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Differences in Treatment Outcome among Marijuana-Dependent Young Adults with and without Antisocial Personality Disorder

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Abstract

Background—Few studies have addressed comorbid antisocial personality disorder (ASPD) and marijuana dependence in young adults, and results from previous studies are inconsistent.

Objectives—This study evaluated differences in pretreatment characteristics and treatment outcomes between marijuana-dependent young adults with and without ASPD.

Methods—Data for this study were derived from a randomized trial, in which marijuana-dependent young adults ($n = 136$) between 18 and 25 years of age were randomized to four behavioral conditions: (1) MET/CBT with CM, (2) MET/CBT without CM, (3) DC with CM, and (4) DC without CM.

Results—Forty-four percent of the participants met DSM-IV-TR criteria for ASPD. ASPD clients had significantly more lifetime alcohol dependence disorders, marijuana use in the 28 days pretreatment, arrests, and assault and weapon charges compared to those without ASPD. ASPD clients did not differ in retention or substance use outcomes at 8 weeks posttreatment or the 6-month follow-up. In general, both groups had more attendance in the voucher condition, but there were no significant ASPD by treatment interactions.

Conclusions—These data suggest that marijuana-dependent young adults with comorbid ASPD do not necessarily have poorer retention or substance use outcomes compared with marijuana-dependent young adults who do not have ASPD when treated in a well-defined behavioral therapy protocol.

Scientific significance—Previous research has shown increased risks for clients with comorbid ASPD and marijuana dependence; however, our findings suggest that specialized programs for clients with ASPD may not be necessary if they are provided with empirically supported, structured treatments.

Keywords

marijuana dependence; young adults; antisocial personality disorder; criminal behavior; treatment outcome

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Declaration of Interest

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

INTRODUCTION

There is a strong association between substance use and antisocial personality disorder (ASPD). In fact, 40–50% of substance users meet the criteria for ASPD (1-3) and about 90% of persons diagnosed with ASPD are substance users (4). However, the research on substance-dependent young adults with and without ASPD is limited and inconsistent.

What has been established is that marijuana is the most commonly abused illicit substance among young adults (5) and that substance abuse treatment can help reduce substance use as well as criminal behavior (6). Alternatively, some studies suggest that substance users with ASPD are at increased risk for treatment attrition, relapse, and recidivism (7). Yet, other studies have found no differences in treatment retention between substance users with and without ASPD (8). Furthermore, most studies have focused on adult populations and have done less to examine differences between substance-abusing young adults with and without ASPD. A focus on marijuana-dependent young adults with and without ASPD is important because frequent marijuana use during young adulthood is associated with health and psychiatric issues and greater delinquency and involvement with the criminal justice system (9,10). Identifying unique differences between marijuana-dependent young adults with and without ASPD is essential to providing effective interventions.

Using data drawn from a randomized, controlled clinical trial of marijuana-dependent young adults with criminal justice involvement that evaluated the efficacy of a MET/CBT treatment approach versus a manualized individual drug counseling (DC) approach (see 11 for further description), this study evaluated differences in baseline characteristics and treatment outcomes for participants with ASPD compared with participants without ASPD. The following research questions were addressed: (1) Do participants with and without ASPD differ in baseline severity of substance use and legal issues? (2) Do the groups differ in level of motivation to change substance abuse at baseline and treatment completion? (3) Do the groups differ in substance use outcomes (e.g., frequency of marijuana use)? (4) Do the groups differ in substance abuse outcomes at 6-month follow-up?

METHODS

Participants

Participants in the main study were 136 marijuana-dependent young adults recruited from the Substance Abuse Treatment Unit (SATU) outpatient treatment facility in New Haven, CT, USA. The Yale University School of Medicine's Institutional Review Board approved this study, and all participants provided written informed consent and completed an informed consent quiz (11) to assure that all study clients fully understood the nature of informed consent. Individuals who met current criteria for marijuana dependence, were appropriate for outpatient treatment, and were between 18 and 25 years of age were included. Individuals who were physically dependent on other illicit substances and/or met lifetime criteria for schizophrenia or bipolar disorder were excluded. All the clients had criminal justice involvement (defined as having probation, parole, or court involvement at the time of the pretreatment assessment).

Treatments

The four experimental interventions consisted of randomized individual manual-guided psychotherapy conditions: MET/CBT versus DC. All participants were additionally randomized to voucher-based CM or no CM. Participants assigned to CM received vouchers contingent on session attendance and submission of marijuana-free urine specimens. The following are the four treatment conditions: (1) MET/CBT with CM, (2) MET/CBT without CM, (3) DC with CM, and (4) DC without CM.

Treatments were manualized and delivered as weekly individual sessions over 8 weeks. Treatments were delivered by doctoral-level clinicians with extensive training, including a 2-day didactic training seminar, close supervision on at least one training case, and ongoing supervision. Treatment sessions were videotaped for supervision, fidelity, and competence (12,13). Independent evaluators, who were blinded to treatment assignment, rated half of the session videotapes and found that study treatments were highly discriminable and no significant differences by treatment condition in mean skill ratings of the clinicians.

Motivational Enhancement/Skills Training (MET/CBT)—This condition emphasized the development of motivation for change and the implementation of skills to bring about that change, using the manualized approach developed for the Marijuana Treatment Project (14). Clinicians used an empathic therapeutic style associated with motivational interviewing to resolve ambivalence, heighten discrepancies about personal goals and marijuana use, and elicit motivation to change. Additionally, exposure to CBT techniques and skills training (e.g., understanding patterns of substance use, strategies for recognizing and coping with craving) was delivered within a motivational interviewing framework.

Contingency Management (CM)—This condition used a two-track incentive system found to be effective in previous trials (15,16) in which participants received vouchers redeemable for goods or services for attending counseling sessions or submitting marijuana-free urine specimens. Participants received a voucher worth \$25 for the first session attended, with increasing value in \$5 increments for each consecutive session attended. Participants also received \$50 in vouchers for the first marijuana-free urine specimen submitted, with increments of \$5 for each consecutive marijuana-free urine thereafter. If the participant attended all 8 sessions and submitted 8 consecutive negative urine specimens, they earned \$880 worth of vouchers (\$340 for attendance and \$540 for negative urine specimens). The voucher values for each independent track were reset to their original level if an individual missed a session, submitted a urine specimen that tested positive for marijuana, or failed to submit a specimen.

Individual Drug Counseling (DC)—This condition was a standardized version of counseling typically offered in community-based clinics. The manual (17,18) placed strong emphasis on achieving abstinence from marijuana and other drugs through utilization of self-help groups and a 12-step approach.

Assessments

Weekly assessments included urinalysis (Varian OnTrak Testcup 5 with adulterant checks), as well as self-reports of substance use collected via the Timeline Followback method, a reliable and valid method for assessing substance use on a day-by-day basis (19). Current and lifetime psychiatric diagnoses (including ASPD) were evaluated using the Structured Clinical Interview for DSM-IV-TR (SCID) (20). The SCID allowed for categorical evaluation of ASPD clinical diagnosis (meeting DSM-IV-TR criteria for ASPD, including history of conduct disorder). The California Psychological Inventory-Socialization Scale (CPI-So) was used as a continuous measure of ASPD (21) and is a valid measure of sociopathy in substance users (22). The CPI-So allowed for evaluation of severity or level of ASPD as it is a continuous measurement of ASPD-related traits. Psychosocial functioning was assessed using the Addiction Severity Index (ASI) (23). Follow-ups were conducted 6 months after the study termination.

Data Analyses

Baseline group differences in demographic and substance use and legal variables were analyzed using an analysis of variance model for continuous variables and chi-square test for

categorical variables. ASPD was measured as both a categorical and a continuous variable. The categorical ASPD variable was diagnosis versus no diagnosis of ASPD from the SCID and the continuous variable was scores from the CPI-So. Pearson correlations were conducted to investigate the relationship between the number of criteria met for ASPD on the SCID and total CPI-So score. Correlations were run between the primary outcomes and the two measures (SCID and CPI-So) by voucher and treatment condition. To measure change in marijuana use, ASI composites, number of new arrests and convictions, as well as therapy $\times$ group effects, repeated-measures multivariate analysis of variance (MANOVA) were conducted on all treatment outcome related continuous variables (i.e., Tables 3 and 4). Missing data due to participant noncompletion (i.e., outcome data) and/or missing variables (e.g., despite being present for the evaluation session, participants did not answer a given item) were excluded from all analyses.

RESULTS

(1) Were marijuana-dependent participants with comorbid ASPD different at baseline from marijuana-dependent participants without ASPD?

Table 1 presents demographic and baseline substance use and diagnostic variables by ASPD group status. There were no significant differences between ASPD groups across most demographic variables (i.e., age, race, gender, current employment, marital status, and education). There were expected significant differences on substance use and legal variables. The comorbid ASPD group had significantly more diagnoses of lifetime alcohol dependence disorders [$\chi^2(1,35) = 6.74, p < .01$], significantly more marijuana use in the 28 days prior to treatment initiation [$F(1,131) = 4.81, p < .03$], and a marginal finding in number of inpatient substance abuse treatments [$F(1,131) = 3.36, p < .06$]. The comorbid ASPD group had significantly more months incarcerated [$F(1,131) = 14.83, p < .00$], significantly more arrests [$F(1,131) = 3.88, p < .05$], significantly more violent arrests [$F(1,131) = 11.43, p < .01$], significantly more assault charges [$F(1,131) = 9.36, p < .01$], and significantly more weapon offenses [$F(1,131) = 4.02, p < .05$].

There were no significant differences between the ASPD groups regarding history of psychiatric treatment or rates of current or lifetime DSM-IV-TR affective or anxiety disorders. No differences were found on most ASI composite scores (alcohol, drug, employment, family, or psychiatric); however, the group without comorbid ASPD did have significantly higher legal severity scores [$F(1,131) = 6.43, p < .01$].

While the ASPD diagnostic criteria from the SCID was found to be correlated with scores on the CPI-So [$r = -.41, p < .001$], none of the primary outcomes were significant (all values of $p > .05$). ASPD was operationalized as a high number of diagnostic criteria met on the SCID and a low score on the CPI-So (see Table 2).

(2) Do the ASPD groups differ in their treatment outcomes?

As shown in Table 3, there were no significant differences between the two groups across the number of sessions attended ($M = 5.2$ sessions, $SD = 2.5$). No significant differences between ASPD groups were found for the percent of marijuana abstinent days per self-report or per number of positive marijuana urine screens across treatment. No differences were found in the number or percent of days incarcerated during treatment; however, there was a trend suggesting participants with comorbid ASPD had more new arrests [$F(1,114) = 3.4, p < .07$].

As shown in Table 4, there were no significant differences from pre- to posttreatment across secondary outcomes. That is, there were no significant differences between the ASPD groups across the ASI employment [$F(1,116) = 1.2, p < .28$], legal [$F(1,115) = 2.7, p < .$

10], family [$F(1,116) = 2.7, p < .10$], psychiatric [$F(1,116) = 2.2, p < .14$], alcohol [$F(1,113) = .19, p < .66$], marijuana [$F(1,115) = .68, p < .41$], and drug composite scores [$F(1,113) = 3.6, p < .06$]. However, there was one significant Time $\times$ Group effect across the ASI medical composite [$F(1,116) = 4.4, p < .04$]. The comorbid ASPD group had better improvement on the medical composite score from pre- to posttreatment than the participants without comorbid ASPD.

(3) Do the ASPD groups differ in their response to treatment modality/contingency management (vouchers)?

The two groups did not differ with respect to voucher condition (with or without vouchers) across percent days of abstinence from marijuana across treatment [$F(1,54) = .48, p < .49$], percent positive urine toxicology screens across treatment [$F(1,55) = 1.9, p < .20$], number of days incarcerated across treatment [$F(1,48) = .005, p < .94$], or number of weeks in treatment [$F(1,58) = 1.2, p < .27$]. However, participants receiving vouchers attended significantly more treatment sessions, regardless of whether or not they had comorbid ASPD [$F(1,58) = 5.6, p < .01$]. Participants with comorbid ASPD that received vouchers attended a mean of 5.47 (2.83) sessions (those without comorbid ASPD: 5.94 (2.29) sessions), while participants with comorbid ASPD who did not receive vouchers attended an average of 4.86 (2.40) sessions (those without comorbid ASPD: 4.50 (2.38) sessions). There was no difference in the relationship between comorbid ASPD and vouchers ($p > .05$).

Analyses were run to explore treatment modality (IDC vs. MET) and comorbid ASPD, and similarly there were no significant main effects of group nor interactions between treatment modality and comorbid ASPD for percent days of abstinence from marijuana across treatment, number of days incarcerated across treatment, number of weeks in treatment, and number of treatment sessions attended (all values of $p > .05$).

Regarding secondary outcomes, there were some overall improvements from pre- to posttreatment regardless of ASPD group modality. All participants had improvement in their legal [$F(1,115) = 12.10, p < .01$], family [$F(1,116) = 12.10, p < .01$], psychiatric [$F(1,116) = 10.0, p < .01$], and marijuana [$F(1,115) = 12.89, p < .01$] ASI composite scores across of treatment regardless of whether they were assigned to voucher/no voucher or IDC/MET.

(4) Were there differences between the two ASPD groups at 6-month follow-up?

As shown in Table 5, there were no significant differences between the two groups in terms of percent days abstinent from marijuana use [$F(1,120) = .03, p < .87$], percent positive marijuana urine screens [$F(1,38) = 2.4, p < .31$], number of new arrests [$F(1,108) = .48, p < .48$], or percent incarcerated during the 6-month follow-ups [$F(1,27) = .82, p < .37$]. Moreover, there were no significant differences between ASPD groups across secondary outcomes during the 6-month follow-up period across the medical [$F(1,111) = 1.9, p < .16$], employment [$F(1,110) = .22, p < .64$], legal [$F(1,107) = 2.63, p < .11$], family [$F(1,110) = .85, p < .36$], psychiatric [$F(1,110) = 2.5, p < .11$], marijuana [$F(1,108) = .01, p < .92$], alcohol [$F(1,108) = .31, p < .58$], and drug [$F(1,107) = .48, p < .49$] ASI composite scores.

Additional analyses were conducted to examine the relationship of voucher versus no voucher and IDC versus MET with ASPD group (i.e., no interactions between treatment conditions and comorbid ASPD) to the above-listed 6-month outcomes. There were no significant group differences on treatment outcomes (% days abstinent from marijuana, % positive marijuana screens, number of new arrests, or number of incarcerations) nor secondary outcomes (ASI composite scores). All analyses resulted in values of $p > .05$.

DISCUSSION

We evaluated differences between marijuana-dependent young adults with and without ASPD before the initiation of treatment, during 8 weeks of treatment, and through a 6-month follow-up. Major findings were as follows: First, there were few baseline differences between the groups beyond those expected due to ASPD (e.g., comorbid ASPD group had significantly more arrests, incarcerations, violent arrests, more assaults, and more weapon offenses). However, the comorbid ASPD group had higher rates of lifetime diagnosis of alcohol use and used more marijuana in the 28 days prior to treatment initiation. Second, there were no differences between ASPD groups across other psychiatric diagnoses or past psychiatric treatments. Third, there were no differences in substance use outcomes between ASPD groups by voucher treatment modality. However, there was a near significant difference between ASPD and Voucher regarding new arrests during treatment. Importantly, they were comparable in retention in treatment and substance use outcome variables during treatment. Additionally, there were no differences between ASPD groups across secondary outcomes from pre- to posttreatment or at the 6-month follow-up or in terms of substance use or legal outcomes.

Despite the assessment of many variables, there were few significant differences between groups at baseline. Compared to the marijuana-dependent young adults without ASPD, the ASPD group had significantly more diagnoses of lifetime alcohol dependence disorders and significantly more marijuana use in the 28 days prior to treatment initiation. Moreover, the comorbid ASPD group had significantly more months incarcerated, arrests, violent arrests, assault charges, and weapon offenses. Results are consistent with studies of co-occurring drug use and ASPD among adult populations (24,25). It is notable that the comorbid ASPD group had more violent charges (e.g., assaults and weapon offenses) which may result from interactive and/or additive effects of ASPD and marijuana use. ASPD symptomatology includes impulsiveness, aggression, and criminal behavior (26), and marijuana use is also associated with disinhibition and impulsivity (27) which is linked to aggression and crime (28). Alternatively, there was significantly more marijuana use in the 28 days prior to treatment initiation, and research has suggested that drug use facilitates or exacerbates violence (29). Moreover, the comorbid ASPD group had more diagnoses of a lifetime alcohol dependence disorder and the additive effects of alcohol and marijuana and ASPD could be contributing to increased history of violent arrests. Further assessment of proximal and temporal relationships between ASPD, marijuana use, and violent crimes is crucial.

Despite previous research on adult populations with comorbid ASPD (30) which found significant baseline differences on ASI composites, the current study found no differences for most composites. However, we should note an unexpected finding that participants without comorbid ASPD had significantly higher baseline legal severity scores despite the comorbid ASPD group having significantly more arrests, incarcerations, and violent arrests.

There were no significant differences between the two groups regarding a previous history of psychiatric treatment or rates of current or lifetime DSM-IV-TR affective or anxiety disorders. Other researchers that study younger substance-abusing populations (e.g., youth and adolescent populations) with co-occurring delinquency (31,32) have found that co-occurring marijuana use and delinquency were associated with unemployment, depression, other drug use, work-related problems, and decreased academic achievement, while we did not find differences. One possible explanation for the difference in our findings may be explained by our use of an older population of individuals (18–25 years of age) with marijuana as the primary drug of choice. Additionally, our study was a well-controlled clinical trial and the ASPD diagnoses were more clearly defined and diagnosed, hence the population was quite different than the participants in previous studies.

Importantly, despite pretreatment differences in groups across marijuana use and violent offenses, there were no significant differences between these groups during treatment or at the 6-month follow-up, suggesting that treatment was as effective for the comorbid ASPD group. Both groups (ASPD vs. non-ASPD) were comparable in treatment retention and substance use outcomes across treatment are consistent with the adult literature. Previous research (24) did not find that ASPD predicted criminal behavior at a 1-year follow-up among a group of adult substance users, which is consistent with our findings. Our study is unique in that we aggressively assessed marijuana use, other illicit drug use, alcohol use, and criminal behavior during 8 weeks of treatment and 6-month follow-up using self-report and objective indicators of use in young adults.

Overall, there was no significant difference in the effectiveness of vouchers for participants with or without ASPD in marijuana use or other drug use during treatment and is consistent with other studies. Contingency management techniques have been found to be effective at decreasing substance use and maintaining positive outcomes (15,16). In our main clinical trial with this population, the MET/CBT condition with vouchers was found to be effective at improving treatment outcomes among this difficult-to-treat population (33).

Finally, it was striking that there were no differences between the groups through the 6-month follow-up, given the comorbid ASPD group showed more severity in legal problems at baseline. Our study suggests that other intrinsic motivators may have been utilized by the participants in both ASPD groups. Typically, the research shows that individuals with co-occurring ASPD have higher rates of legal recidivism shortly after they are released from prison-based facilities (34). However, it is important to note that in our study, both groups received evidence-based therapies targeted to decrease their substance use and improve outcomes at all time points. This study was consistent with another similar study in which we found similar treatment outcomes between cocaine-dependent clients with and without active criminal justice involvement (35).

This study had limitations that should be noted. First, this study focused on young adult marijuana users who agreed to participate in a clinical trial and met inclusion/exclusion criteria. Second, all participants were court referred and the legal system may have served as an external motivator increasing engagement and reductions in substance use and legal trouble across the ASPD groups. Although not predicted, it may be that removing the external motivator of legal involvement may lead to more evident ASPD group differences. Third, although a novel study, the sample size was limited to assess ASPD by the four treatment groups over time. Fourth, we did not have a control group to assess the differences in these high risk groups in a no-treatment conditions. Lastly, we only assessed up to a 6-month follow-up time point and it is difficult to ascertain whether the treatment outcomes would be maintained at longer follow-ups. However, our other research in this area with a cocaine abusing population suggests that positive substance abuse and legal outcomes would be maintained (35).

Nevertheless, this study may have important implications for treating young adult marijuana users referred by probation. Our data suggest that the marijuana-dependent clients with comorbid ASPD, a difficult-to-treat population, may have rates of retention and substance use outcomes that are comparable to those of marijuana-dependent individuals without ASPD, when provided with empirically supported, structured treatments. Findings suggest that specialized programs may not be needed for marijuana users with comorbid ASPD. Further investigation is needed with a larger sample size to assess any differences in behavioral therapy modalities across marijuana-dependent young adults with and without comorbid ASPD.

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TABLE 1

Baseline differences between marijuana-dependent clients with and without ASPD.

Variables	MJ + ASPD (n = 60)	MJ alone (n = 76)	Total (n = 136)	df	χ^2/F	p
Age, mean (SD) years	21.29 (1.94)	21.10 (2.29)	131	1	.27	.60
Race, % (n)						
African American	62 (36)	56 (41)	77	3	1.97	.58
Hispanic	16 (9)	12 (9)	18			
White	17 (10)	27 (20)	30			
Other	5 (3)	4 (3)	6			
Employed full time (%)	24 (14)	16 (12)	26	5	3.06	.69
Marital status						
Never married (%)	97 (56)	96 (70)	126	3	2.20	.53
Married (%)	0 (0)	1 (1)	1			
Separated (%)	2 (1)	0 (0)	1			
Living in a permanent relationship (%)	2 (1)	3 (2)	3			
Education level (%)						
Partial college training	10 (6)	22 (16)	22	3	5.99	.11
High school/GED	41 (24)	32 (23)	47			
Partial high school	45 (26)	47 (34)	60			
Junior high school	0 (0)	3 (2)	2			
Number previous substance use treatments						
Outpatient	.67 (.87)	.58 (2.03)	131	1	.12	.73
Inpatient	.12 (.38)	.03 (.16)	131	1	3.59	.06
Number previous psychiatric treatments						
Outpatient	.43 (1.5)	.45 (1.82)	131	1	.01	.94
Inpatient	.07 (.39)	.12 (.46)	131	1	.50	.48
Alcohol disorder in lifetime, yes (%) (n)	35 (20)	15 (11)	31	1	6.74	.01
Any depressive disorder	10 (6)	11 (8)	14	1	.01	.91
Any anxiety disorder	24 (14)	19 (14)	28	1	.42	.52
Pre Tx drug use, mean (SD) days in past 28						
Alcohol	2.98 (4.49)	2.66 (4.35)	131	1	.18	.68
Marijuana	15.05 (10.48)	11.16 (9.75)	131	1	4.81	.03

Variables	MJ + ASPD (n = 60)	MJ alone (n = 76)	Total (n = 136)	df	χ^2/F	p
Cocaine	0 (.0)	.03 (.26)	93	1	.57	.45
ASI composite scores, mean (SD)						
Legal	.15 (.17)	.23 (.17)	131	1	6.43	.01
Alcohol	.04 (.06)	.040 (.06)	131	1	.39	.53
Drug	.01 (.01)	.00 (.01)	131	1	.15	.70
Employment	.71 (.27)	.71 (.29)	131	1	.04	.84
Family	.09 (.12)	.08 (.12)	131	1	.40	.53
Psychiatric	.13 (.15)	.10 (.13)	131	1	1.23	.27
# of mo. incarcerated over lifetime, mean (SD)	14.07 (16.65)	4.86 (10.55)	131	1	14.83	<.001
Number of arrests, mean (SD)	6.22 (5.48)	4.51 (4.49)	131	1	3.88	.05
Number of violent arrests, mean (SD)	1.21 (1.58)	.49 (.78)	131	1	11.43	<.001
Different violent arrests, mean (SD)						
Robbery	.10 (.36)	.07 (.25)	131	1	.42	.52
Assault	.79 (1.27)	.27 (.63)	131	1	9.36	<.001
Rape	0 (0)	.03 (.16)	131	1	1.61	.21
Homicide	0 (0)	0 (0)	131	1		
Weapons	.31 (.71)	.12 (.33)	131	1	4.02	.05

TABLE 2

Correlations between primary outcomes $\times$ SCID and CPI-So $\times$ voucher and treatment condition.

	# ASPD criteria		CPI-So score	
	Pearson	<i>p</i>	Pearson	<i>p</i>
No Voucher				
Number of sessions	.088	.498	.039	.751
Number weeks in Tx	.039	.763	.029	.817
% days abstinent	.218	.335	-.090	.48
% urines MJ positive	-.064	.623	.131	.293
Amount vouch earned for negative urine	-.054	.772	-.054	.767
Total amount vouch earned	-.122	.514	-.034	.852
Total arrests	.125	.354	-.131	.309
Total day spent in prison	-.025	.852	.071	.582
Voucher				
Number of sessions	.037	.766	-.009	.942
Number weeks in Tx	.043	.732	-.026	.836
% days abstinent	.011	.931	.064	.620
% urines MJ positive	-.066	.603	-.016	.902
Amount vouch earned for negative urine	.017	.928	.215	.236
Total amount vouch earned	.058	.754	.119	.518
Total arrests	.067	.607	-.027	.838
Total day spent in prison	-.031	.811	.103	.432
No MET				
Number of sessions	.055	.662	.076	.541
Number weeks in Tx	.057	.654	-.025	.840
% days abstinent	.05	.706	.021	.868
% urines MJ positive	-.205	.111	.135	.287
Total arrests	.206	.124	-.102	.437
Total day spent in prison	-.001	.991	.122	.355
MET				
Number of sessions	.036	.778	-.059	.638
Number weeks in Tx	-.004	.978	.046	.714
% days abstinent	.051	.693	-.019	.879
% urines MJ positive	.062	.627	-.049	.697
Amount vouch earned for negative urine	-.021	.872	.073	.562
Total amount vouch earned	-.034	.790	.025	.842
Total arrests	-.042	.746	-.051	.693
Total day spent in prison	-.049	.706	.070	.586

TABLE 3

Treatment outcome by group.

Primary outcomes	MJ + ASPD (n = 60)	MJ alone (n = 76)	Total (n = 136)	df	F/ χ^2	p
Number of sessions attended, mean (SD)	5.17 (2.62)	5.19 (2.43)		131	1	.00 .97
% days abstinent from marijuana	.72 (.30)	.70 (.35)		124	1	.17 .68
# positive MJ urine screens across 8 weeks Treatment	.62 (.44)	.67 (.41)		127	1	.50 .48
# of new arrests over 8 weeks of Tx	4 (8.2%)	3 (4.5%)		7	1	.65 .33
# of days incarcerated during 8 weeks of Tx	1.77 (7.90)	2.33 (10.73)		114	1	.10 .76
# incarcerated over 8 weeks of Tx, % (n)	3(6.1%)	3 (4.5%)		6	1	.16 .50

Note: For continuous measures (e.g., number of sessions attended, number of sessions attended) the total column reflects the number of participants for whom data for this variable were collected. All continuous measures were analyzed through the use of a MANOVA. For categorical variables (e.g., yes/no re-arrest or yes/no incarcerated) the total column reflects the number of participants across groups that responded affirmatively to that item. All categorical variables were analyzed with chi-square analyses.

TABLE 4

Mean (SD) for ASI composite scores by group from baseline to treatment completion.

Secondary outcomes	MJ + ASPD (n = 49)	MJ alone (n = 67)	Total (n = 116)	Time		Group		Time × group	
				F	p	F	p	F	p
Medical week 0	.11 (.22)	.05 (.14)	.08 (.18)	5.15	.03	.51	.48	4.38	.04
Medical week 8	.03 (.12)	.05 (.16)	.04 (.14)						
Employment week 0	.72 (.26)	.70 (.29)	.70 (.28)	.32	.57	.57	.45	1.17	.28
Employment week 8	.72 (.27)	.67 (.30)	.69 (.29)						
Legal week 0	.15 (.16)	.23 (.17)	.19 (.17)	12.10	<.001	3.43	.07	2.76	.10
Legal week 8	.12 (.15)	.13 (.15)	.12 (.15)						
Family week 0	.09 (.12)	.07 (.12)	.08 (.12)	12.94	<.001	.43	.51	1.04	.31
Family week 8	.04 (.08)	.04 (.11)	.04 (.10)						
Psych week 0	.13 (.16)	.09 (.12)	.11 (.14)	10.04	<.001	.83	.36	2.20	.14
Psych week 8	.06 (.12)	.06 (.16)	.06 (.15)						
Alcohol week 0	.04 (.06)	.04 (.06)	.04 (.06)	.44	.51	.31	.58	.19	.66
Alcohol week 8	.04 (.07)	.03 (.09)	.04 (.08)						
Marijuana week 0	.34 (.27)	.29 (.23)	.31 (.24)	12.89	<.001	.43	.51	.68	.41
Marijuana week 8	.22 (.26)	.22 (.26)	.22 (.26)						
Drug week 0	.01 (.01)	.01 (.01)	.01 (.01)	.53	.47	2.13	.15	3.56	.06
Drug week 8	.00 (.01)	.01 (.05)	.01 (.04)						

TABLE 5

Six month follow-up outcomes by group.

Outcomes	MJ + ASPD	MJ alone	Total	df	F/ χ^2	p
% days abstinent from marijuana during 6-month follow-up, mean (SD)	70 (.31)	69 (.32)	120	1	.03	.872
% positive MJ urine screens (n) at the 6-month follow-up	57 (.27)	42 (.11)	38	2	2.36	.307
Number new arrests across 6-month follow-up	.66 (.271)	.41 (.89)	108	1	.48	.488
% Incarcerated during 6-month follow-up (n)	28 (.18)	21 (.9)	27	1	.82	.366
ASI composites at 6-month follow-up						
Medical	.02 (.08)	.07 (.20)	114	1	1.97	.163
Employment	.67 (.28)	.70 (.30)	114	1	.22	.641
Legal	.17 (.18)	.12 (.15)	111	1	2.63	.108
Family	.08 (.11)	.11 (.13)	114	1	.85	.358
Psych	.06 (.12)	.10 (.15)	114	1	2.58	.111
Alcohol	.05 (.06)	.04 (.11)	112	1	.01	.917
Marijuana	.22 (.26)	.20 (.23)	112	1	.31	.578
Drug	.00 (.01)	.01 (.04)	111	1	.48	.492

Notes: For ASI data, participants who were missing any of the key variables used in calculating a composite were not included in analyses; thus although 114 participants completed the 6-month follow-up visit, not all cases could be analyzed. For all other variables in this table, the total column refers to the number total number of participants (across the groups) that had that experience (e.g., % positive MJ urine screens at 6-month follow-up is 38, meaning 38 participants were positive, and an additional 76 participants were negative for a grand total of 114 participants screened).