A Contingency Management Intervention for Adolescent Marijuana Abuse and Conduct Problems

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ABSTRACT

Objective: To describe an innovative treatment for adolescent marijuana abuse and provide initial information about its feasibility, acceptability, and potential efficacy. **Method:** Provided an intervention composed of (1) a clinic-administered, abstinence-based incentive program; (2) parent-directed contingency management targeting substance use and conduct problems; (3) a clinic-administered incentive program for parent participation; and (4) individual cognitive-behavioral therapy for adolescents. Data are presented for 19 adolescents, age 15–18 years. Measures of substance use, psychopathology, and parenting were collected before and after the 14-week treatment. Substance use measures were also collected 1 month post-treatment. Substance use was monitored by twice-weekly urine and breath testing. An intent-to-treat model was used. **Results:** Adolescents and parents attended an average of 10.3 and 10.6 of 14 sessions, respectively. Substance use, externalizing behaviors, and negative parenting behaviors decreased by treatment end. Urine testing indicated that abstinence increased from 37% at intake to 74% at treatment end (z value = 2.28, p = .02) and that 53% of adolescents were abstinent 30 days post-treatment. **Conclusions:** Preliminary data provide support for the feasibility and acceptability of a family-based, contingency management model to treat adolescent substance use and conduct problems. Controlled efficacy studies with larger samples are needed. *J. Am. Acad. Child Adolesc. Psychiatry,* 2005;44(6):513–521. **Key Words:** contingency management, adolescent marijuana abuse.

Marijuana remains the most prevalent illicit substance used by adolescents (Substance Abuse Mental Health Services Administration, 2000). Adolescents who use marijuana regularly are also at risk of experiencing delinquency, school failure, physical and psychological problems, and selling illegal drugs (Dennis et al., 1999). The number of adolescents receiving treatment at publicly funded treatment centers for marijuana abuse or dependence doubled from 1992 to 2000, and the majority of all adolescent substance abuse admissions report marijuana as their primary substance (Substance Abuse Mental Health Services Administration, 2000).

A major risk factor for adolescent substance abuse is the presence of childhood conduct problems (Brook et al., 1995). Substance abuse and conduct problems share important risk factors including family conflict, poor parental monitoring, parental substance use, academic problems, and association with deviant peers (Anderson and Henry, 1994; Brook et al., 1989). More than half of adolescents with substance abuse problems also experience conduct problems (Dennis et al., 2004), and such problems are strong predictors of poor outcome during treatment for substance abuse (Kaminer et al., 1992).

Despite a growing need for adolescent substance abuse treatment, little consensus exists on how to best treat this clinical population. Reviews of literature indicate that adolescents in treatment have better outcomes than adolescents not in treatment and suggest that family-based interventions hold much promise (Waldron, 1997; Williams et al., 2000). Although early studies in this area were difficult to interpret because of methodological

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limitations, three well-designed studies confirm previous impressions of the efficacy of family-based treatments (Dennis et al., 2004; Liddle et al., 2001; Waldron et al., 2001). These studies demonstrated that many adolescents significantly reduced their use from intake to post-treatment and follow-up. However, despite these reductions, a number of adolescents failed to achieve abstinence based on urine testing and continued to report using marijuana on a weekly to monthly basis. Thus, there remains much room for improvement of treatment services in this area. This article describes a multicomponent, contingency management (CM)–based treatment that specifically targets conduct problems in addition to substance abuse and combines evidence-based interventions for substance use, conduct problems, and treatment compliance. A brief discussion of the theoretical and empirical basis for this treatment model is followed by a presentation of initial data from families who received this intervention.

Contingency Management Interventions for Substance Abuse

CM approaches to adult substance abuse are one of the most thoroughly researched and effective behavioral procedures for increasing drug abstinence and associated treatment targets when integrated with other effective psychosocial treatments (Higgins et al., 2002). Essentially, CM interventions use reinforcement or punishment contingencies to increase or decrease the frequency of predetermined therapeutic goals (Budney et al., 2001). To our knowledge, only two studies have examined CM with adolescent substance users (Azrin et al., 1994; Corby et al., 2000). In both studies, a significantly higher percentage of adolescents were abstinent during CM implementation compared with control conditions. Our multicomponent model expands on these initial CM efficacy demonstrations.

Adolescent Treatment Model

To create a developmentally appropriate CM intervention, we considered three factors. First, adolescents rarely seek treatment on their own but instead are brought to treatment by their parents. Oftentimes, adolescents do not perceive their substance use as problematic and therefore are rarely motivated to quit use or remain abstinent (Dennis et al., 2000). Second, parents are likely to consider their adolescent's marijuana use as problematic and are usually motivated to take action. However, they may not have the skills to effectively change their adolescent's behavior. Third, conduct problems often predate and co-occur with adolescent substance abuse (Lynskey and Fergusson, 1995), suggesting that targeting conduct problems might enhance outcomes in treatment for substance abuse.

Our model integrates four empirically based interventions designed to address these issues. First, an abstinence-based reinforcement intervention (voucher program) is used to enhance motivation to engage in treatment and engender marijuana and other drug abstinence. Monetary-based incentives are provided by the clinic for abstinence documented by urine and breath testing (Budney and Higgins, 1998). Second, a parent-directed CM program is employed to further motivate initiation and maintenance of drug abstinence and to better manage other related behavior problems. The family management (FM) curriculum from the Adolescent Transitions Program teaches parents basic principles and skills to decrease problem behaviors and increase prosocial behaviors (Dishion and Kavanagh, 2003). Because parent compliance with FM treatment has a positive impact on treatment outcome (Nye et al., 1995), the third component of this model uses CM to motivate parent participation. Here, parents earn chances to win prizes for actively participating in each treatment component (Fishbowl procedure: Petry et al., 2000). Last, adolescents receive individual therapy to enhance motivation and provide coping skills training focused on achieving and maintaining abstinence (motivational enhancement therapy and cognitive-behavioral therapy (MET/CBT12) (Sampl and Kadden, 2001; Webb et al., 2001). In summary, the combination of the individual therapy, voucher program, FM curriculum, and incentives for parent participation is designed to increase adolescents' motivation to achieve and maintain abstinence, parents' abilities to use effective parenting to decrease substance use and other behavior problems, and adolescents' coping skills to help them adapt to a substance-free lifestyle. Details on how to obtain these four interventions are given below. Documents describing how to integrate these four interventions are available on the Journal's Web site at www.jaacap.com via the Article Plus feature.

A randomized clinical trial examining the efficacy of this CM treatment is ongoing. Here we present data from 19 adolescents who were enrolled in the CM treatment

during the pilot phase of the project. The purpose of this pilot study was to examine (1) the feasibility of using a family-based CM treatment to target adolescent substance use and conduct problems and (2) whether participation in this treatment model is associated with reductions in adolescent substance use and conduct problems and increases in protective parenting behaviors.

METHOD

Participants

Families living in a small metropolitan area were referred by school administrators, the juvenile justice system, community therapists, or physicians or were self-referred. To participate, adolescents must have (1) been between 12 and 18 years old, (2) reported using marijuana during the previous 30 days or had a marijuana-positive urine test result, and (3) lived with a parent/guardian who agreed to participate. Adolescents were ineligible if they (1) displayed active psychosis or current suicidal behavior or had a severe medical illness limiting participation or (2) had severe alcohol, opiate, or cocaine dependence requiring more intensive treatment. No adolescents were excluded based on these criteria. Written informed consent was obtained from the parent(s) or legal guardian; assent was obtained from the adolescent.

Nineteen adolescents, 17 mothers, and 14 fathers participated in treatment. Twelve families had two-parent participation, five families had mother-only participation, and two families had father-only participation. Participant demographic characteristics for both adolescents and parents are listed in Table 1. An intent-to-treat model was used in which all families who attended one or more sessions are included in subsequent analyses.

TABLE 1
Participant Demographic Characteristics

	Adolescents (N = 19)
Sex	
Boys	17 (89%)
Mean age	16.4 (1.0)
Race/ethnicity	
White	18 (95%)
Hispanic	1 (5%)
Education status	
In high school	17 (89%)
Graduated/obtained general equivalency diploma	2 (11%)
Mean grade	10.8 (1.0)
Received mental health services in past year	11 (58%)
Socioeconomic status[a]	5.9 (2.3)

	Parents	
	Mothers (N = 17)	Fathers (N = 14)
Mean age	45.4 (5.9)	47.1 (7.4)
Race/ethnicity		
White	14 (82%)	14 (100%)
Hispanic	2 (12%)	
Biracial	1 (6%)	
Mean years of education	15.8 (2.4)	14.9 (2.9)
Marital status		
Married/remarried	11 (65%)	10 (71%)
Divorced/single	6 (35%)	4 (29%)

[a] A score of 5.9 on the (Hollingshead, 1975) scale represents the following types of occupations: technicians, semiprofessionals, and small business owners.

Procedures

Program Structure. An initial evaluation assessed adolescent substance use and related risk factors such as adolescent, family, and parent characteristics. Treatment involved one 90-minute weekly therapy session for 14 consecutive weeks and twice-weekly drug testing. Each session included a brief check-in with the adolescent and parent(s), a 40-minute individual session with the adolescent, a 40-minute session with the parent(s) alone, and a brief wrap-up with everyone together. To increase two-parent participation, therapists provided outreach (i.e., direct phone calls) to nonparticipating parents to request their participation.

Substance Monitoring. Adolescents provided urine specimens at each session and at a second appointment between sessions. The enzyme multiplied immunoassay technique (Dade-Behring, San Jose, CA) was used to determine abstinence. Marijuana may remain detectable at a standard cannabinoid cutoff level of 50 ng/mL for 2 to 3 weeks after initiation of abstinence in persons who have been using frequently (daily or almost daily; Hawks and Chiang, 1986). However, once a negative urine test result is achieved, subsequent isolated episodes of use will likely test positive at this cutoff level for only 3 to 4 days (Huestis et al., 1996). Hence, to measure continuous abstinence, we required adolescents to participate in twice weekly urine testing. A same-sex staff member observed provision of the specimen. An alcohol breath test was performed at each visit, and parents were trained to use and provided with disposable breathalyzers to test for alcohol use at home. Reports of substance use since the last visit were obtained from the adolescent and parent. Specimens were immediately screened for marijuana, cocaine, opioids, benzodiazepines, amphetamines, and methamphetamines, and results were provided during the clinic visit. If either the adolescent or parents reported substance use, or a drug-positive urine specimen or breath test result was obtained, the adolescent was considered positive for substance use for the purpose of CM implementation.

Voucher Program. The abstinence-based incentive program is designed so that (1) substance use and its absence are readily detected, (2) abstinence is reinforced, (3) substance use results in a loss of reinforcement, and (4) positive reinforcement gleaned from drug abstinence is used to increase nondrug reinforcement. This program was similar to that used in our adult studies of cocaine and marijuana dependence (Budney and Higgins, 1998). Briefly, adolescents earned monetary-based rewards in the form of vouchers each time that abstinence was documented as described above. The value of the vouchers earned increased incrementally with each consecutive test to encourage achievement of longer periods of continuous abstinence. To discourage substance use, the value of the voucher reverted to its initial value

whenever substance use occurred. However, after substance use, the voucher value could return to the level achieved before use with the provision of three consecutive negative specimens. Adolescents could earn as much as $590.00 in vouchers if they remained abstinent throughout treatment. Vouchers earned were redeemed for goods or services that therapists deemed in concert with the treatment goal of increasing prosocial, nondrug-related activities. Examples of voucher purchases include gift certificates to clothing stores, restaurants, and movie theaters. Clinic staff made all purchases so that no cash was provided to adolescents. Details describing how to implement the voucher program can be found in Budney and Higgins (1998) or downloaded from the following Web address: http://165.112.78.61/TXManuals/CRA/CRA1.html.

FM Sessions. Topics covered in the FM curriculum include identifying and labeling adolescent behavior, developing incentives and consequences for change, limit-setting, monitoring, and relationship skills such as problem solving and negotiation. In addition, a substance monitoring contract (SMC) was developed between the parent(s) and youth specifying positive and negative consequences implemented in response to abstinence and substance use, respectively. The first session provided an overview of the FM curriculum (Dishion et al., 2003). The remainder of the first session and the second session reviewed feedback reports summarizing assessment information regarding the adolescent's substance use and risk factors, and parent risk factors (parenting behaviors, marital satisfaction, parent psychopathology including substance use). During session 3, the SMC was established. The therapist and parents developed a list of potential incentives for abstinence and negative consequences for substance use that could be implemented after each substance testing appointment. All subsequent sessions followed a standard format. Sessions began by reviewing substance testing results and evaluating or modifying the SMC. Homework assignments were reviewed, and training from the FM curriculum was provided. The FM curriculum is described in detail in Dishion and Kavanagh (2003). At times, therapists provided check-in calls to prompt parents experiencing difficulty completing homework.

Fishbowl CM Procedure. Each week, parents were asked to complete the following six tasks: attend therapy, attend mid-week urine testing appointments, implement the SMC after urine testing appointments (one urine test on the day of therapy and a second urine test appointment midway between therapy sessions), complete homework, and administer breathalyzer tests. While some parents engage in these tasks willingly, others have more difficulty as they are frustrated with their teen and ambivalent about exerting such effort and energy. Parents earned one ''pull'' for each task that they completed weekly. Each pull allowed parents to draw from a fishbowl containing both ''winning'' and non-''winning'' slips. Winning slips ranged in value from small, medium, to large prizes. Examples of prizes included gift certificates to local restaurants, movie theaters, and grocery stores. At the end of each parent session, the therapist reviewed whether each parent completed the six tasks. Parents were then awarded the number of pulls that corresponded to the number of tasks that they completed. Thus, if a parent completed all six tasks, he or she earned six pulls. Parents then drew from the fishbowl. If a parent drew winning slips, those slips were exchanged immediately for earned prizes. Details on how to implement this procedure can be found in Petry et al. (2000).

Adolescent Sessions. Individual sessions followed the MET/CBT12 curriculum (Sampl and Kadden, 2001; Webb et al., 2001). MET/CBT12 targets substance refusal skills, enhancing social support networks, assertive communication skills, mood management skills, and skills for managing substance use cravings. The first two sessions used motivational interviewing to review feedback reports summarizing assessment information regarding substance use and risk factors and to establish goals. Subsequent sessions began by reviewing substance testing results and discussing substance use or cravings using a behavioral functional analysis model. The therapist reviewed voucher earnings and encouraged spending on prosocial activities. The therapist also reviewed compliance with the SMC. Homework assignments were discussed, and a specific coping skills module from the MET/CBT12 curriculum was presented. MET/CBT12 manuals can be obtained at the following Web site: http://www.health.org.

Therapists also provided case management by coordinating with community providers to ensure families were receiving appropriate services to manage related problems such as attention-deficit/hyperactivity disorder, internalizing problems, school problems, and legal problems. Examples of treatment provided by community resources include psychotropic medication, individual therapy both via school and community mental health providers, and school evaluations. In addition, at treatment end, families were offered an additional 12 weeks of weekly substance testing and referred, when appropriate, to other community resources that provided additional FM to help maintain the CM structure established at home.

Measures

Family members completed measures assessing adolescent substance use and related risk factors. One parent in each household was selected to provide biweekly assessments of parenting and adolescent behavior problems (14 mothers and five fathers). If only one parent participated in treatment, that parent was selected to provide these ratings. If two parents participated, the parent who had the most contact with the adolescent and who could consistently commit to completing the twice-weekly ratings was selected. Only the selected parent's reports and a subset of all measures are presented in this initial report.

Substance Use. Substance use was assessed at intake and twice weekly throughout treatment using the Time-Line Follow-Back method (Sobell and Sobell, 1992), parent report, urinalysis, and breathalyzer tests. Substance use disorders were assessed using the Vermont Structured Diagnostic Interview modified for the *DSM-IV* (Hudziak et al., 2004).

All 19 adolescents met diagnostic criteria for either marijuana abuse or dependence, and nine (47%) also met criteria for alcohol abuse or dependence. One youth also met criteria for cocaine and opiate dependence. Twelve (63%) adolescents provided a marijuana-positive urine specimen at intake. On average, adolescents reported using marijuana 2.1 (SD = 1.6) times per day on 14.4 (SD = 11.5) days in the month before intake. Adolescents reported drinking 3.4 (SD = 4.1) alcoholic drinks per day on 2.8 (SD = 6.7) days in the month before intake. Eight (42%) adolescents were regular tobacco users.

Adolescent Psychopathology. Parents and adolescents completed the Child Behavior Checklist (CBCL) and Youth Self-Report (YSR) (Achenbach, 1991; Achenbach and Rescorla, 2001). The CBCL and YSR yield scores on eight syndromes and three broad scales. Only the Externalizing and Internalizing Problems Scales are reported here. The Externalizing Problems Scale includes items concerning rule breaking and aggressive behaviors and the Internalizing Problems Scale includes items concerning anxiety, depression, withdrawn behaviors, and somatic complaints. The CBCL and YSR ask informants to report on behaviors during the past 6 months.

At treatment end, parents and adolescents were asked to report on behaviors during the past 3 months.

Adolescents and parents were also individually administered the Vermont Structured Diagnostic Interview (Hudziak et al., 2004). This interview uses diagnostic criteria based on the *DSM-IV* to assess for disorders more commonly diagnosed in childhood and adolescence. Interviews were performed by trained interviewers and supervised by licensed clinical psychologists. The interview has demonstrated good psychometric properties (Hudziak et al., 2004). The mean κ for disruptive behavior disorders was 0.62 and 0.69 for internalizing disorders. Intake information on adolescent psychopathology by informant is presented in Table 2. Parents consistently endorsed more psychopathology compared with adolescents.

Parenting Measures. Parents completed the Alabama Parenting Questionnaire (Frick, 1991) at intake and the end of treatment. The Alabama Parenting Questionnaire can be scored for the following factors: positive involvement, ineffective discipline, and deficient monitoring (Wells et al., 2000). The positive involvement scale measures the degree to which parents show interest in and offer praise, affection, and other forms of positive reinforcement. Ineffective discipline measures the predictability and consistency of discipline practices. Deficient monitoring measures the degree to which the child is outside parental supervision.

To examine parenting behaviors, we used parents' average responses across items on each of the three parenting scales. At intake, parents' mean item scores on positive involvement indicated that they "sometimes" (score of 3) to "often" (score of 4) interacted and/or used positive reinforcement with their adolescent. Parents' mean item scores on ineffective discipline and deficient monitoring, respectively, indicated that they "almost never" (score of 2) to "sometimes" (score of 3) used inconsistent discipline and 2 = "almost never" (score of 2) to "sometimes" (score of 3) engaged in poor monitoring behaviors.

Missing Data. At intake, there were no missing data. End of treatment data are missing for two adolescents and three parents. Thus, at the end of treatment, we present data from 17 adolescents and 16 parents.

TABLE 2
Adolescent Psychopathology at Intake

Psychopathology (N = 19)	No. based on Adolescent Reports	No. based on Parent Reports
DSM-IV oppositional defiant disorder/conduct disorder	8 (42%)	11 (58%)
DSM-IV depression/anxiety	3 (16%)	12 (63%)
DSM-IV attention–deficit hyperactivity disorder	4 (21%)	9 (47%)
No. of diagnoses per adolescent in addition to substance abuse/dependence		
1 diagnosis	3 (16%)	5 (26%)
2 diagnoses	4 (21%)	5 (26%)
≥3 diagnoses	2 (11%)	6 (32%)
Clinical range above the 90th %ile ($T \geq 63$)	*YSR*	*CBCL*
Externalizing	10 (53%)	14 (74%)
Internalizing	4 (21%)	14 (74%)

YSR = Youth Self-Report; CBCL = Child Behavior Checklist.

RESULTS

Participation

Adolescents attended an average of 10.4 (SD = 4.5) of 14 sessions and completed an average of 4.1 (SD = 3.3) of 10 homework assignments. For two-parent families, both parents attended an average of 9.7 (SD = 4.8) sessions together. Across all families, at least one parent attended an average of 10.7 (SD = 4.7) sessions. Mothers completed an average of 5.2 (SD = 4.7) and fathers completed an average of 5.4 (SD = 4.8) of 10 assignments. Adolescents earned an average of $232.53 (SD = $203.68) of $590.00 possible voucher earnings. Parents earned an average of 36.4 (SD = 25.2) pulls from the fishbowl incentive program per household, earning prizes totaling an average of $94.59 (SD = $93.96).

Substance Use Outcomes

For marijuana use outcomes, unexcused absences (e.g., urine test was scheduled but youth failed to attend appointment) were considered positive for marijuana. At times, families requested an excused absence in advance (e.g., absence due to holiday, schedule conflict). On average, families requested 1.2 (SD = 1.4) excused absences. Families permitted excused absences were required to make up the excused urine testing appointments, which often meant extending the number of scheduled urine testing appointments beyond the treatment end assessment. In an effort to hold time constant, the treatment end assessment occurred 14 weeks after the first day of treatment, regardless of excused absences. Consequently, in some cases, the treatment end assessment may have occurred before the end of therapy or urine testing.

Of the 28 scheduled urine specimens, adolescents (N = 19) provided an average of 13.3 (SD = 10.6) marijuana-negative specimens. The mean longest period of continuous abstinence from marijuana during treatment was 6.7 (SD = 5.3) weeks as reflected by urine testing and 8.4 (SD = 5.1) weeks as reflected by self-report. Figure 1 displays the percentage of abstinence for each of the 28 scheduled urine testing appointments across the 14 weeks of treatment. All clinic-administered breath tests were alcohol negative. Parents administered an average of 11.4 (SD = 20.6) breath tests at home. The mean longest period of continuous abstinence from alcohol during treatment was 10.5 (SD = 4.1) weeks as reflected by self-report.

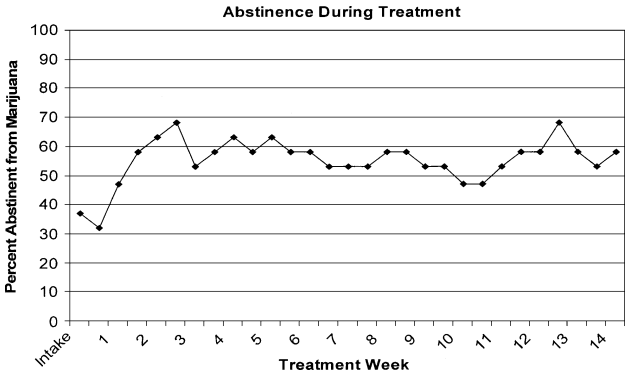

Fig. 1 Abstinence.

At the end of treatment assessment, 17 of 19 adolescents provided urine specimens. Table 3 shows pre- and posttreatment substance use data. Fourteen (74%) adolescents provided a marijuana-negative urine specimen compared with seven (37%) at intake. A test for significance of the difference between the two proportions of marijuana-negative specimens at intake and treatment end was significant ($p = .02$), indicating greater marijuana abstinence at treatment end. There was a significant decrease in reported days of marijuana use when comparing the month before intake and the last 30 days of treatment.

At treatment end, 74% of adolescents reported no alcohol use during the last month of treatment and provided alcohol-negative breath tests at home and at the clinic compared with 47% during the month before intake. A test for significance of the difference between the two proportions of adolescents reporting no alcohol use at intake and treatment end was not significant ($p = .10$). The decrease in the number of reported days of alcohol use was also not significant when comparing the month before intake and the last 30 days of treatment. All 17 adolescents who provided a urine specimen at treatment end tested negative for all other drugs compared with one adolescent who tested positive for opiates and cocaine at intake.

Nineteen adolescents provided self-report and 15 adolescents provided urine specimens 1 month after treatment ended. Two of the four adolescents missing urine specimens self-reported marijuana use post-treatment. Assuming the remaining two missing urine specimens were marijuana positive, 53% of all 19 adolescents were abstinent 30 days after treatment. Of the adolescents who had a marijuana-negative specimen at treatment end, 71% were still abstinent 1 month later based on urine testing. Self-report data indicated that, on average, adolescents reported using marijuana 1.7 (SD = 0.8) times per day on 4.2 (SD = 8.7) days and drinking

TABLE 3
Means, z, and *F* Values Reflecting Changes Between Intake and End of Treatment

	Intake	Treatment End	*z* value/*F* value	*df*	*p* Value
Adolescent substance use ($N = 19$)					
Marijuana-negative urine test result	7 of 19	14 of 19	2.28	1	.02
Days used marijuana in past month[a]	14.37 (11.5)	4.47 (9.2)	12.14	18	.003
No reported alcohol use	9 of 19	14 of 19	1.66	1	.10
Days used alcohol in past month[a]	2.84 (6.7)	0.47 (1.0)	3.70	18	.07
Adolescent psychopathology ($n = 16$ for CBCL, $n = 17$ for YSR)					
CBCL externalizing	65.31 (8.0)	61.06 (7.3)	4.97	15	.042
CBCL internalizing	63.06 (9.1)	59.56 (10.0)	5.40	15	.035
YSR externalizing	59.06 (12.0)	56.76 (11.3)	.74	16	.403
YSR internalizing	53.65 (12.2)	49.06 (12.7)	2.41	16	.140
Parenting behaviors ($N = 16$)					
Deficient monitoring[b]	2.20 (0.5)	1.79 (0.3)	17.93	15	.001
Ineffective discipline[b]	2.23 (0.5)	1.57 (0.4)	39.34	15	.000
Positive involvement[c]	3.50 (0.4)	3.39 (0.4)	3.51	15	.081

Note: CBCL = Child Behavior Checklist; YSR = Youth Self-Report.
[a] Self-reports of substance use compare number of days used in the 30 days before intake and the last 30 days of treatment.
[b] High scores indicate less monitoring and use of consistent discipline.
[c] High scores indicate more daily involvement and use of positive parenting practices.

3.5 (SD = 3.5) alcoholic drinks per day on 0.2 (SD = 0.7) days during the posttreatment month.

Adolescent Psychopathology

Table 3 shows pre- and posttreatment CBCL and YSR scores. Parent reports of externalizing and internalizing problems on the CBCL decreased significantly between intake and treatment end. In contrast, adolescent reports of externalizing and internalizing problems did not change significantly.

Parenting

The deficient monitoring and ineffective discipline scales changed significantly from intake to treatment end, indicating increases in monitoring and use of consistent discipline (Table 3). Positive involvement scores did not change significantly.

DISCUSSION

This CM-based outpatient program designed to treat adolescents who abuse marijuana and other drugs included behavioral interventions targeting conduct problems in addition to substance use. Information gleaned from an initial sample of 19 adolescents and their families suggests that the program is acceptable to participants and has promise for engendering high rates of retention and compliance. We are cautiously optimistic about the program's ability to promote drug abstinence, reduction in conduct problems, and improvement in parenting behaviors.

Adolescents and their parent(s) attended the majority of therapy sessions and urine testing appointments and completed approximately half of the homework assignments. In 63% of families, both parents participated. One study by Irvine et al. (1999) used the Adolescent Transitions Program described in the current intervention model with at-risk middle school children and their families. Of families who attended at least one session, 62% of families attended seven to 12 sessions (Irvine et al., 1999). Thus, the attendance rates found in the current study are promising because they are as good or better than would be typically expected for this type of intervention. It is difficult to assess the homework completion rates because the majority of trials similar to this one do not present such data. We intend to conduct future analyses to relate such indices of treatment compliance to treatment outcome. Compliance with treatment, including attendance, program completion, and homework completion, has been associated with increases in positive child behavior and decreases in negative child behaviors (Nye et al., 1995). This CM program encouraged participation in several ways. First, the voucher program was designed to increase the adolescent's motivation to attend the clinic to provide evidence of drug abstinence. Second, parental attendance, assignment completion, and efforts to increase their adolescent's compliance with the program were directly reinforced through the fishbowl procedure. Third, therapists provided outreach (i.e., direct phone calls) to nonparticipating parents to request their participation. Fourth, therapists provided check-in calls to prompt parents to complete homework.

Approximately three fourths of adolescents were abstinent from marijuana by treatment end compared with one third who provided a marijuana-negative specimen at intake. Similarly, three fourths of youths reported no alcohol use during the last month of treatment compared with one half who reported no use during the month before intake. The majority of adolescents were still abstinent 30 days post-treatment. Although no control group was available for comparison, such findings suggest that this CM model offers promise to enhance treatment outcomes.

Concordant with previous reports (Dennis et al., 2004; Liddle et al., 2001; Waldron et al., 2001), the majority of adolescents displayed significant externalizing problems, suggesting that interventions that specifically target conduct problems appear warranted. Parent reports on the CBCL indicated decreases in externalizing problems over the course of treatment, providing preliminary support for the use of FM treatment in adolescent substance abuse treatment. In addition, parent reports on the Alabama Parenting Questionnaire indicated significant improvement in their ability to monitor their adolescent's activities and use consistent forms of discipline. Previous family-based clinical trials targeting adolescent substance use have reported mixed results in reducing conduct problems (Liddle et al., 2001; Waldron et al., 2001). In two studies of multidimensional family therapy, parenting practices were found to significantly improve (Liddle et al., 2001; Schmidt et al., 1996).

Also concordant with previous research, a significant number of adolescents experienced internalizing problems according to parent reports (Dennis et al., 2004; Waldron et al., 2001). Therapists provided case

management (i.e., provided professional referrals) to help address problems not directly targeted in treatment including depression and anxiety. Although the MET/CBT12 curriculum contains content designed to address cognitions and behaviors associated with internalizing symptoms, this CM model did not attempt to specifically address internalizing symptoms. Including a component that specifically targets depression and anxiety might further enhance outcomes. This seems especially important in light of a recent review indicating that regular marijuana use is related to subsequent internalizing problems (Rey et al., 2004). A pilot study of a family-based CBT program designed to target substance use and depression demonstrated success in reducing rates of both problems (Curry et al., 2003).

Limitations

This sample includes a small number of cases, and without a control treatment condition for comparison, it is difficult to draw conclusions regarding outcomes. We are currently conducting a randomized trial to determine the efficacy of this treatment and examine whether changes in parenting behaviors mediate treatment outcomes. Second, participation required a pretreatment acknowledgment that a parent would participate each week. Hence, results generalize only to adolescents who meet such treatment conditions. Note, however, that we believe that with outreach efforts and flexible scheduling, the majority of available parents or guardians will agree to participate. Third, participating adolescents were primarily white, had two-parent participation, had parents with relatively high levels of education, lived in small metropolitan or rural communities, and reported marijuana as their primary drug of abuse. Thus, the generalizability of the CM treatment model to other populations of adolescents and to other types of substance dependence is unknown. Finally, therapists provided case management, referring families to community providers for problems not directly addressed in this treatment model. Consequently, it may be that changes in adolescent substance use and other psychopathology were due in part to successful treatment of comorbid disorders.

Clinical Implications

Without efficacy data from controlled trials, the clinical implications of the current findings must be viewed with caution. These data provide preliminary support for using clinic- and parent-directed CM to treat adolescent substance abuse and conduct problems. The multicomponent treatment was feasible and acceptable to families, and initial results suggest substantial reductions in substance use and conduct problems and improvements in parenting behaviors. It is important to consider potential modifications that would enhance feasibility in clinical practice settings. For instance, to accommodate billing concerns, the 90-minute weekly session could be divided into twice-weekly therapy sessions, one for parent and one for the adolescent. In addition, research on adult substance abuse treatment has demonstrated success in using incentive systems in traditional clinical settings funded by donations or the use of lower magnitude incentives (Petry et al., 2001). If the use of incentives can help increase treatment retention and attendance, clinics may find it cost effective to incorporate such strategies as those described in the model presented here. Future research using larger samples and examining treatment outcomes over time will help to further evaluate the utility of this model.

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