

Contingency-Management for Cannabis (Marijuana) Abuse and Dependence

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In

Contingency Management in the Treatment of Substance Use Disorders:

A Science-Based Treatment Innovation

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The Cannabis Problem

Cannabis remains the most widely used illicit drug among adults and adolescents in the United States, Australia, and numerous European countries (European Monitoring Center for Drugs and Drug Addiction, 2003; Hall, Johnston, & Donnelly, 1999; SAMHSA, 2003a). An estimated 14.6 million people in the United States are current (past month) cannabis users (SAMHSA, 2003a). Recent estimates of adolescent cannabis use indicate that 6%, 16%, and 20% of 8th, 10th, and 12th graders, respectively, used cannabis during the previous month (Johnston, O'Malley, Bachman, & Schulenberg, 2005). Although some may consider cannabis a “soft drug” with few consequences associated with its use, regular cannabis use has been linked to impairment in cognitive functioning, motivation, health, employment, and psychiatric functioning (Kalant, Corrigall, Hall, & Smart, 1999; Kandel, 1984). Regular use among adolescents is associated with greater risk of experiencing delinquency, school failure, health and psychological problems (Dennis, Godley, & Titus, 1999).

Lifetime and past year prevalence of cannabis disorder (abuse or dependence) far exceed that of any other illicit substance use disorder (Compton, Conway, Sinson, Colliver, & Grant, 2005). Rates of conditional dependence, that is, the risk of developing dependence among those who have used the drug, suggest that the “dependence potential” of cannabis is substantial (9%), albeit lower than alcohol (15%), cocaine (17%), or heroin (23%) (Anthony, Warner, & Kessler, 1994). More frequent use results in greater risk for dependence with some estimates indicating that the rate of dependence is 20-30% among those using at least 5 times (Hall et al., 1999).

Most relevant to this chapter, those who develop cannabis-related problems do enroll in treatment. In the US and Australia, treatment admissions for cannabis increased since the early 1990's such that they occur at a rate comparable with admissions for cocaine and heroin (SAMHSA, 2003b; Torres, Mattik, Chen, & Baillie, 1995). Note that individuals under the age of 20 comprise about 45% of all cannabis-related admissions. The severity and specificity of

the problems has been well documented. The great majority of adult patients have been using cannabis for over 10 years, use marijuana on a daily basis, use multiple times per day, clearly meet DSM-dependence criteria, report experiencing withdrawal symptoms and repeated unsuccessful attempts to stop using, and perceive themselves as unable to quit (Budney, Hughes, Moore, & Vandrey, 2004; Budney, Moore, Higgins, & Rocha, in press; Stephens, Babor, Kadden, Miller, & The Marijuana Treatment Project Research Group, 2002) The most common marijuana-related consequences reported are feeling bad/guilty, procrastination, low productivity, low self-confidence, interpersonal/family problems, memory problems, and financial difficulties.

During the past 12 years, a handful of clinical trials targeting cannabis abuse and dependence suggest that treatment efficacy appears comparable to that observed with other substances dependence disorders (McRae, Budney, & Brady, 2003). Cognitive-behavioral and motivational interventions like Relapse Prevention, Behavioral Coping Skills Therapy, and Motivational Enhancement Therapy appear efficacious. However, many participants who enroll in these treatments do not have positive outcomes. That is, many never achieve abstinence or substantial reductions in cannabis use, and many of those who are initially successful relapse. Thus, as with treatments for all types of substance dependence, the development and testing of more potent interventions remains a priority.

Why Contingency Management for Cannabis Dependence

Because contingency-management (CM) interventions represent a treatment approach with great potential to effectively motivate and facilitate change, it may be particularly useful for treating individuals for cannabis abuse or dependence, as their motivation to change their cannabis use may not be as great as those seeking treatment for other types of drug abuse (Budney, Radonovich, Higgins, & Wong, 1998). Perhaps because cannabis abusers do not typically experience the type of acute crises or severity of consequences that often drive alcohol, cocaine-, or heroin-dependent individuals into treatment, their motivation and

commitment to change may be more capricious than that of persons seeking treatment for other types of substance problems. CM interventions targeting abstinence from cannabis might enhance motivation to initiate abstinence and facilitate sustained efforts not to use.

Abstinence-based Vouchers for Cannabis Dependence

Borrowing from the CM model developed for treatment of cocaine dependence (Chapter 2; (Higgins et al., 1991)), we sought to develop an abstinence-based voucher program that could increase rates of initial abstinence among adults seeking treatment for cannabis dependence. The basic concept behind this CM intervention is to reinforce documented abstinence by providing monetary-based vouchers that can be used to increase participation in alternative healthy lifestyle activities. Below we describe this CM procedure for cannabis dependence, highlighting the modifications to the original voucher program for cocaine dependence.

Objective Measure of Abstinence (Urine Toxicology)

Urinalysis testing provides the usual and typically best method for obtaining the documented evidence needed to effectively administer a CM program targeting drug abstinence. With cannabis, such testing poses some unique issues that deserve comment. First, regular, heavy cannabis users are likely to test positive for cannabis use for 1-3 weeks after cessation at detection levels of 50 or 100ng/ml, which are the accepted cutoff levels for documenting recent abstinence. Thus, in our voucher program for cannabis, we provide a two-week notice prior to initiating the voucher program that informs clients that it will take two weeks of abstinence from cannabis for them to achieve a cannabis-negative urinalysis result. Thus, reinforcement for abstinence must be delayed. Note that some clinical agencies and researchers have begun to use quantitative or semi-quantitative testing for cannabinoid levels as a means to differentiate abstinence from residual cannabinoids. These methods could potentially reduce the need for delaying reinforcement. However, the accuracy of these procedures depends heavily on more frequent testing in the early weeks of abstinence and can be much costlier than the qualitative tests that rely on standardized cutoffs.

A second related concern much less frequently encountered is the possibility that a participant can provide a urine specimen that is negative for cannabis use on one day and then positive for cannabis the next day. This may occur because cannabinoid metabolites are stored in the fatty cells and the rate of their release can vary depending on things like exercise. We have observed this only a handful of times, but it is worth noting. A third concern is that urinary cannabinoid levels are affected by the dilution factor of the urine specimen provided. Many clients either intentionally or inadvertently drink large quantities of liquid that dilute a urine specimen such that a false negative test result is obtained. If possible, a method to screen for dilute urine specimens should be used as part of the urine toxicology program. Measurement of creatinine is one method to objectively test for the dilution factor.

Notwithstanding these issues, the methods to detect recent cannabis use described here have been used effectively and without substantial problems in multiple clinical trials. A comprehensive understanding of the urine toxicology process can facilitate implementation of an effective program.

Voucher Schedule

Our voucher schedule designed for cannabis abstinence does not commence until the third week of treatment because of the aforementioned issue with the prolonged presence of cannabinoids in the urine. Therapists provide comprehensive information about the urine toxicology program and the voucher system to help participants understand, accept and comply with the program. During the two weeks prior to initiating the voucher program, participants are provided with a voucher (\$5.00 value) each time they provide a valid urine specimen. This procedure serves multiple functions: a) reinforces the provision of the urine specimen, b) serves as a priming reinforcer to demonstrate what can be gained via the voucher program, and c) reinforces abstinence in those who have already initiated cannabis abstinence.

A second modification involves the frequency of urine testing and therefore frequency of reinforcement delivery. We conduct urine tests and deliver vouchers on a twice per week rather than three times per week schedule as had been used in the original voucher program for cocaine. Our decision to modify the schedule was twofold. First, we felt it was more practical for participants to make two rather than three visits to the clinic per week. Second, we were concerned that a single instance of cannabis use would carryover to multiple urine tests with the more frequent schedule. The twice a week schedule should be sufficient to detect most any cannabis use without exacerbating the potential for carryovers. In summary, we believed that the practical advantages and reduction in the carryover problem gained with the twice per week schedule outweighed the potential benefits that might come from using a voucher delivery schedule that would reinforce abstinence more frequently.

Third, overall magnitude (value) of the reinforcement schedule used in our cannabis voucher programs was reduced by almost 50% compared with what had been used in the cocaine programs (\$570 vs. \$1030 potential earnings over 12 weeks). Again, we felt it was more practical (less costly) to use lower magnitude vouchers. Second, we thought that the use of lower magnitude vouchers might be sufficient to effectively engender abstinence in cannabis dependent adults. Although the lower magnitude turned out to be effective (Budney, Higgins, Radonovich, & Novy, 2000; Budney et al., in press), we expect that using a higher magnitude voucher program would further enhance the effects of the voucher program we have tested to date.

All other aspects of the voucher reinforcement schedule were similar to the original cocaine program. The schedule is illustrated in Table 1. Voucher earnings escalated with each consecutive cannabis-negative specimen provided. A documented week of abstinence (two consecutive negative specimens) earned a \$10 voucher bonus. Cannabis-positive specimens or missed specimens resulted in no voucher earnings, and the value of the next cannabis-negative specimen was reset to the amount that was provided for the first negative

specimen. If following a cannabis-positive specimen, three consecutive negative specimens were provided, the value of the vouchers returned to the level achieved prior to the submission of the positive specimen. Each time participants provided a urine specimen negative for cannabis they were given a slip of paper (voucher) indicating current and cumulative earnings. Voucher earnings could then be redeemed at any time for retail goods or services chosen by the participant and agreed upon by their therapist. Research staff made all purchases.

Implementation

Effective implementation of a voucher program requires a clear understanding of the rationale for the program, good communication with the participant, and awareness of and preparation for clinical issues that are critical to its success. We have discussed these factors in more detail elsewhere (Budney & Higgins, 1998; Budney, Sigmon, & Higgins, 2001). Here we briefly review a few important aspects of implementation.

Most clients are expecting individual or group counseling when they seek treatment for cannabis. Hence, therapists must foster understanding, interest, and compliance with a voucher program that is likely unfamiliar to clients, and which may give rise to skepticism or mistrust. For example, embracing urine testing as an essential element of the treatment process may foster resistance from many clients. Even therapists may be hesitant about the need for urine testing and how it may affect the client's willingness to participate. Similarly, the idea of "rewarding" abstinence will likely be novel and perplexing to all involved. Therapists and staff must also be prepared to deal with issues such as the participant's denial of cannabis use in the face of a cannabis-positive urine test. Effective clinical responses to these types of issues are important for retention and advancement of treatment progress.

Efficacy of Abstinence-based Vouchers

Cannabis Dependent Adults

As discussed above, cognitive-behavioral and motivational treatment approaches have demonstrated efficacy for cannabis abuse and dependence. However, as with treatments for

other types of substance dependence, there remains room for improved success rates. Two trials have now examined whether an abstinence-based voucher program can enhance cannabis abstinence outcomes (Budney et al., 2000; Budney et al., in press).

Trial 1. Three outpatient treatments were compared: a brief motivational therapy (M), brief motivational therapy combined with cognitive-behavioral coping-skills therapy (MBT), and a combination of the brief motivational therapy, the coping-skills therapy and an abstinence-based voucher program (MBTV). Sixty adults (43 men and 17 women) seeking treatment for cannabis dependence were randomly assigned to one of the three treatment conditions. All participants met DSM-III-R criteria for current cannabis dependence. Exclusion criteria included dependence on alcohol or any other drug except nicotine. Most participants used cannabis on an almost daily basis, smoked multiple times per day, and had been regular cannabis users for 10-15 years. Most participants were Caucasian (83%) with an average age of 32 ($SD=8.5$) years.

All three treatments lasted 14 weeks and were manual-driven. All participants provided urine specimens on a twice weekly schedule throughout treatment. The M treatment was adapted from the motivational enhancement therapy used in the Project Match alcohol treatment study (Project Match Research Group, 1998). Participants received four individual motivational interviewing sessions spaced throughout the treatment period. The MBT treatment combined the motivational enhancement therapy with an adapted version of the Behavioral Coping Skills Therapy also used in Project Match. The coping skills component involved once weekly individual therapy sessions focused on increasing motivation, developing skills to help achieve and maintain cannabis abstinence, and setting lifestyle change goals. The MBTV treatment integrated the abstinence-based voucher program described above with MBT. In addition to providing MBT, therapists regularly reviewed and discussed voucher earnings and purchases with the goal of using the vouchers to promote abstinence and to facilitate healthy lifestyle change goals.

Rates of treatment acceptability (attended more than one session) and treatment completion did not significantly differ across the three treatments. The primary treatment outcome variable was the longest period of documented continuous cannabis abstinence based on the urinalysis testing. Missing urinalysis specimens were considered positive for cannabis. The MBTV group achieved significantly longer periods continuous cannabis abstinence ($M = 4.8 \pm 4.9$ weeks) than the MBT ($M = 2.3 \pm 3.0$ weeks) or M group (1.6 ± 2.4 weeks). A significantly greater percentage of participants in the MBTV group were able to achieve specific periods of cannabis abstinence (i.e., at least 4, 6, or 10 weeks) than in the MBT or M groups, and a greater percentage of MBTV participants were abstinent at the end of treatment (35% vs. 10% vs. 5%). No treatment group differences were detected on other drug use or psychosocial outcome measures. However, significant improvement from intake to treatment completion was noted within all groups on the self-reported days of cannabis use and multiple measures of psychosocial functioning.

This study clearly demonstrated that the addition of an abstinence-based voucher program to previously documented effective therapies enhanced abstinence during treatment for cannabis dependence. Of note, the specific effect of the voucher program was to increase continuous periods of abstinence, which was the hypothesized outcome based on the design of the reinforcement schedule.

Trial 2. Many unanswered questions emanated from this initial study. First, because the voucher component was integrated with MBT, we could not determine how MBT contributed to the effects of the voucher program. Second, we had no information on whether the voucher program is effective if delivered without MBT. Third, we did not know whether the positive effects of the voucher program would be maintained post-treatment. A second study was designed to address these issues (Budney et al., in press).

Ninety cannabis-dependent adults (69 men, 21 women) with similar sociodemographics as in Trial 1 were enrolled in a randomized clinical trial comparing one of three treatments. MBTV

was provided as in Trial 1. MBT was provided as in Trial 1 with one exception; participants received a \$5 voucher for each urine specimen provided (scheduled twice weekly) independent of the test results to encourage compliance with the monitoring program and help equate retention across groups. The third condition was vouchers alone (V). This involved the same abstinence-based voucher program delivered in the MBTV condition. An initial 20-30 minute meeting with a clinical research staff member provided the participant with the rationale for and details of the voucher program. The program was described as a method to enhance and maintain initial motivation to abstain from marijuana use by providing a structure (urine monitoring) and incentive (vouchers) for doing so. The details of the program were provided in a written abstinence contract discussed thoroughly with staff. V participants (as well as those in the other 2 conditions) received a guide to quitting pamphlet and information on local self-help groups. Contact with staff following this initial meeting was limited to twice per week urine toxicology testing. At each visit, staff conducted a brief interview to assess for clinical crises, and asked if the participant wanted to make a purchase with their voucher earnings.

Rates of treatment acceptability were again high (85%) and did not differ across the three treatments. This was an important finding as we were initially concerned that those offered V alone might reject the idea of not receiving some type of counseling. However, very few participants expressed disappointment when they received their assignment to V, and the rate of treatment retention did not differ between the treatment conditions.

Results observed during the abstinence period provided a partial replication of Trial 1. During the treatment period, MBTV engendered more abstinence than MBT, but the difference was not statistically significant. Interestingly, V alone clearly engendered longer periods of continuous abstinence than MBT. V also produced longer periods of abstinence than MBTV, but not significantly so. A similar pattern of results was observed with a dichotomous measure of cannabis abstinence, i.e., percentage of participants who achieved specified periods of abstinence. These findings indicated a positive effect of vouchers on rates of initial

abstinence, and did not demonstrate an enhancement effect of adding MBT to the voucher program.

Post-treatment findings showed that the positive effects observed with MBTV during the active treatment period were maintained during the 12-month follow-up, i.e., MBTV engendered significantly greater post-treatment abstinence levels than MBT (*Figure 1*). Results also suggested that adding MBT to the vouchers enhanced post-treatment outcome. That is, MBTV evidenced a trend towards higher abstinence rates than V alone, despite V showing higher rates of abstinence during treatment. Abstinence rates for V alone and MBT did not differ during the follow-up period suggesting that the positive effects of V alone in comparison with MBT did not maintain once treatment had ended. However, the “equivalence” of V and MBT across the post-treatment period also suggests that V alone is a viable treatment alternative that might be considered for adults seeking treatment for cannabis dependence.

In sum, these two studies suggest that the integration of V and MBT provided overall better abstinence outcomes over time than either intervention delivered alone. Findings from Trial 2 also suggest that the voucher program appears to be a potent intervention for engendering initial abstinence, even when delivered without any type of counseling services. The MBT component (motivational enhancement and coping skills training) may be particularly beneficial for maintaining the positive effects of the vouchers.

A few comments regarding the limitations of these studies are warranted. Other than abstinence outcomes, few outcome differences were observed between treatment groups. The clinical importance of various indices of change and improvement are not clear. Moreover, outcomes achieved even with the combined treatment conditions have much room for improvement. Related to these issues is the relative cost of the various treatment combinations. It appears clear that vouchers can enhance the efficacy of standard cognitive-behavioral treatments, and cognitive-behavioral treatments may help maintain abstinence effects achieved with vouchers. However, are the costs related to integrating these treatment

components the most cost-effective way to provide services to outpatients in need of treatment for cannabis dependence? Evaluation of cost effectiveness in the context of future testing of interventions that manipulate parameters such as type, frequency, intensity, and magnitude of both CM and counseling interventions is needed to develop optimal cost-effective interventions for cannabis dependence.

Cannabis Abusing Adolescents

Cannabis is being used at increasingly younger ages, and use by adolescents is twice as high as in 1991 (SAMHSA, 2003a). Such use is associated with emotional, health, and behavioral problems, and marijuana is the leading illicit drug mentioned in emergency room admissions and autopsies (SAMHSA, 2004). Adolescents are also more likely to meet criteria for cannabis dependence than for alcohol dependence (Young et al., 2002). The number of adolescents receiving treatment for primary cannabis abuse or dependence increased 350% from 1992 to 2002, and the majority of adolescent substance abuse admissions report cannabis as the primary substance (SAMHSA, 2003b).

Despite a growing need for adolescent marijuana abuse treatment, little consensus exists on how to best treat this clinical population. Family-based and cognitive-behavioral treatments appear to hold promise (Liddle, 2004; Waldron & Kaminer, 2004). Most recently, a large multi-site study demonstrated positive effects across five empirically-based interventions for cannabis abusing teens: 1) Multidimensional Family Therapy, 2) Community Reinforcement Approach, 3 & 4) Five and 12 session versions of Motivational Enhancement Therapy (MET) combined with CBT, and 5) MET/CBT combined with Family Support Network (Dennis et al., 2004). Across groups, significant improvement in drug use and decreases in symptoms of dependence were observed. While promising and offering multiple alternatives for treatment, the majority of teens across these treatments did not report positive outcomes. As with treatment for adults, there remains room to enhance the effects of adolescent interventions for cannabis.

Chapter 12 provides an in-depth discussion of CM approaches with adolescent substance abusers. Here, we briefly describe a multi-component CM intervention that we have developed for adolescent cannabis abusers in an effort to enhance rates of positive outcomes in this clinical population (Kamon, Budney, & Stanger, 2005). The 14-week treatment comprises weekly 90-minute counseling sessions that integrate individual cognitive behavioral therapy (CBT) with the adolescent, with two CM components: an abstinence-based voucher program and behavioral parent training for the parent(s).

The adolescent CBT sessions follow the MET/CBT5+7 curriculum (Webb, Scudder, Kaminer, & Kadden, 2001). The abstinence-based voucher program (V) uses the same reinforcement schedule described for our trials with adult cannabis abusers. The major modification to this program is that the reinforcement contingency is on abstinence from cannabis, alcohol and other drugs, not just cannabis. Documentation of abstinence is based on urine toxicology, parent-administered breathalyzers, and parent reports. Note that targeting multiple drugs has generally decreased the efficacy of CM interventions (Lussier, Higgins, Heil, Badger, & Mongeon, 2006). Nonetheless we chose to target all substances for the following reasons. First, although cannabis is the primary drug of abuse for these youth, they quite frequently use alcohol, and occasionally use other drugs such as opiates cocaine, or amphetamines. One concern with such other substance use, particularly with alcohol intoxication, was that it would impair judgment and potentially prompt cannabis use even among those committed to abstaining. Second, and perhaps most importantly, we felt that parents would not be receptive to a treatment that provides reinforcement for cannabis abstinence in situations where we know that their child has been using other substances typically considered more harmful than marijuana. Our experience to date using this procedure suggests that placing voucher contingencies on all drugs of abuse with these adolescent marijuana abusers is not problematic. Little other drug use is usually observed, attrition is low, and the majority of adolescents earn incentives for drug abstinence during the intervention.

The other CM intervention, behavioral parent training, involved teaching the parents to effectively use CM procedures. We felt that parent involvement was crucial with adolescents for several reasons. First, adolescents rarely seek treatment on their own, but are brought to treatment by their parents. Accordingly, they frequently do not perceive their cannabis use as a problem, and motivation is low to quit using and remain abstinent. Second, parents typically consider their youths' cannabis use a problem, are motivated to take action, but do not necessarily have the knowledge or skills to effectively change their adolescents' behavior. Hence, our parent interventions were designed to motivate adolescents and provide parents with tools and strategies to manage substance abuse and related conduct problems.

The parent-directed CM (PCM) has two primary components, a substance monitoring contract (SMC) and behavioral parent training. The SMC uses a behavioral contract among the therapist, parent(s), and youth that focused on substance use or abstinence. The contract specified positive and negative consequences to be delivered by the parents in response to documented abstinence or use (based on the aforementioned monitoring procedures). The consequences were determined via a collaborative process between therapist, parent and adolescent, and reevaluated each week during weekly counseling sessions.

The second CM component was a behavioral parent training program delivered to the parents during the weekly sessions. The Family Management curriculum of the Adolescent Transitions program, was used to teach parents basic principles and skills designed to decrease problem behaviors and increase prosocial behaviors (Dishion et al., 2003). This program, designed to target youth conduct problems seemed likely to yield broad benefits because conduct problems are highly co-morbid with and strong predictors of poor outcomes among treated adolescent substance abusers (Randall, Henggeler, Pickrel, & Brondino, 1999; Young et al., 2002). We also utilized a CM intervention to enhance parent participation and compliance. The Fishbowl technique (Petry, Martin, Cooney, & Kranzler, 2000) was used to reward parents for completing therapeutic activities (e.g. attendance, homework, SMC). Last,

an additional 12 weeks of 1x-weekly urine testing following the treatment program were provided to encourage parents to continue using the SMC. Continued monitoring and implementation of the SMC were hypothesized to improve maintenance of abstinence and reduce relapse rates during the immediate post-treatment period.

An initial pilot study of this CM-based intervention evaluated outcomes for 19 youth who received this multi-component intervention: individual CBT + PCM +V (Kamon et al., 2005). Adolescents attended an average of 10.4 (SD=4.5) of 14 sessions and at least one parent attended an average of 10.7 (SD=4.7) sessions. Over the course of treatment, youth showed significant reductions in cannabis use. Twice as many adolescents provided cannabis-negative urine specimens at the end of treatment compared with intake (37% vs. 74%), and days of cannabis use reported during the last month of treatment significantly decreased from intake (M=14.37 (SD=11.5) vs. 4.47 (SD=9.2)). Significant improvements in internalizing and externalizing psychopathology were observed as measured by the Child Behavior Checklist and Youth Self-Report (Achenbach & Rescorla, 2001). Indicators of positive changes in parenting behavior as measured by the Alabama Parenting Questionnaire also showed significant improvement (Wells et al., 2000). Overall, this initial uncontrolled trial suggested that CBT+PCM+V was acceptable to parents and adolescents, produced substantial reductions in cannabis use and conduct problems, and produced improvements in parenting.

We are currently conducting a randomized trial to test the efficacy of this CM intervention for adolescent marijuana abuse. We hypothesize that PCM+V will 1) engender longer periods of cannabis abstinence when added to CBT and 2) enhance maintenance of abstinence following treatment. Preliminary findings appear to provide support for this intervention (Budney, 2005). Future analyses and studies are planned to determine the unique effects of the two CM components and to test for behavioral mechanisms of action.

Cannabis Abuse in Probation-Referred Young Adults

A substantial proportion of those seeking treatment for cannabis are under the age of 25 and report involvement with the criminal justice system (SAMHSA, 2003a). Like the adolescent population described above, many outpatients with this profile are not highly motivated to quit using cannabis use and do not engage well in treatment. Sinha and colleagues (2003) conducted a randomized trial to determine if adding a modified voucher program to a 3-session motivational enhancement treatment would improve outcomes among probation-referred young adults referred to outpatient treatment for cannabis abuse. The voucher program was designed to reinforce attendance at counseling sessions rather than abstinence from cannabis. Voucher earnings escalated from a \$25 voucher for attendance at session one, \$35 for session two, and \$45 for the third, and a \$5 voucher was provided for arriving within 5 minutes of the appointment time for each session. Vouchers could be redeemed for prosocial items or services. The voucher program was successful in that those who received vouchers were more likely to complete treatment (64% vs. 39%), attend sessions (2.3 vs. 1.8), and continue with treatment after completing the 3 sessions. The voucher program enhanced treatment attendance and engagement as hypothesized, however, no concomitant effects were observed for cannabis use or other psychosocial outcome measures.

Cannabis use in Individuals with Severe Psychiatric Illness

Cannabis is the most common illicit drug used among individuals with schizophrenia (Kandel, Chen, Warner, Kessler, & Grant, 1997; Zisook et al., 1992), and has been associated with numerous adverse consequences such as earlier or more abrupt onset of symptomatology, poor medication compliance, increasing risk for recurrent symptoms or relapse (Dixon, Haas, Weiden, Sweeney, & Frances, 1991; Negrete & Gill, 1999). However, this clinical population does not typically identify cannabis use as problematic and self-refer for treatment. CM strategies therefore might offer a method for enhancing motivation and prompting quit attempts.

Sigmon and colleagues (2000) conducted an initial feasibility study with adults diagnosed with schizophrenia or another serious mental illness who were not seeking treatment for cannabis. Participants were recruited with newspaper advertisements and posters in a local mental health clinic. A within-subject experimental design examined the effects of three abstinence-incentive conditions during which participants received either \$25, \$50, or \$100 in cash (not vouchers) each time they provided a specimen that was negative for cannabis use. Abstinence engendered in these incentive conditions were compared with two baseline conditions during which participants received \$25 independent of urinalysis results each time they submitted a urine specimen. Each condition involved twice per week urinalysis testing, lasted one week, and did not include any counseling. Results clearly showed that the three incentive conditions effectively engendered greater periods of cannabis abstinence than the baseline conditions. Surprisingly no differences were observed among incentive conditions. These findings provided initial evidence that cannabis use among severely, mentally-ill individuals is sensitive to CM reinforcement interventions.

A second within-subject study examined abstinence-based vouchers rather than cash incentives (Sigmon & Higgins, in press). A 12-week voucher program similar to that used in the original cocaine studies was evaluated. Results again clearly showed that the voucher program effectively engendered cannabis abstinence. As reviewed in Chapter 11, similar findings have been reported with cigarette smoking in individuals with schizophrenia. Moreover, examples of the effective use of innovative CM-based interventions to reduce substance use in clinical samples of severely mentally ill adults have begun to appear in the literature (see Chapter 11).

Cannabis as a Secondary Drug of Abuse

Cannabis tends to be the most common other drug used by individuals seeking treatment for other types of drug dependence (Budney, Bickel, & Amass, 1998; Budney, Higgins, & Wong, 1996). Such cannabis use is commonly viewed as a significant risk factor for relapse or

treatment failure, although the empirical support for this is equivocal (Epstein & Preston, 2003). This issue presents a significant challenge for treatment providers because the majority of these individuals do not consider their cannabis use problematic, and their readiness to change is significantly lower for cannabis use than their primary substance of abuse. Hence, CM interventions may offer a promising approach for addressing cannabis use in these difficult clinical populations.

The Opiate Clinic

The majority of adults enrolled in clinics that provide methadone or buprenorphine maintenance programs for opiate dependence report cannabis use (Calsyn & Saxon, 1999). The clinical importance of such use is many times minimized because the problems and consequences related to cannabis use are usually considered minimal compared with those associated with opiate dependence. Accordingly, many clinics do not conduct regular urinalysis testing for cannabis, and if they do, many do not have any negative consequences associated with detection of cannabis use. Such lack of consequences may give the impression that such use is condoned. In response to this issue, a number of studies have explored the effects of CM-based approaches targeting cannabis use in these clinics.

Calsyn and Saxon (1999) capitalized on the well-documented positive effects of using take-home medication privileges to engender positive behaviors in this clinical population. They devised a cannabis CM program to function as an adjunct to an existing CM program that required 6 months of drug-negative urinalysis tests (except for cannabis) in order to earn twice-a-week methadone dose take-home privileges (i.e., had to attend the clinic twice per week to pick up their medication). The cannabis CM intervention increased the requirement for obtaining twice-weekly take home status to include cannabis-negative urinalysis test results. This quasi-experimental study involved 8 adults who had already earned the twice-per-week take-home under the usual clinic CM program, but were still using cannabis regularly. A 6-month notice informed these participants about the new cannabis requirement. Three of the

eight cannabis users achieved abstinence during this 6-month period. The other five lost their take-home privilege when the new program began due to cannabis-positive urine tests. One of these subsequently initiated cannabis abstinence and earned back the privilege. The other four remained at the lower privilege status (thrice weekly take-homes) for the remainder of the one-year study. This study demonstrated how a CM program targeting cannabis in this population can be implemented without having significant adverse effects on other aspects of treatment.

Primary Cocaine Dependence

Many in treatment for cocaine dependence use cannabis regularly, and many of those who stop using cocaine continue to use cannabis (Budney et al., 1996). As in the opiate clinic, this poses a clinical dilemma regarding how best to address this issue without adversely affecting cocaine use outcomes. We conducted a small-N demonstration study to explore a sequential strategy of initially targeting abstinence from cocaine with a voucher program, and subsequently targeting cannabis after cocaine abstinence has been achieved (Budney, Higgins, Delaney, Kent, & Bickel, 1991). The experience of achieving cocaine abstinence and its associated positive effects might increase awareness of how cannabis use negatively impacts a prosocial lifestyle and enhance motivation to quit. Moreover, an initial positive experience with a voucher program for cocaine might motivate participation in a similar program that targets cannabis abstinence.

Using a multiple-baseline design, a 12-week voucher program first engendered cocaine abstinence in 2 participants, but both continued to use cannabis regularly despite counseling that encouraged cannabis abstinence. At the end of the 12 weeks, both participants were offered a second 12-week voucher program at staggered time intervals that involved a modified contingency requiring abstinence from both cocaine and cannabis. Both participants achieved abstinence from both drugs with initiation of cannabis abstinence coinciding with initiation of the modified voucher program. Unfortunately, following discontinuation of the

program, both participants resumed cannabis use. They did, however, remain abstinent from cocaine. This small study illustrated that voucher programs offer an effective method for initiating cannabis abstinence in multiple drug users who are ambivalent about their cannabis use, but also suggested that additional intervention may be needed to obtain enduring effects.

Conclusion

Although only a few carefully controlled studies have examined the effects of CM on clinical samples of cannabis abusers, the findings clearly demonstrate that these approaches can be effective and should be considered a viable treatment alternative. With cannabis, the usual questions surrounding the cost-effectiveness of CM programs arise, perhaps with even more concern than with other substance dependence treatments. Some might question whether or not cannabis dependence is a substantial problem in need of more potent and perhaps more costly treatments. Historically, cannabis dependence has not been viewed as a significant problem, and it was questioned whether cannabis dependence existed at all (Stephens & Roffman, 1994). More recently however, an empirical base of knowledge has accumulated demonstrating the significant impact of cannabis abuse and dependence on a substantial number of youth and adults. The large number of persons that enroll in treatment with cannabis use disorders clearly indicates the clinical and public health importance of this problem. Effective dissemination of information about the adverse impact of cannabis may need to occur simultaneously with efforts to disseminate effective treatments like CM that require additional resources or modifications to existing treatment programs. The practical and clinical obstacles to these efforts have been discussed in depth elsewhere (Kirby, Amass, & McLellan, 1999).

Table 1. Voucher Earnings Schedule for Cannabis Abstinence

	Test 1	Test 2	Bonus	Total
Weeks 1-2	(vouchers are provided independent of test results)			
	\$5.00	\$5.00	-----	\$10.00
	\$5.00	\$5.00	----	\$10.00
Week 3	\$1.50	\$3.00	\$10.00	\$14.50
Week 4	\$4.50	\$6.00	\$10.00	\$20.50
Week 5	\$7.50	\$9.00	\$10.00	\$26.50
Week 6	\$10.50	\$12.00	\$10.00	\$32.50
Week 7	\$13.50	\$15.00	\$10.00	\$38.50
Week 8	\$16.50	\$18.00	\$10.00	\$44.50
Week 9	\$19.50	\$21.00	\$10.00	\$50.50
Week 10	\$22.50	\$24.00	\$10.00	\$56.50
Week 11	\$25.50	\$27.00	\$10.00	\$62.50
Week 12	\$28.50	\$30.00	\$10.00	\$68.50
Week 13	\$31.50	\$33.00	\$10.00	\$74.50
Week 14	\$34.50	\$36.00	\$10.00	\$80.50
Total				\$590.00

* Voucher earnings for participants who provide all cannabis-negative urine specimens

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Figure 1

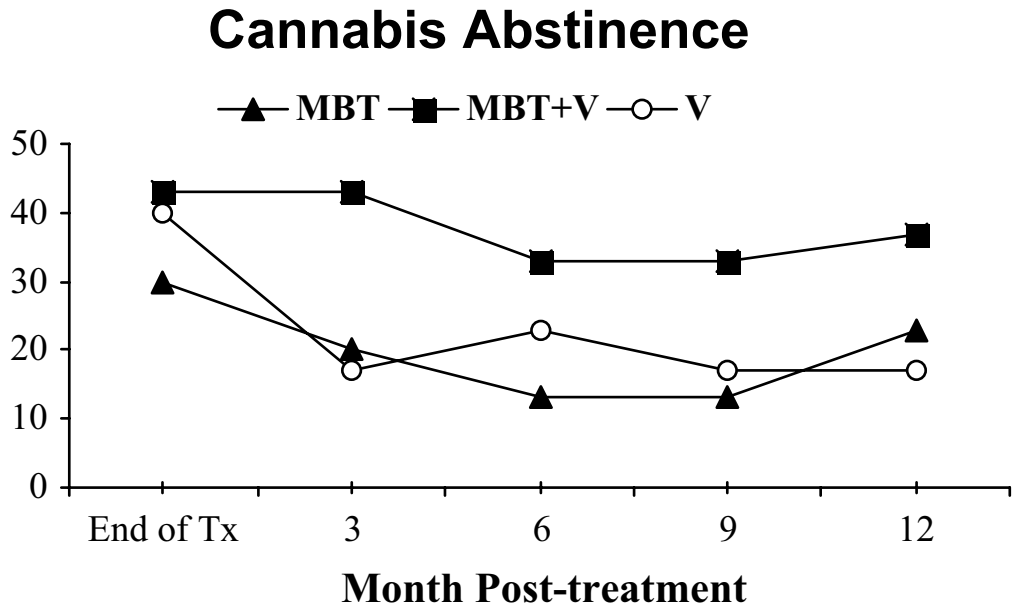


Figure Caption

Point prevalence abstinence rates as determined by urine toxicology results at the end of treatment and at each 3-month post-treatment assessment. Figure is adapted from (Budney et al., in press)