

Brief Treatments for Cannabis Dependence: Findings From a Randomized Multisite Trial

The Marijuana Treatment Project Research Group

This study evaluated the efficacy of 2 brief interventions for cannabis-dependent adults. A multisite randomized controlled trial compared cannabis use outcomes across 3 study conditions: (a) 2 sessions of motivational enhancement therapy (MET); (b) 9 sessions of multicomponent therapy that included MET, cognitive-behavioral therapy, and case management; and (c) a delayed treatment control (DTC) condition. Participants were 450 adult marijuana smokers with a *Diagnostic and Statistical Manual of Mental Disorders* (4th ed.; American Psychiatric Association, 1994) diagnosis of cannabis dependence. Assessments were conducted at baseline, and at 4, 9, and 15 months postrandomization. The 9-session treatment reduced marijuana smoking and associated consequences significantly more than the 2-session treatment, which also reduced marijuana use relative to the DTC condition. Most differences between treatments were maintained over the follow-up period. Discussion focuses on the relative efficacy of these brief treatments and the clinical significance of the observed changes in marijuana use.

Of the 15.9 million illicit drug users estimated from the 2001 National Household Survey on Drug Abuse, 76% were current (past month) users of marijuana, and the majority of these (56%) used marijuana exclusively (Substance Abuse and Mental Health Services Administration [SAMHSA], 2002). The proportion of the U.S. adult population who meet *Diagnostic and Statistical Manual of Mental Disorders* (4th ed.; *DSM-IV*; American Psychiatric Association, 1994) criteria for cannabis dependence has been

estimated at 4.2% (Anthony, Warner, & Kessler, 1994), the highest prevalence for any substance other than alcohol. Cessation of marijuana use by some chronic marijuana users has been associated with a withdrawal syndrome characterized by anxiety, irritability, restlessness, sleep disturbance, and appetite change (Budney, Novy, & Hughes, 1999; Haney, Ward, Comer, Foltin, & Fischman, 1999; Kouri & Pope, 2000; Weisbeck et al., 1996). Although marijuana dependence is often secondary to alcohol, cocaine, and opiate abuse, some marijuana users have begun to seek treatment for marijuana as their primary drug of abuse (Roffman & Barnhart, 1987; Stephens, Roffman, & Simpson, 1993). Findings from the SAMHSA Drug and Alcohol Services Information System indicate that marijuana was the primary substance of abuse for 14.1% of adult admissions reported to the Treatment Episode Data Set in 2000 (SAMHSA, 2003). The relatively low treatment utilization by persons with cannabis dependence might be due to lack of specific treatment for marijuana dependence and to the reluctance of many chronic marijuana users to seek treatment in programs dominated by alcoholics and people dependent on heroin and cocaine (Stephens et al., 1993).

Heavy marijuana users surveyed both in the community and in drug abuse treatment settings report a variety of medical and psychosocial problems related to their marijuana use (Budney, Radonovich, Higgins, & Wong, 1998; Roffman & Barnhart, 1987; Stephens, Roffman, & Curtin, 2000; Stephens, Roffman, & Simpson, 1994), and there is evidence that regular use is associated with pulmonary, reproductive, and immunologic consequences (Committee on Substance Abuse, 1999). Marijuana-dependent adults seeking treatment report that their use has persisted in the face of multiple forms of impairment, and most perceive themselves as being unable to stop (Stephens et al., 1994, 2000).

Recent studies have identified potentially effective interventions for marijuana-dependent adults (Budney, Higgins, Radonovich, & Novy, 2000; Stephens et al., 1994, 2000), but these studies also have raised questions about the optimal duration or intensity of treatment and the generalizability of treatment effects to more diverse populations. In a study of 212 daily marijuana smokers,

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Funding for this research was provided by Substance Abuse and Mental Health Services Administration, Center for Substance Abuse Treatment Grants UR4 TI11273, UR4 TI11310, UR4 TI11274, and UR4 TI11270. The opinions expressed are those of the authors. We thank Deborah Talamini for administrative support, Ron Jackson for facilitating the University of Washington and Evergreen Treatment Services collaboration, and the numerous therapists and research assistants who were responsible for the implementation of the study.

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Stephens et al. (1994) compared 10 sessions of cognitive-behavioral group therapy (CBT) with 10 sessions of group discussion. All treatment groups met weekly for the first 8 weeks and then every other week for the next 4 weeks for a total of ten 2-hr sessions. Both groups showed similar reductions in marijuana use and related problems. Continuous abstinence rates at 3, 6, and 12 month follow-ups were only 37%, 22%, and 14%, respectively. Nevertheless, significant and clinically meaningful reductions in the frequency of marijuana use and associated problems were observed at each follow-up. Contrary to predictions, the CBT group did not have a greater reduction in marijuana use. And the lack of differences between intervention conditions left open the possibility that change was due in part to high levels of motivation in this self-referred and high-functioning sample.

In a subsequent study, Stephens et al. (2000) extended the length of the CBT group intervention (i.e., 14 sessions over 4 months) and compared it with two individual sessions of motivational enhancement therapy (MET) and with a delayed treatment control (DTC) condition in a sample of 291 adult daily marijuana smokers. Both active treatments were associated with substantial reductions in marijuana use relative to the DTC condition. Frequency of use and related problems were reduced by more than 50% throughout the 16-month follow-up in both active treatments. The two-session MET treatment produced outcomes comparable to the longer CBT treatment at all follow-up points, suggesting that brief interventions may be as effective as extended counseling for this population. The DTC condition helped rule out motivation for change as the sole explanation for the apparent effects of treatment. However, the lack of differences between treatments was difficult to interpret because length of treatment was confounded with treatment modality (group vs. individual) and therapist experience (MET had more experienced therapists). Again, the sample was relatively homogenous, with most participants being relatively high-functioning White males.

Budney et al. (2000) randomly assigned 60 marijuana-dependent adults to one of three treatments that varied in intensity and content: 4 sessions of MET, 14 sessions of combined MET/CBT, or 14 sessions of MET/CBT plus the use of voucher-based incentives that were linked to weekly negative urinalysis results. The same therapists delivered all treatments individually. The voucher-based condition produced more weeks of continuous abstinence from marijuana during the 14-week treatment period and greater abstinence at the end of treatment (35%) than MET/CBT (10%) or MET (5%) conditions. There were no significant differences between the briefer MET treatment and longer MET/CBT without vouchers. However, the small sample size may have limited the study's ability to detect trends favoring the 14-session MET/CBT intervention.

Another recent study of brief interventions for treatment-seeking adult marijuana users in Australia compared six sessions of MET/CBT with one session of MET/CBT and with a DTC condition (Copeland, Swift, Roffman, & Stephens, 2001). Both treatments were delivered individually and produced greater reductions in marijuana use compared with the DTC condition at a 6-month follow-up. However, the few significant differences between the two active treatments were inconsistent and did not clearly favor the longer treatment. Again, continuous abstinence rates were low, but reductions in problems associated with use appeared to be substantial.

These studies indicate that many marijuana-dependent adults respond well to several types of interventions, even though continuous abstinence is a less common outcome than reduced marijuana use. The studies comparing different therapeutic modalities raise important questions about the optimal duration, intensity, and type of treatment. The generalizability of findings is also unknown because the studies have been conducted in a limited number of localities with fairly homogenous samples of treatment seekers. The present article describes a multisite randomized clinical trial designed to replicate and extend findings from previous studies. A two-session MET intervention was compared with a nine-session multicomponent intervention. The location of the study in three demographically distinct communities was intended to increase sample heterogeneity and to assess the generalizability of the outcomes. We hypothesized that both treatments would produce outcomes superior to untreated controls. Furthermore, we hypothesized that the nine-session treatment would result in better outcomes than the two-session intervention despite the relative lack of differences in previous studies. Trends in two of those studies suggest that somewhat longer MET/CBT treatments would fare better if therapist experience and modality were controlled.

Method

Participants

Recruitment took place between May 1997 and August 1998. Of the 450 randomized patients, 84% were referred to the project via specific advertising that offered free treatment; 8% were referred by a family member, friend, or relative; 5% were referred from a general advertisement for the agency or clinic; and the remainder were from social service agencies, medical doctors, private practitioners (nonmedical), or self-referrals. The advertisements targeted adults who were interested in receiving free outpatient treatment composed of individual therapy to help them quit their heavy marijuana use (see Steinberg et al., 2002). To attract minority and female participants, sites used gender-specific and minority-specific outreach strategies that made use of local media, public service announcements, and flyers. Interested individuals were invited to call or visit the treatment site for information.

The three collaborating sites collectively recruited 450 eligible participants, with a final sample of 308 men and 142 women. Participants were recruited through media advertisements and agency referrals. A total of 1,211 interested callers were screened by telephone during the 16-month recruitment period. Of these initial callers, 398 (33%) were ineligible because they met one or more of the following exclusion criteria: unwillingness to accept random assignment (21%), legal status that might have interfered with treatment (e.g., mandated treatment, pending jail sentencing; 16%), current *DSM-IV* (American Psychiatric Association, 1994) diagnosis of dependence on another drug or alcohol (31%), need for immediate medical or psychiatric treatment that did not allow for randomization into the DTC group (16%), currently receiving therapy or attending a self-help group (20%), and inability to provide a contact person (20%).

As shown in Figure 1, 813 of those screened were eligible, but 363 callers declined to participate or did not attend the baseline interview. Participants were eligible if they were 18 years of age or older, had a *DSM-IV* (American Psychiatric Association, 1994) diagnosis of current marijuana dependence, and used marijuana on at least 40 of the 90 days prior to the study. Study participants ($N = 450$) were compared with eligible individuals who declined study participation ($n = 363$) on variables obtained during the screening interview. Nonparticipants were more likely to be African Americans, $\chi^2(3, N = 813) = 17.7, p < .01$; unmarried, $\chi^2(1, N = 813) = 10.6, p < .01$; less educated, $t(811) = 5.03,$

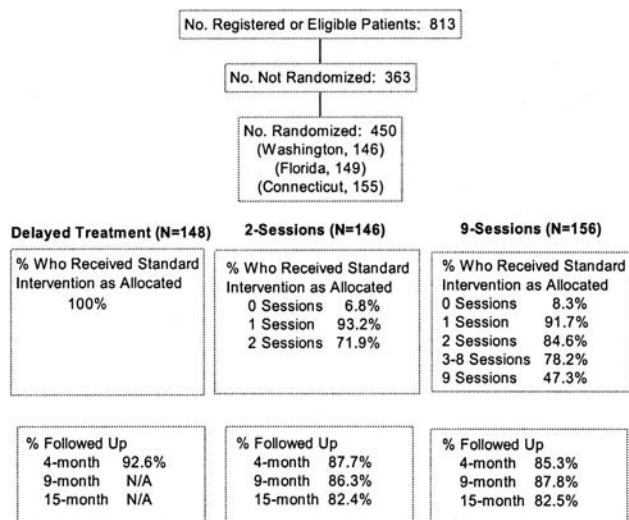


Figure 1. Profile of marijuana treatment project. N/A = not applicable.

$p < .001$, and unemployed, $\chi^2(2, N = 813) = 18.23, p < .001$, than those who participated (see Vendetti, McRee, Miller, Christiansen, & Herrell, & The Marijuana Treatment Project Research Group, 2002, for more information on pretreatment dropouts).

As shown in Table 1, participants were primarily men (68.0%) who had

an average of 14 years of education. Sixty-nine percent were White, whereas 12.0% were African American and 17.1% were Hispanic. Approximately 60.0% of the sample was currently unmarried. Sixty-nine percent worked full-time, 14.0% worked part-time, and 12.4% were unemployed. The average age of the sample was 36 years (range = 18–62).

On average, participants reported using marijuana on 82 of the past 90 days, smoking 3.7 times a day, and being high more than 6 hr a day. Use of alcohol and other drugs was infrequent. The sample also reported a mean of 17.9 years of *regular marijuana use* (defined as 3 or more times per week) and 9.2 years of self-defined “problem use.” Participants endorsed an average of 5.6 of the 7 *DSM-IV* (American Psychiatric Association, 1994) dependence criteria. Only 18% had ever received treatment for drug abuse, and 7% had been treated for alcohol abuse. There were no significant differences among participants assigned to the three study conditions on basic demographic or problem severity measures (see Stephens et al., 2002, for a detailed presentation of the success of randomization).

Research Design and Sites

The study was conducted at the University of Connecticut’s Department of Psychiatry, Farmington, CT ($n = 155$); The Village South, Inc., Miami, FL ($n = 149$); and Evergreen Treatment Services, Seattle, WA ($n = 146$). Two of the sites (Miami and Seattle) were outpatient substance abuse treatment facilities not affiliated with universities. Sites were chosen through a competitive process that took into account geographic representation, access to clinical facilities, and potential for recruiting a diverse group of chronic marijuana users.

The participants recruited at the three sites were similar in age, marital status, and years employed in their current position, but they differed in

Table 1
Baseline Characteristics of the Randomized Sample by Treatment Condition, With Means and Standard Deviations for Continuous Variables

| Variable | Total $N = 450$ | Delayed $n = 148$ | 2-session $n = 146$ | 9-session $n = 156$ | χ^2 | p | F | p |
|---------------------------|--------------------|----------------------|------------------------|------------------------|----------|------|------|------|
| Categorical | | | | | | | | |
| Men (%) | 68.4 | 70.9 | 63.7 | 70.5 | 2.26 | .323 | | |
| Ethnicity (%) | | | | | 8.95 | .176 | | |
| White | 69.3 | 76.4 | 65.1 | 66.7 | | | | |
| Hispanic | 17.3 | 15.5 | 20.5 | 16.0 | | | | |
| African American | 12.2 | 8.1 | 13.0 | 15.4 | | | | |
| Other | 1.1 | 0.0 | 1.4 | 1.9 | | | | |
| Not married (%) | 59.8 | 60.8 | 59.6 | 59.0 | 0.11 | .947 | | |
| Residence (%) | | | | | 0.85 | .932 | | |
| Owns | 45.8 | 48.6 | 43.8 | 44.9 | | | | |
| Rents | 51.8 | 49.3 | 53.4 | 52.6 | | | | |
| Room/shelter | 2.4 | 2.0 | 2.7 | 2.6 | | | | |
| Employment (%) | | | | | 2.75 | .840 | | |
| Full-time | 69.1 | 70.3 | 65.8 | 71.2 | | | | |
| Part-time | 14.0 | 13.5 | 16.4 | 12.2 | | | | |
| Unemployed | 12.4 | 10.8 | 13.0 | 13.5 | | | | |
| Student/retired/homemaker | 4.4 | 5.4 | 4.8 | 3.2 | | | | |
| Continuous | | | | | | | | |
| Age | | | | | | | 0.90 | .408 |
| M | 36.10 | 36.61 | 35.36 | 36.30 | | | | |
| SD | 8.33 | 8.72 | 8.05 | 8.22 | | | | |
| Years of education | | | | | | | 1.36 | .257 |
| M | 14.17 | 14.39 | 13.95 | 14.18 | | | | |
| SD | 2.32 | 2.43 | 2.37 | 2.18 | | | | |
| Years at present job | | | | | | | 0.33 | .720 |
| M | 5.21 | 5.30 | 4.71 | 5.08 | | | | |
| SD | 5.66 | 5.92 | 5.45 | 5.87 | | | | |

ethnic distribution, education, and employment rates. Such differences were anticipated given the diversity in the demographic makeup of these regions. Small differences were also found across sites in the baseline frequency and quantity of marijuana, alcohol, and other drug use. Participants in Miami tended to use marijuana and other illicit drugs more frequently, whereas alcohol use and related problems were higher in Seattle (see Stephens et al., 2002, for more detail and discussion of site differences).

The three treatment conditions were (a) a two-session MET intervention lasting 5 weeks; (b) a nine-session, 3-month duration multicomponent treatment that added CBT and case management (CM) to MET sessions; and (c) a 4-month DTC group. Both active treatments were delivered individually. Participants were randomly assigned to conditions at each site using an urn randomization program (Stout, Wirtz, Carbonari, & Del Boca, 1994) to balance key variables (i.e., age, gender, ethnicity, employment status, education, and marijuana problem severity, as measured by the Marijuana Problem Scale described below) across treatment groups. The research design and sample size provided sufficient power to detect medium-sized effects between treatment conditions (see Stephens et al., 2002, for more information on the rationale and design of the study).

Assessment Procedures

Baseline assessments. All participants completed a baseline assessment session conducted by trained research staff at each site. During the baseline session, participants signed an informed consent form and completed a series of structured interviews and self-report questionnaires. Diagnoses of alcohol and drug abuse or dependence were obtained using the Structured Clinical Interview (SCID; First, Spitzer, Gibbon, & Williams, 1996) for the *DSM-IV* (American Psychiatric Association, 1994), which has been shown to yield valid and reliable psychiatric diagnoses. The SCID was used to make a final determination of eligibility (presence of marijuana dependence) and to assess dependence severity. The total number of dependence and abuse symptoms (range = 0–11) was used to measure the severity of marijuana-related consequences. The Addiction Severity Index (ASI; McLellan et al., 1992), a structured interview, was used to measure the severity of medical, employment, legal, alcohol and drug, and psychiatric problems. The time line follow-back (TLFB; Sobell & Sobell, 1992) interview was used to measure the frequency and pattern of marijuana and other drug consumption. The TLFB used calendar prompts for the 90 days prior to the interview and was modified to identify the time periods of each day (i.e., 12:00 a.m.–6:00 a.m.; 6:00 a.m.–12:00 p.m.; 12:00 p.m.–6:00 p.m.; 6:00 p.m.–12:00 a.m.) during which the participant smoked marijuana to assess the extent of smoking across the day. Single-item summary measures of the quantities of marijuana (e.g., number of joints) and alcohol (i.e., standard drinks) consumed on a typical day of use were added to the TLFB interview, rather than assessing quantity consumed on each day of the period. An index of total number of standard alcoholic drinks consumed during the 90 days before assessment was constructed by multiplying the number of days of any use by the typical number of drinks per day.

Participants also completed several self-report questionnaires that served as secondary outcomes. The Beck Depression Inventory (BDI; Beck, Ward, & Mendelson, 1961) and the state portion of the State-Trait Anxiety Inventory (STAI; Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983) were used to measure common psychological states associated with substance abuse. The Marijuana Problem Scale (MPS; Stephens et al., 2000) was used to measure the occurrence of 19 recent (previous 90 days) problems (e.g., guilt, low energy, medical problems, sleep disturbance, legal problems) associated with cannabis use. The MPS was included to characterize the possible benefits of reducing marijuana use. Additional self-report measures of potential predictors of outcomes were included for exploratory purposes, but presentation of these data is beyond the scope of the present article.

Collateral interviews. Collateral verification of substance use was obtained from a random sample of one third of the participants at the 4- and 9-month follow-up assessments. Collaterals were spouses or partners (56%), other relatives (15%), or friends (29%) of the participants. Collaterals were interviewed by phone and provided estimates of the frequency of marijuana, alcohol, and other drug use during the 90 days preceding the follow-up. At the 4- and 9-month follow-ups, the correlations between participant and collateral reports of days of marijuana use were .73 and .68, respectively, indicating a moderate to high level of agreement.

One hundred percent of those who reported complete abstinence during the 4-month follow-up were corroborated by their collateral informants, whereas 91% who reported smoking marijuana during this time period were in agreement with their informants. The 9% of disagreement occurred because the collateral reported abstinence when the participant reported smoking. The discrepancies for both indices occurred because participants reported more marijuana use than collaterals.

Urine toxicology tests. Urine toxicology tests were used to screen participants for exclusion criteria (e.g., unreported drug use) and to validate verbal report measures. Urine samples, collected at intake and at the 4- and 9-month follow-up points, were processed by a centralized laboratory to detect recent use of tetrahydrocannabinol and nine other psychoactive substances. Enzyme immunoassay tests were used as a first pass. Quantitative analysis was conducted on all positive screenings using gas chromatography/mass spectrometry. The screening results were compared with self-reported marijuana use during the 2-week period before the specimen was collected. Percentage of agreement was very high for each time point (94% at baseline, 91% at 4 months, 92% at 9 months). As with the collateral data, most discrepancies occurred because participants reported marijuana use when the urine screening indicated that the participant was abstinent. For example, approximately 5% of participants reported smoking during the 2-week time period when their urine results were negative. This discrepancy might be due to the participant reporting marijuana use that occurred earlier in the 2-week time period before the specimen collection, resulting in the marijuana metabolite being undetectable in the urine at the time of the test. Even smaller proportions of participants reported abstinence when their urine screens were positive (0.9% at baseline, 3.6% at 4 months, and 2.9% at 9 months). False positives can arise for a number of reasons, including procedural errors such as incorrect sample identification or clerical error. Both the urine specimen results and collateral informant interview data suggest that participants did not systematically underreport their use of marijuana.

Treatment Interventions

The two-session and nine-session interventions were similar to those used in previous studies (Budney et al., 2000; Stephens et al., 1994, 2000), with somewhat greater latitude given to therapists in the nine-session protocol to meet the needs of a more racially and socioeconomically diverse sample (see Steinberg et al., 2002, for a more detailed presentation of the treatments). Both treatments promoted complete abstinence from marijuana as the treatment goal but were not dogmatic in this regard. Therapists attempted to help participants who had a goal of moderate use to see the advantage of initiating a period of complete abstinence before attempting controlled use, but they continued to support attempts to reduce marijuana consumption if complete abstinence was rejected. The same therapists conducted both treatments at each site.

The primary models used in the study were MET and CBT. *MET* refers to an empathic therapeutic style designed to resolve ambivalence and elicit motivation to change (Dunn, DeRoo, & Rivara, 2001; Miller & Rollnick, 2002). *MET* intervention is based on the assumption that even if clients possess sufficient skills to curtail their marijuana use, they must first resolve their ambivalence about marijuana use and increase their motivation to change. Once they have decided that the costs of marijuana use outweigh the benefits, they are more likely to use their existing abilities and

support systems to stop marijuana use. In studies with adult marijuana users, one (Copeland et al., 2001) or two sessions (Stephens et al., 2000) of motivational interviewing were found to be more efficacious than no treatment.

A CBT intervention was included in the present trial because motivation to change may not be sufficient by itself, especially for clients who began using marijuana in their early teens and who have been using it regularly ever since (Baer, Kivlahan, & Donovan, 1999). Regular use since adolescence may leave them with coping skills deficits that could handicap their efforts to curtail use, no matter how strong their motivation. Hence, cognitive restructuring and skills training may be required to develop the personal coping resources needed to achieve and maintain abstinence (Monti, Abrams, Kadden, & Cooney, 1989). Combining a motivational intervention with skills training is likely to result in enhanced engagement in treatment and better substance use outcomes. In support of this, a review of motivational intervention studies for substance use disorders (Dunn et al., 2001) found that the most change occurred when motivational sessions were added as an enhancement before more intensive treatment.

To a lesser extent, CM constructs were used to broaden the focus of CBT treatment beyond substance abuse alone. The CM component was suggested by research on the importance of identifying and reducing nonsubstance problems in the lives of drug users in order to achieve successful substance use outcomes (McLellan et al., 1997).

Two-session intervention. The two-session treatment involved MET sessions scheduled 1 week and 5 weeks after randomization. These 1-hr sessions were separated by 1 month to allow participants enough time to make changes that could be evaluated and discussed with the therapist at the second meeting. During the first session, the therapist reviewed and discussed a personal feedback report (PFR) to motivate the client and provide support for the selection of treatment goals and strategies for change. The PFR included summaries of the client's recent marijuana use, problems, concerns, attitudes favoring and opposing change in marijuana use, and ratings of self-confidence about change. At the second session, efforts to reduce marijuana use were reviewed and adjustments in strategy were made as necessary. MET was used to address ambivalence as needed. Participants had the option of involving a significant other (SO; e.g., spouse, partner, or friend) during the second session. When present (15% of the sessions), the SO was involved in identifying the pros and cons of change and in developing strategies for remaining abstinent.

Nine-session intervention. The nine-session therapy included elements of MET, CM, and CBT and was delivered over a 12-week period. It was designed to permit a tailoring of content to meet the needs of a diverse sample (see Steinberg et al., 2002). The first eight sessions were scheduled weekly, starting 1 week after baseline assessment. The ninth session was scheduled during Week 12, 4 weeks after the eighth session, in order to give participants the opportunity to review change strategies with their therapists after a period without weekly contact. The first two sessions involved the review of a PFR and the use of MET to bolster motivation for change. However, the treatment protocol allowed counselors to return to MET strategies throughout the nine sessions to acknowledge any ambivalence regarding change and to assist the client in making use of the upcoming sessions, given possible changes in goals (e.g., not motivated to quit, but wishing to become moderate in marijuana use; ambivalent about initiating any change) and current motivational levels.

The CM component was suggested by research on the importance of identifying and reducing nonsubstance problems in the lives of drug users in order to achieve successful substance use outcomes (McLellan et al., 1997). During the two CM sessions that typically followed MET sessions, therapists used data from the ASI (McLellan et al., 1992) and other instruments, as well as the participant's self-report, to identify potential obstacles to abstinence related to marijuana use (e.g., legal, housing, social support, vocational, psychiatric, transportation, parenting, and medical problems). They subsequently worked together to set goals, identify resources in the community, develop a plan, and monitor progress toward

goal attainment for each targeted problem. In subsequent sessions, some time was devoted to a review and discussion of progress toward these goals. Although the protocol suggested two sessions of CM, it allowed therapists to devote more or less CM time in subsequent sessions, depending on participants' needs.

The CBT component of the treatment protocol offered the third opportunity for tailoring therapy to the needs of a diverse clientele. CBT identifies potential triggers or high-risk situations for drug use and helps the client develop coping skills to avoid drug use in those situations. The protocol included five core and five elective CBT modules adapted from prior treatment protocols for marijuana use (Stephens et al., 2000) and other drugs (e.g., Kadden et al., 1992). The core sessions were (a) Understanding Marijuana Use Patterns, (b) Coping with Cravings and Urges to Use, (c) Managing Thoughts about Re-Starting Marijuana Use, (d) Problem Solving, and (e) Marijuana Refusal Skills. Five elective modules covered the following areas: Planning for Emergencies/Coping with a Lapse, Seemingly Irrelevant Decisions, Managing Negative Moods and Depression, Assertiveness, and Anger Management. Although the remaining five sessions were designated primarily for CBT, therapists were given latitude in deciding along with the client whether to cover all CBT modules, modify the order in which they were covered, and/or substitute certain electives for core modules. Furthermore, the need for MET to address ambivalence or CM to address substantial nonsubstance problems altered the exact ratio of treatment components.

In the nine-session intervention, 29% of the participants involved an SO who could attend up to two sessions. The first session oriented the SO to the treatment and sought to foster the client's motivation by encouraging the SO and participant to discuss the impact of the participant's marijuana use on the relationship or family. The counselor helped the SO and client formulate a change plan that involved identifying areas in which the SO could help the participant with their treatment goals. The second SO session focused on how the SO and client had worked with each other, allowing the therapist to work on communication skills. Future support for the achievement and maintenance of behavior change was also considered.

DTC condition. Participants assigned to the DTC condition waited 4 months and then completed a second assessment. The DTC group also was assessed briefly by phone at 4 and 12 weeks postrandomization to check for possible clinical deterioration during the waiting period. No participants were referred to treatment or withdrawn from the trial because of clinical deterioration. At the completion of the 4-month waiting period, participants in the DTC group were allowed to initiate either of the two treatment protocols. We found that 23.7% chose the two-session intervention, 63.5% chose the nine-session intervention, and 12.8% entered neither treatment. We also compared DTC participants who chose the two-session treatment with participants randomized to the same brief treatment in terms of number of sessions completed. Interestingly, those who could choose the brief treatment attended significantly fewer sessions ($M = 1.23$) than those who were assigned to it ($M = 1.65$), $t(179) = 3.29$, $p < .01$. There were no differences between groups that chose or were assigned to the extended treatment.

Therapist Training and Treatment Fidelity

Therapists ($N = 13$) were primarily psychologists and master's-level therapists with previous experience in behavioral therapies. They were trained to follow detailed therapy manuals developed by investigators for each of the three treatments. The manuals prescribed the content and technique of each therapy session. Following an initial 2-day training at the project's Coordinating Center, therapists returned to their respective sites. They were certified to begin conducting the treatments only after a review of several videotaped therapy sessions with pilot participants to demonstrate that they were competently following the treatment protocols. The training supervisor at the Coordinating Center continued the supervision of each therapist throughout the study period by reviewing randomly selected therapy videotapes.

Independent evaluators blind to treatment assignments reviewed 633 treatment sessions for therapist competency, adherence to protocol, and other indicators of therapy process. Therapists were found to closely adhere to the manuals throughout treatment. There were no significant differences across sites in treatment adherence, competence, and other process measures.

Follow-Up Procedures

Participants in both of the active treatment conditions were assessed at 4, 9, and 15 months after the start of treatment using relevant baseline assessment instruments. The primary assessment for the DTC group was conducted at 4 months postrandomization. DTC participants were not assessed after the 4-month follow-up. Research assistants were not blinded to the participant's experimental condition. The TLFB (Sobell & Sobell, 1992), ASI (McLellan et al., 1992), and SCID (First et al., 1996; Cannabis Use Disorders section) were repeated at the 4- and 9-month in-person follow-ups, as were questionnaires assessing marijuana-related problems and potential mediators of treatment effects. Participants were paid \$50 for each of the 4- and 9-month follow-ups. At 15 months, participants received \$25 for completing telephone interviews that assessed only frequency of marijuana use and negative consequences via the MPS (Stephens et al., 2000).

Data Analysis

General linear model (GLM) analyses were performed on outcome measures from each follow-up. Treatment condition and research site were between-participants factors, and the follow-up assessment points formed a within-participants factor labeled *time*. Initial outcomes at the 4-month follow-up were evaluated with 3 (treatment) \times 2 (site) \times 2 (time) GLM analyses because the DTC condition was only available at this follow-up. Significant interactions were followed by planned contrasts comparing means of the treatment conditions or sites while controlling for the baseline value of the dependent variable. A Bonferroni-corrected alpha of .016 (.05/3) indicated treatment differences. Change over time and maintenance of treatment gains for the two active treatments were evaluated across the baseline, 4-month follow-up, and 9-month follow-up assessments with 2 (treatment) \times 2 (site) \times 3 (time) GLM analyses. The 15-month follow-up data were analyzed separately, with 2 (treatment) \times 2 (time) GLM analyses comparing baseline and follow-up measures. Comparisons with baseline data are provided for descriptive purposes along with appropriate cautions in their interpretation. Initially, analyses included only participants completing the respective follow-up assessments. Additional analyses were performed to assess the impact of missing data on the primary outcomes. The primary outcome measure was the proportion of days of marijuana use during the preceding 90 days, which reflected the degree of success in achieving abstinence. Secondary outcome measures included the mean number of quarterly periods during which marijuana was used per day of use (0–4), the number of joints smoked per day, number of problems related to use (i.e., total score from the MPS [Stephens et al., 2000] scale; 0–19), number of SCID (First et al., 1996) dependence symptoms (0–7), number of SCID abuse symptoms (0–4), ASI (McLellan et al., 1992) composite scores, and measures of depression (BDI; Beck et al., 1961) and anxiety (STAI; Spielberger et al., 1983).

Results

Treatment Attendance

The mean number of sessions attended by MET clients was 1.6, with 71.9% receiving both sessions (see Figure 1). For the nine-session treatment, the mean number of sessions attended was 6.5.

Over 47.0% of the sample attended all nine sessions, whereas 8.3% failed to attend any sessions.

Cannabis Use and Related Problems

Table 2 presents the baseline, 4-, and 9-month follow-up means (and standard deviations) for the primary and secondary cannabis-related outcome measures for each treatment condition. At the 4-month follow-up, we observed consistent differences between groups on measures of marijuana use and related consequences during the previous 90 days. Significant effects of time on all measures were qualified by significant Treatment \times Time interactions (see Table 2). There were no significant Treatment \times Site \times Time interactions. We found a main effect of site, $F(2, 388) = 16.90, p < .001$, and a significant Site \times Time interaction, $F(2, 388) = 7.63, p < .001$, on the measure of joints smoked per day. At baseline, mean number of joints smoked per day was highest at the Farmington site and lowest at the Seattle site, with all three sites differing significantly from each other. At the 4-month follow-up, after controlling for baseline use, there were no significant differences between sites in the mean number of joints smoked per day.

The percentages of reductions in days smoked from baseline were 15.9%, 35.7%, and 58.8% for the DTC, two-session, and nine-session treatment conditions, respectively. The planned contrasts indicated that both the two-session and nine-session treatments resulted in greater reductions in the percentage of days of marijuana smoking compared with the DTC condition. Between-group effect sizes (d ; Cohen, 1988) for the two-session and nine-session treatments compared with the DTC condition were .59 and 1.14, respectively. Furthermore, the nine-session treatment produced significantly greater reductions than the two-session treatment ($d = .52$). Figure 2 illustrates the results for the percentage of days when marijuana was used in the previous 90 days.

A similar pattern of results was evident in the GLM analyses for other measures of marijuana use and related problems at the 4-month follow-up. Both the two-session ($d = .60$) and nine-session ($d = .91$) treatments resulted in significantly fewer periods of marijuana use per day relative to the DTC condition, and the nine-session participants reported fewer periods of marijuana use than the two-session participants ($d = .40$). There were fewer dependence symptoms in the two-session ($d = .33$) and nine-session ($d = .90$) conditions relative to the DTC condition, with the nine-session condition differing significantly from the two-session condition ($d = .52$). The number of joints smoked per day was significantly lower in both active treatment groups compared with the DTC group ($ds = .29$ and $.43$), but did not differ significantly between active treatments. On measures of marijuana abuse symptoms and marijuana-related problems, the nine-session treatment showed greater reductions than both the two-session treatment and the DTC condition, which did not differ significantly from each other (abuse symptoms $ds = .38$ and $.63$, respectively; marijuana problem $ds = .53$ and $.41$, respectively).

When the analyses were restricted to the two active treatments across the baseline, 4-month, and 9-month follow-ups, significant effects of time remained on all measures. Planned comparisons confirmed that all marijuana use measures were significantly reduced from baseline. We found significant Treatment \times Time interactions on measures of percentage of days smoking, periods

Table 2
Measures of Marijuana Use and Related Problems Assessed at Treatment Intake (Baseline) and at 4-Month and 9-Month Follow-Up According to Three Study Conditions

| Variable | Delayed treatment ^a | | | 2-session treatment ^a | | | 9-session treatment ^b | | | Treatment × Time Effect | |
|----------------------------|--------------------------------|-----------|------------|----------------------------------|-----------|------------|----------------------------------|-----------|------------|-------------------------|----------|
| | <i>M</i> | <i>SD</i> | 95% CI | <i>M</i> | <i>SD</i> | 95% CI | <i>M</i> | <i>SD</i> | 95% CI | <i>F</i> | <i>p</i> |
| Percentage of days smoking | | | | | | | | | | | |
| Baseline | 89.88 | 14.11 | 87.2; 92.6 | 86.92 | 17.15 | 84.1; 89.7 | 87.56 | 17.24 | 84.8; 90.3 | | |
| 4 months | 75.59 | 30.69 | 69.7; 81.5 | 55.86 | 36.18 | 49.7; 62.0 | 36.17 | 38.83 | 30.0; 42.1 | 41.83 | <.001 |
| 9 months | | | | 59.76 | 36.78 | 53.4; 66.6 | 43.87 | 37.48 | 39.8; 52.5 | 10.16 | <.001 |
| Periods smoked per day | | | | | | | | | | | |
| Baseline | 2.35 | 0.83 | 2.2; 2.5 | 2.24 | 0.73 | 2.1; 2.4 | 2.32 | 0.81 | 2.2; 2.4 | | |
| 4 months | 1.95 | 1.05 | 1.8; 2.1 | 1.35 | 0.89 | 1.2; 1.5 | 1.02 | 1.07 | 0.9; 1.2 | 29.80 | <.001 |
| 9 months | | | | 1.39 | 0.92 | 1.2; 1.6 | 1.19 | 1.02 | 1.1; 1.4 | 4.96 | <.01 |
| Joints per day | | | | | | | | | | | |
| Baseline | 2.77 | 2.19 | 2.4; 3.2 | 3.02 | 2.80 | 2.6; 3.4 | 2.79 | 2.35 | 2.3; 3.2 | | |
| 4 months | 2.03 | 1.94 | 1.7; 2.3 | 1.50 | 1.62 | 1.2; 1.8 | 1.00 | 1.71 | 0.9; 1.5 | 3.91 | <.05 |
| 9 months | | | | 1.59 | 2.28 | 1.4; 2.4 | 1.48 | 2.53 | 1.6; 2.6 | 0.12 | >.05 |
| Dependence symptoms | | | | | | | | | | | |
| Baseline | 5.56 | 1.33 | 5.74; 5.80 | 5.70 | 1.20 | 5.5; 5.6 | 5.62 | 1.17 | 5.4; 5.8 | | |
| 4 months | 4.36 | 1.92 | 4.0; 4.68 | 3.70 | 2.26 | 3.3; 4.1 | 2.47 | 2.34 | 2.1; 2.8 | 23.78 | <.001 |
| 9 months | | | | 3.63 | 2.08 | 3.2; 4.0 | 2.81 | 2.40 | 2.5; 3.3 | 6.11 | <.01 |
| Abuse symptoms | | | | | | | | | | | |
| Baseline | 2.11 | 0.84 | 2.0; 2.2 | 2.10 | 0.87 | 2.0; 2.2 | 2.06 | 0.77 | 1.9; 2.2 | | |
| 4 months | 1.63 | 0.91 | 1.5; 1.8 | 1.38 | 1.10 | 1.2; 1.6 | 1.03 | 1.02 | 0.9; 1.2 | 7.38 | <.001 |
| 9 months | | | | 1.59 | 1.04 | 1.4; 1.8 | 1.11 | 1.07 | 0.9; 1.3 | 4.94 | <.01 |
| Marijuana problems | | | | | | | | | | | |
| Baseline | 9.07 | 3.53 | 8.5; 9.7 | 10.18 | 3.47 | 9.5; 10.8 | 9.47 | 3.51 | 8.9; 10.1 | | |
| 4 months | 7.77 | 3.90 | 7.0; 8.5 | 8.35 | 4.06 | 7.6; 9.1 | 6.02 | 4.85 | 5.3; 6.8 | 9.99 | <.001 |
| 9 months | | | | 7.22 | 4.21 | 6.3; 7.9 | 5.43 | 4.31 | 4.8; 6.2 | 2.79 | >.05 |

Note. The delayed-treatment group was not assessed at the 9-month follow-up. CI = confidence interval.

^aData for the baseline and 4-month follow-up are based on those participants with complete data at both assessments (delayed = 137; 2-session = 128; 9-session = 133). ^bData for the 9-month follow-up are based on those participants with complete data at all three assessments (2-session = 120; 9-session = 126).

smoked per day, as well as dependence and abuse symptoms (see Table 2). Comparisons of means at the 9-month follow-up controlling for baseline values of the same measures indicated that there were greater reductions in the nine-session treatment compared with the two-session treatment for the percentage of days of marijuana use ($d = .37$), dependence symptoms ($d = .31$), and abuse symptoms ($d = .45$). Again, we found a main effect of site, $F(2, 242) = 10.83, p < .001$, and a Site × Time interaction, $F(1, 242) = 3.28, p < .05$, on the measure of joints smoked per day that reflected only the baseline differences between sites. A significant Site × Time interaction on the measure of joints per day was similar to that found for 4-month analyses.

The GLM analyses performed on summary measures of percentage of days of marijuana use, joints smoked per day, and the MPS (Stephens et al., 2000) at the 15-month telephone follow-up showed significant effects of time on all variables and reflected reductions in marijuana use relative to baseline values. A significant Treatment × Time interaction, $F(1, 242) = 4.41, p < .05$,

revealed that participants in the nine-session treatment had a lower percentage of days of marijuana use ($M = 44.86, SD = 40.52$) compared with the two-session treatment ($M = 53.65, SD = 38.57$), although the between-groups effect size was small ($d = .22$). However, reductions in the percentage of days of use relative to baseline were still substantial in both conditions (48% and 33%, respectively). There was no differential effect of treatments for joints per day or marijuana-related problems.

Effects of Missing Data

The overall 4-month, 9-month, and 15-month follow-up rates were 89%, 87%, and 83%, respectively. Attrition from follow-up did not differ as a function of treatment assignment at any follow-up (see Figure 1). Comparisons of those lost to follow-up with those interviewed revealed no significant differences for gender, age, education, marijuana use, or dependence severity

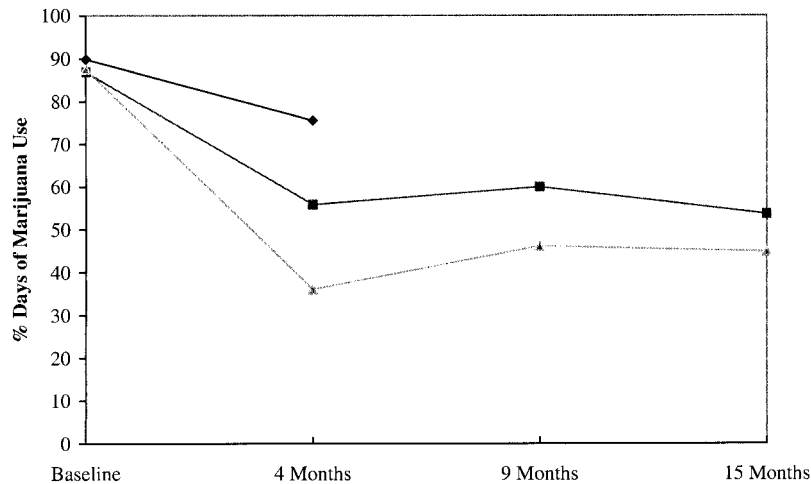


Figure 2. Percentage of days of marijuana use. Solid diamonds = delayed treatment; solid squares = two-session treatment; solid triangles = nine-session treatment.

measures. Thus, follow-up samples appeared to be representative of the randomized sample.

To further explore the effect of missing data, we repeated the analyses of the primary outcome variable by using the participant's baseline value if follow-up data were missing. The same pattern of significant time and Treatment \times Time interactions was found for percentage of days of marijuana use at the 4-month, $F(2, 441) = 30.56, p < .001$, 9-month, $F(4, 882) = 28.01, p < .001$, and 15-month, $F(1, 296) = 3.71, p < .06$, follow-ups, although the latter effect did not quite reach conventional levels of significance. There were no significant effects of site in these analyses.

Abstinence and Improvement Outcomes

At the 4-month follow-up, there were significant differences in rates of complete abstinence for the preceding 90 days, $\chi^2(N = 398) = 25.22, p < .001$. The nine-session condition showed higher rates of complete abstinence (22.6%) compared with the two-session (8.6%) and DTC (3.6%) conditions. Abstinence rates for the nine-session (15.6%) and two-session (9.5%) treatments did not differ significantly at the 9-month follow-up, $\chi^2(N = 261) = 2.15, p > .05$. At the 15-month follow-up, more nine-session participants reported 90 days of abstinence (22.7%) compared with two-session participants (12.5%), $\chi^2(N = 248) = 4.38, p < .001$. To investigate whether a subset of participants could be considered improved despite continued use, we classified users as improved if they did not report any symptoms of dependence or abuse in the SCID (First et al., 1996) interviews. Table 3 shows the percentages of participants who were abstinent, improved, or not improved at the 4- and 9-month follow-ups by treatment condition, as well as their rates of marijuana use. Improvement could not be calculated for the 15-month follow-up because the SCID was not administered. An additional 4%–9% of participants could be categorized as improved, depending on the treatment group and follow-up. Rates of improvement were generally comparable in the two active treatments and larger than in the DTC condition. As can be seen, users without problems had reduced their marijuana use substan-

tially more than continuing users, who were still experiencing dependence or abuse symptoms.

Secondary Outcomes

Table 4 shows outcomes on measures of psychosocial functioning. In these analyses, there were main effects of site on several variables previously noted to have differed at baseline, but no interactions of site with time and treatment. There were significant effects of time on the BDI (Beck et al., 1961), STAI-S (Spielberger et al., 1983), and ASI (McLellan et al., 1992) psychiatric composite scores in both the 4-month and 9-month analyses that indicated reduced levels of psychological distress at both follow-ups. However, only the STAI-S at the 4-month follow-up showed a significant Treatment \times Time interaction. Anxiety was lower in the nine-session treatment than in the other treatment conditions. This difference was no longer significant at the 9-month follow-up. There were no significant time effects in the analyses of ASI employment and medical composite scores, suggesting that little change occurred. Contrasts following significant Treatment \times Time effects on the measure of employment functioning at both follow-ups failed to show any significant differences between treatment conditions after controlling for baseline values.

The ASI (McLellan et al., 1992) Alcohol Composite score showed a significant effect of time at the 4-month follow-up, indicating an overall reduction in alcohol problem severity. But there was no time effect in the 9-month analyses, and Treatment \times Time interactions were not evident at either follow-up. However, the analyses of total drinks consumed showed significant time effects at both follow-ups generally indicative of reduced drinking. In the 9-month analyses, we found both a significant Treatment \times Time effect (see Table 4) and a significant Treatment \times Site \times Time effect, $F(4, 478) = 3.75, p < .01$. Subsequent 2 (treatment) \times 3 (time) GLM analyses performed separately for each site revealed that a significant Treatment \times Time interaction was present only at the Miami site. At this site, two-session participants reported significant reductions in alcohol use at the 4-month

Table 3
Abstinent, Improved, and Not Improved Outcomes

| Follow-up | Treatment condition | | | Percentage of days used marijuana | |
|--------------|---------------------|----------------|----------------|-----------------------------------|-----------|
| | Delayed | 2-session | 9-session | <i>M</i> | <i>SD</i> |
| 4 months | <i>n</i> = 137 | <i>n</i> = 127 | <i>n</i> = 132 | | |
| Abstinent | 3.6% | 8.7% | 22.7% | 0.0 | 0.0 |
| Improved | 3.6% | 8.7% | 7.6% | 12.0 | 16.6 |
| Not improved | 92.7% | 82.7% | 69.7% | 67.6 | 33.0 |
| 9 months | | <i>n</i> = 125 | <i>n</i> = 137 | | |
| Abstinent | | 9.6% | 15.3% | 0.0 | 0.0 |
| Improved | | 5.6% | 9.5% | 19.5 | 20.1 |
| Not improved | | 84.8% | 75.2% | 64.3 | 33.1 |

Note. Participants were classified as improved if they reported marijuana use but did not report any *DSM-IV* symptoms of dependence or abuse in the 90-day period prior to the follow-up.

follow-up and further reductions at the 9-month follow-up. In contrast, nine-session participants decreased their alcohol use somewhat at 4 months but had increased their use relative to baseline at the 9-month follow-up. This pattern was not found at either of the other sites, and there was no evidence of a similar pattern of change at the Miami site on any other measures of drug use. Therefore, we urge caution in its interpretation.

To further explore whether changes in alcohol use were related to changes in marijuana use, we computed partial correlations between the percentage of days of marijuana use and each of the two measures of alcohol use (i.e., ASI [McLellan et al., 1992] composite and total drinks) at each follow-up. We controlled for the baseline value of each measure in computing the correlations to examine the relationship between change in marijuana use and change in alcohol use (i.e., residualized change scores). None of the partial correlations were significant, and all were less than .10. Taken together, these analyses suggest a tendency for alcohol use to decline somewhat over time and that change was not related to changes in marijuana use.

Generalizability of Outcomes

To explore whether outcomes were generalizable across gender, ethnicity (White, non-White), and employment status (employed full-time, part-time, unemployed), we included each of these potential moderators in sets of exploratory analyses. For each set, we included one of the moderators as a between-participants factor in GLM analyses. We then repeated analyses for all outcome measures at all follow-ups. There were no significant three-way interactions between treatment condition, moderator status, and time in any of the sets. Thus, there was no indication that these characteristics influenced the pattern of outcomes.

Discussion

The results of this randomized trial suggest that both a two-session motivational treatment and a nine-session multicomponent treatment were effective in reducing marijuana use compared with a DTC condition. The nine-session intervention produced superior outcomes compared with the two-session treatment in terms of

reductions in marijuana use up to 12 months following treatment termination. Reductions in marijuana use were accompanied by reductions in symptoms of marijuana dependence and abuse. Treatment effects were robust across sites and a number of participant characteristics, including gender and ethnicity. The findings relating to follow-up rates, validity of self-reports, and treatment fidelity suggest that the study was executed with a high degree of internal validity. Overall, the findings suggest that treatment for marijuana dependence could have a significant impact on chronic marijuana use and that both substance abuse treatment programs and behavioral health care providers should consider making marijuana-specific treatment more available and accessible.

The very modest reductions in marijuana use for participants assigned to the DTC condition underline the significance of the changes among those assigned to the two active treatment conditions. The findings from the DTC group suggest that marijuana-focused treatments may be necessary for this population to achieve abstinence or to significantly reduce marijuana use. It is of note that many participants reported some difficulty in finding help for their marijuana-related problems through the current drug abuse treatment system. The findings are generally consistent with prior studies (Budney et al., 1998; Stephens et al., 1994, 2000) in suggesting that well-defined behavioral treatments for marijuana dependence produce encouraging levels of improvement, and that treatment is associated with clinically meaningful benefits even for those who do not achieve complete abstinence.

There are also some important differences between the outcomes observed in this study and those reported in previous research. Stephens et al. (2000) found no differences between 2-session and 14-session treatments. Although the research designs and treatments evaluated in the two studies were similar, the Stephens et al. study delivered the longer treatment in a group format, used more experienced therapists for the brief treatment, and recruited a less diverse and possibly more motivated sample. In contrast, our findings are more similar to two more recent studies that compared treatments of different lengths (Budney et al., 2000; Copeland et al., 2001) and uncovered some evidence that longer treatments produced better outcomes. In those studies, the same therapists delivered the treatments individually, but relatively small samples may have prevented definitive conclusions regarding differences between treatment conditions.

In addition to the reductions observed in the frequency and daily intensity of marijuana smoking, there were parallel reductions in marijuana-dependence symptoms and marijuana-related problems. In each of these measures, the nine-session group showed the greatest improvements, the two-session group showed intermediate reductions, and the DTC group showed little change. Although the magnitudes of change in the nine-session treatment are large and clinically meaningful, we cannot draw the same conclusion for the two-session condition. Although we observed statistically significant reductions in frequency of marijuana use and dependence symptoms relative to no treatment, other measures of problems related to marijuana use were not consistently different. Thus, it may be that small reductions in marijuana use do not result in meaningful changes on clinical indices. To further explore the meaning of reduced use, we categorized participants as abstinent, improved, or not improved for the 90-day period preceding follow-up. Abstinence rates were relatively small overall but clearly

Table 4

Measures of Medical, Psychiatric, Other Secondary Outcomes Assessed at Treatment Intake (Baseline), and at 4-Month and 9-Month Follow-Up According to Three Study Conditions

| Variable | Delayed treatment ^a | | | 2-session treatment ^a | | | 9-session treatment ^b | | | Treatment × Time Effect | |
|---------------------------|--------------------------------|-----------|------------|----------------------------------|-----------|------------|----------------------------------|-----------|------------|-------------------------|----------|
| | <i>M</i> | <i>SD</i> | 95% CI | <i>M</i> | <i>SD</i> | 95% CI | <i>M</i> | <i>SD</i> | 95% CI | <i>F</i> | <i>p</i> |
| BDI | | | | | | | | | | | |
| Baseline | 10.09 | 7.35 | 8.8; 11.4 | 13.21 | 8.60 | 11.8; 14.6 | 11.39 | 7.00 | 10.0; 12.8 | | |
| 4 months | 7.87 | 6.78 | 6.5; 9.2 | 10.35 | 8.50 | 8.9; 11.8 | 7.71 | 7.76 | 6.3; 9.1 | 1.41 | >.05 |
| 9 months | | | | 10.16 | 9.36 | 7.4; 11.6 | 7.34 | 8.29 | 5.3; 9.5 | 0.09 | >.05 |
| STAI-S | | | | | | | | | | | |
| Baseline | 37.29 | 11.53 | 35.3; 39.3 | 41.61 | 12.19 | 39.5; 43.7 | 39.87 | 11.62 | 37.8; 41.9 | | |
| 4 months | 35.50 | 11.21 | 33.6; 37.4 | 37.50 | 11.61 | 35.5; 39.5 | 33.35 | 10.13 | 31.4; 35.3 | 5.24 | <.01 |
| 9 months | | | | 38.85 | 12.66 | 36.2; 40.4 | 33.61 | 11.32 | 31.7; 35.9 | 1.68 | >.05 |
| ASI medical composite | | | | | | | | | | | |
| Baseline | 0.16 | 0.25 | 0.1; 0.2 | 0.28 | 0.31 | 0.2; 0.3 | 0.26 | 0.30 | 0.2; 0.3 | | |
| 4 months | 0.15 | 0.26 | 0.1; 0.2 | 0.29 | 0.35 | 0.2; 0.3 | 0.22 | 0.30 | 0.2; 0.3 | 1.35 | >.05 |
| 9 months | | | | 0.26 | 0.32 | 0.2; 0.3 | 0.25 | 0.32 | 0.2; 0.3 | 1.58 | >.05 |
| ASI employment composite | | | | | | | | | | | |
| Baseline | 0.18 | 0.16 | 0.1; 0.2 | 0.24 | 0.25 | 0.2; 0.3 | 0.23 | 0.21 | 0.2; 0.3 | | |
| 4 months | 0.20 | 0.17 | 0.2; 0.2 | 0.22 | 0.22 | 0.2; 0.3 | 0.20 | 0.19 | 0.2; 0.2 | 3.41 | <.05 |
| 9 months | | | | 0.21 | 0.24 | 0.2; 0.2 | 0.22 | 0.20 | 0.2; 0.3 | 3.37 | <.05 |
| ASI psychiatric composite | | | | | | | | | | | |
| Baseline | 0.14 | 0.17 | 0.1; 0.2 | 0.16 | 0.19 | 0.1; 0.2 | 0.15 | 0.19 | 0.1; 0.2 | | |
| 4 months | 0.13 | 0.18 | 0.1; 0.2 | 0.15 | 0.19 | 0.1; 0.2 | 0.13 | 0.18 | 0.1; 0.2 | 0.11 | >.05 |
| 9 months | | | | 0.19 | 0.20 | 0.1; 0.2 | 0.14 | 0.19 | 0.1; 0.2 | 0.67 | >.05 |
| ASI alcohol composite | | | | | | | | | | | |
| Baseline | 0.11 | 0.12 | 0.1; 0.1 | 0.12 | 0.13 | 0.1; 0.1 | 0.11 | 0.13 | 0.1; 0.1 | | |
| 4 months | 0.11 | 0.12 | 0.1; 0.1 | 0.11 | 0.11 | 0.1; 0.1 | 0.10 | 0.11 | 0.1; 0.1 | 0.54 | >.05 |
| 9 months | | | | 0.12 | 0.13 | 0.1; 0.1 | 0.10 | 0.11 | 0.1; 0.1 | 0.16 | >.05 |
| Total drinks | | | | | | | | | | | |
| Baseline | 46.57 | 85.48 | | 59.41 | 84.56 | | 48.79 | 79.10 | | | |
| 4 months | 42.92 | 62.48 | | 46.00 | 72.63 | | 34.81 | 71.49 | | 0.82 | >.05 |
| 9 months | | | | 45.56 | 76.62 | | 46.12 | 106.70 | | 4.37 | <.05 |

Note. The delayed-treatment group was not assessed at the 9-month follow-up. BDI = Beck Depression Inventory; STAI-S = State-Trait Anxiety Inventory, State Version; ASI = Addiction Severity Index composite scores.

^a Data for the baseline and 4-month follow-up are based on those participants with complete data at both assessments (delayed = 137; 2-session = 128; 9-session = 133). ^b Data for the 9-month follow-up are based on those participants with complete data at all three assessments (2-session = 120; 9-session = 126).

avored the nine-session condition. Improvement occurred about equally in both the two-session and nine-session conditions, and less frequently in the DTC condition. Improved participants were using marijuana on 12%–20% of days on average, whereas the not improved participants were using only 64%–68% of the days. These findings support the notion that complete abstinence is not the only clinically meaningful outcome of treatment. It is important to note that our definition of improvement was very conservative and required participants to be without any symptoms of abuse or dependence. These improvement rates should be thought of only as illustrations of the impact of reduced use. It is likely that many additional participants experienced meaningful reductions in

problems associated with marijuana use without achieving abstinence.

Effects of treatment on depression, psychiatric severity, medical problems, and alcohol use severity over time were not significant. These findings are consistent with other studies (Budney et al., 2000; Copeland et al., 2001) and may be a function of low initial problem severity in these areas. We have argued that the constellation of concerns that bring marijuana users to treatment may not manifest themselves in major socioeconomic or psychosocial problems (Stephens, Babor, Kadden, Miller, & The Marijuana Treatment Project Research Group, 2002). Instead, it may be a more subtle dissatisfaction with multiple areas of functioning and

concerns about future health problems that motivate the desire to quit or reduce use.

Consistent with prior studies focused solely on the treatment of marijuana use (Stephens et al., 2000, 1994), there was no evidence that reductions in marijuana use led to an increase in alcohol use. Although primary marijuana users without significant other drug involvement may be underrepresented in existing treatment agencies, this finding, along with our general success in recruiting large samples of such users, supports the development, dissemination, and marketing of treatment programs for this population of users.

Several limitations of the study should be noted. First, many participants sought help in response to specific advertisements for treatment of primary marijuana dependence. Thus, the results may not generalize to persons whose marijuana dependence is secondary to other types of substance dependence, who are referred to treatment under legal mandate, or who are unmotivated to seek treatment. Second, the design does not allow for conclusions regarding the “active ingredients” in the treatments, only that more treatment was better than less treatment. Numbers of sessions were confounded with differential content and process such that it is impossible to know whether the CBT and CM were specifically active in the improved outcomes in the nine-session condition. Future analyses of therapy session process ratings in relation to outcomes may shed some light on important aspects of the interventions but are beyond the scope of this article. Future studies should consider dismantling designs in which hypothesized active components of the interventions are offered individually or in specific combinations and are compared with appropriate attention-placebo interventions to control for number of sessions of contact. Third, we were unable to conduct a full in-person assessment 12 months after treatment because of funding limitations. Although results at the 15-month follow-up suggest the maintenance of marijuana use outcomes, future studies should address longer term outcomes. Finally, outcomes may have been influenced by different expectancies of success created by the treatments of different lengths. Participants were told that neither active treatment was known to be superior to the other, but assessment of differential treatment efficacy expectancies was not conducted.

Unlike the historical portrayal of marijuana as a benign drug, this study as well as previous research suggest that individuals can develop a chronic use pattern that is associated with dependence symptoms and recurrent psychosocial problems. Individuals who use marijuana chronically as their primary drug tend not to seek treatment in traditional drug treatment settings. It appears from this and other studies that when given the opportunity, many respond to treatment primarily by cutting back rather than quitting entirely. There is thus ample reason to explore ways to improve outcomes, evaluate the economic costs and benefits of the treatments, and study the effect of brief treatments for marijuana dependence in nontraditional settings such as primary care practices. The evidence for treatment efficacy presented in this article should also prompt efforts toward screening and early intervention in emergency departments, correctional facilities, and other settings.

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Received December 6, 2002

Revision received August 4, 2003

Accepted August 11, 2003 ■

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