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Six-Month Treatment Outcomes of Cocaine-Dependent Patients With and Without PTSD in a Multisite National Trial*

LISA M. NAJAVITS, PH.D.,† MELANIE S. HARNED, PH.D.,† ROBERT J. GALLOP, PH.D.,† STEPHEN F. BUTLER, PH.D.,† JACQUES P. BARBER, PH.D.,† MICHAEL E. THASE, M.D.,† AND PAUL CRITS-CHRISTOPH, PH.D.†

National Center for Posttraumatic Stress Disorder, Veterans Affairs Boston Healthcare System, 150 South Huntington Avenue (116B-3), Boston, Massachusetts 02130

ABSTRACT. Objective: This study examined 6-month treatment outcomes among 428 cocaine-dependent outpatients with ($n = 34$) and without ($n = 394$) posttraumatic stress disorder (PTSD) in a randomized controlled multisite clinical trial of manual-based psychotherapies for substance use disorder (SUD). **Method:** Assessments were completed at baseline and monthly during the 6-month treatment. With longitudinal mixed-effects models, we compared outcomes between SUD-PTSD and SUD-only patients and also examined rates of within-group change. **Results:** Results indicated a highly consistent pattern: the SUD-PTSD patients were more impaired to begin with and remained so across time compared with SUD-only patients (with the exception of substance use and addiction-related legal and employment problems, which did not differ between groups). Also, the SUD-PTSD patients improved less than SUD-only patients in alcohol use and the majority of addiction-related psychosocial problems. However, the two groups did not differ significantly in improvement over time on drug use or global psychological severity. **Conclusions:** The greater impairment and relative lack of improvement of SUD-PTSD patients, compared with those with SUD-only, suggest a need for dual-diagnosis treatments that more directly target their areas of difficulty. (*J. Stud. Alcohol Drugs* **68:** 353-361, 2007)

AN ASSOCIATION BETWEEN SUBSTANCE USE disorder (SUD) and posttraumatic stress disorder (PTSD) is by now well established. For example, epidemiological data document that, among men who experience PTSD in their lifetime, 52% develop alcohol-use disorder and 35% develop drug-use disorder. Among women, the rates are 28% and 27%, respectively (Kessler et al., 1995). In clinical settings, the rate of co-occurring PTSD and SUD is higher, with 11%-34% in substance-use treatment estimated to have current PTSD and, for women in particular, 30%-59% (Najavits et al., 1997, 2003). Studies also have consistently shown greater impairment on a wide variety of variables in those with the dual diagnosis compared with those with either disorder alone (Brady et al., 1994; Hien et al., 2000; Najavits et al., 1997, 1998a; Ouimette et al., 1999).

Few studies, however, have examined treatment outcome in this dual-diagnosis population. Those that do fall into two types. The first type tests a specific therapy for the dual diagnosis, which thus far have usually been uncontrolled pilot studies with relatively small samples (Brady et al., 2001; Donovan et al., 2001; Najavits et al., 1998b, 2005; Zlotnick et al., 2003) and, even in recent controlled trials, include only patients who have the dual diagnosis (no comparison to a SUD- or PTSD-only sample) (e.g., Hien et al., 2004; Cohen and Hien, 2006; Najavits et al., 2006; Triffleman, 2000). The second type are naturalistic studies, sometimes with larger samples, but typically with unstandardized diagnostic assessment, few assessment points, lack of rigorous inclusion criteria, and diverse treatments not designed for the dual diagnosis, often unspecified and/or uncontrolled in amount and type (e.g., Morrissey et al., 2005; Ouimette et al., 1998, 1999, 2003). The first type of study generally has shown improvements in PTSD and/or trauma-related symptoms, SUD symptoms, and other areas of functioning and pathology (Brady, 2001; Donovan

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†Correspondence may be sent to Lisa M. Najavits at the above address or via email at: lisa_najavits@hms.harvard.edu. She is with the Harvard Medical School, McLean Hospital and Veterans Affairs Boston, Boston, MA. Melanie S. Harned is with the Department of Psychology, University of Washington, Seattle, WA. Robert J. Gallop is with the Department of Mathematics, Applied Statistics Program, West Chester University, West Chester, PA. Stephen F. Butler is with Inflexxion, Inc., Newton, MA. Jacques P. Barber is with the Center for Psychotherapy Research, Department of Psychiatry, University of Pennsylvania School of Medicine, Philadelphia, PA. Michael E. Thase is with the Department of Psychiatry and the Western Psychiatric Institute and Clinic, University of Pittsburgh Medical Center, Pittsburgh, PA. Paul Crits-Christoph is with the University of Pennsylvania School of Medicine, Philadelphia, PA.

et al., 2001; Hien et al., 2004; Najavits et al., 1998b, 2005, 2006; Triffleman, 2000; Zlotnick et al., 2003). In the second type of study, results indicate that the dual-diagnosis patients typically have worse outcomes on a variety of measures than those with SUD alone (Hien et al., 2000; Ouimette et al., 1999) or PTSD alone (Dansky et al., 1998). However, improvements over time are nonetheless found for the dual diagnosis patients (Dansky et al., 1998), particularly when they receive more PTSD-focused treatment and more psychosocial treatment generally (Ouimette et al., 2000, 2003).

The current study is the first known project to evaluate outcome in a sample with the dual diagnosis compared with those with SUD alone in a rigorously conducted psychosocial treatment trial. The project offers a relatively large sample size, standardized diagnostic and other assessment, and a wide range of outcomes assessed monthly over 6 months. The trial used only manual-based therapies for SUD and stringently controlled external treatments. We thus have the opportunity to evaluate the impact of SUD therapy on patients with both PTSD and SUD compared with those with SUD alone. This is of strong relevance in that SUD treatment represents the typical treatment scenario for SUD-PTSD patients. Despite repeated calls over many years for increased PTSD and mental health treatment for patients with this dual diagnosis (Brady, 2001; Brady et al., 1994; Ouimette and Brown, 2002), in clinical practice it remains the norm that such patients are usually referred to SUD treatment to attain substance abstinence before or instead of mental health treatment (Brown et al., 1995; Najavits et al., 2004). Thus, how they fare in SUD treatment that was not designed to address PTSD could help inform clinical practice and public policy.

Method

Data were collected during the main phase of the National Institute on Drug Abuse Collaborative Cocaine Treatment Study (NCCTS). This controlled, randomized, multicenter clinical trial studied the efficacy of four psychosocial treatments for cocaine-dependent outpatients: individual cognitive therapy (CT; Beck et al., 1993); individual supportive-expressive therapy (SE; Mark and Luborsky, 1992), a psychodynamic treatment derived from Luborsky (1984); individual 12-step drug counseling (IDC; Mercer and Woody, 1992); and group 12-step drug counseling (GDC; Mercer et al., 1994). Details about the rationale and methods of the study (Crits-Christoph et al., 1997), the procedures for selection and training of therapists and counselors (Crits-Christoph et al., 1998), and the main outcome results (Crits-Christoph et al., 1999) are presented elsewhere. In addition, previous research on PTSD using data from the NCCTS has examined the clinical profile of PTSD versus non-PTSD patients (Najavits et al., 1998a) and rates and symptoms of PTSD (Najavits et al., 2003). The study was conducted in two phases. A pilot phase of the study focused on staff training and development of study protocols. The main phase, from which the data for the present study are derived, was the actual outcome trial.

Participants

Participants in the current study were 428 adult outpatients who completed two trauma measures, described below. All participants met Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV; American Psychiatric Association, 1994), diagnostic criteria for cocaine dependence (current or in early partial remission) and had used cocaine in the 30 days before intake. Potential participants were excluded from the study by telephone screening or during an intake interview if they had a history of bipolar disorder, schizophrenia, or organic mental disorder; required treatment (psychopharmacological or psychosocial) beyond that provided by the study or were unwilling to discontinue such treatment; were mandated to attend treatment or were awaiting incarceration; were at risk for imminent suicide or homicide; had been hospitalized for substance-use treatment for more than 10 days in the past month; were not between the ages of 18 and 60; had a life-threatening or destabilizing medical illness; were more than 12 weeks pregnant; were homeless or lacked a stable living situation; or planned to move away from the area within 2 years. Potential participants with SUDs other than cocaine dependence were included if cocaine dependence was their primary diagnosis and they did not meet DSM-IV criteria for opioid dependence (current or in early partial remission). SUD diagnoses were assessed during the intake interview by the Structured Clinical Interview for DSM-IV (SCID; Spitzer et al., 1997), administered by master's- or doctoral-level diagnosticians who were selected and trained by the University of Pennsylvania Assessment Unit of the Center for Psychotherapy Research. Severity of cocaine dependence was determined using a 9-point rating scale adapted from the Anxiety Disorders Interview Schedule-Revised (DiNardo and Barlow, 1988) that reflects the diagnostician's judgment of subjective distress or functional impairment.

All participants were initially screened by telephone, and eligible patients were invited for an intake interview that included informed consent. Following the intake, patients began an orientation phase during which they were required to attend three clinic visits within 14 days, including one group session and two case management visits. In this orientation phase, patients were provided with information about self-help groups; HIV risk reduction; and housing, job, and financial needs. Patients meeting attendance requirements then completed a postorientation assessment, were randomized to treatment, and began the active phase

of the study. The 6-month active phase consisted of weekly sessions of GDC for all patients, totaling 32. Patients who also received individual treatment (CT, SE, or IDC) had sessions twice per week during the first 12 weeks and weekly during the second 12 weeks, totaling 36. A final 3-month booster phase included one individual session per month for patients in CT, SE, or IDC, and one individual meeting per month with a group counselor for patients in GDC alone. Treatments were free of charge and were not tailored in any way for PTSD.

Initial assessments were completed during the intake interview and at postorientation (hereafter referred to collectively as baseline), monthly during the active phase of treatment (Months 1-6), and at four points during the follow-up phase (Months 9, 12, 15, and 18). The current study analyzes data from the assessments that occurred at baseline and during the 6-month active phase of treatment. The outcome measures in the current study were completed at baseline and monthly during the active phase (Months 1-6). Participants were paid a nominal fee for completing all assessments. They completed assessments even if they withdrew from treatment during the trial. As described elsewhere (Crits-Christoph et al., 1999), data collection was relatively successful despite the high levels of attrition from treatment that occurred; that is, on average, patients attended a mean (SD) of 4.5 (1.9) of the six monthly assessments during the active phase of treatment.

Measures

PTSD. To determine a DSM-IV diagnosis of PTSD at baseline, two self-report measures were used. The Trauma History Questionnaire (THQ; Green, 1996) assessed lifetime history of traumatic events (Criterion A of the PTSD diagnosis). The THQ assesses 23 traumatic events that fall within three general categories: (1) crime related (4 items; e.g., mugging, robbery), (2) general disaster (13 items; e.g., car accident, seeing someone killed or seriously injured, natural disaster), and (3) unwanted physical and sexual experiences (6 items; e.g., rape, physical assault). The THQ has been shown to have high test-retest reliability over a 2- to 3-month period, and item correlations ranged from .47 to 1.00, with a mean of .70 (Green, 1996).

The Modified PTSD Symptom Scale (MPSSR; Falsetti et al., 1993) assessed current PTSD symptoms using DSM-IV criteria. The MPSSR contains 17 items, which represent the B, C, and D criteria of PTSD. Items were rated by severity from 1 ("not at all") to 5 ("extremely"). The MPSSR was administered only to those participants who endorsed at least one trauma on the THQ at baseline. The MPSSR has been found to have high internal consistency in both treatment (.96) and community samples (.97), and concurrent validity with the SCID (Falsetti et al., 1993). In a psychometric study of the MPSSR in a substance abuse sample, the measure showed an 89% correct classification rate for the PTSD diagnosis when compared with an interview-based PTSD measure (Coffey et al., 1998).

To obtain a DSM-IV diagnosis of PTSD, patients had to endorse at least one lifetime traumatic event on the THQ (Criterion A) and to have scores of 3 ("moderate") or higher on the MPSSR items that represent Criteria B, C, and D. Specifically, patients had to endorse a minimum of one intrusive/re-experiencing symptom (Criterion B), three avoidance/numbing symptoms (Criterion C), and two hyperarousal symptoms (Criterion D). Only those participants with fewer than five items missing on the MPSSR were included.

Outcome measures. A variety of measures were used to assess outcomes, including substance use and addiction-related psychosocial problems, psychological symptoms, and interpersonal problems.

The Addiction Severity Index (ASI; McLellan et al., 1992) is a semistructured clinical interview that assesses seven life areas that are affected by addiction, including drug use, alcohol use, legal involvement, family/social relationships, employment, medical status, and psychiatric functioning. The ASI was administered by study diagnosticians or research assistants. The reliability and validity of the instrument has been found to be high across a wide range of substance users (McLellan et al., 1985, 1992).

The Brief Symptom Inventory (BSI; Derogatis, 1992) is a 53-item self-report scale used to measure nine primary symptom dimensions (somatization, obsessive-compulsive behavior, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation, and psychoticism) as well as a Global Severity Index. The BSI measures psychological symptoms in the past week, and items are rated on a 5-point scale ranging from 0 ("not at all") to 4 ("extremely"). The BSI has demonstrated good internal consistency, test-retest reliability, construct validity, and convergent and discriminant validity (Derogatis and Melisaratos, 1983; Morlan and Tan, 1998).

The Inventory of Interpersonal Problems (IIP; Horowitz et al., 1988) was used to assess self-reported difficulties in interpersonal relatedness. The IIP contains items derived from content analysis of the intake interviews of psychiatric patients and reflect interpersonal difficulties in eight areas (i.e., domineering, vindictive, socially avoidant, nonassertive, exploitable, intrusive, overnurturant, cold). Items are rated on a 5-point scale ranging from 0 ("not at all") to 4 ("extremely distressing"). The internal consistency of the subscales and total score has been found to range from .82 to .94, and 10-week test-retest reliability was .80 to .98 (Horowitz et al., 1988). Items from the IIP have been shown to have discriminant validity in distinguishing individuals with and without personality disorders (Kim and Pilkonis, 1999; Scarpa et al., 1999). The IIP can be scored in various manners, but for the purposes of this

study the total score was used as a global index of interpersonal dysfunction.

Data analysis

Three topics were addressed: (1) patient characteristics, (2) differences in treatment outcome across time between SUD-PTSD and SUD-only patients, and (3) rates of within-group change across time for SUD-PTSD and SUD-only patients. Two-tailed independent samples t tests and chi-square tests were used to compare the two groups' sociodemographics, cocaine use characteristics, and substance dependence diagnoses at baseline. Results are reported at the $p < .05$ level.

Mixed-effects models (Bryk and Raudenbush, 1992) were used to compare the two groups across time. Two types of mixed-effects models were implemented: random regression modeling (RRM; also known as hierarchical linear models and multilevel linear models; Bryk and Raudenbush, 1992; Littell et al., 1996) and mixed-model analysis of variance (MMANOVA; Khuri et al., 1998). Differences in rates of change were compared across time between the SUD-PTSD and SUD-only groups. In addition, contrast estimates were conducted to examine rates of within-group change across time. These types of mixed-effects models use all data available at each time point, thus increasing statistical power. To allow for the possibility of nonlinear data, both linear (i.e., RRM) and curvilinear (i.e., MMANOVA) models were tested for each of the outcome variables, and a likelihood ratio test determined which model would be reported. For all mixed-effects models, the appropriate covariance structures were analytically determined based on a mixture of chi-squares in comparing nested models (Verbeke, 1997).

Pattern-mixture analysis (Hedeker and Gibbons, 1997) was implemented to assess the potential impact of treatment dropout as well as rates of assessment completion. A binary treatment completion variable (0 = treatment dropout, 1 = completed treatment) and a three-level assessment completion variable (0 = missed at least one time point and provided no further data, 1 = missed at least one time point but provided data at a later time point, and 2 = provided data at all six follow-up time points) were used to define patterns and were entered as predictors in separate RRM and MMANOVA models. To determine whether differences in the slopes depend on treatment completer or assessment completer status, a three-way interaction of Completer Status × PTSD Group × Time was included in the models with a significant PTSD × Time interaction. To determine whether the average difference between groups depends on treatment completer or assessment completer status, a two-way interaction of Completer Status × PTSD group was included in the models with a significant main effect for PTSD.

Results

Participant characteristics

Sociodemographics, cocaine use characteristics, and substance dependence diagnoses. For the full sample, participants were 77.1% male, with a mean age of 34.03 (6.34) years. Most were white (57.5%), with 40.0% black, 1.2% Hispanic, 0.7% Native American, and 0.7% Asian. Almost one half were single (44.4%), with 29.2% married or cohabitating, and 26.4% separated, divorced, or widowed. Most participants were employed (57.6%), 38.4% were unemployed, and 4.0% were students, homemakers, disabled, or retired. They reported using cocaine a mean of 11.98 (8.13) days, and spending a mean of $1,190 ($1,366.98) on cocaine during the month before entering the study. The mean severity rating of their cocaine dependence diagnosis was 5.96 (0.98) on the 0-8 scale. Secondary substance-dependence diagnoses included: alcohol (34.3%), cannabis (4.9%), and sedatives (0.7%).

PTSD and trauma. Thirty-four patients (7.9%) had a DSM-IV diagnosis of PTSD at baseline according to the THQ and MPSSR. Their mean number of lifetime traumas was 8.47 (3.08) of the 23 events assessed by the THQ. Their most frequent type of trauma was general disaster (mean = 4.88 [2.03]), followed by physical and sexual trauma (mean = 2.12 [1.41]), and crime-related trauma (mean = 1.47 [1.13]).

Comparison of SUD-PTSD versus SUD-only patients. We next compared the patients with and without PTSD on all sociodemographics, cocaine use characteristics, and substance-dependence diagnoses (see Table 1). SUD-PTSD and SUD-only patients differed significantly on gender. All other comparisons were nonsignificant.

Treatment outcome: SUD-PTSD versus SUD-only patients

For each outcome measure, a mixed-effects model was computed that included PTSD status (PTSD vs no PTSD), time (baseline and Months 1-6), and a PTSD × Time interaction as independent variables. In addition, given the significant between-group difference on gender, this variable was included in the models as a covariate. The small number of PTSD patients within each of the four treatment modalities made it impossible to conduct analyses by treatment condition, and all subjects were therefore aggregated across treatments. Overall, nine outcome measures were examined and, of these, five (55.5%) showed a significant effect for PTSD status (see Table 2). All results were in the same direction, indicating that SUD-PTSD patients evidenced greater impairment than SUD-only patients across time. With the exception of two outcomes, a significant effect for Time was found in all models (n = 7; 77.8%), indicating that patients improved across the 6 months of

TABLE 1. A comparison of SUD-PTSD and SUD-only patients on sociodemographics, cocaine-use characteristics, and substance-dependence diagnoses

Sociodemographics	SUD-PTSD (n = 34)	SUD-only (n = 394)	Statistic
Age, mean (SD)	32.71 (5.40)	34.15 (6.41)	t = 1.27, 426 df, p = .20
Gender, %			χ^2 = 18.88, 1 df, p < .001
Female	47.1	20.3	
Male	52.9	79.7	
Marital status, %			χ^2 = 1.98, 2 df, p = .37
Single	55.9	43.4	
Married/cohabitating	23.5	29.7	
Divorced/separated/widowed	20.6	26.9	
Race			χ^2 = 0.05, 2 df, p = .97
White	55.9	57.6	
Black	41.2	39.8	
Other	2.9	2.5	
Employment status			χ^2 = 2.62, 2 df, p = .27
Employed	50.0	58.3	
Unemployed	41.2	38.2	
Student/disabled/ retired/homemaker	8.8	3.6	
Cocaine-use characteristics, mean (SD)			
Severity of cocaine dependence	6.26 (1.08)	5.94 (0.97)	t = 1.86, 426 df, p = .06
Days of cocaine use in past 30	14.29 (8.74)	11.78 (8.06)	t = 1.73, 425 df, p = .08
Amount spent on cocaine in past 30 days	$1,519.12 (1,500.00)	$1,161.53 (1,353.18)	t = 1.46, 425 df, p = .14
Substance-dependence diagnoses[a], %			
Alcohol dependence	44.1	33.5	χ^2 = 1.56, 1 df, p = .21
Cannabis dependence	2.9	5.1	Fisher's exact: p = 1.00
Sedative dependence	2.9	0.5	Fisher's exact: p = .20

Notes: SUD = substance use disorder; PTSD = posttraumatic stress disorder. [a]No subjects met criteria for hallucinogen, inhalant, amphetamine, or polysubstance dependence.

treatment. In addition, one (11.1%) of the PTSD × Time interactions was significant. The number of significant effects far exceeded the number expected by chance (0.45; i.e., 5% of nine). Within-group descriptives and slope estimates were also calculated to examine rates of within-group change across time. These analyses indicated that for four (44.4%) of the outcomes, the SUD-PTSD patients showed no improvement, whereas the SUD-only patients improved significantly (see Table 3).

Addiction-related problems. As shown in Table 2, the mixed-effects models found significant effects for PTSD status on the ASI psychiatric, medical, and family-social composites. For each of these outcomes, SUD-PTSD patients were more impaired than SUD-only patients across time. In addition, a significant PTSD × Time interaction was found for the ASI legal composite, indicating that SUD-PTSD patients showed less improvement in the area of addiction-related legal problems than SUD-only patients. The ASI drug, alcohol, and employment composites did not have significant effects for PTSD or the PTSD × Time interaction in the mixed-effects models. However, the contrast estimates examining rates of within-group change (see Table 3) found that, in contrast to the SUD-only patients, the SUD-PTSD patients did not improve on the majority of addiction-related outcomes (i.e., the ASI alcohol, legal, employment, and psychiatric composites). Both SUD-PTSD and SUD-only patients improved on the ASI drug and family-social composites, whereas neither group improved in the area of addiction-related medical problems.

Psychological symptoms. A significant effect for PTSD status was found for the BSI Global Severity Index in a mixed-effect model, indicating that SUD-PTSD patients reported higher levels of psychological symptoms than SUD-only patients across time (see Table 2). In addition, a trend-level effect (p = .06) of PTSD × Time was found, indicating that SUD-PTSD patients improved more than SUD-only patients in global psychological distress. These results likely reflect a floor effect; namely, compared with the SUD-PTSD patients, the SUD-only patients had significantly lower scores on the Global Severity Index at baseline (t = 7.42, 421 df, p < .001) and therefore had less room to improve during treatment (see Table 3 for means and standard deviations). As shown in Table 3, the within-group slope estimates indicate that both the SUD-PTSD and SUD-only patients improved significantly in global psychological severity.

Interpersonal problems. A significant effect for PTSD status was found for the IIP total score in the mixed-effects model analyses (see Table 2), indicating that the SUD-PTSD patients reported more difficulties with interpersonal

TABLE 2. Mixed-effects model comparing SUD-PTSD and SUD-only patients across time on substance use, psychological, and interpersonal outcomes

	PTSD			Time			PTSD × Time		
Outcome	*F*	df	*p*	*F*	df	*p*	*F*	df	*p*
Addiction Severity Index									
Drug[a]	2.68	1/434	.10	342.86	1/507	<.001	1.54	1/537	.21
Alcohol	2.77	1/437	.10	47.03	1/358	<.001	0.11	1/398	.74
Legal	1.44	1/441	.23	0.01	1/441	.91	6.31	1/441	.01
Family-Social	25.01	1/457	<.001	64.25	1/403	<.001	0.24	1/451	.63
Employment	0.34	1/434	.56	8.36	1/375	.004	0.43	1/415	.51
Medical[a]	4.77	1/450	.03	0.33	1/628	.56	0.26	1/671	.61
Psychiatric[a]	13.54	1/440	<.001	38.27	1/570	<.001	0.23	1/603	.63
Brief Symptom Inventory									
Global Severity Index[a]	71.55	1/433	<.001	82.66	1/429	<.001	3.59	1/475	.06
Inventory of Interpersonal Problems									
Total score[b]	28.54	1/394	<.001	14.41	5/276	<.001	2.05	5/296	.07

Notes: Gender was included as a covariate in all models. Models were fit sequentially as follows: (1) Main effects model—model includes main effects for posttraumatic stress disorder (PTSD), time, and gender, and (2) inclusion of the Time × PTSD interaction. If the interactions were nonsignificant they were removed from the model, and the results reported for the main effects are from the main-effects model. Unless otherwise specified, the mixed-effects model results are from unstructured hierarchical linear models. All mixed-effects models were based on all available data across time points. SUD = substance use disorder. [a]Random slope and random intercept hierarchical linear models were used; [b]mixed-model analysis of variance was used.

relatedness than SUD-only patients across time. In addition, a trend-level effect (p = .07) of PTSD × Time was found, indicating that SUD-PTSD patients showed less improvement across time in the area of interpersonal problems than SUD-only patients.

Analysis of the effects of missing data patterns. There was no difference between SUD-PTSD patients and SUD-only patients on the rate of dropout from treatment (76.5% vs 68.0%; χ^2 = 1.04, 1 df, p = .31). SUD-only patients (mean = 4.63 [1.84]) completed significantly more ASIs over the six follow-up points than SUD-PTSD patients (mean = 3.79 [2.18]) (t = 2.50, 426 df, p < .02). There were no between-group differences in the rates of assessment completion of either the BSI (SUD-PTSD: mean = 3.41 [2.12] vs SUD-only: mean = 4.04 [2.12]; t = 1.66, 426 df, p = .10) or the IIP (SUD-PTSD: mean = 3.41 [2.12] vs SUD-only: mean = 4.02 [2.12]; t = 1.60, 426 df, p = .11). The majority of SUD-PTSD and SUD-only patients completed each outcome measure at each follow-up point (range: 52.9%-80.5%). In addition, the majority of subjects either

TABLE 3. Within-group descriptives and estimates of change across time for SUD-PTSD and SUD-only patients on substance use, psychological, and interpersonal outcomes

	SUD-PTSD (n = 34)						SUD-only (n = 394)					
Measure	Baseline Mean (SD)	Month 3 Mean (SD)	Month 6 Mean (SD)	Slope	*t*	*p*	Baseline Mean (SD)	Month 3 Mean (SD)	Month 6 Mean (SD)	Slope	*t*	*p*
Addiction Severity Index												
Drug	.26 (.07)	.12 (.10)	.13 (.08)	-.019	-6.07	<.001	.24 (.06)	.12 (.08)	.12 (.09)	-.015	-17.54	<.001
Alcohol	.24 (.24)	.15 (.22)	.19 (.25)	-.009	-1.50	.13	.22 (.22)	.13 (.17)	.14 (.16)	-.010	-6.69	<.001
Legal	.06 (.12)	.03 (.10)	.07 (.14)	.007	1.25	.21	.10 (.17)	.05 (.13)	.05 (.13)	-.007	-4.87	<.001
Family-Social	.32 (.28)	.32 (.28)	.28 (.25)	-.018	-2.60	.01	.21 (.22)	.13 (.20)	.12 (.18)	-.015	-7.59	<.001
Employment	.56 (.29)	.52 (.33)	.49 (.31)	-.010	-1.39	.16	.48 (.30)	.46 (.31)	.45 (.31)	-.005	-2.61	.01
Medical	.32 (.33)	.16 (.31)	.33 (.34)	.004	0.34	.73	.18 (.28)	.18 (.28)	.19 (.31)	-.002	-0.70	.49
Psychiatric	.24 (.20)	.24 (.20)	.22 (.18)	-.007	-1.16	.25	.19 (.19)	.12 (.18)	.12 (.18)	-.010	-6.09	<.001
Brief Symptom Inventory												
Global Severity Index	1.13 (0.60)	1.00 (0.79)	0.88 (0.93)	-.061	-4.26	<.001	0.50 (0.46)	0.31 (0.39)	0.32 (0.47)	-.033	-8.28	<.001
Inventory of Interpersonal Problems												
Total score[a]	91.77 (41.34)	92.20 (35.28)	100.96 (37.50)	NA	NA	NA	65.81 (36.49)	43.02 (34.90)	46.07 (42.12)	NA	NA	NA

Notes: Means and standard deviations at baseline, the middle of treatment (Month 3), and the end of treatment (Month 6) are provided for descriptive purposes only. The mixed-model analyses used all available data from baseline and each of the 6 monthly follow-up time points. Within-group slope estimates were derived through a contrast of parameter estimates from the hierarchical linear models. SUD = substance use disorder; PTSD = posttraumatic stress disorder. [a]Mixed-model analysis of variance was used; therefore, no slope estimates were generated.

completed all six follow-up time points (average across instruments = 41.0%) or missed at least one time point but provided data at a later time point (average across instruments = 41.1%). Only an average of 17.9% of subjects missed at least one time point and then did not return to provide any further data. This pattern of assessment completion did not differ between SUD-PTSD and SUD-only patients for any outcome measure (ASI: χ^2 = 1.03, 2 df, p = .60; BSI: χ^2 =1.80, 2 df, p = .41; IIP: χ^2 = 1.59, 2 df, p = .45). Using pattern-mixture models, we examined the potential effects of missing data and treatment drop-out on each of the outcome variables with significant PTSD or PTSD × Time effects in the mixed-effects models, and there was no evidence that the findings were biased by the rate of assessment completion or attrition from treatment.

Discussion

This is the first known study to evaluate outcomes of a large number of cocaine-dependent patients (n = 428) with and without PTSD in a rigorous, multisite treatment trial. Strengths of the study include the use of manual-based treatments all designed for SUD, control over external treatments, standardized diagnostic assessment, monthly assessments, a substantial rate of diversity (43% minority patients), and a broad range of outcome variables (e.g., addiction-related problems, psychological symptoms, and interpersonal problems). The use of longitudinal mixed-effects models also allowed an analysis that was less sensitive to missed assessments and dropout.

Several main findings emerged. SUD-PTSD patients were worse to begin with and remained worse across time compared with SUD-only patients on all psychological and interpersonal outcomes, including global psychological severity, addiction-related psychiatric problems, problems with interpersonal relatedness, and addiction-related family and social problems. SUD-PTSD patients also reported more severe addiction-related medical problems than SUD-only patients. These results are consistent with prior studies, which have consistently found that those with the dual diagnosis appear more impaired than those with either diagnosis alone (Brady et al., 1994; Najavits et al., 1998a; Ouimette and Brown, 2002). Ours appears to be one of the first studies, however, to document this pattern across time using carefully controlled, manualized treatments as well as a wide range of measures. The only other comparable study that we know of is that of Cohen and Hien (2006), who also found that a SUD-PTSD sample was highly symptomatic even when provided with manual-based treatments. Interestingly, the dual-diagnosis patients did not differ from SUD-only patients in drug use over time (i.e., ASI drug composite), which might suggest that SUD-focused treatment may be just as helpful to them as to SUD-only patients for drug-use outcomes. Whether the dual-diagnosis patients would have improved even more if given treatment for both PTSD and SUD, however, remains largely unaddressed both in this study and in the broader literature. There has been repeated speculation that addressing both disorders might improve their outcomes, but there are as yet few studies on this (Hien et al., 2004).

Also notable were the results indicating that the SUD-PTSD patients showed no improvement over time on the majority of addiction-related outcomes (i.e., ASI alcohol, legal, employment, and psychiatric composites), whereas the SUD-only patients improved significantly in each of these areas. In contrast, SUD-PTSD and SUD-only patients both improved significantly on drug use, addiction-related family and social problems, and global psychological severity. It is heartening that SUD patients with and without PTSD showed improvement over time in some areas, but it also appears that the dual-diagnosis patients may need either longer or more focused treatment to address some of the more enduring difficulties that showed less improvement during treatment (when compared with SUD-only patients). Given the high number of treatment sessions provided in this project, the need for even more treatment may be at odds with current managed-care and manual-based models but nonetheless may represent a clinical reality that needs attention. Here, too, whether providing PTSD-focused treatment improves some of these outcomes has yet to be determined.

One limitation of the study was our inability to analyze results by treatment condition due to not having sufficient PTSD patients within each of the four modalities. Thus, we could not address, for example, whether SUD-PTSD patients may have improved more in some of the manual-based treatments compared with the others. Second, the sample was primarily male (reflecting men's greater rate of SUD overall; Kessler et al., 1994) and were selected for cocaine dependence. Future research could address broader samples. Similarly, all patients were volunteers for a treatment trial and met stringent entry criteria (e.g., requiring patients to discontinue all other professionally led therapies). The generalizability of our findings must therefore be interpreted cautiously. Our lower rate of PTSD (7.9%) compared with other treatment-seeking SUD samples may also be a function of these sampling issues. However, because of limitations in our data, we were unable to determine how many PTSD patients were actually screened out owing to our entry criteria. If we compare our rate of PTSD with that of other studies that specifically address cocaine, there is closer concordance with some studies (e.g., an 11.8% rate of lifetime PTSD among crack cocaine users in Falck et al., 2004, and a 22% rate of current PTSD in a cocaine dependence sample in Back et al., 2000). Third, we had available only self-report measures for the diagnosis of PTSD (although our measures were psychometrically strong), and we did not include any objective measure of

substance use (e.g., urinalysis). Finally, this article represents a post hoc analysis. The sample was not originally recruited for the presence of PTSD, and, with a relatively small number of PTSD patients relative to non-PTSD patients, all results should be interpreted as exploratory. A larger prospective trial designed to address PTSD and SUD would be an important next step in this research area.

It is hoped that future research will address additional samples of SUD-PTSD patients, will compare therapies for the dual diagnosis compared with those for just one or the other disorder, and will explore mechanisms of action that might help to better understand exactly what in SUD treatment helps to promote change in this population.

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References

American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders (DSM-IV), Washington, DC, 1994.

Back, S., Dansky, B.S., Coffey, S.F., Saladin, M.E., Sonne, S., and Brady, K.T. Cocaine dependence with and without post-traumatic stress disorder: A comparison of substance use, trauma history and psychiatric comorbidity. Amer. J. Addict. **9:** 51-62, 2000.

Beck, A.T., Wright, F.D., Newman, C.F., and Liese, B.S. Cognitive Therapy of Substance Abuse, New York: Guilford Press, 1993.

Brady, K.T. Comorbid posttraumatic stress disorder and substance use disorders. Psychiat. Ann. **31:** 313-319, 2001.

Brady, K.T., Dansky, B.S., Back, S.E., Foa, E.B., and Caroll, K.M. Exposure therapy in the treatment of PTSD among cocaine-dependent individuals: Preliminary findings. J. Subst. Abuse Treat. **21:** 47-54, 2001.

Brady, K.T., Killeen, T., Saladin, M.E., Dansky, B.S., and Becker, S. Comorbid substance abuse and posttraumatic stress disorder: Characteristics of women in treatment. Amer. J. Addict. **3:** 160-164, 1994.

Brown, P.J., Recupero, P.R., and Stout, R. PTSD substance abuse comorbidity and treatment utilization. Addict. Behav. **20:** 251-254, 1995.

Bryk, A.S. and Raudenbush, S.W. Hierarchical Linear Models: Applications and Data Analysis Methods, Thousand Oaks, CA: Sage, 1992.

Coffey, S.F., Dansky, B.S., Falsetti, S.A., Saladin, M.E., and Brady, K.T. Screening for PTSD in a substance abuse sample: Psychometric properties of a modified version of the PTSD Symptom Scale Self-Report. J. Traumat. Stress **11:** 393-399, 1998.

Cohen, L.R. and Hien, D.A. Treatment outcomes for women with substance abuse and PTSD who have experienced complex trauma. Psychiat. Serv. **57:** 100-106, 2006.

Crits-Christoph, P., Siqueland, L., Blaine, J., Frank, A., Luborsky, L., Onken, L.S., Muenz, L., Thase, M.E., Weiss, R.D., Gastfriend, D.R., Woody, G., Barber, J.P., Butler, S.F., Daley, D., Bishop, S., Najavits, L.M., Lis, J., Mercer, D., Griffin, M.L., Moras, K., and Beck, A.T. The National Institute on Drug Abuse Collaborative Cocaine Treatment Study: Rationale and methods. Arch. Gen. Psychiat. **54:** 721-726, 1997.

Crits-Christoph, P., Siqueland, L., Blaine, J., Frank, A., Luborsky, L., Onken, L.S., Muenz, L.R., Thase, M.E., Weiss, R.D., Gastfriend, D.R., Woody, G.E., Barber, J.P., Butler, S.F., Daley, D., Salloum, I., Bishop, S., Najavits, L.M., Lis, J., Mercer, D., Griffin, M.L., Moras, K., and Beck, A.T. Psychosocial treatments for cocaine dependence: National Institute on Drug Abuse Collaborative Cocaine Treatment Study. Arch. Gen. Psychiat. **56:** 493-502, 1999.

Crits-Christoph, P., Siqueland, L., Chittams, J., Barber, J.P., Beck, A.T., Frank, A., Liese, B., Luborsky, L., Mark, D., Mercer, D., Onken, L.S., Najavits, L.M., Thase, M.E., and Woody, G. Training in cognitive therapy, supportive-expressive therapy, and drug counseling therapies for cocaine dependence. J. Cons. Clin. Psychol. **66:** 484-492, 1998.

Dansky, B.S., Brady, K.T., and Saladin, M.E. Untreated symptoms of PTSD among cocaine-dependent individuals: Changes over time. J. Subst. Abuse Treat. **15:** 499-504, 1998.

Donovan, B., Padin-Rivera, E., and Kowaliw, S. "Transcend": Initial outcomes from a posttraumatic stress disorder/substance abuse treatment program. J. Traumat. Stress **14:** 757-772, 2001.

Derogatis, L.R. Brief Symptom Inventory, Baltimore, MD: Clinical Psychometric Research, 1992.

Derogatis, L.R. and Melisaratos, N. The Brief Symptom Inventory: An introductory report. Psychol. Med. **13:** 595-605, 1983.

DiNardo, P.A. and Barlow, D.H. Anxiety Disorders Interview Schedule-Revised (ADIS-R), Albany, NY: Phobia and Anxiety Disorders Clinic, 1988.

Falck, R.S., Wang, J., Siegal, H.A., and Carlson, R.G. The prevalence of psychiatric disorder among a community sample of crack cocaine users: An exploratory study with practical implications. J. Nerv. Ment. Dis. **192:** 503-507, 2004.

Falsetti, S.A., Resnick, H.S., Resick, P.A., and Kilpatrick, D.G. The Modified PTSD Symptom Scale: A brief self-report measure of posttraumatic stress disorder. Behav. Ther. **16:** 161-162, 1993.

Green, B. Trauma History Questionnaire (adapted from the DSM-IV field trial High Magnitude Stressor Questionnaire). In: Stamm, B.H. and Varra, E.M. (Eds.) Measurement of Stress, Trauma, and Adaptation, Lutherville, MD: Sidran Press, 1996, pp. 366-368.

HEDEKER, D. AND GIBBONS, R.D. Application of random-effects pattern-mixture models for missing data in longitudinal studies. Psychol. Meth. 2: 64-78, 1997.

HIEN, D.A., COHEN, L.R., MIELE, G.M., LITT, L.C., AND CAPSTICK, C. Promising treatments for women with comorbid PTSD and substance use disorders. Amer. J. Psychiat. 161: 1426-1432, 2004.

HIEN, D.A., NUNES, E., LEVIN, F.R., AND FRASER, D. Posttraumatic stress disorder and short-term outcome in early methadone maintenance treatment. J. Subst. Abuse Treat. 19: 31-37, 2000.

HOROWITZ, L.M., ROSENBERG, S.E., BAER, B.A., URENO, G., AND VILLASENOR, V.S. Inventory of Interpersonal Problems: Psychometric properties and clinical applications. J. Cons. Clin. Psychol. 56: 885-892, 1988.

KESSLER, R.C., MCGONAGLE, K.A., ZHAO, S., NELSON, C.B., HUGHES, M., ESHLEMAN, S., WITTCHEN, H.U., AND KENDLER, S. Lifetime and 12-month prevalence of DSM-III-R psychiatric disorders in the United States: Results from the National Comorbidity Survey. Arch. Gen. Psychiat. 51: 8-19, 1994.

KESSLER, R.C., SONNEGA, A., BROMET, E., HUGHES, M., AND NELSON, C.B. Posttraumatic stress disorder in the National Comorbidity Survey. Arch. Gen. Psychiat. 52: 1048-1060, 1995.

KHURI, A.I., MATHEW, T., AND SINHA, B.K. Statistical Tests for Mixed Linear Models, New York: John Wiley & Sons, 1998.

KIM, Y. AND PILKONIS, P.A. Selecting the most informative items in the IIP scales for personality disorders: An application of item response theory. J. Pers. Dis. 13: 157-174, 1999.

LUBORSKY, L. Principles of Psychoanalytic Psychotherapy: A Manual for Supportive-Expressive Treatment, New York: Basic Books, 1984.

MCLELLAN, A.T., KUSHNER, H., METZGER, D., PETERS, R., SMITH, I., GRISSOM, G., PETTINATI, H., AND ARGERIOU, M. The fifth edition of the Addiction Severity Index. J. Subst. Abuse Treat. 9: 199-213, 1992.

MCLELLAN, A.T., LUBORSKY, L., CACCIOLA, J., GRIFFITH, J., EVANS, F., BARR, H.L., AND O'BRIEN, C.P. New data from the Addiction Severity Index: Reliability and validity in three centers. J. Nerv. Ment. Dis. 173: 412-423, 1985.

MARK, D. AND LUBORSKY, L. A manual for the use of supportive-expressive psychotherapy in the treatment of cocaine abuse, Philadelphia, PA: Department of Psychiatry, University of Pennsylvania, 1992, unpublished manuscript.

MERCER, D., CARPENTER, G., DALEY, D., PATTERSON, C., AND VOLPICELLI, J. Addiction Recovery Manual. Philadelphia, PA: Treatment Research Unit, University of Pennsylvania, 1994.

MERCER, D. AND WOODY, G. Addiction counseling, Philadelphia, PA: Center for Studies of Addiction, University of Pennsylvania-Philadelphia Veterans Affairs Medical Center, 1992, unpublished manuscript.

MORLAN, K.K. AND TAN, S.-Y. Comparison of the Brief Psychiatric Rating Scale and the Brief Symptom Inventory. J. Clin. Psychol. 54: 885-894, 1998.

MORRISSEY, J.P., JACKSON, E.W., ELLIS, A.R., AMARO, H., BROWN, V.B., AND NAJAVITS, L.M. 12-month outcomes of trauma-informed interventions for women with co-occurring disorders. Psychiat. Serv. 56: 1213-1222, 2005.

NAJAVITS, L.M., GALLOP, R.J., AND WEISS, R.D. Seeking Safety therapy for adolescent girls with PTSD and substance use disorder: A randomized controlled trial. J. Behav. Hlth Serv. Res. 33: 453-463, 2006.

NAJAVITS, L.M., GASTFRIEND, D.R., BARBER, J.P., REIF, S., MUENZ, L.R., BLAINE, J., FRANK, A., CRITS-CHRISTOPH, P., THASE, M., AND WEISS, R.D. Cocaine dependence with and without posttraumatic stress disorder among subjects in the National Institute on Drug Abuse Collaborative Cocaine Treatment Study. Amer. J. Psychiat. 155: 214-219, 1998.

NAJAVITS, L.M., RUNKEL, R., NEUNER, C., FRANK, A.F., THASE, M.E., CRITS-CHRISTOPH, P., AND BLAINE, J. Rates and symptoms of PTSD among cocaine-dependent patients. J. Stud. Alcohol 64: 601-606, 2003.

NAJAVITS, L.M., SCHMITZ, M., GOTTHARDT, S., AND WEISS, R.D. Seeking Safety plus Exposure Therapy: An outcome study in men with PTSD and substance dependence. J. Psychoact. Drugs 27: 425-435, 2005.

NAJAVITS, L.M., SULLIVAN, T.P., SCHMITZ, M., WEISS, R.D., AND LEE, C.S.N. Treatment utilization of women with PTSD and substance dependence. Amer. J. Addict. 13: 215-224, 2004.

NAJAVITS, L.M., WEISS, R.D., AND SHAW, S.R. The link between substance abuse and posttraumatic stress disorder in women: A research review. Amer. J. Addict. 6: 273-283, 1997.

NAJAVITS, L.M., WEISS, R.D., SHAW, S.R., AND MUENZ, L.R. "Seeking Safety": Outcome of a new cognitive-behavioral psychotherapy for women with posttraumatic stress disorder and substance dependence. J. Traumat. Stress 11: 437-456, 1998.

OUIMETTE, P.C., AHRENS, C., MOOS, R.H., AND FINNEY, J.W. During treatment changes in substance abuse patients with posttraumatic stress disorder: The influence of specific interventions and program environments. J. Subst. Abuse Treat. 15: 555-564, 1998.

OUIMETTE, P.C. AND BROWN, P.J. Trauma and Substance Abuse: Causes, Consequences, and Treatment of Comorbid Disorders, Washington, DC: American Psychological Assn Press, 2003.

OUIMETTE, P.C., FINNEY, J.W., AND MOOS, R.H. Two-year posttreatment functioning and coping of substance abuse patients with posttraumatic stress disorder. Psychol. Addict. Behav. 13: 105-114, 1999.

OUIMETTE, P.C., MOOS, R.H., AND FINNEY, J.W. Two-year mental health service use and course of remission in patients with substance use and posttraumatic stress disorders. J. Stud. Alcohol 61: 247-253, 2000.

OUIMETTE, P.C., MOOS, R.H., AND FINNEY, J.W. PTSD treatment and 5-year remission among patients with substance use and posttraumatic stress disorders. J. Cons. Clin. Psychol. 71: 410-414, 2003.

SCARPA, A., LUSCHER, K.A., SMALLEY, K.J., PILKONIS, P.A., KIM, Y., AND WILLIAMS, W.C. Screening for personality disorders in a nonclinical population. J. Pers. Disord. 13: 345-360, 1999.

SPITZER, R.L., WILLIAMS, J.B.W., AND GIBBON, M. Structured Clinical Interview for DSM-IV-Patient Version, New York: Biometrics Research Institute, 1997.

TRIFFLEMAN, E. Gender differences in a controlled pilot study of psychosocial treatments in substance dependent patients with post-traumatic stress disorder: Design considerations and outcomes. Alcsm Treat. Q. 18 (3): 113-126, 2000.

VERBEKE, G. AND MOLENBERGHS, G. Linear Mixed Models in Practice: A SAS-Oriented Approach, New York: Springer, 1997.

ZLOTNICK, C., NAJAVITS, L.M., ROHSENOW, D.J., AND JOHNSON, D.M. A cognitive-behavioral treatment for incarcerated women with substance abuse disorder and posttraumatic stress disorder: Findings from a pilot study. J. Subst. Abuse Treat. 25: 99-105, 2003.