developing a therapeutic alliance with the adolescent is a cardinal feature of the MDFT approach. The *parent* module enhances parenting skills in the areas of monitoring and limit-setting, rebuilding emotional attachments with the adolescent, and increasing participation in the adolescent's life (Schmidt, Liddle, & Dakof, 1996). This module explores the intrapersonal and interpersonal functioning of parents apart from the parenting role, so that personal resources are cultivated and impediments to effective parenting addressed. The *family interaction* module facilitates change in family relationship patterns by providing an interactional context wherein family members are helped to validate the perspectives of other members, decrease conflict, increase communication, and improve problem solving (Diamond & Liddle, 1996). The *extrafamilial* module establishes collaborative relationships among all systems to which the adolescent is connected (e.g., school, juvenile justice, recreational).

2.4. Measures

2.4.1. Demographic information

The Intake Form, completed by both adolescents and parents, provided basic background and demographic information, including race, gender, age, family income, adolescents' history of mental health treatment, and family history of substance abuse, mental health, and legal problems.

2.4.2. Adolescent substance use

The Timeline Follow Back Method (TLFB), adapted to interview adolescents about their substance use (Bry & Krinsky, 1992; Bry, Conboy, & Bisgay, 1986), was used in this study to measure youths' substance use during the previous 30-day period. The TLFB method obtains retrospective reports of daily substance use by using a calendar and other memory prompts to stimulate recall. It yields consistently high test-retest correlations over periods up to 1 year (Carey, 1997; Maisto, McKay, & Connors, 1990), and has been shown to correlate with other self-reports as well as with collateral reports (Sobell & Sobell, 1992).

2.4.3. Adolescent substance use and psychiatric disorders

The Diagnostic Interview Schedule for Children, 2nd ed. (DISC-2.3), was used to assess the presence of substance use and psychiatric disorders. Trained assessors administered the DISC (Costello et al., 1982; Fisher et al., 1991) to each adolescent (DISC-C) and to his or her parent (DISC-P). This standardized interview, which has the advantage of reducing variation in interviewer style and interpretation (Weinstein, Noam, Grimes, & Stone, 1990), yields diagnoses based on the DSM-III-R nosological system of the presence of specific symptoms. Adequate reliability and validity have been reported (Shaffer, 1994).

2.4.4. Adolescent psychological involvement with substances

The Personal Experience Inventory (PEI; Winters & Henly, 1989) is an adolescent self-report measure designed to identify problems associated with adolescent chemical involvement. The 29-item "Personal Involvement with Chemicals" scale was administered, which measures use in appropriate settings, use for psychological benefit (self medication), planning activities to allow for use, and preoccupation with use. Its psychometric properties are excellent and well documented with clinical and normal samples (Winters & Henly, 1989) and minority inner city populations as well as suburban samples (Friedman & Granick, 1994; Winters, Stinchfield, & Henly, 1993).

2.4.5. Adolescent emotional and behavioral symptoms

The Child Behavior Checklist (CBCL; Achenbach, 1991a), a parent-report measure, was used to assess adolescent's symptoms. Broad band *t*-scores on the Internalizing scale (Withdrawn + Somatic Complaints + Anxious/Depressed scales) and the Externalizing scale (Delinquent + Aggressive scales) were used as indicators of internalizing and externalizing symptoms. The Youth Self Report (YSR), the parallel adolescent self-report measure modeled after the CBCL (Achenbach, 1991b), was also used to measure symptoms. Both measures have demonstrated adequate reliability and validity and discriminate between clinically referred and non-referred adolescents (Achenbach, 1991a, 1991b).

2.4.6. Parental psychopathology

The Symptom Checklist-90-R (Derogatis, 1983) was administered to participants' parents to determine their level of psychiatric symptoms. The Global Severity Index was used as a general index of severity of parental psychopathology. The measure has shown excellent reliability and convergent validity (Derogatis, 1983).

2.4.7. Family conflict and cohesion

The Family Environment Scale (FES; Moos & Moos, 1974) is a widely used true-false instrument designed to assess a range of environmental characteristics of families.

Two subscales were administered to both adolescents and their parents in this study to assess family-level cohesion and conflict. The FES has demonstrated reliability, content validity, and construct validity (Moos, 1990), distinguishing normal and disturbed families (Bischof, Stith, & Whitney, 1995; Dixon, 1986).

2.5. Data analytic strategy

First, we examined the hypothesis that adolescent substance abusers with different types of comorbidity would demonstrate clinically meaningful differences at intake to treatment. All adolescents in the sample were grouped based on the presence of internalizing and externalizing disorders using the DISC (by either parent or adolescent report). A substance use disorder with no co-existing disorders determined membership in the “Exclusive Substance Abusing” group. The presence of an externalizing disorder (Conduct Disorder, Oppositional Defiant Disorder, and/or Attention Deficit-Hyperactivity Disorder) plus a substance use disorder determined membership in the “Externalizing” group. Adolescents diagnosed with an internalizing disorder (one or more of the following: Simple Phobia, Social Phobia, Panic Disorder with or without agoraphobia, Overanxious Disorder, Generalized Anxiety Disorder, Avoidant Disorder, Mania/Hypomania, Major Depression, and/or Dysthymia) plus a substance use disorder were categorized in the “Internalizing” group. Finally, those with a substance use disorder and both an externalizing and an internalizing disorder were categorized in the “Mixed” group.

We examined demographics across the groups to determine significant differences. Cross tabulations with chi-square tests of significance were performed to determine differences in the gender and ethnic distributions across groups, as well as adolescent and family history of mental health, drug abuse, and legal problems. Differences in family income and age were tested using ANOVA with Scheffe post hoc tests.

Groups were compared using ANOVA with Scheffe post hoc tests on global parental psychopathology and family conflict and cohesion. They were also compared on intake levels of substance use, externalizing and internalizing symptoms, and total problem scores. Alpha levels were adjusted using a Dunn-Bonferroni correction within each set of ANOVAs to correct for multiple ANOVAs.

Next, latent growth curve modeling (LGM) was used to examine differential trajectories of substance use change over treatment and up to 12-month followup. Substance use frequency during the previous 30 days was analyzed as the outcome variable. We further explored whether treatment condition moderated any of the differences in treatment effects by comorbid group. Gender, age, and number of sessions of therapy completed were also examined as time invariant covariates to determine the extent of variability in outcomes explained by these factors.

3. Results

3.1. Psychiatric comorbidity among adolescent substance abusers

At intake, 12% of the sample had a diagnosis of substance abuse or dependence only ($n = 21$); 5% had substance abuse/dependence plus an internalizing disorder ($n = 9$); 35% had substance abuse/dependence plus an externalizing disorder ($n = 65$); and 48% had substance abuse/dependence plus an internalizing disorder and an externalizing disorder ($n = 87$). In addition to having a substance use disorder, 20% of the sample had one psychiatric disorder, 24% had two psychiatric disorders, 17% had three psychiatric disorders, and 26% had four or more disorders. Conduct Disorder was the most common single disorder (69%), followed by Attention Deficit-Hyperactivity Disorder (28%). About one third of the sample received a diagnosis of one or more depressive disorders (30%) and a slightly larger percentage received a diagnosis of one or more anxiety disorders (38%).

3.2. Comparing comorbid groups of adolescent substance abusers

The groups described above were compared on critical variables to determine pretreatment differences among adolescent substance abusers with no co-existing disorders, “Externalizing,” and “Mixed” disorders. The “Internalizing” group, representing only 5% of the sample, was not included in subsequent analyses due to its small size. A series of cross tabulations with chi-square tests of significance and ANOVA with Scheffe post hoc tests were conducted comparing the three groups described above.

3.2.1. Demographic variables

First, gender and race distributions were analyzed to determine whether there were differences among groups on either of these variables. Cross tabulations with chi-square tests of significance were conducted on both variables, and the alpha level was adjusted to .025 using the Dunn-Bonferroni correction. Race did not differentiate the groups ($\chi^2[1,4] = 0.22, p = .64$). However, analyses of gender distributions revealed differential representation in the comorbid groups ($\chi^2[1,2] = 12.26, p < .001$). Boys were overrepresented in the Exclusive Substance Abusing (14% vs. 3% for girls) and Externalizing (42% vs. 14% for girls) groups, whereas girls were overrepresented in the Mixed group (83% vs. 44% for boys).

Age and family income were also examined to determine differences among symptom groups using ANOVA with Scheffe post hoc tests. The alpha level was corrected to .025 using the Dunn-Bonferroni correction for two ANOVAs. Family income did not distinguish groups ($F[2,159] = 1.90, p = 0.15$). Analyses revealed significant differences in average age ($F[2,170] = 4.07, p = .02$). Adolescents in

the Exclusive Substance Abusing group were significantly older ($M = 16.10$, $SD = 0.70$) than adolescents in the Externalizing group ($M = 15.31$, $SD = 1.22$) and adolescents in the Mixed group ($M = 15.28$, $SD = 1.30$).

3.2.2. Intake differences in substance use among comorbid groups

One-way analyses of variance with post hoc Scheffé tests were conducted to determine differences in frequency of substance use during the past 30 days. The PEI Personal Involvement with Chemicals scale was also used to compare the groups. The alpha level was corrected to .025 for two separate ANOVAs using the Dunn-Bonferroni correction. These results are presented in Table 1.

Results reveal that comorbid groups did not differ significantly on adolescent self-reported substance use or involvement with substances at intake. No differences were found among groups on frequency of substance use during the past 30 days ($F[2,170] = 1.20$, $p = 0.30$) or psychological involvement with substances ($F[2,159] = 1.54$, $p = 0.22$).

Differences were found in age at first use of marijuana using a cross tabulation with chi-square test of significance ($\chi^2[1,6] = 4.07$, $p = .05$). Exclusive Substance Abusers were overrepresented in the group reporting initiating marijuana use after age 15 (62% vs. 19% of Externalizers and 26% for Mixed).

3.2.3. Intake differences in psychiatric comorbidity among comorbid groups

Comorbid groups were also compared on intake levels of both adolescent (YSR) and parent reports (CBCL) of internalizing and externalizing symptoms and total problems, with alpha adjusted to .008 for six separate ANOVAs

using the Dunn-Bonferroni correction. Adolescents in the Exclusive group had the lowest rates of total problems and internalizing and externalizing symptoms and the Mixed group had the highest rates of these symptoms (see Table 1). Using parent reports (CBCL), total problems ($F[2,162] = 20.53$, $p < .001$), internalizing ($F[2,162] = 18.37$, $p < .001$) and externalizing symptoms ($F[2,162] = 21.00$, $p < .001$) significantly differentiated groups. For CBCL total problems, the Exclusive group ($M = 51.68$, $SD = 9.15$) had fewer symptoms than either the Externalizers ($M = 61.05$, $SD = 10.60$) or Mixed teens ($M = 67.24$, $SD = 9.77$), and the Externalizers had fewer symptoms than the Mixed group. Using adolescents' reports (YSR), total problems ($F[2,164] = 11.93$, $p < .001$), internalizing ($F[2,164] = 11.34$, $p < .001$) and externalizing symptoms ($F[2,164] = 14.70$, $p < .001$) significantly differentiated groups. For YSR total problems, the Exclusive group ($M = 44.05$, $SD = 7.98$) had fewer symptoms than either the Externalizers ($M = 53.08$, $SD = 10.88$) or Mixed teens ($M = 56.88$, $SD = 11.03$).

Results also revealed that the groups differed on number of diagnoses endorsed by either the parent or adolescent on the DISC ($F[2,170] = 99.42$, $p < .001$); adolescents in the Mixed group had significantly more diagnoses on the DISC ($M = 4.93$, $SD = 1.52$) as compared to either of the other groups (Exclusive [$M = 1.14$, $SD = 0.36$]; Externalizers [$M = 2.85$, $SD = 1.03$]), and Externalizers had more diagnoses than Exclusive Substance Abusers. Finally, an examination of mental health treatment history using cross tabulation with chi-square test of significance revealed greater likelihood of previous mental health treatment among teens in the Mixed group ($\chi^2[1,2] = 4.97$, $p = .02$) than youth in the other two groups.

Table 1
Intake differences among comorbid groups

Variable	Exclusive M (SD)	Externalizing M (SD)	Mixed M (SD)	F
Age	16.10 (0.70) ^a	15.31 (1.22) ^b	15.28 (1.30) ^b	4.07*
Days took substances in last 30	9.14 (9.77)	11.29 (9.02)	12.46 (8.95)	1.20
Involvement w/substances (PEI)	24.57 (15.69)	29.68 (17.83)	31.79 (16.66)	1.54
Number of diagnoses (DISC)	1.14 (0.36) ^a	2.85 (1.03) ^b	4.93 (1.52) ^c	99.42**
Parent psychopathology (SCL)	0.35 (0.40)	0.39 (0.38)	0.54 (0.52)	2.51
Family cohesion (FES Adol.)	6.62 (1.50)	5.88 (1.97)	5.30 (2.14)	4.13
Family conflict (FES Adol.)	3.26 (2.00)	4.17 (2.09)	4.35 (1.90)	2.31
Family cohesion (FES Parent)	6.90 (1.89) ^a	6.21 (2.03)	5.51 (2.13) ^b	4.59*
Family conflict (FES Parent)	2.50 (1.54) ^a	3.84 (2.26) ^b	4.23 (1.75) ^b	6.42*
Total problems (YSR)	44.05 (7.98) ^a	53.08 (10.88) ^b	56.88 (11.03) ^b	11.93**
Internalizing problems (YSR)	41.80 (8.82) ^b	46.88 (11.04) ^b	53.03 (11.06) ^a	11.34**
Externalizing problems (YSR)	46.90 (9.36) ^a	59.54 (11.05) ^b	61.66 (11.21) ^b	14.70**
Total problems (CBCL)	51.68 (9.33) ^a	61.05 (10.60) ^b	67.24 (9.77) ^c	20.53**
Internalizing problems (CBCL)	47.47 (12.22) ^b	54.16 (10.69) ^b	62.16 (10.84) ^a	18.37**
Externalizing problems (CBCL)	53.68 (9.15) ^a	65.86 (10.72) ^b	69.63 (8.95) ^b	21.00**

^a Groups with the same superscript letter are not significantly different at $p < .01$.

^b Groups with the same superscript letter are not significantly different at $p < .01$.

^c Groups with the same superscript letter are not significantly different at $p < .01$.

* $p < .01$.

** $p < .001$.

3.2.4. Intake differences in family variables among comorbid groups

Parental psychopathology and both parent- and adolescent-reported family conflict and cohesion were examined to determine differences in comorbid groups using one-way analyses of variance with post hoc Scheffe tests (see Table 1). The alpha level was corrected to .01 using the Dunn-Bonferroni correction for five separate ANOVAs. Parents' reports of their own psychological symptoms were not significantly different among the comorbid groups ($F[2,166] = 2.51, p = .08$). Parent-reported family conflict ($F[2,161] = 6.42, p = .002$) and family cohesion ($F[2,162] = 4.59, p = .01$) distinguished comorbid groups at intake. According to parent reports, families of Exclusive Substance Abusers had higher levels of cohesion ($M = 6.9, SD = 1.9$) than families of Mixed teens ($M = 5.5, SD = 2.1$) and lower levels of conflict ($M = 2.5, SD = 1.5$) than both Mixed Substance Abusers ($M = 4.23, SD = 1.7$) and Externalizers ($M = 3.8, SD = 2.3$).

Finally, an examination of legal, mental health, and substance abuse problems among family members using cross tabulations with chi-square tests of significance revealed a pattern of greater family dysfunction among teens in the Mixed group and less dysfunction among family members of Exclusive Substance Abusers. The alpha level was adjusted to .01 for four tests using the Dunn-Bonferroni correction. Family history of alcohol problems ($\chi^2[1,2] = 4.41, p = .036$) only marginally distinguished the groups, however drug problems ($\chi^2[1,2] = 5.92, p = .01$), mental health problems ($\chi^2[1,2] = 9.50, p = .002$), and legal problems ($\chi^2[1,2] = 9.63, p = .002$) significantly differentiated them. Families of Exclusive Substance Abusers were least likely and families of Mixed adolescents were most likely to have a history of these problems.

3.3. Differences in treatment outcomes by comorbid group

Analyses were then conducted to compare the treatment responses of adolescents in the comorbid groups. The groups were first compared on overall number of sessions completed and their engagement and retention in treatment. Number of therapy sessions completed did not significantly differentiate groups ($F[2,170] = 0.75, p = .47$). Chi-square tests of treatment engagement (attending 1 session or more) ($\chi^2[1,2] = 0.07, p = .79$) and completion (attending 16 sessions or more) were also insignificant ($\chi^2[1,2] = 3.16, p = .08$), indicating that adolescents in the three comorbid groups received comparable levels of treatment dosage.

Latent growth curve modeling via the statistical software M-Plus (Muthen & Muthen, 1998–2002) was then used to examine drug use trajectories of youth in the three comorbid groups from intake to discharge and up to 6 and 12 months post-discharge from treatment. LGM provides improved estimates of change over time in comparison to traditional repeated measures ANOVA techniques as well as allowing

for missing data in within-subjects variables. Recent developments in the software M-Plus also allow for the use of nonequivalent time intervals between assessment points (Muthen & Muthen, 1998–2002). LGM analyses for all outcomes proceeded in several stages. First, an unrestricted growth curve analysis was conducted to assess within-subject change in the outcome variable from intake to 12 months following treatment termination. Second, comorbidity group was entered as a between-subjects covariate to ascertain any differences in the growth parameters (i.e., intercept and slope) among the three comorbid groups over time. Third, we investigated whether treatment condition moderated the different treatment responses of the comorbid groups by entering this variable and its interaction with comorbidity group in the between-subjects analysis. Finally, we examined whether other between-subjects factors (e.g., age, gender, and number of treatment sessions completed) accounted for additional variance in the models.

The unrestricted growth curve for substance use (specifically, number of days of alcohol and/or marijuana use during the last 30 days) fit the data well ($\chi^2[5,173] = 4.65, p = .46$, Comparative Fit Index (CFI) = 1.0). At intake, the average level of substance use was 12.7 days out of the last 30, with a significant variance ($t = 4.38, p < .001$). The statistically significant variance estimate indicates that there were significant individual differences among youth with respect to substance use at entry into the study. The average decrease in substance use from intake to the 12-month followup was -2.39 ($t = -5.32, p < .001$), with a significant variance ($t = 13.3, p \leq .001$). These results indicate that substance use significantly decreased from intake to the 12-month followup across all adolescents, irrespective of comorbid condition, and that the adolescents differed considerably in the rate at which their substance use decreased.

Next, comorbid group was entered to the model to examine if substance use outcomes differed by comorbid group. This model also fit the data well ($\chi^2[3,173] = 4.10, p = .25, CFI = .97$). As noted above using a one-way ANOVA, there was no difference in initial status (intercept) among the three groups on substance use ($t = 1.12$). However, the three comorbid groups had significantly different linear rates of change over time ($t = -2.35, p < .05$). Further, the change trajectories of the comorbid groups demonstrated a quadratic effect (i.e., acceleration or change in change; $t = 2.20, p < .05$). Fig. 1 shows the different trajectories of youth over time in the three comorbid groups. Specifically, after initial increases in substance use between treatment intake and discharge, youth in the Exclusive Substance Abuse group demonstrated marked reduction in substance use between the 6- and 12-month followup, while youth in the Externalizing group showed steady increase in use between intake and 6-month followup and slower recovery between 6 and 12 months post-treatment. Youth in the Mixed group demonstrated some recovery between intake and treatment discharge, but by the 12-month followup had demonstrated a return to

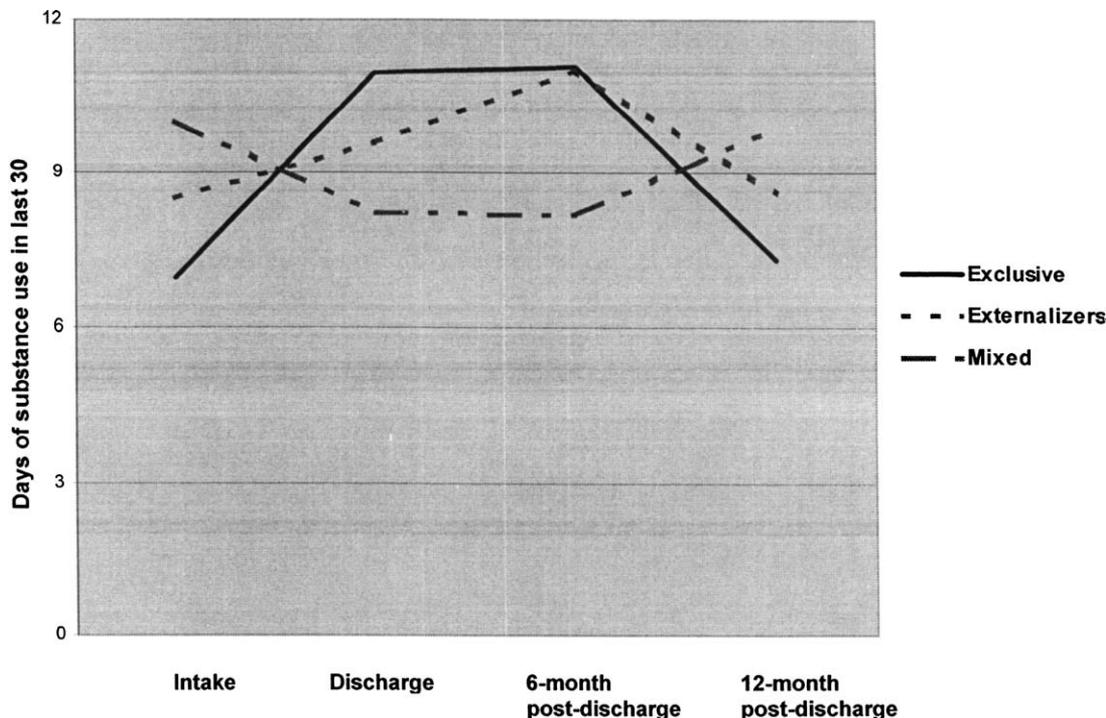


Fig. 1. Trajectories of change in adolescent-reported substance use among comorbid groups

pretreatment substance use levels. These effects were not moderated by treatment condition assigned ($t = 1.51$). Nor did any other between subject factors we tested (age, gender, and number of treatment sessions completed) either predict substance use trajectories or moderate the effect of comorbidity group on substance use trajectories.

4. Discussion

The results of this study are consistent with a growing body of literature that implicates psychiatric comorbidity as one of the most significant challenges in the development of effective treatments for drug abusers. Although many studies have established the negative impact of comorbidity on drug treatment outcomes among adult clients, this study is one of the first to link comorbidity to poor treatment response among adolescent drug abusers in two state-of-the-art treatments. Given the accumulating evidence for poorer treatment outcomes of comorbid drug abusers not only in standard community treatment programs, but also in empirically supported interventions as in the current study, treatment development efforts are needed to adapt and design more effective interventions for these multiple problem youth.

As in previous studies with clinically referred substance abusers (e.g., Grella et al., 2001), youth exhibiting greater psychiatric comorbidity presented for treatment with higher levels of dysfunction. The “Mixed” group exhibited higher levels of overall symptoms and internalizing symptoms than

either of the other groups at intake to treatment. Both “Mixed” youth and “Externalizers” had elevated externalizing symptoms in comparison to “Exclusive Substance Abusers,” but they did not differ from each other on this dimension. “Mixed” adolescents also came from families with more significant alcohol and drug problems, legal problems, and mental health problems. Their families also had lower levels of cohesion than families of Exclusive Substance Abusers, and parents of both Mixed and Externalizing teens reported higher levels of conflict than parents of Exclusive Substance Abusers. In contrast to previous findings, however (e.g., Horner & Scheibe, 1997; Miller-Johnson et al., 1998), comorbidity was not associated with higher frequency of substance use or psychological involvement with substances at intake to treatment. Taken together, these findings suggest that both comorbid groups, but particularly the “Mixed” group, present for treatment with complex problems that may require specialized interventions.

Girls were overrepresented in the “Mixed” group, with a constellation of both externalizing and internalizing disorders, and more family problems. These results support previous work suggesting that female substance abusers are particularly vulnerable for a range of problems, including both comorbidity and family dysfunction (e.g., Dakof, 2000; Jainchill, DeLeon, & Yagelka, 1997). Because girls characteristically manifest internalizing disorders (e.g., Deykin, Buka, & Zeena, 1992), their problems may be overlooked by parents, teachers, and providers until they reach an extreme level. In fact, female substance abusers suffer from both internalizing and externalizing problems in conjunction

with substance abuse (Dakof, 2000), as well as greater severity than males on a number of indicators, such as health problems, acute stress, and substance dependence symptoms (Dennis, Godley, & Titus, 1999). Interestingly, there is some support for the hypothesis that internalizing problems serve a protective function against drug use for males but not for females (Rivers, Greenbaum, & Goldberg, 2001; Steele, Forehand, Armistead, & Brody, 1995). These results are considered within a growing body of literature that suggests that female substance abusers are at risk for long-term problems (Rao, Daley, & Hammen, 2000) that require special interventions (Dakof, 2000).

Teens in the “Exclusive Substance Abuser” group were older on average than adolescents in the two comorbid groups. This finding is consistent with developmental psychopathology literature linking emotional and behavioral problems to earlier initiation into problem substance use (Loeber, 1989), as well as studies of drug abusers that demonstrate earlier initiation of substance use among those with comorbid psychiatric disorders (Dennis et al., 1999; Franken & Hendriks, 2000; Rohde et al., 1996). Further, the earlier onset of delinquency and associated problems, the greater its severity and chronicity (Loeber, Green, Lahey, Frick, & McBurnett, 2000). Thus, while the “chicken and egg” debate over the primacy of substance use vs. comorbidity continues, early problems in both domains are prognostic of chronic substance use and antisocial behavior well into adulthood (Lahey & Loeber, 1997; Swadi, 1999).

The primary focus of the study was to examine treatment response of youth in the three comorbid groups. Treatment response differed by comorbid group, as predicted given the treatment findings on comorbidity among adult substance abusers and the growing adolescent drug treatment research knowledge base. Contrary to some research in this area (e.g., Kaminer et al., 1992), comorbidity was not related to premature termination from treatment. Adolescents in the three groups received comparable treatment dosage. Thus, as other research has shown (e.g., Rivers et al., 2001), comorbidity did not significantly predict attendance, nor can the differential treatment responses uncovered be attributed to differential treatment dosage.

Teens in the three groups did not differ on either frequency of substance use or psychological involvement with substances at intake or discharge from treatment, yet their long-term rates of recovery differed. Interestingly, youth in the Exclusive Substance Abusing group showed increases in substance use during treatment but responded more positively during the followup period. Thus, the more encouraging outcomes of the Exclusive Substance Abusing group only became apparent between the 6- and 12-month followup period, in which their rate of improvement was significantly faster than either of the other two groups. In contrast, youth in the Mixed group showed slight reductions in substance use from intake to discharge, but their gains leveled off between discharge and 6 months and then returned to intake levels by the 12-month post-treatment

assessment. Although these analyses did not address the mechanisms by which youth in the three groups achieved reductions in substance use, it is possible that for the youth with comorbid psychopathology, a lack of significant improvement in their emotional and behavioral symptoms may have led to the leveling off of drug use treatment gains in the longer term. These results corroborate mounting evidence for less positive long-term treatment outcomes for youth with comorbid conditions (e.g., Myers et al., 1998). These findings also highlight the importance of examining longer-term trajectories of treatment response with adolescent drug abusers to obtain a more comprehensive account of the impact of interventions.

The fact that treatment condition did not moderate these effects suggests that comorbidity poses significant challenges regardless of intervention approach. McLellan et al. (1986) found in studying adult addicts that comorbidity was the strongest predictor of outcome across a range of treatment programs. Currently there is only a very limited understanding of why comorbid youth are particularly challenging to treat, and no research investigating the specific interventions that might lead to greater success with youth presenting with particular comorbid problems. For instance, one study showed that refusal skills do not differentiate adolescent drug abusers with comorbidity from those without comorbid disorders (Donohue, Van Hasselt, Hersen, & Perrin, 1999). The self-medication hypothesis has not held up well in empirical tests. In sum, although we have fairly conclusive evidence to suggest that psychiatric comorbidity is associated with poorer treatment outcomes for adolescent drug abusers, this is only the barest beginning in understanding how to address this substantial problem. Outlining the next steps in designing more effective interventions for these youth with comorbid substance abuse and psychiatric problems is an enormous challenge and a top priority for treatment developers.

4.1. Limitations

Certain limitations in the current study need to be acknowledged. First, the study relied on the self-reports of the teens themselves, many of whom were court involved and perhaps reluctant to share incriminating data with the study team. The parents’ self-reports of their own psychopathology and family problems likewise must be interpreted with caution, given that some may have been hesitant to discuss these details in the context of a study in which these issues might be explored in treatment. However, the consistency of findings obtained from parents and adolescents lends confidence to the results. Yet the study is further limited by generalizability issues. For instance, the results cannot be generalized to a non-juvenile justice-involved sample. These specific comorbid groups and the findings pertaining to them may only apply to youth who are largely juvenile-justice involved, and even then mostly male and African-American.

4.2. Clinical implications

The results of this study point to a need for greater attention to and more comprehensive assessment of psychiatric comorbidity in working with substance abusing teens and their families. Such assessments may lead to more appropriate treatment planning and intervention, and further support a movement within the field away from a unidimensional disease model in which “one size fits all.” Until psychiatric comorbidity is adequately assessed and targeted in treatment, progress in intervening with this very difficult population will remain limited. Further, treatment development efforts are increasingly moving in the direction of maximizing flexibility in currently established approaches to account for the significant heterogeneity of adolescent substance abusers.

4.3. Future research directions

While these results add to an existing knowledge base of the negative impact of psychiatric comorbidity on substance use outcomes, only the barest beginning has been made in treatment research efforts to improve interventions for these youth. Studies are needed to outline the specific interventions related to success and failure for teens with different comorbid problems. For instance, process research illuminating within-therapy factors that relate to positive and negative outcomes would significantly advance the field. Research examining different mechanisms of change in treatment and over followup periods for youth with different comorbid problems could also lead to more effective interventions. Clearly, the issue of psychiatric comorbidity remains one of the most challenging and significant puzzles for adolescent drug abuse treatment researchers.

Acknowledgments

Completion of this research was supported by grants from the National Institute on Drug Abuse (Grant No. P50 s07697, H. Liddle, PI; Grant No. R03 DA13657, C. Rowe, PI). A limited portion of this work was presented at the College on Problems of Drug Dependence Annual Conference (Scottsdale, AZ, 2001). We gratefully acknowledge Gayle Dakof, Ph.D., Manuel Tejada, Ph.D., and Arlene Frank, Ph.D. for their significant contributions to this manuscript.

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