

psychosocial interventions: interventions for cannabis use problems

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introduction

Cannabis remains the most widely used illicit substance in most developed countries that regulate cannabis (Australian Institute of Health and Welfare, 2007; European Monitoring Center for Drugs and Drug Addiction, 2003; SAMHSA, 2004, 2005). Despite continued public controversy regarding the addictive potential and associated harm related to cannabis use and misuse, the need for primary and secondary interventions to address cannabis-related problems among youth and adults has become more and more clear over the past 15 years. For example, in the US, the prevalence of cannabis abuse and dependence (as operationalized in the DSM among adults) increased despite a stabilization of overall rates of cannabis use, and both rates of use and prevalence of disorders increased among adolescents (Compton, Grant, Colliver, Glantz, & Stinson, 2004). Because of the comparatively large proportion of individuals who use cannabis compared with other illicit drugs, the prevalence rate for lifetime cannabis dependence, is more than double that for any other illicit substances (Anthony & Helzer, 1991; Anthony, Warner & Kessler, 1994). Treatment admissions to outpatient and inpatient facilities for primary cannabis problems have more than doubled from 1993 (7%) to 2003 (16%) in the US and similar increases are reported in Australia (SAMHSA, 2004). Indeed cannabis was the principal drug of concern for 25% of the closed treatment cases in Australia in 2006.

Consequences cited by adults seeking treatment for cannabis dependence appear similar to those reported by those seeking treatment for other substance dependence disorders although they tend to be less severe than most others (cf. Budney, 2006; Copeland, Swift, Roffman, & Stephens, 2001; Stephens, Babor, Kadden, Miller, & The Marijuana Treatment Project Research Group, 2002). Most of those seeking treatment perceive themselves as unable to stop, and most experience withdrawal upon cessation. Consequences commonly cited include relationship and family problems, guilt related to cannabis use, financial difficulties, low energy and self esteem, dissatisfaction with productivity level, sleep and memory problems, and low life satisfaction (Gruber, Pope & Hudson, 2003; Stephens et al., 2002). The extent of cannabis abuse

and its associated consequences clearly indicates that this is a public health problem that requires systematic efforts focused on prevention and intervention.

evidence of treatment efficacy

The first sign of systematic evaluation of interventions for cannabis-related problems appeared in the literature approximately 20 years ago. Researchers from the University of Washington (USA) placed a newspaper advertisement asking anyone who was concerned about their marijuana (cannabis) use to call for an anonymous interview (Roffman & Barnhart, 1987). The substantial response suggested that many cannabis users were interested in receiving help to stop or reduce their use. Subsequently, this research group and others have conducted multiple randomized clinical trials evaluating behavioral approaches to the treatment of cannabis abuse. In contrast, almost no clinical trials evaluating pharmacological interventions have been published, however, a number of human laboratory studies evaluating the potential of various medications have appeared in the literature. Below, I first review the behavioral intervention literature, and then provide a brief overview of studies that have explored the potential of pharmacotherapies. Where appropriate, I provide information on unpublished studies for which promising results were presented at scientific conferences. Note that previous reviews of the cannabis intervention literature have recently been published (Budney, In Press; Budney, Moore, Sigmon, & Higgins, 2006; Copeland, 2004; Denis, Lavie, Fatseas, & Auriacombe, 2006; McRae, Budney, & Brady, 2003; Roffman & Stephens, 2006)

behavioral (psychological) treatment approaches

Nine randomized trials for adult or young adult cannabis abuse/dependence have been reported on in the published literature. Results indicate that behaviorally-based outpatient treatments are effective for reducing cannabis consumption and engendering abstinence. The interventions tested reflect adaptations of interventions developed to treat alcohol, cocaine, or nicotine dependence.

Cognitive-behavioral (CBT), motivational enhancement interventions (MET), and contingency management (CM) interventions and their combinations have received the most evaluation. Before discussing individual studies in detail, a brief description of each intervention is provided below.

CBT is typically delivered in 45-60 minute, weekly individual or group counseling sessions. Tested CBT interventions for cannabis have ranged from six-14 sessions. CBT focuses on teaching skills relevant to quitting cannabis and avoiding or coping with other problems that might interfere with good outcomes. These include: functional analysis of cannabis use and cravings, self-management planning to avoid or cope with drug-use triggers, drug refusal skills, problem-solving skills, and lifestyle management. Each session involves analysis of recent cannabis use or cravings, planning for coping with situations that might trigger use or craving, brief training on a coping skill, role-playing or other interactive exercises, and practice assignments. Detailed and instructional description of CBT sessions for cannabis dependence is available on-line in a published treatment manual, Brief Counseling for Cannabis Dependence (Steinberg et al., 2005).

MET involves a more brief (one-four sessions), less directive approach than CBT, and is typically delivered in 45-90 minute individual sessions. MET is based on the motivational interviewing theory and technique described in Miller and Rollnick (Miller & Rollnick, 2002). MET addresses ambivalence about quitting and seeks to strengthen motivation to change. Therapists use a non-confrontational style of counseling to guide the patient towards commitment to and action towards change. MET techniques include: strategic expression of empathy, reflection, summarization, affirmation, reinforcement of self-efficacy, exploration of pros and cons of drug use, rolling with resistance, and forging a goal plan when ready. Again, a more detailed illustration of MET for cannabis dependence is found in the Brief Counseling for Cannabis Dependence manual cited above.

CM involves the systematic use of positive and negative consequences (reward and punishment) following a target behavior (Budney, Sigmon, Higgins, & Coombs, 2001). In the case of treatments for cannabis dependence, two types of CM have been tested to date, i.e., abstinence-based and attendance-based vouchers. This incentive-based intervention was adapted from a program developed for the treatment of cocaine dependence (Budney & Higgins, 1998; Higgins et al., 1994). The abstinence-

based voucher program provides tangible incentives contingent on cannabis abstinence documented via a once or twice-weekly drug-testing program. Vouchers have a monetary value that escalates with each consecutive negative drug test. Earned vouchers can be exchanged for prosocial retail items or services that will putatively serve as alternative reinforcers to cannabis use.

Evidence for MET/CBT. Much of the evidence for MET/CBT-based treatments originates from the clinical trials conducted by the Roffman and Stephens research group. An initial randomized trial was designed to test a 10-session *group-delivered* CBT intervention (Stephens, Roffman & Simpson, 1994). This intervention focused on relapse vulnerabilities by emphasizing lifestyle balance and coping with high-risk situations. Quit contracts, functional analysis of high-risk situations, in-session exercises and handouts on coping strategies, and homework assignments were the primary modes of intervention. The comparison treatment was a social support intervention that emphasized the usefulness of group support for change. The group sessions focused on getting and giving support, dealing with denial and mood swings, and interacting with peers who continued to use cannabis. Both groups showed reduced cannabis use at the end of treatment and the end of the 12-month follow-up period. Self-reported abstinence rates at one year were approximately 17% and an additional 19% were considered improved based on a greater than 50% reduction in cannabis use levels. Although this magnitude of improvement suggests positive effects of the treatments, the lack of between-group differences prevents concluding that the treatment interventions were potent. Other limitations of note include: participants were required to pay a \$50 deposit to participate in the study and inclusion of a primarily Caucasian sample.

A second study was designed to replicate and extend these findings (Stephens, Roffman & Curtin, 2000). A three-group design was used to compare an *enhanced* 14-session CBT intervention, a two-session MET intervention and a delayed-treatment control condition (DTC). Compared to the 10-session group CBT examined in the first study, the enhanced CBT was made longer (14 weekly *group sessions* delivered over four months) with the goal being to provide a longer period to build motivation and allow a more comprehensive treatment to be delivered. The content of sessions was very similar to the first study. MET was tested because of the growing evidence that brief interventions of this sort might work well with alcohol abuse and dependence. It was adapted

from Miller's Drinking Check-Up (Miller, Benefield & Tonigan, 1993). During two *individual* 90-min sessions, participants worked with a therapist who provided feedback from a comprehensive assessment using motivational interviewing techniques, and instructed subjects on CBT techniques that could be used to abstain from cannabis.

Days of use, number of uses per day, dependence symptoms, and problems related to use were reduced significantly in the CBT and MET groups compared with the DTC group; however, ***no significant differences were observed between CBT and MET conditions on any outcome measures.*** Abstinance rates for the 90 days preceding the four-month assessment were identical for CBT and MET (37%) and significantly greater than for the DTC group (9%). At 16-months cannabis use remained lower than pre-treatment levels, and the abstinance rates were 29% for CBT and 28% for MET. These results support the findings of the initial study indicating that *group-delivered* CBT has efficacy for the treatment of cannabis dependence and associated problems. It also provides initial evidence for the efficacy of MET with this population. Of note, the same limitations related to participant inclusion as in the first study (deposit required for entry and primarily Caucasian) remain for this study. Moreover, the active treatment comparisons were confounded by treatment delivery modality (group vs. individual) and therapist experience (more experienced therapists conducted MET).

The next trial to appear in the literature was conducted in Australia and was a collaboration with the Stephens and Roffman group (Copeland et al., 2001). This trial compared a hybrid, six-session intervention that combined MET and CBT, a one-session MET/CBT treatment, and a DTC condition. Outcomes were assessed at a 24-week follow-up interview, and measures included percentage reporting abstinance, number of cannabis-use related problems, and psychological distress. Comparative results generally were consistent with the previous trials. The six-session MET/CBT and the one-session MET/CBT both reported fewer cannabis-related problems and less concern related to their use than the DTC, and abstinance rates during the month prior to the follow-up favored the active interventions. No clear differences between the two active treatments was observed, although some trends emerged suggestive of better abstinance rates with six-session MET/CBT. Of note, a positive relation between therapist experience and outcome was reported across both treatment conditions.

The next trial in this series represents the most comprehensive and generalizable efficacy study of treatments for cannabis dependence (Marijuana Treatment Project Research Group, 2004). The trial was conducted at three sites in the US with a total of sample size of 450. A three-group design compared a nine-session hybrid MET/CBT treatment, a two-session MET intervention and a DTC. Follow-up assessments at four, nine and 15 months assessed days of cannabis use, amount of use (joints per day), cannabis dependence symptoms, and cannabis-related problems. The MET/CBT and MET interventions again produced better cannabis reduction and abstinance outcomes (fewer days, periods, and joints) than the DTC. *Of importance, findings also clearly showed that nine-session MET/CBT engendered better cannabis use outcomes and reductions in abuse/dependence symptoms than MET at the four- and nine-month assessments.* Similar differences remained at 15 months, but were not as robust. These results, for the most part, generalized across the three sites, and were not moderated by ethnicity or gender.

In summary, these initial trials of MET, CBT and their combination demonstrate that many adults with cannabis abuse and dependence problems respond positively to several variants of MET and CBT, including group- and individually-delivered CBT, CBT of varying length, and even very brief, one to two session MET interventions. Reduced cannabis use, rather than abstinance is the more common outcome observed in these trials. The reduction in frequency and quantity of use appears clinically important as concomitant reductions in related problems and symptoms of dependence are reported. The findings also suggest that longer MET/CBT interventions treatments may produce more robust outcomes, and more experienced therapists may be associated with greater potency of these types of treatments.

Evidence for Contingency Management (CM).

Although the trials of MET and CBT reviewed above clearly demonstrated their efficacy, absolute outcomes might best be described as modest, for many individuals did not improve substantially and few achieved enduring abstinance. In an effort to further enhance outcomes, Budney and colleagues examined the efficacy of integrating a CM intervention with MET/CBT for treating cannabis dependence. An initial trial of CM compared four-session MET, 14-session combined MET/CBT, and 14-session MET/CBT+CM (Budney, Higgins, Radonovich, & Novy, 2000). The incentive-based CM program provided an opportunity for participants to earn up to \$590 in

vouchers if cannabis abstinence was documented via twice-weekly urine drug testing throughout the entire program. MET/CBT+CM engendered significantly more weeks of continuous cannabis abstinence during treatment than MET/CBT or MET alone, providing initial evidence for the efficacy of the voucher program. No clear differences in abstinence rates were observed between MET and MET/CBT, although the combined intervention showed trends toward superior outcome. Other outcome measures such as days of cannabis use, and scores on a cannabis problem scale improved over time for all three treatments, but no between-group differences were observed. This study did not assess post-treatment outcomes.

A second trial extended the evaluation of the abstinence-based CM program (Budney, Moore, Rocha, & Higgins, 2006). MET/CBT+CM was compared with MET/CBT alone, and CM alone (no counseling). Post-treatment assessments were conducted out to one year to assess the enduring effects of the treatments. The incentive program was identical to that used in the prior study. The MET/CBT alone intervention differed from the initial study by including a “participation” incentive program in which \$5 vouchers were provided for each scheduled urine specimen (twice per week). This procedure was included to ensure equivalent retention and treatment contact between treatment conditions. Both treatments that included CM engendered greater initial rates of continuous abstinence than MET/CBT alone. The combination, MET/CBT+CM, did not produce better abstinence outcomes during the treatment period than CM delivered alone. However, during the post-treatment period, MET/CBT+CM evidenced greater rates of abstinence than CM alone, highlighting the importance of MET/CBT to longer-term maintenance of abstinence, and the overall superior outcomes of the MET/CBT+CM intervention. No differences in abstinence rates between CM alone and MET/CBT alone were observed during the post-treatment period. As in the initial trial, other outcome measures (days of cannabis use, score on marijuana problems scale) showed improvement across groups, but no between-group differences were observed. The proportion of participants reporting no symptoms of dependence, however, was higher in MET/CBT+CM than the other two treatment conditions. An important limitation of both these CM trials was that the participants were almost entirely Caucasian and lived in a small metropolitan area.

A third CM trial conducted by another research group showed additional support for the efficacy of an

abstinence-based program (Kadden, Litt, Kabela-Cormier, & Petry, 2007). This study tested a slightly different incentive program that involved only once per week urine testing that lasted seven weeks, with total potential voucher earnings for complete abstinence of \$385. MET/CBT+CM was compared with MET/CBT alone, CM alone, and Case Management only. Importantly, this study included a more diverse (40% minority) and larger sample (N=240) than the prior two CM trials. Overall, the outcome results supported those found in the earlier CM studies. During treatment, CM alone and MET/CBT+CM engendered greater continuous abstinence outcomes than MET/CBT alone and Case Management. Throughout the one-year follow-up period, MET/CBT+CM sustained the positive abstinence effects, but CM alone did not. Of note, like the previous CM trials, self-reported days of use, amount of use, and marijuana problem scale scores improved across all groups, but did not differ between groups.

Two additional studies have focused on the use of CM to enhance outcomes with probation-referred young adults (ages 18-25) receiving outpatient treatment for cannabis abuse. Sinha and colleagues (2003) conducted a randomized trial comparing three-session MET with MET plus an *attendance-based* voucher program. Voucher earnings escalated from a \$25 voucher for attendance at session one, \$35 for session two, and \$45 for the third. An additional \$5 voucher was provided for arriving within five minutes of the appointment time. Participants in the MET+CM condition were more likely to complete treatment (64% vs. 39%), attend sessions (2.3 vs. 1.8), and continue with treatment after completing the three sessions indicating that the attendance-based incentives were effective. However, no concomitant effects were observed for cannabis use or other psychosocial outcome measures.

Carroll et al., (2006) extended the evaluation of CM with probation-referred young adults in a four-group study that compared MET/CBT+CM, MET/CBT alone, Drug Counseling (DC) alone, and DC+CM. Young adults who received CM participated in two parallel voucher programs: one for attendance and one for cannabis abstinence. Participants could earn \$880 in vouchers if they attended all eight MET/CBT sessions and provided all cannabis-negative urine specimens. MET/CBT involved eight weekly individual sessions, the content of which was consistent with that used in the aforementioned multi-site study. DC involved eight weekly individual sessions emphasizing the use of self-help groups and concepts compatible with the 12-step approach (Baker, 1998; Mercer & Woody,

1999). CM engendered higher rates of attendance, with the best attendance and completion rates observed with the combination of MET/CBT+CM. MET/CBT also engendered higher rates of attendance than DC. Consistent with previous findings, CM engendered greater cannabis abstinence during treatment, with no difference observed between MET/CBT and DC. At three- and six-month post-treatment assessments, no significant differences in point prevalence abstinence rates across the four groups were observed. CM did not show clear enhancement effects during the follow-up, however, MET/CBT/CM showed the highest rates of abstinence at the later follow-ups. Also of note, a significant effect of MET/CBT was observed in self-reported days of cannabis use; those who received MET/CBT decreased their use more over time compared with those receiving DC.

In summary, all five CM studies reported positive effects on cannabis use outcomes. Clear and consistent evidence exists for the efficacy of abstinence-based incentive programs engendering high rates of *initial and during treatment abstinence*. This result was observed even when CM was delivered without counseling in two of the studies. These same studies showed that combining MET/CBT with CM appears to produce the most *enduring positive effects on cannabis abstinence* when assessed out to one year post-treatment.

Continuing Care Interventions. Negligible response to treatment and relapse following a positive response are two common outcomes even among the efficacious treatments reviewed above. Recognizing this, as well as the fact that many succeed at overcoming dependence only after multiple treatment exposures, Stephens, Roffman and colleagues have begun to explore chronic care models of treatment (Stephens & Roffman, 2005). Cannabis Dependence Treatment PRN (PRN) was developed and initially tested in a randomized trial. The PRN model involved four initial sessions of MET/CBT, after which participants were given the option of engaging in additional continuing care sessions over a subsequent 28-month period. The number of sessions and their timing was determined by the participant. The comparison condition was the nine-session MET/CBT intervention used in the aforementioned multi-site trial. Overall, no robust effects of the PRN model were observed. However, three observations warrant mention. First, the initial four-session MET/CBT intervention that was part of the PRN program engendered less cannabis abstinence than the nine-session intervention. Second, only 25% of PRN participants used any

continuing care sessions. Third, the individuals who attended the greatest number of continuing care sessions showed a high level of abstinence (approximately 60% reported 90 days abstinence prior to the follow-up assessment). Testing of a chronic care model that includes a more potent initial treatment and one that can more effectively engage clients in continued care sessions might enhance longer-term outcomes.

clinical significance of treatment effects: what outcome measures show change?

As indicated above, sufficient evidence has accumulated to clearly support the conclusion that behaviorally-based interventions can help many of those who seek treatment for cannabis use disorders. What do we know about the type and magnitude of change engendered by such treatment interventions? Are these clinically significant changes? What becomes clear in reviewing these studies is that there is no simple method for determining clinical significance. A variety of methods and measures are used to designate change that is believed to be meaningful. However, no “norms” exist for measures of cannabis use or consequences of cannabis use. Thus we are left to examine changes from baseline as well as accepted standards of outcome such as abstinence and diagnostic indicators. Here we briefly summarize what measures appear sensitive to the MET, CBT, and CM interventions described in the published clinical trials.

Clearly, **abstinence** (cessation of use) has showed sensitivity to all three interventions and their combinations. Abstinence however, has been measured in multiple ways. Regarding **continuous periods of documented abstinence**, it appears that all three interventions engender abstinence of at least some substantial length, and the CM interventions designed to specifically to promote continuous abstinence appear most potent. How long a period of abstinence is “meaningful” is not clear, but even relatively brief periods such as two to six weeks have shown prognostic significance for longer-term outcomes with cannabis dependence and other substances (Budney et al., 2000; Budney, Moore, Rocha et al., 2006; Carroll et al., 2006; Higgins et al., 2003). Another measure of abstinence, **reduced days of cannabis use** appears sensitive to all three interventions, with substantial reductions of well over 50% of baseline a typical outcome across studies and types of treatments. Reductions in frequency

and or quantity of use on the days cannabis has also been sensitive to change. **Number of joints, number of water pipes, number of times smoking, number of periods smoked during the day** have all shown significant change associated with treatment across multiple studies.

Other indicators of positive treatment effects such as **reduction in cannabis dependence symptoms or severity** as measured via diagnostic interviews or the Severity of Dependence Scale have shown sensitivity to change across studies and types of treatments. Similarly, **measures of consequences** associated with cannabis use, the Marijuana Problem Scale and the Cannabis Problems Questionnaire, show clear reductions in response to treatment across most studies. All these aforementioned outcome measures have good face validity and the magnitude of change observed across studies would suggest that these positive indicators of response to treatment reflect clinically meaningful changes in cannabis use and associated problems.

Last, some studies have attempted to measure change in **family, employment, social, psychiatric, and medical functioning**. The Addiction Severity Index (ASI), the SCL-90, and the BSI have been employed across multiple studies with mixed findings. Perhaps the best way to summarize these results is that, significant and robust change in such measures has not been engendered consistently by the treatments under study. Discussion of potential explanations for equivocal findings across studies is beyond the scope of this paper.

general limitations of the treatment outcomes research

Even with the most highly efficacious treatment for adults, MET/CBT+CM, only about half of those who enroll in treatment achieve an initial period of abstinence (greater than two weeks), and among those who do, approximately half return to use or relapse within a year (Budney, Moore, Rocha et al., 2006; Kadden et al., 2007). One-year reported abstinence rates across studies for MET/CBT have ranged between 19%-29% at one yr and nine-28% for MET. An additional proportion of adults report a reduction in use and problems associated with use, however, there still remain a substantial proportion that do not show evidence of progress. Clearly, there remains much room for improvement in rates of change in cannabis use for adults who enter outpatient treatment. Moreover, issues such as access and cost effectiveness must be addressed to

promote dissemination of these effective treatment services to the general clinical population. These issues are discussed more in the last section of this paper.

secondary prevention

Of the approximate 14 million persons in the US who used cannabis during the past month (SAMHSA, 2006), more than four million report problems related to cannabis consistent with abuse or dependence, yet only about seven to eight per cent of these individuals received treatment. Stephens, Roffman and colleagues have recently developed “Check-Up” interventions designed to reach cannabis users (adolescents and adults) who have not sought treatment either because they are ambivalent about stopping, or do not perceive their use to be a problem or at least not a problem severe enough to warrant treatment (Stephens et al., 2004; Walker et al., 2006). Here we will briefly discuss findings from the Check-Up intervention designed for adults.

A Check-Up (CU) intervention was designed to reach cannabis users experiencing adverse consequences, but who were ambivalent about change and not likely to enter treatment (Stephens et al., 2004). Cannabis users called the clinic in response to advertisements stating that objective, up-to-date information on cannabis use and its effects was available. Upon contact they were told that this was not a treatment study and were invited to the clinic for an assessment, that would then be followed by either a one-session personalized feedback session (CU), a one-session therapist guided Multi-media session (documentary and slide show providing objective information on cannabis and its effects) or a delayed session (choice of either CU or Multimedia delayed by seven weeks). Callers were near-daily cannabis users, two-thirds of whom were in the pre-contemplation or contemplation stage of change. The CU condition resulted in greater reductions in cannabis use and associated problems over the course of 12 months than the Multi-media condition; however, absolute levels of change were relatively small. This study showed that this intervention model attracted a “unique” sample of ambivalent cannabis users who may be ideal candidates for secondary interventions like the CU. Continued exploration of more potent CU models offers promise as a method for reaching cannabis users who would otherwise not have contacted the typical treatment system, at least not at this stage of their use. A second CU study sought to enhance outcomes by adding four sessions of MET/CBT following the initial two MET sessions (Stephens,

Walker & Fearer, 2004). The six-session intervention successfully engaged participants, but unfortunately did not result in greater reductions in cannabis use. Absolute measures of change were similar to those observed in the initial study.

secondary cannabis abuse

In addition to being the most common illicit drug used in the general population, cannabis is also the most common “other drug” used by those seeking treatment for other types of drug dependence. Such 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). Many individuals who seek and enter treatment for heroin/opiate dependence or cocaine dependence do not consider their cannabis use problematic, and thus their readiness to quit or make changes to their cannabis use is typically low.

In the methadone or buprenorphine clinics the clinical importance of cannabis use is commonly minimized because the problems and consequences related to it appear minimal compared with those associated with opiate dependence. The lack of concerted attention to promoting cannabis abstinence in the opiate dependence clinic may give the impression that such use is condoned, but a more accurate descriptor would be that it is tolerated. Some have begun to explore CM-based approaches targeting cannabis use in this clinical population with the rationale being that explicit reinforcement or punishment interventions tied to cannabis use might motivate and prompt change in those not currently interested in changing. Calsyn and Saxon (1999) employed a cannabis CM program that required cannabis-negative urinalysis test results to obtain twice-weekly take home medication status. Fifty percent responded to the contingency, while the other half accepted a decrease in their take home status privileges and continued use of cannabis. Kidorf, Neufeld, King, Clark, & Brooner, (2007) tested a similar approach to reducing cannabis in methadone maintenance patients. Patients were informed that counseling attendance requirements would increase from once per week to an additional three hours per week for testing positive for cannabis (or any other substance). Ten of fifteen patients discontinued cannabis use when informed about the new counseling rule. Five tested positive for cannabis and were required to attend the additional counseling sessions. Of those, four reduced use in response to this intervention and eventually discontinued use and returned to the lower level, counseling requirement. One patient dropped out of treatment.

In the **cocaine clinic**, where again many patients do not endorse a goal to stop cannabis use, the clinician must decide how to best approach the cannabis issue without adversely affecting treatment for cocaine dependence (Budney, Higgins & Wong, 1996). A two-participant study explored a sequential strategy of initially targeting abstinence from cocaine with an abstinence-based incentive program, and subsequently targeting cannabis (Budney, Higgins, Delaney, Kent, & Bickel, 1991). The rationale behind this approach was that the experience of achieving cocaine abstinence might increase awareness of how cannabis use negatively impacts a prosocial lifestyle. Moreover, an initial positive experience with a voucher program for cocaine might motivate participation in a similar program that targets cannabis. A 12-week voucher program engendered cocaine abstinence in both 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 program that required abstinence from both cocaine and cannabis to earn vouchers. Abstinence from both drugs was achieved. Unfortunately, both participants resumed cannabis use following the voucher program, but remained abstinent from cocaine.

These studies from the opiate and cocaine clinics demonstrate how systematic approaches to “secondary” cannabis abuse can be implemented without producing adverse effects on other treatment for the “primary” drug. Using stepped care or sequential approaches appears effective for initiating abstinence among those ambivalent about stopping their cannabis use, however, longer term contingencies or additional interventions may be needed (Kidorf et al., 2007) to obtain enduring effects.

pharmacotherapy

Increased recognition of the cannabis withdrawal syndrome and the rapid accumulation of knowledge about the structure and functioning of the endogenous cannabinoid system has spawned research on the potential use of medications to treat cannabis dependence (Hart, 2005). To date, the cannabis withdrawal syndrome has been the primary focus of the medication development efforts because research over the last decade has established the reliability, validity, and timecourse of a cannabis withdrawal syndrome, and has demonstrated its potential clinical importance (Budney & Hughes, 2006; Budney, Hughes, Moore, & Vandrey, 2004).

Many of those trying to stop using cannabis report multiple withdrawal symptoms, which indicate that these symptoms adversely impact quit attempts. People also report use of cannabis or other drugs to relieve these symptoms (Copersino et al., 2006). Although this syndrome does not appear to include major medical or psychiatric consequences, its severity appears comparable to tobacco withdrawal, and thus targeting cannabis withdrawal symptoms with medications may enhance outcomes and promote successful cessation attempts.

A number of human laboratory studies and one small clinical trial on potential pharmacotherapies for cannabis dependence have appeared in the literature. Bupropion, divalproex, lofexidine, naltrexone, nefazadone, and oral THC have been evaluated in laboratory studies with cannabis dependent participants who were not seeking treatment and not planning to quit (Hart, 2005). Divalproex has also been evaluated in an outpatient placebo-controlled trial (Levin et al., 2004). Of these, only oral THC, and the combination of lofexidine and THC have shown good promise, with nefazadone and bupropion engendering mixed results. Bupropion worsened symptoms in one study (Haney et al., 2001), and showed some positive effects on craving and withdrawal discomfort in a second, unpublished study (Penetar et al., 2006). Nefazadone decreased ratings of a few withdrawal symptoms (anxiety and muscle pain), but other symptoms (irritable, miserable and trouble sleeping) remained high (Haney, Hart, Ward, & Foltin, 2003).

The rationale for the potential use of oral THC as a medication parallels that of other agonist or replacement therapies such as methadone/buprenorphine for opiate dependence and nicotine replacement for cigarette smoking. Oral THC reduced craving and suppressed ratings of anxiety, feeling miserable, trouble sleeping, and chills in an initial residential laboratory study of cannabis withdrawal (Haney et al., 2004). These findings were replicated in an outpatient laboratory study, during which a moderate dose of oral THC (10mg/tid) suppressed many withdrawal symptoms and a higher dose (30mg/tid) provided almost complete suppression of cannabis withdrawal (Budney, Vandrey, Hughes, Moore, & Bahrenburg, 2007). Most recently, Haney et al., (2007) examined the effects of oral THC, lofexidine, an alpha(2)-adrenergic receptor agonist, and their combination on cannabis withdrawal and a laboratory model of relapse. The rationale for evaluating lofexidine was its potential to decrease the noradrenergic activity that putatively occurs during

cannabis withdrawal (similar to the rationale for use of clonidine for opioid withdrawal). THC reversed the anorexia and weight loss associated with cannabis withdrawal, and decreased a subset of withdrawal symptoms, but increased sleep onset latency, and did not decrease cannabis relapse. Lofexidine was sedating, worsened abstinence-related anorexia, and did not robustly attenuate withdrawal, but improved sleep and decreased marijuana relapse. The combination of lofexidine and THC produced the most robust improvements in sleep and decreased cannabis withdrawal and relapse relative to either medication alone.

Investigation of antagonist therapies has yet to proliferate in the literature on human cannabis dependence. Heustis and colleagues have demonstrated that a cannabinoid receptor antagonist (SR141617A, Rimonabant) can block subjective and physiologic effects of cannabis in humans (Huestis et al., 2001). For some time now, the nonhuman animal research literature on SR141617A and other antagonists indicates their potential clinical utility (Lichtman & Martin, 2002), however, these compounds have not been readily available for human research on cannabis dependence.

Opioid antagonists have also received some investigation as potential cannabis treatment agents because of the interplay between the endogenous opioid and cannabinoid systems and non-human research suggesting that opioid antagonists can may block some of the reinforcing effects of THC. Initial studies in the human laboratory, however, were not consistent with the animal literature failing to show any signal that such opioid antagonists might be useful for cannabis dependence treatment (Greenwald & Stitzer, 2000; Haney, Bisaga, & Foltin, 2003). Most recently, however, Haney (2007) tested whether the failure to show positive effects with naltrexone might have something to do with the dose used in prior studies and the cannabis use history of the participants. In a *group of regular cannabis smokers*, low-dose naltrexone (12mg) blunted the intoxicating effects of low dose THC (20 mg) while increasing ratings of anxiety at a higher THC dose (40 mg). In a *group of who did not use cannabis*, low-dose naltrexone enhanced the intoxicating effects of a low THC dose (2.5 mg) and decreased anxiety ratings following a high dose of THC (10 mg).

In summary, the literature on pharmacotherapy for cannabis dependence has provided support for further testing of agonist (THC) approaches and their use in combination with other medications such as

lofexidine. Antagonist therapies have yet to receive adequate attention, however, both cannabinoid and opioid antagonists appear to warrant more study. Most pharmacotherapy studies to date have been limited by testing of only a limited range of doses, and have studied primarily non-clinical populations. Continued exploration of compounds that target mood, sleep difficulty, craving, and appetite would appear warranted given the potent and reliable abstinence symptoms observed in withdrawal studies. Other promising targets include decreases in dopamine activity in the mesolimbic dopamine pathway, and comorbid disorders such as depression or anxiety.

summary and recommendations

We have argued elsewhere, and reiterate here, that the nonhuman and human laboratory, epidemiological, and clinical literatures clearly indicate that cannabis dependence is much more similar to than different from other types of dependence (Budney, 2006; Budney & Hughes, 2006). Like with other substances of abuse, sociodemographic, environmental, genetic, and perhaps neuro-cognitive factors contribute to the risk of abuse of cannabis. Reasons for treatment-seeking related to cannabis also appear similar to that for other substances (Budney, Radonovich, Higgins, & Wong, 1998; Dennis, Babor, Roebuck, & Donaldson, 2002; Stephens, Roffman, & Simpson, 1993), and the rate of response to treatments appears similar to that observed for other types of substance dependence.

MET, CBT and CM each have relatively strong empirical support for their efficacy. The cumulative findings from the extant studies indicate that (1) each of these interventions represents a reasonable and efficacious treatment approach, (2) combining MET and CBT is likely more potent than providing MET alone, and (3) an intervention that integrates all three approaches, MET/CBT/CM has the greatest probability of engendering positive outcomes, particularly as measured by rates of abstinence from cannabis, (4) MET/CBT appears most important for maintaining treatment gains, and perhaps engendering continued improvement post-treatment, and (5) although these treatments are efficacious there remains much room for improvement in rates of initial response to treatment and reduction in relapse. In contrast to the behavioral treatment literature, the research on pharmacotherapies for cannabis dependence has yet to yield findings to support specific medication suggestions or guidelines. The literature on oral THC is most promising, but clinical

trials have yet to be conducted. This said, what clinical recommendations could be gleaned from the extant treatment research literature?

I offer the following suggestions:

1. Treatment providers should receive training and master the basic concepts and techniques of MET and CBT. The need and importance of high quality, intensive training to adequately train clinicians should not be underestimated. The existing data suggests that experience/quality of MET/CBT delivery is related to outcome.
2. Without any empirical guidance regarding optimal duration, clinicians should be prepared to offer initial MET/CBT interventions that range from two-14 sessions. Consideration of stepped care models or offering the client a choice of alternative treatments and durations should be considered as potential guiding principles for initial treatment options. Note there is little to no literature to suggest effective strategies for matching specific types of patients to specific types of treatments.
3. The literature has yet to provide adequate guidance on potential potency differences between group- and individually-delivered CBT. If possible, agencies might offer client choice and have both alternatives available.
4. At this time the BMDC manual developed for the large multi-site trial (Marijuana Treatment Project Research Group, 2004; Steinberg et al., 2005) might offer the best published guide to delivery of an empirically supported MET/CBT intervention.
5. To maximize positive outcomes, treatment providers and agencies should develop abstinence-based CM interventions for integration with MET/CBT. The optimal magnitude and schedule of the incentive program is not clear, however, guidelines for three alternative effective programs can be gleaned from the cannabis CM literature cited above. Providers could also consider other alternatives for abstinence-based CM interventions based on the efficacy literature on CM treatments for other types of substance dependence (Higgins, Silverman & Heil, 2008; Lussier, Heil, Mongeon, Badger, & Higgins, 2006; Petry & Simic, 2002).
6. Because of substantial non-response/relapse rates, providers should be prepared to extend treatment past 14 weeks, and consider chronic care models with either booster sessions, check-ups, readministration of MET/CBT. There is not

much literature to guide the specific content of effective models, but guidelines for basic chronic care model principles are available (McKay, 2005, 2006).

7. Alternative models of treatment that have shown efficacy with other types of substance dependence might also be considered for treatment of cannabis dependence because, historically the behavioral interventions that have demonstrated effectiveness for other substances have worked equally well for cannabis.

future directions

The last 15 years we have witnessed great advances in the empirical base for cannabis treatment approaches. Increased recognition that cannabis is a drug that can lead to addiction and significant negative consequences has led to the development of cannabis-specific interventions and treatment materials paralleling those used with other substance use disorders. These advances have increased the “acceptability” of seeking and providing treatment for cannabis, and as such the number of individuals seeking help has increased. Optimistic expectations for continued enhancements to current treatment approaches appear warranted given that behavioral-based treatments continue to demonstrate incremental gains in efficacy as innovative applications based on the underlying principles of behavior that guide these interventions are evaluated. As discussed above, more potent treatment approaches and intervention strategies for cannabis abuse and dependence are needed to combat moderate initial response rates and substantial relapse rates. Better understanding of the mechanisms of action of these treatments and predictors of outcome will hopefully lead to innovations that can better match individuals to particular treatment modalities, or result in modifications to treatment approaches that deliver more of the “active ingredients” necessary for change. For example, with CM interventions, factors related to frequency, duration, and magnitude of the incentive schedule used to reinforce abstinence are likely to be systematically related to the potency of the intervention and its influence on outcome (Lussier et al., 2006). The attention now being given to chronic care models of treatment also holds promise for addressing what is becoming the more accepted position that substance dependence problems typically have a chronic course, and likely require ongoing intervention to maintain gains and limit future relapses and consequences. Rapid advances

in the neurobiology of cannabis and the cannabinoid system provide further hope for increasingly effective pharmacotherapy options either as primary or secondary interventions. Continued development of cost-effective interventions also needs to become a priority. In addition to treatment approaches discussed above, innovative technologies (computer, internet, telephone) to enhance or assist in delivery of treatment should be explored.

Another issue in need of attention is that of the possibility of cannabis moderation goals rather than abstinence goals for some patients. Certainly many adults who use cannabis and many who enter treatment are ambivalent about completely giving up their cannabis use. The only published study to our knowledge on this topic reported that 28% those enrolling in treatment indicated a moderation rather than abstinence goal, and over the course of treatment and follow-up rates of those indicating abstinence goals further declined (Lozano, Stephens & Roffman, 2006). Little is known about what constitutes non-harmful use of cannabis, and when and if moderation represents an appropriate clinical goal for treatment. The sparse data available on moderation goals (Lozano et al., 2006) is fairly consistent with what is observed in the alcohol treatment literature. That is, moderation is a viable and achievable goal for some individuals, but abstinence goals appear to predict better outcomes, and those with moderation goals have a greater probability of not meeting their goal. Unlike alcohol, moderation-focused treatments for cannabis have yet to be tested, and thus no guidelines or predictors for who might be appropriate for this approach are available. The illicit status of cannabis introduces additional concerns and consequences when assessing cannabis use and considering non-abstinence treatment goals.

Equally important to treatment development research is the pressing need to tackle issues related to dissemination and translation of effective treatments. Unfortunately the substance abuse services delivery system continues to lag behind research advances that delineate effective treatment approaches. Serious challenges related to access and cost impede adoption of important scientific advances in drug dependence treatment in general. The current treatment system experiences difficulty recruiting, training and retaining treatment staff, inadequate financing to provide treatment, insufficient treatment availability to meet demand, and slow adoption of research-based treatment innovations, which all contribute to limited access to the most effective

treatments (Carroll & Rounsaville, 2007; McLellan, Carise & Kleber, 2003). The availability of the types of the efficacious treatments described above (MET, CBT, and CM) is low, even though evidence for these approaches with substance dependence problems other than cannabis has been documented for many years. Although mainstream among treatment researchers, few community-based substance abuse counselors are currently trained to provide quality MET/CBT and treatment providers remain ambivalent about CM interventions because of their cost and CM's basic premise, i.e., providing incentives for not using substances (Kirby, Benishek, Dugosh, & Kerwin, 2006; Ritter & Cameron, 2007). On a more optimistic note, one recent US survey indicated that approximately 30% of treatment programs have adopted some type of CM intervention for their clinic (Ducharme, Knudsen, Roman, & Johnson, 2007), and NIDA's Clinical Trials Network is actively promoting the dissemination of CM interventions in real-world settings. Additionally, the National Institute for Health and Clinical Excellence in the UK recommended using CM as a best practice for opioid detoxification (Pilling, Strang & Gerada, 2007). The high prevalence of cannabis use disorders in many countries makes these dissemination issues particularly relevant to cannabis interventions. Treatment services research must continue to investigate novel, efficient, and effective methods for treatment dissemination and implementation.

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