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Contingency Management in Community Programs Treating Adolescent Substance Abuse: A Feasibility Study

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Abstract

PROBLEM—Adolescent substance abuse remains a public health problem, and more effective treatment approaches are needed.

PURPOSE—The study aims to determine the feasibility and preliminary effectiveness of implementing a cost-effective contingency management (CM) intervention in community substance abuse treatment for adolescents with marijuana use disorders.

METHODS—Thirty-one adolescents with primary marijuana use disorder enrolled in a community treatment program were randomized.

FINDINGS—There were no significant group differences in percent negative UDS, sustained negative UDS, or retention in treatment.

CONCLUSIONS—CM was difficult to integrate into community treatment programs and did not seem to be an effective adjunct to standard community substance abuse treatment for adolescents with marijuana use disorders. Modifying the CM procedure for adolescents, changing staff attitudes toward CM, and/or combining CM with other evidence-based psychosocial treatment may improve outcomes.

Search terms

Adolescents; contingency management; marijuana use disorder

Data from the 2009 National Survey on Drug Use and Health showed that current marijuana use in 12- to 17-year-olds increased from 6.7% in 2007 and 2008 to 7.3% in 2009 (Substance Abuse and Mental Health Services Administration, 2010). In the most recent Monitoring the Future report on adolescent drug use (Johnston, O'Malley, Bachman, & Schulenberg, 2011), there was a slight increase in past month marijuana use in 8th graders (8%), 10th graders (16.7%), and 12th graders (21.4%). Marijuana use prevalence is two to three times higher than any other drug category.

Although evidence is growing to support behavioral interventions, there is still limited consensus on the best approaches for treating adolescents with substance use disorders. Effective treatments must retain adolescents in treatment long enough for them to benefit from cognitive and psychosocial strategies on which many treatments are based. Contingency management (CM), a procedure that uses tangible incentives to reinforce positive behavior change, has been shown to be efficacious in many difficult-to-treat substance-dependent populations. CM is rooted in behavioral modification operant conditioning. Behaviors that are reinforced are more likely to reoccur and behaviors that are punished are less likely to reoccur (Skinner, 1969). Drug use is a conditioned behavior with continued use being reinforced by the rewarding properties of the drug. This behavior is best altered by providing positive reinforcement for more adaptive behavior (i.e., abstinence) versus negative reinforcement of old (drug using) behaviors (Bigelow, Stitzer, Griffiths, & Liebson, 1981). Contingency management procedures, coupled with certain psychosocial interventions such as cognitive behavioral therapy (CBT), motivational enhancement therapy (MET), and family therapy, have been shown to increase retention in treatment and reduce drug use in adolescents and young adults with marijuana use disorders (Budney, Moore, Rocha, & Higgins, 2006; Carroll et al., 2006; Kadden, Litt, Kabela-Cormier, & Petry, 2007; Stanger, Budney, Kamon, & Thostensen, 2009). Henggeler et al. (2006) found that CM increased retention and abstinence rates when added to multisystemic family therapy and standard community treatment in an adolescent drug court population.

Despite a body of evidence supporting the efficacy of CM in the treatment of substance-abusing populations, clinicians in frontline treatment settings have been reluctant to adopt CM into their usual practice and integration of CM into standard treatment in community programs among adolescents has not been well studied. Kirby, Benishek, Dugosh, and Kerwin (2006) explored beliefs regarding CM in a large sample of community treatment providers. Although approximately half of those surveyed said they would be open to using CM, the most commonly reported objections were the cost of incentives, incentives not addressing the underlying issues and incentives not targeting multiple behaviors or treatment goals. Other less common concerns included incentives being considered a "bribe," causing discord among patients, and undermining the treatment process and internal motivation.

The present study was intended to explore the feasibility of integrating a cost-effective CM procedure similar to the one developed by Petry, Martin, Cooney, and Kranzler (2000) into standard community treatment for adolescents with primary marijuana use disorders. This study differs from previous studies in that CM was not coupled with another evidence-based psychosocial treatment and exclusion criteria were minimized so that participants were more representative of those typically seen in community programs. It was hypothesized that participants randomized to the incentive group plus standard community treatment would be retained in treatment longer, have a greater percentage of urine drug screens (UDS) negative for marijuana, and have longer periods of sustained marijuana abstinence than those participants randomized to a control group plus standard community treatment. In order to encourage submission of UDS, participants in the control group were given a set number of draws for each UDS submission. They received two draws for each UDS submitted (regardless of results) throughout the intervention period. This was necessary to increase the

likelihood that the control group would submit sufficient UDS for comparison with the experimental group.

Method

Adolescents with primary marijuana use disorders were recruited from outpatient community substance abuse treatment programs to participate in this 10-week randomized controlled trial. Consecutive admissions to the community programs were approached at intake assessment and asked about their willingness to participate. Adolescents could participate in the study only if they were enrolled in one of the participating clinical programs. All study procedures were approved by the Medical University of South Carolina Institutional Review Board prior to implementing any study procedures.

Procedures

After obtaining informed consent from parents or guardians and assent from the adolescents under the age of 18, 31 adolescents were randomized to either CM plus standard community treatment or a control group plus standard community treatment following baseline assessment. The standard treatment at the community programs from which study participants were enrolled supported abstinence-based recovery and consisted mainly of group therapy, including 12-step treatment, relapse prevention, education classes, case management, intensive in-home services, and/or family counseling occurring from 1 to 4 days per week. Eighty percent of the adolescents were receiving treatment four or more hours on two or more days per week. The remaining adolescents were seen once per week in either group or individual therapy. Two treatment programs were added after the first year to increase recruitment. One of the programs from which four participants were recruited treated adolescents with behavioral and emotional problems. This was an intensive outpatient program consisting of individual, group, and family therapies. Treatment targeted behavioral self-control and social skill acquisition, and also included substance abuse groups for those adolescents with identified substance use problems. The other treatment program had similar services to the initial recruitment site. The average length of the treatment programs was 10–12 weeks. Programs accepted self-pay, private insurance, and Medicaid. Individual payment plans based on financial conditions were arranged for indigent self-pay patients. There were no between-group differences in the number of days or hours of community treatment that participants were enrolled in. Eligibility included adolescents aged 12–18, presence of a primary marijuana use disorder, past 45-day marijuana use, and enrollment in standard treatment at a community treatment program. Past 45-day use was selected as a criterion because some adolescents were on a wait list due to a delay in entry into the clinical treatment program. Adolescents could have another substance use disorder provided that marijuana was their primary substance use disorder. Adolescents who were suicidal, homicidal, psychotic, or unable to comprehend English were excluded. In order to increase recruitment, community program counselors who referred any patient to the study had their name put in a bowl for a drawing to receive a \$50 gift certificate at the end of each month.

All participants submitted UDS twice weekly for 10 weeks with at least 48 hr between the UDS (i.e., Monday/Thursday, Monday/Wednesday, Tuesday/Thursday). Urine drug screen collections were scheduled on the treatment program days for those participants attending two or more days per week. Participants attending once per week agreed to return to the clinic during nontreatment appointments to provide urine samples. All treatment programs provided transportation to and from appointments, including appointments to provide study samples. Participants who dropped out of their standard community treatment program were not allowed to remain in the intervention component of the study but could participate in follow-up assessments.

Participants in the CM group earned chances to draw for prizes contingent on submitting negative UDS and breathalyzers negative for alcohol. With consecutive negative UDS and breathalyzers negative for alcohol, the number of chances to draw from the prize bowl increased weekly by one. If a participant submitted a positive UDS or had an unexcused absence from treatment, the number of draws was reset back to zero. The use of escalating schedules has been shown to increase sustained behavior change (Roll & Higgins, 2000; Roll & Shoptaw, 2006). To discourage switching to other substances of abuse, participants also had to test negative for other substances (i.e., alcohol, cocaine/crack, nonprescribed amphetamines, opiates, methamphetamine). Incentives contingent on abstinence from all drugs of abuse was a requirement in the Stanger et al. (2009) study, which targeted marijuana use. Participants in the noncontingent control group earned two draws for each UDS submission, regardless of results. All participants were given excused absences if the agency was closed for holidays or they or their parents/caretakers notified the staff in advance of nonattendance. Participants were allowed one excused absence per week without penalty, with excused missing visits coded as negative if the most proximal samples before and after the missing value had negative results. There were no group differences in excused absences. Prize draws were not allowed for excused absences; however, the escalation schedule was not reset with an excused absence. UDS results were not reported to treatment staff or parents but were available if requested; however, there were no requests made throughout the study.

Due to the long excretion half-life of marijuana in urine, all participants were given 2 weeks for marijuana washout and received two draws for prizes per urine submitted during the first 2 weeks of the study. This 2-week washout reinforcement procedure was used in the Stanger et al. (2009) adolescent marijuana study. The research staff who conducted the CM procedure were employed by the community programs and were trained by the principal investigator using the National Institute on Drug Abuse (NIDA) Blending product, Promoting Awareness for Motivational Incentives. One research staff participated in an earlier larger NIDA Clinical Trial Network study that explored the use of CM in stimulant users (Petry et al., 2005). However, the research staff did not provide direct clinical services in the standard community treatment program.

The prize draw bowl contained 244 chits that were assigned a specific value: 100 assigned “good job” (no monetary value), 100 assigned “small prize” (\$1–\$2), 40 assigned “large prize” (\$20), and 4 assigned “jumbo prize” (\$80). Any participant in the CM group who tested negative at all 20 visits throughout the 10-week study period could receive a total of 112 draws. To further increase motivation for continuous abstinence and reduce frustration, participants in the CM group received a one-time large bonus prize after their first 2 weeks of consecutive negative UDS. Participants exchanged chits for selected prizes from a prize cabinet containing items appealing to adolescents, such as phone cards, video games, iPods, iTunes, skateboards, baseball caps, basketballs, jewelry, wristbands, and snacks.

Urine drug testing was performed using the five-panel QuickTox Multiple drug dip card (marijuana, cocaine, opiates, methamphetamine, and amphetamine), which has a cutoff of 50 ng/mL for the THC metabolite, 11-nor-delta-9-THC-9-carboxylic acid (THCCOOH). Positive UDS were sent to the lab for a quantitative analysis of the THCCOOH level using the Enzyme Multiplied Immunoassay Technique system. As hydration affects THC levels, a creatinine-corrected ratio consisting of the THC quantitative level and urine creatinine level was calculated to identify any new marijuana use. If the subsequent THC level to creatinine ratio was decreased by 50% or less and no more than 5 days passed since the last UDS submission, the UDS was considered negative (Huestis & Cone, 1998). Adolescents were informed of this UDS procedure and the possibility that they may have to wait 24 hr for their prize draws. Throughout the 10 weeks, only eight positive UDS (9.8%), five (6.4%) from

incentives and three (4.3%) from control, were converted to negative using this method. Urine sample collection was supervised by a same-gender staff member and also checked for temperature and adulterants. Previous CM studies have used results from the on-site testing alone and have not considered the possibility that positive UDS for marijuana may not be indicative of new use (Stanger et al., 2009). The primary outcomes were the percentage of negative UDS, retention in treatment, and longest sustained abstinence from marijuana across the 10 weeks. Retention was determined by the number of weeks retained in the study. Secondary outcomes included changes from baseline to 12 weeks in impulsivity as measured by the Barrett Impulsivity Scale (BIS) and changes in craving as measured by the marijuana craving questionnaire.

Assessments

Baseline assessment measures included the Composite International Diagnostic Interview (CIDI), a structured 30 to 60-min interview used to establish *Diagnostic and Statistical Manual of Mental Disorders-IV* diagnoses of marijuana and other substance abuse and dependence. The ability of the CIDI to discriminate adolescent patients with substance use disorders (SUD) from controls in terms of abuse (61% patients and 7.1% controls; $p < .00005$) and dependence (78% patients and 4.7% controls; $p < .00005$) diagnoses has been demonstrated to be excellent (Crowley, Mikulich, Ehlers, Whitmore, & Macdonald, 2001). The Teen Addiction Severity Index (T-ASI) is a valid, reliable, semi-structured interview that measures the severity of substance use and associated problem domains, including alcohol and substance use, school or employment, family, peer/social, legal, and psychiatric problems. The T-ASI has good discriminate validity for detecting comorbid substance use in adolescents hospitalized for psychiatric treatment. Inter-rater reliability across T-ASI subscales is high ($R = 0.78$). The T-ASI was administered at baseline (Kaminer, Wagner, Plummer, & Seifer, 1993). Primary marijuana use was determined by a question on the T-ASI “What substance is the major problem for you?” The Time-Line Follow-Back (TLFB), adapted for use with adolescents, measures daily quantity and frequency of drug and alcohol consumption by retrospective self-reports. Interclass correlation coefficient for past 90-day cannabis use is 0.83 (Levy et al., 2004). The TLFB shows good convergent validity for marijuana use compared with other assessments, including urine drug screens (pretreatment past 90-day self-report use, 99%, and positive urine drug screen, 83%) and parent ($r = 0.37$, $p < .001$) and sibling ($r = 0.44$, $p < .001$) collateral reports (Waldron, Slesnick, Brody, Turner, & Peterson, 2001). The TLFB was collected at baseline to determine past 45-day marijuana use. The Diagnostic Interview Schedule for Children-Predictive Scales, administered by computer to youths, was used to screen for the presence or absence of co-occurring psychiatric disorders: panic disorder, generalized anxiety disorder, obsessive-compulsive disorder, major depressive disorder, mania, psychotic disorder, attention deficit hyperactivity disorder, oppositional defiant disorder, and conduct disorder. This instrument has demonstrated excellent sensitivity and specificity (range 80% to 100%) compared with the full Diagnostic Interview Schedule for Children. Positive predictive screening value is high (0.4–0.7) (Lucas et al., 2001).

The Marijuana Craving Questionnaire (MCQ-12), a 12-item self-report questionnaire extracted from the original 47 item MCQ, measures four different dimensions of craving in individuals with marijuana use history: compulsivity or inability to control use, emotionality or use to relieve withdrawal or negative mood, expectancy or anticipation of positive outcomes, and purposefulness or intention/planning to use. The MCQ-12 was constructed by selecting the three items from each dimension that exhibited optimal within-factor reliability (Cronbach’s alpha coefficient [0.55–0.77] and inter-item correlation [0.29–0.52]) (Heishman, Singleton, & Liguori, 2001). The MCQ was administered at baseline and 3-month follow-up. The Barrett Impulsivity Scale (BIS-II-A), a 30-item Likert scale that has

been edited for adolescents, measures motor impulsiveness, cognitive complexity, self-control, immediate gratification, attention, and perseverance. The BIS-11-A has good internal consistency (Cronbach's alpha 0.78) and adequate total inter-item correlations (0.29) (Fossati, Barratt, Acquarini & DiCeglie, 2002). The BIS was administered at baseline and 3-month follow-up. Participants received a large prize for completion of assessments at baseline and follow-up visits.

Analysis

Between-group differences in demographic and psychosocial characteristics were analyzed using chi-square for categorical and one-way analysis of variance for continuous data. Group differences in overall percent negative UDS, longest duration of sustained abstinence and retention in treatment were analyzed using analysis of covariance regression models. Covariates in the regression model included baseline UDS and randomized treatment group. Baseline UDS was entered as a covariate because drug use at intake has been shown to be a strong indicator of during-treatment outcome (Moore & Budney, 2002).

To account for missing and incomplete data, percent negative UDS was evaluated in two ways: (a) overall percentage of submitted samples that were free of each target drug (marijuana, stimulants, alcohol, opioids) and (b) overall percentage of samples out of the 20 scheduled visits that were free of each target drug (marijuana, stimulants, alcohol, opioids). The longest duration of abstinence from the primary target drugs for each participant was defined as the number of consecutive samples obtained under the twice-weekly schedule that indicated abstinence from marijuana and other drugs of abuse. Retention in treatment included the number of weeks attended during the study period. All analyses were conducted according to the intent-to-treat principle. Analyses were performed using SPSS 15 for windows (SPSS Inc., Chicago, IL, USA), with a significance level set at 0.05.

Results

From October 2006 through May 2009, 275 adolescents and/or parents were screened, 79 parents/guardians were consented, 47 of which were both parental consent and adolescent assent. Thirty-one participants were enrolled and randomized. Five adolescents were enrolled from two community programs that were added halfway through the study to increase enrollment. Those not randomized were either not interested, reported not using any marijuana in the past 45 days, or did not return after the initial clinic intake appointment. Demographic and psychosocial characteristics were similar across sites and there were no between group differences (Table 1). Participants were primarily African American, male, approximately 15.6 ± 1.1 years of age (range 14–18 years of age), living with a single parent/guardian, and referred to treatment by the Department of Juvenile Justice. Eighty percent of participants were enrolled in Medicaid insurance, indicating that these adolescents lived in households that were less than 150% above poverty. Seventeen percent of the adolescents were self-pay with a sliding scale fee for service. Thirty-two percent of the participants had another substance use disorder, primarily alcohol use disorder, and 42% had symptoms of conduct and/or oppositional defiant disorder by self-report. Fifty-five percent had a positive UDS for marijuana at baseline. The average age of initiation for marijuana use was 12.9 ± 1.6 years of age. One participant met diagnostic criteria for marijuana abuse and all other participants met criteria for marijuana dependence. There were no between-group differences in any baseline substance use variables, including measures of craving (MCQ) and impulsivity (BIS). At baseline, 48% used tobacco on 15 or more days in the past 30 days. The demographic characteristics were consistent with those reported in the Department of Alcohol and Drug Abuse state intake admission statistics (South Carolina Department of Alcohol and Other Drug Abuse Services, 2009).

Values reported for primary outcome variables are model-estimated marginal means and standard errors for the factor combinations of group and baseline UDS. Treatment retention and UDS results for the 10-week intervention period are displayed in Table 2. There were no group differences in the number of UDS provided ($F[1,27] = 0.01, p = .9$), retention ($F[1,27] = 0.035, p = .9$), sustained abstinence ($F[1,27] = 0.16, p = .9$), percent negative submitted UDS ($F[1,27] = 1.23, p = .3$), or percent negative out of total scheduled UDS ($F[1,27] = 0.28, p = .6$). Other drug use was minimal throughout the study. Three participants had one UDS positive for both marijuana and cocaine, one participant had two UDS positive for marijuana and cocaine, and one participant had four UDS that were positive for marijuana and opiates. No participants used another substance in the absence of marijuana use.

Participants with a positive baseline UDS (55%) had a significantly lower percentage of negative submitted UDS throughout the 10 weeks (0.29 ± 0.08 versus 0.78 ± 0.08 for those with a negative UDS). The majority of those with positive UDS at baseline who did subsequently submit a negative UDS did so by the third week (80%) in the study. Participants in the CM group received an average of approximately \$157.00 in prizes while those in the control group received \$151.00 during the 10-week intervention period. Seven participants in the incentive group received a bonus prize worth \$20 for their first four consecutive negative UDS. There was no increase in marijuana or any other substance abuse in either group following receipt of either a large or jumbo prize.

Only four participants in each group completed the 10-week study intervention.

Follow-up at 3 months was obtained on 14 (45%) participants, seven participants in the CM group and seven participants in the control group. Six participants who did not complete the study intervention participated in the follow-up. Although sample sizes were small, there were no group by time interaction differences in impulsivity as measured by the BIS (73.8 ± 8.1 to 69.2 ± 7.3 for CM and 72.7 ± 7.2 to 70.6 ± 10.0 for the control group; $F[1,11] 0.361, p = .6$). There was a group by time interaction on craving as measured the MCQ (30.8 ± 19 to 17.3 ± 8.8 for CM participants and 38.5 ± 16 to 35.3 ± 13.9 for the control group, $F[1,11] 6.35, p = .03$).

Discussion

Preliminary results suggest that this cost-effective method of CM was difficult to integrate into community substance abuse programs and may not be efficacious in adolescents with marijuana use disorder being treated in community substance abuse treatment. Although CM has been effective when packaged with certain manual-based psychosocial treatments, in the current trial this CM method did not seem to be an effective adjunct to standard community substance abuse treatment. Stanger et al. (2009) compared abstinence-based CM plus MET/CBT plus family management counseling (experimental condition) with attendance-based CM plus MET/CBT and parent psychoeducation (control condition) for adolescents with marijuana use disorders. Adolescents in the abstinence based CM experimental condition had 7.6 weeks of continuous abstinence versus 5.1 weeks of continuous abstinence in the control condition ($p = .04$). In the current study, participants only achieved on average two and a half weeks of sustained abstinence.

Henggeler et al. (2006) used CM to enhance a 12-month drug court intervention plus multisystemic family therapy (MST) for juvenile offenders who abused substances. Adolescents were reinforced with vouchers for submitting negative UDS. The CM/MST drug court group had a lower percentage of positive marijuana UDS compared with the MST drug court group without CM and the standard drug court (DC) only group (18%, 28%, and 69%, respectively). Drug use in the standard DC only group was comparable with

the drug use in the current study. The evidence-based psychosocial interventions (MET/CBT and MST) used in conjunction with CM in the studies mentioned previously used manual-based therapies that were closely supervised and monitored for fidelity. Standard treatment as usual in the current study consisted mainly of group therapy without a manual and no supervision for fidelity. Thus, CM may increase the efficacy of another evidence-based treatment, but the effect may not be strong enough when added to nonevidence-based treatments that are typically used in many community programs.

The adolescents were difficult to recruit, as well as to retain in the study intervention. Most of the adolescents had already been using marijuana for several years and were experiencing numerous psychosocial, behavioral, and legal problems. Court-ordered adolescents may be reluctant to participate in any voluntary program which involves more frequent urine drug testing. Several recent studies did not find a substantial impact on drug use with the addition of abstinence-based CM to standard DC treatment programs (Marlowe, Festinger, Dugosh, Arabia, & Kirby, 2008; Prendergast, Hall, Roll, & Warda, 2008). Other recruitment/retention barriers included transportation problems, having limited time for any other program activities and lack of parental engagement in treatment. Unlike the Henggeler et al. (2006) and Stanger et al. (2009) studies that involved parental participation, most of the adolescents in the current study lived in single-parent households or lived with another relative and there was very limited parental involvement in the standard treatment program.

Contingency management research has shown that factors such as magnitude of the reinforcer, schedule of reinforcement, and escalating the value of the reinforcer for sustained target behavior can positively impact outcomes (Petry, 2000). The value of the incentives must be sufficient to compete with the reinforcing properties of substances of abuse. In the Stanger et al. (2009) study, adolescents in the experimental condition earned an average of \$312 versus \$113 in the control condition. Compared with previous studies, in the present study the value of the incentives earned was much lower and equivalent between groups (\$157.00 for incentives; \$151.00 for control), possibly not sufficient to compete with the rewarding effects of marijuana. All participants were given an initial 2-week washout period where they were given two draws per UDS submission. Participants in the incentive group were also given a large prize for the first 2 weeks of continuous abstinence. In the incentive group, three participants never submitted a negative UDS, two of whom dropped out in the washout phase. Future studies may improve outcomes by increasing the value of incentives and/or having a two-level incentive procedure with incentives for attendance in both study groups and incentives for abstinence in the experimental condition.

The present study used a variable ratio or an intermittent schedule of reinforcement, which is cost-effective. The adolescents in the CM group had a 50% chance of getting a prize per draw. Although adolescents could increase their chances of winning prizes by earning an increased number of draws if they remained drug free, they could also lose accumulated draws if they had a positive UDS. Adolescent substance abusers have been shown to exhibit more impulsivity and deficits in delayed rewards (Dougherty et al., 2007). The uncertainty associated with the reinforcement in the current study may have impacted outcomes. It is possible that the risk of not receiving prizes when drawing from the prize bowl may disappoint and discourage adolescents. Increasing the certainty of the reinforcement may therefore be a better option to increase motivation. Studies that reinforce with vouchers may be more suitable for adolescents. Reinstating the escalation schedule after a reset may also increase motivation after a lapse/relapse. In the Stanger et al. (2009) study, the escalation schedule was reinstated to the highest level previously achieved when adolescents had three consecutive negative UDS after a reset.

Challenges in adopting CM in adolescent programs include clinician awareness of the evidence supporting this intervention. Henggeler et al. (2008) studied adoption patterns in clinicians trained in CM for adolescent substance abuse. Despite incentivizing counselors and providing the resources needed to implement CM (workshop manual, incentives for patients, urine drug screen kits), only 58% of counselors endorsed using CM 6 months following the workshop training. Barriers most often cited by counselors included having other clinical priorities, lack of engagement of adolescents and families, adolescents not viewing substance abuse as a problem, and therapists' busy schedules. Counselors in the current study were reluctant to refer participants to the study despite receiving incentives for recruitment. It is likely that providing a reinforcer in the control group for submitting a UDS regardless of results may have been problematic for counselors. Having participants in the control group with positive UDS draw for prizes may be perceived as rewarding drug use. The community programs in the current study were abstinence-based programs. Adolescents who continued to test positive for drugs of abuse were often referred to more intensive inpatient, residential, or detention programs. This suggests that the feasibility of integrating CM in abstinence-based programs may be difficult as adolescents may be referred out of the program before CM has had a chance to take effect. Future studies should address program and counselor concerns when designing CM studies in frontline community programs. Disseminating CM in community programs has been an ongoing challenge; however, there is an increase in counselor positive attitudes and adoption of CM in programs that receive training in CM (Ducharme, Knudsen, Abraham & Roman, 2010). The NIDA Clinical Trials Network and the National Addiction Treatment Technology Centers have collaborated to produce a comprehensive CM training package, as well as a website for community programs interested in learning more about implementing a CM program (<http://www.attcnetwork.org/explore/priorityareas/science/blendinginitiative/pami/>).

Limitations

Although the present study was exploratory, there were several limitations. The sample size may have been too small to detect effects. It was not possible to randomize participants according to the level of standard treatment they received or the severity of marijuana use. However, the groups were similar with regard to psychosocial variables, substance use, and the frequency and intensity of clinical program they were enrolled in at baseline. No information on parent/guardian drug use was collected due to legal reporting requirements biasing self-reports. Also, during the course of the study, some participants may have been in the same treatment program during the same period of time, making it difficult to control for socialization or interaction effects. The adolescents were instructed to pick up any prizes they earned when they left their treatment program for the day and not to bring prize earnings into their usual treatment program. Participants could have been acquaintances or friends which may have influenced participation in the study or other outcomes. Conducting treatment effectiveness research in frontline community treatment programs is challenging due to the heterogeneity of the population and having less control over inclusion and exclusion criteria typically applied in efficacy studies.

Participants were difficult to retain in treatment, with only eight participants completing the 10 weeks. The lesser magnitude of earnings achieved in the present study may be attributed to low abstinence rates. Increasing the magnitude and certainty of reinforcers may improve abstinence rates. Finally, despite intensive efforts to track down participants for follow-up visits, only 45% of participants completed follow-up at 3 months.

Conclusion

Although CM has been used with success in patients of all ages with a variety of substance use disorders, in the present study this particular CM program may be more effective in this patient population if packaged with other evidence-based psychosocial therapies such as cognitive behavioral, motivational enhancement, and/or multisystemic family therapy. Increasing the value of the reinforcer, changing the schedule of reinforcement, and/or reinforcing other target behavior in addition to abstinence from drug use may improve retention and substance use outcomes. Adolescents who enter treatment with a positive UDS for marijuana have poorer treatment outcomes than those testing negative, suggesting the need for more aggressive and innovative approaches at the onset of treatment. Education regarding the evidence that supports the use of CM and providing CM implementation resources may improve the integration and use of CM in standard community treatment.

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Table 1

Baseline Demographics/Psychosocial Characteristics

	Incentive <i>n</i> = 16	Control <i>n</i> = 15	Total <i>n</i> = 31	<i>p</i> Value
Age (mean years)	15.6 ± 1.3	15.4 ± 1.2	15.5 ± 1.2	.61
Gender, <i>n</i> (%)				
Male	13 (81)	13 (87)	26 (84)	.68
Female	3 (19)	2 (13)	5 (16)	
Race, <i>n</i> (%)				
African American	12 (75)	12 (80)	24 (77)	.62
Caucasian	3 (19)	3 (20)	6 (19)	
Other	1 (6)		1 (3)	
Education (mean years)	8.1 ± 1.4	8.7 ± 1.4	8.4 ± 1.4	.25
Department of Juvenile Justice referred, <i>n</i> (%)	11 (52)	10 (48)	21 (68)	.9
Living situation, <i>n</i> (%)				
Both parents	6 (38)	3 (20)	9 (29)	.55
Single parent/	8 (50)	10 (67)	18 (58)	
Other relative	2 (13)	2 (13)	4 (13)	
Other substance use disorders, <i>n</i> (%)	7 (44)	3 (20)	10 (32)	.25
Other Axis I disorder, <i>n</i> (%)	9 (56)	6 (40)	15 (48)	.48
Age initiated use (mean years)	13.2 ± 1.2	12.5 ± 2.0	12.9 ± 1.6	.3
Baseline urine drug screen marijuana positive, <i>n</i> (%)	10 (63)	7 (47)	17 (55)	.4

Table 2Urine Drug Screen Results (UDS) and Retention by Group and Baseline UDS^a

	Incentive <i>n</i> = 16	Control <i>n</i> = 15	Total <i>n</i> = 30	<i>p</i> Value
UDS provided (mean)	10.1 ± 1.5	10.0 ± 1.5	10.1 ± 1.1	.9
Retention weeks (mean)	6.7 ± 0.8	6.9 ± 0.8	6.8 ± 0.6	.9
Sustained negative UDS (mean)	5.3 ± 1.2	5.1 ± 1.3	5.2 ± 0.9	.9
Mean % negative submitted UDS	57%	42%	53%	.3
Mean % negative scheduled UDS	38%	32%	35%	.6

^aValues represent average for participants in each group.