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## Psychosocial Treatments for Cocaine Abuse 12-Month Treatment Outcomes

JEFFREY A. HOFFMAN, PhD,\* BARRY D. CAUDILL, PhD,\* JOSEPH J. KOMAN, III, PhD,†  
JAMES W. LUCKEY, PhD,‡ PATRICK M. FLYNN, PhD,‡ DALE W. MAYO, MA\*

\*Center for Drug Treatment and Research, The Koba Institute, Inc., 1156 Fifteenth Street, N.W.,  
Suite 200, Washington, DC 20005-1704; †Arlington, VA;

‡Research Triangle Institute, Research Triangle Park, NC 27709-2194

**Abstract**—*The 12-month posttreatment outcome results for a randomized clinical trial that tested the effectiveness of various combinations of 4-month psychosocial treatment interventions are reported for 184 clients who used cocaine. Clients primarily used crack (93%), and the majority were African American (95%). Overall, clients exhibited substantial pre-post treatment gains: reduced regular cocaine use, reduced other drug use, reduced regular alcohol use, and reduced involvement in illegal activities. Logistic regression models produced significant odds ratios showing that those who used cocaine regularly during the year after treatment were more likely to have attended fewer treatment sessions, to be female, to be less educated, to have been regular cocaine users prior to treatment, and to have spent fewer days incarcerated during the 12-months after treatment. It was concluded that treatment positively impacted posttreatment gains, and it was suggested that selective tailoring of additional treatment services may produce additional treatment gains.*

**Keywords**—psychosocial cocaine abuse treatment; treatment outcome.

### INTRODUCTION

CRACK COCAINE ABUSE, in a number of descriptive reports and empirical studies, has been linked closely to a myriad of social problems ranging from increased crime to overall social and family dysfunction (Wallace, 1991). The association of crack use with higher crime rates is most evident in larger American cities where prevalence of use is high. For example, the most

commonly used drug among arrestees in the District of Columbia is crack cocaine. Cocaine was present in 43% of those arrestees tested and in 84% of those who had positive drug tests in August 1994 (Carver, 1994).

Although crack use does not directly contribute to the transmission of HIV, many crack users exchange sex for crack and engage in high-risk sexual behavior (Washton, 1989). Identifying effective treatments for cocaine abuse is critical in reducing the spread of HIV among crack smokers (Des Jarlais, Friedman, Woods, & Milliken, 1992). Despite the increasing recognition of the need to identify more effective strategies for treating cocaine abusers, research in this area is relatively sparse (Kleinman et al., 1990; Wallace, 1991; Washton & Gold, 1987).

Since no pharmacologic treatment for cocaine de-

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Requests for reprints should be addressed to Jeffrey A. Hoffman, PhD, Center for Drug Treatment and Research, The Koba Institute, Inc., 1156 Fifteenth Street, N.W., Suite 200, Washington, DC 20005-1704.

pendence has been shown to be effective consistently, such as methadone maintenance for heroin addiction (Des Jarlais & Friedman, 1988; Weiss, 1989), psychosocial approaches must continue to be refined and tested. Various recent efforts have suggested that the clinical efficacy of "standard group therapies" would be enhanced by including elements such as social skills training (Monti, Abrams, Kadden, & Cooney, 1989), relapse prevention (Marlatt & Gordon, 1985; Wilson, 1992), enhancing clients' levels of social support (Havassy, Hall, & Wasserman, 1991), or treating co-existing psychopathology (Woody, McLellan, Luborsky, & O'Brien, 1990). Preliminary studies also suggest that intervention programs that incorporate a combination of these approaches, along with incentives, may be successful (Higgins et al., 1995).

The current investigation was designed to extend this effort to combine various approaches and interventions with a sample of cocaine abusers who primarily smoked crack. A standard form of group therapy for cocaine abuse (clients attending group counseling sessions twice a week) was compared with a more intensive form of group therapy (group counseling 5 days a week). This group counseling model utilized a cognitive-behavioral approach with an emphasis on relapse prevention skills training. This type of approach has been found to be superior to more general clinical management in a recent controlled clinical trial at 1-year follow-up (Carroll et al., 1994). Secondly, the clinical impact of adding additional individual treatment services to both group therapy models was examined. The current effort was tailored to examine the clinical impact of these differential strategies on treatment retention and exposure and on postdischarge outcomes, including drug use, alcohol use, and illegal behaviors 12 months after discharge from treatment.

## METHOD

### Subjects

The current investigation included 184 cocaine-abusing subjects who participated in the National Institute on Drug Abuse (NIDA) funded project entitled Strategies to Enhance Cocaine Treatment and Outpatient Retention (SECTOR) from 1990 through 1993. The project was operated by the Koba Institute in Washington, DC, from 1990 through 1993 in collaboration with Research Triangle Institute (RTI). Clients were recruited through a variety of sources, including newspaper advertisements, radio public service announcements, and referrals from detoxification centers, local hospitals, employee assistance programs, and criminal justice agencies. Admission criteria included cocaine abuse or dependence for at least 1 month prior to referral; at least 18 years of age; no dependency on other drugs; not currently suffering from severe psychiatric symp-

toms; and able and willing to participate in an outpatient treatment study. Subjects were required to sign a detailed consent form that explained the nature and duration of the treatment and assessment requirements.

The subject pool reported here included only those who were available for both intake and 12-month follow-up interviews (66% of the overall sample). Of these subjects, 93% were crack smokers, 60% were male, and the majority were African American (95%). Subjects' mean age was 32 years; on average, they had a 12th-grade education; 61% were unemployed; 20% were married or lived with a partner; and most were self-referred (61%). Relative to the total population treated in project SECTOR, clients in this subsample did not differ from the overall treatment population on any demographic measure except employment status. Subjects reached for the follow-up interview were slightly more likely to be employed full-time (39%), than were those in the total SECTOR treatment population at intake (34%). Full-time work was defined as working 35 or more hours a week for 40 weeks or more.

### Treatment Condition Assignments

Upon entry into the study, clients were assigned randomly to one of six 4-month treatment conditions according to a  $2 \times 3$  experimental design. The randomization was conducted according to computer-generated random numbers in blocks of 6 with no predetermined stratification for gender or other variables. Clients were assigned to participate either in Standard Group Therapy (90-min sessions twice a week) or in Intensive Group Therapy (120-min sessions 5 times a week); then within these groups they received either (a) no additional services, (b) Individual Psychotherapy, or (c) Individual Psychotherapy and Family Therapy. Individual Psychotherapy was offered in 1-h sessions twice weekly in Month 1 and weekly thereafter utilizing a cognitive-behavioral approach incorporating didactic and experiential material. The focus of Individual Psychotherapy was to build on the client's strengths rather than to uncover underlying conflicts by discussing issues such as current relationships in the client's life and how they relate to his or her drug use. The Family Therapy was offered in 90-min sessions once weekly beginning in Month 2 and emphasized a psychoeducational approach that focused on identifying and setting goals to encourage better communication, cohesion, and understanding among family members. In addition, all clients could attend up to 4 vocational assessment/therapy sessions on an individual basis, and up to 4 family group therapy sessions (once a month), which provided general education about substance abuse and addiction and allowed family members to discuss common concerns. The group therapy program was based on an intensive, manual-driven,

psychosocial cocaine abuse treatment intervention called the *Living in Balance* (LIB) program (Hoffman, Caudill, Landry & Associates, 1993). The LIB program was based on a series of psychoeducational and experiential client training modules, with a central emphasis on relapse prevention, and covering areas such as drug education, physical health, emotional well-being, social relationships, educational and vocational issues, and recreational and spiritual needs.

Four months was chosen as the length of the treatment program, because that was the standard length of public-funded outpatient treatment programs in the Washington, DC, area. For those clients who completed the 4-month treatment program, a graduation ceremony was held in which client testimonies were offered. Most of these clients expressed satisfaction with the treatment program, regardless of treatment assignment, and a small number expressed the desire to continue in treatment. The group counseling staff generally perceived 4 months to be sufficient time for group counseling, however, the individual and family therapists often felt that 4 months was too short a treatment period for those interventions. Minimal follow-up care was provided and consisted primarily of referring clients to 12-Step and other self-help support groups. In a few cases, referrals were made to specialized support groups, such as for incest survivors, and also to mental health professionals.

#### Intake and Follow-up Assessment Interviews

A repeated measures methodology was used in the overall approach to client assessment and included two comprehensive evaluations of client characteristics and behaviors at admission, one at the end of treatment and one 12 months after discharge. Each of these interviews took approximately 90 minutes to complete and included questionnaire items that covered major domains of interest. This assessment battery was developed by the RTI staff and incorporated elements from the Treatment Outcome Prospective Study, a large-scale national study of drug treatment efforts (Hubbard et al., 1989). The battery was refined further and used in NIDA's Drug Abuse Treatment Outcome Study (Horton, 1993).

As part of the intake interview process, for which they received a monetary incentive, clients provided interviewers with responses to highly structured intake questionnaires. The intake interviews covered socio-demographic characteristics, personal and family history of drug and alcohol use, illegal behavior and arrest history, previous treatment experience, physical health, social functioning, mental health and assessments of *DSM-III-R* (American Psychiatric Association, 1987) psychoactive substance dependence, mood disorders, and antisocial personality disorder.

At the end of treatment, approximately 4 months

after admission, an end-of-treatment interview was conducted to obtain information about the treatment clients received, including their knowledge of and attitudes toward drug use and recovery. Key measures assessed at intake were also reevaluated. Approximately 12-months after discharge, clients were interviewed using a questionnaire that focused on their functional status at the time of discharge; treatment and other services they received since discharge; substance use; relapse; and other posttreatment outcome measures, such as employment, illegal activity, psychiatric symptomatology, health status, and social functioning.

All of these interviews were designed to provide an overall assessment of client impairment before, during, and after treatment. Furthermore, they were developed to facilitate comparisons, both within and across multiple domains. Interviews emphasized behaviors and levels of functioning that can influence and be influenced by treatment and subsequent treatment outcomes. In assessing psychiatric/mental health problems, two basic approaches were used: nosological and dimensional. Standard diagnostic criteria were used in the nosological approach to categorize clients into *DSM-III-R* (American Psychiatric Association, 1987) diagnostic categories. Items and modules from the Composite International Diagnostic Interview (CIDI) and the Diagnostic Interview Schedule (DIS) were included in the second intake interview to assess three disorders that commonly occur among substance abuse treatment clients: antisocial personality, anxiety, and depressive disorders (Flynn, Craddock, Luckey, Hubbard, and Duntzman, in press; Horton, 1993). The dimensional approach focused more on symptom severity and was assessed by using such measures as the Symptom Check List-90 Revised (SCL-90-R) and the Socialization (So) scale from the California Psychological Inventory (CPI).

## RESULTS

### Treatment Retention and Treatment Exposure

Treatment retention for each client was defined as the number of days between the first and the last treatment session. Treatment exposure was defined as the number of actual treatment sessions attended. A  $2 \times 3$  General Linear Models (GLM) analysis revealed no group differences by condition for treatment retention. A  $2 \times 3$  GLM analysis revealed significant group differences in treatment exposure rates. There was a significant main effect for Intensive versus Standard Group Therapies,  $F(1, 178) = 18.11, p < 0.0001$ . Clients assigned to Intensive Group Therapy conditions attended more sessions overall (29.5) than did clients assigned to Standard Group Therapy conditions (14.9). There was a significant main effect for adding individual services to the Group Therapy conditions,  $F(2, 178) =$

3.88,  $p < 0.05$ . A Duncan's Multiple Range Test revealed that adding Individual Psychotherapy or Individual Psychotherapy and Family Therapy significantly increased the number of sessions attended (21.8 and 27.3 sessions, respectively) compared with 17.2 sessions for the Standard Group Therapy condition.

The treatment completion rates (defined by having completed at least 90 days in treatment) were as follows for this subject pool: 19.1% for Standard Group Treatment (SGT) alone; 38.5% for SGT plus Individual Psychotherapy (IP); 46.8% for SGT plus IP plus Family Therapy (FT); 45.2% for Intensive Group Treatment (IGT) alone; 34.3% for IGT plus IP; 38.5% for IGT plus IP plus FT; with an overall average completion rate of 38%.

### Validity of Self-Reported Drug Use

To verify client self-report, we analyzed data from 122 clients for whom both in-treatment urine data and in-treatment self-reported cocaine use data were available. During treatment, clients provided weekly random urine samples which were tested for cocaine, heroin, amphetamines, PCP, and marijuana. Study protocol called for urine collection to be observed directly by a staff member of the same sex, however, in some instances a staff member of the same sex was not available and the urine collection was not observed. During each treatment session clients completed Cocaine Craving Questionnaires, which included a question about recent cocaine use. For this analysis, the last in-treatment urine analysis result was compared with the last in-treatment craving questionnaire. The drug testing was conducted anywhere from the same day the self-report was taken to 3 days later. Urine analysis allows for a 3-day window for detecting positive findings for cocaine use.

Results of this analysis revealed that 109 (89%) clients self-report of cocaine use matched their urine analysis results (71% had a negative urine analysis result and reported no cocaine use; 18% had a positive urine analysis result and reported cocaine use); 13 clients' (11%) self-report of cocaine use did not match their urine analysis results (3% had a negative urine analysis result and reported cocaine use; 8% had a positive urine analysis result and reported no cocaine use). These results suggest that a majority of our sample provided truthful responses to self-report questions regarding in-treatment cocaine use. Among those testing positive for cocaine, 70% reported recent cocaine use.

### Postdischarge Outcomes

Regular cocaine use, regular use of other drugs, regular alcohol use, any illegal activities, nondrug-related illegal activities, and drug sales were examined during

the first year after treatment. Regular use of drugs other than alcohol was defined as weekly or more frequent use during the 12 months after discharge. A series of chi-square analyses were conducted to determine whether these outcome measures differed by treatment condition. There were no significant differences for these variables by treatment condition. Therefore, all clients from all conditions were collapsed into one group for the remaining analyses. All analyses were based on the 184 subjects who were available for both the intake interview and the 12-month follow-up interview and improvement rates reflect only cases where matched pretreatment and posttreatment data were available. The results are shown graphically in Figure 1.

Upon admission, 84% of clients were regular users of cocaine. At the time of the follow-up interview, only 23% of clients reported regular use, which was a statistically significant change ( $\chi^2 = 5.1$ ,  $p < 0.05$ ). The category for other drug use was based on whether clients had used any illegal drugs in the past year other than cocaine. Upon admission, 21% of clients reported regular use of other drugs. During the follow-up interviews, only 7% of clients reported continued use of other drugs, which was statistically significant,  $\chi^2 = 5.6$ ,  $p < 0.05$ . Regular alcohol use was defined as alcohol use at least 3 to 4 days a week in the last year. Upon admission, 31% of clients reported regular alcohol use. At the time of the follow-up interviews, 16% reported regular alcohol use, which reflected a significant reduction ( $\chi^2 = 23.4$ ,  $p < 0.01$ ).

Upon admission, 31% of clients reported engaging in illegal activities in the year before admission. At the time of the follow-up interview, the percentage reporting illegal activities had been reduced to 22% ( $\chi^2 = 8.6$ ,  $p < 0.05$ ). Non drug-related illegal activities included all illegal behavior (e.g., aggravated assault, burglary, theft, robbery, stolen property/fencing, forgery/embezzlement, and gambling) other than selling illegal drugs and driving while intoxicated. Upon admission, 19% of clients reported non-drug-related illegal activities in the year before admission. At the time of the follow-up interview, reports of this behavior had been reduced to 14%, which approached statistical significance ( $\chi^2 = 2.7$ ,  $p = 0.10$ ). Upon admission, 13% of clients reported that they had participated in drug sales in the preceding 12 months. During the follow-up interview, reports of drug sales had been reduced to 9%, which was a significant change ( $\chi^2 = 13.7$ ,  $p < 0.01$ ).

### Treatment Retention and 12-Month Treatment Outcomes

Analyses were conducted to determine whether treatment retention (the number of days between first and last session) was linked to treatment outcomes. Results

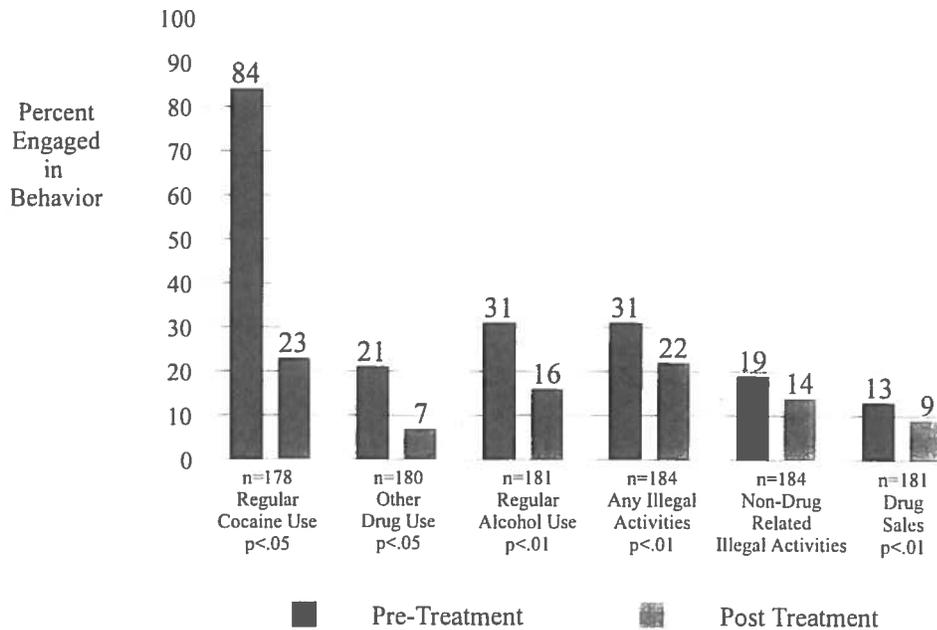


FIGURE 1. Change from 12 months pretreatment to 12 months posttreatment.

for each variable are displayed in Figure 2. Clients who were regular users of cocaine at follow-up were more likely to have dropped out of treatment earlier (39 days) than clients who were not (59 days),  $t(182) = 2.44, p < 0.05$ . Clients who reported regular use of other drugs at follow-up were also more likely to have left treatment earlier (19 days) than those clients who did not (58 days),  $t(182) = 2.89, p < 0.05$ . Clients who were regular alcohol users at follow-up were more

likely to have dropped out of treatment earlier (32 days) than clients who were not (59 days),  $t(182) = 2.81, p < 0.05$ .

Clients who reported engaging in illegal behavior at the follow-up interview were more likely to leave treatment sooner than were clients reporting no such behavior (35 days and 60 days, respectively),  $t(182) = 3.01, p < 0.05$ . Similarly, clients reporting nondrug-related illegal behavior at follow-up were more likely

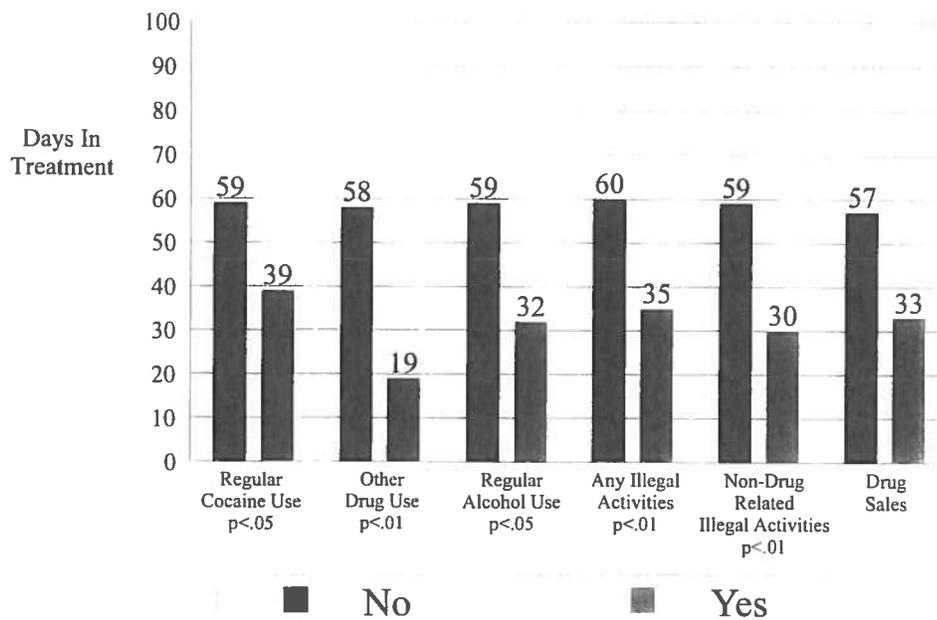


FIGURE 2. Treatment retention by 12-month treatment outcomes.

to have left treatment earlier (30 days) than clients who reported no such activities (59 days),  $t(182) = 2.85$ ,  $p < 0.05$ . Also clients reporting drug sales in the year after treatment discharge exhibited a trend toward leaving treatment earlier (33 days) than clients who reported no such behavior (57 days),  $t(179) = 1.89$ ,  $p < 0.10$ .

### Treatment Exposure and 12-Month Treatment Outcomes

Analyses were conducted to examine the relationship between treatment exposure (number of sessions attended) and outcome measures. Results are displayed in Figure 3. Clients who reported regular use of cocaine at the 12-month follow-up interview were more likely to have attended fewer treatment sessions overall (15) than clients who did not report regular use of cocaine in the preceding year (25),  $t(182) = 2.31$ ,  $p < 0.05$ . Clients reporting regular use of other drugs at follow-up were more likely to have attended fewer treatment sessions overall (5) than those who did not (24)  $t(182) = 2.82$ ,  $p < 0.05$ . There was a trend for those clients reporting regular use of alcohol at follow-up to have attended fewer sessions (15 vs. 24)  $t(182) = 1.77$ ,  $p < 0.10$ .

Clients who reported engaging in illegal behavior during the year after treatment attended fewer treatment sessions than did clients reporting no such behavior (14 vs. 25 sessions)  $t(182) = 2.47$ ,  $p < 0.05$ . Clients reporting nondrug-related illegal behavior at follow-up attended fewer treatment sessions (12) than did clients who reported no such activities (24),  $t(182) =$

2.4,  $p < 0.05$ . While clients reporting drug sales in the year after treatment discharge left treatment earlier (13 sessions) than clients who reported no such behavior (23 sessions), this difference was not statistically significant.

### Multivariate Modeling

A multivariate model was developed to examine factors contributing to posttreatment cocaine use. A key focus of this modeling was the role of treatment exposure. The advantage of multivariate models is that, along with treatment exposure, they allow one to simultaneously control for the impact of various other independent variables including client characteristics, amount of prior exposure to treatment, and posttreatment experiences and behaviors upon cocaine use in the year following discharge from the SECTOR treatment program.

Our dependent variable in the model was frequency of cocaine use in the year following treatment. This was operationalized as a dichotomous variable: weekly or more frequent use, or less than weekly use. We also examined no use versus use and obtained essentially the same results. Independent variables tested for inclusion in the final model included treatment exposure (number of SECTOR treatment sessions attended); demographic characteristics (gender, age, marital status, and educational level); baseline characteristics (frequency of cocaine use in the prior year, criminal justice status at admission, lifetime depression, and weeks of drug abuse treatment prior to this treatment episode); posttreatment experiences (days of additional

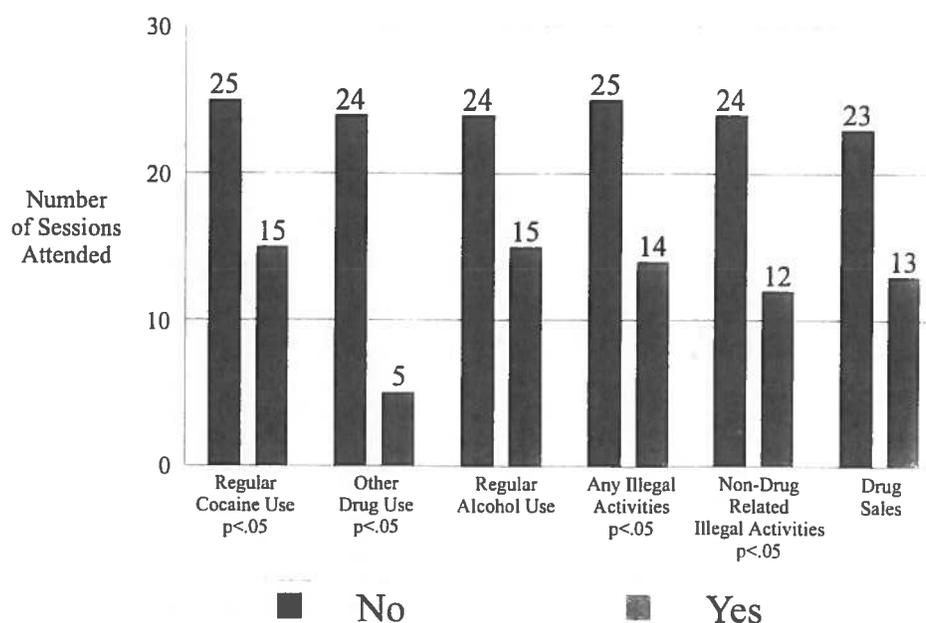


FIGURE 3. Treatment exposure by 12-month treatment outcomes.

substance treatment in the year subsequent to the experimental condition, frequent attendance at self-help meetings defined as 50 or more meetings during this period, and weeks incarcerated to control for exposure); and, drug use other than cocaine in the follow-up year (regular alcohol use, weekly or more frequent use of illicit drugs other than cocaine, and the interaction of these two variables). We did not include race as a demographic characteristic in the model because almost all (95%) of the subjects were African Americans.

Because the dependent variable was categorical, a logistic regression procedure was used. Logistic regression provides log-odds coefficients for each independent variable. These coefficients indicate the change in the log odds of the posttreatment behavior given a one unit increase in the corresponding independent variable. Each coefficient is adjusted for the effects of the remaining independent variables. A more readily interpretable estimate of the effect of each of the independent variables is the odds ratio, the exponential function of the log-odds coefficients. The coefficients indicate the odds ratio associated with a 1-unit increase in the corresponding independent variable. Odds ratios equal to 1.0 indicate that the variable has no effect on the odds of the posttreatment behavior. Odds ratios greater than 1.0 indicate that the variable increases the odds of the posttreatment behavior, while odds ratios less than 1.0 indicate that the variable decreases the odds of the posttreatment behavior.

The general procedure used in the development of the model incorporated several steps to determine vari-

ables for inclusion in the final model. The first step was to enter all of the aforementioned independent variables in the logistic regression equation. Parameters not approaching significance were dropped from the model. Next, several iterations of model trimming were done to develop the most parsimonious model. Rather than relying solely on a fixed rule (e.g., include only variables significant at  $p < 0.05$ ), the selection of the final list of variables included both statistical considerations and meaningfulness. Variables that were conceptually or clinically meaningful and that approached significance were retained as well as those that met the  $p < 0.05$  criterion. The model was robust in that the finding for the key variable of interest, number of treatment sessions, did not vary appreciably with the inclusion or exclusion of the other variables.

Variables selected for inclusion in the final model were gender, educational level, weeks of treatment prior to the experimental condition, days of additional treatment following discharge from SECTOR, frequent attendance at self-help meetings, weeks incarcerated during the 12-month follow-up interval, baseline cocaine use, and the number of treatment sessions attended.

The chi-square for the overall model was 36.25 (10 *df*,  $p < 0.01$ ) indicating a significant relationship between the independent variables and the probability of regular cocaine use during the follow-up period. Findings for each of the variables in the final model are shown in Table 1. Of the 8 variables, 4 were significant at the  $p < 0.05$  level (SECTOR treatment sessions, gender, educational level, and baseline cocaine use). With treatment sessions, the odds ratio indicates, for

TABLE 1  
Logistic Regression Results, Odds of Weekly or More Frequent Use of Cocaine in the Year After Treatment

Independent Variable	Odds Ratio	Interpretive Statement
Treatment Sessions	0.980*	The greater the number of treatment sessions attended during SECTOR, the less likely one would be a weekly or more frequent user of cocaine at follow-up.
Demographic and Baseline Characteristics of Subjects		
Gender	0.376*	Males had only 38% the odds of weekly cocaine use as compared to females during the year after treatment.
Educational level	0.767*	The more years of education the less likely to be weekly users of cocaine after treatment.
Baseline cocaine use	4.882*	Those who used cocaine weekly or more frequently at baseline had 5 times the odds of weekly use at follow-up.
Pre-SECTOR weeks of treatment	1.021	<i>ns</i>
Posttreatment Experiences During 1-Year Follow-up Period		
Weeks incarcerated	0.960	<i>ns</i>
Post-SECTOR treatment days	1.006	<i>ns</i>
Frequent attendance at self-help groups	1.676	<i>ns</i>

\* $p < .05$ .

Concordant, 78.7%; discordant, 21.1%; tied, 0.2%; Somer's  $D = 0.575$ ; gamma = 0.576; tau-a = 0.213;  $c = 0.788$ .

example, that if someone attended 10 additional sessions of treatment, they had only 81% the odds of being a regular cocaine user at follow-up compared to someone who did not, i.e.,  $[1.0 - 10 * (1.0 - 0.981)]$ . The remaining treatment variables (treatment exposure prior to and after participation in SECTOR, including frequent attendance at self-help groups) were retained because the modeling targeted treatment exposure. In addition, weeks incarcerated during the follow-up period was retained because it approached significance ( $p < 0.12$ ). The odds ratio is provided for each variable in the model. For the primary independent variable, number of treatment sessions, the odds ratio of 0.980 was significantly different from 1.0. This ratio means that for each additional treatment session attended, the odds of being a weekly cocaine user at follow-up are reduced by 0.020. Along with the odds ratio, we have provided interpretative statements for each significant variable in the table.

## DISCUSSION

This investigation was designed to examine comparative outcomes for cocaine abusers who were provided with more intensive group and individual therapies than the standard group counseling twice a week that was typically available to this inner-city population. Current findings suggest that the nature of treatment services provided did not have a differential impact on clients in the long-term. However, providing more intensive group therapy services, or adding individual treatment services to group counseling procedures, did lead to significant increases in the rate of client participation in treatment. Treatment exposure was linked closely to a series of improvements in various central domains of clients' functioning a year after terminating treatment. Clients with increased treatment exposure were less likely a year later to use cocaine regularly, to use other drugs, to drink alcohol regularly, or to engage in criminal behavior.

The finding that various treatment approaches and interventions did not predict later drug use but that greater treatment exposure for the entire sample was related to less drug use at 12 months posttreatment might suggest that once a minimum level of treatment is provided, additional sessions should be tailored to each individual client's needs. In other words, simply offering more intensive group and individual outpatient services may not be associated with better outcomes, but selective tailoring of additional services to individual needs may be more effective. In support of this position, McLellan (1995) has found that matching specific treatment services to specific client needs may be more important and independent of whether the services are provided to clients as inpatients or outpatients.

Results from the current investigation also suggest

that research on treatment matching efforts with this population may be a useful line of inquiry. Female clients, for example, were more than twice as likely a year after treatment termination to still be regular users of cocaine. Perhaps providing more services specifically tailored for women would improve this form of treatment. Clients with lower educational levels were significantly more likely to be using cocaine regularly at follow-up. This finding indicates that the cognitive and behavioral skills orientation of the treatment approach used in this study may need to be adjusted for clients with lower levels of education. The factor that was linked most strongly to frequent cocaine use at follow-up was the frequency of use upon admission.

The impact of treatment upon behaviors during the year after treatment termination was relatively dramatic in this study, especially considering prior reports of high dropout and relapse rates in similar populations (Stark, 1992; Wallace, 1991). Upon admission, for example, 84% of clients reported regular cocaine use. A year after treatment termination, only 23% of these same clients reported regular use of cocaine. The effect of treatment was also similarly dramatic in other domains of clients' functioning. Given that greater treatment exposure was associated with better outcomes, future treatment studies might focus on increasing overall treatment exposure.

For instance, the work of Higgins and colleagues (1995) has shown that an incentive program in which cocaine abstinence was reinforced with vouchers exchangeable for retail items substantially increased treatment exposure and was associated with better long-term outcomes than treatment without vouchers. Although these results were obtained with a largely non-urban, nonminority subject population, further research should examine these promising techniques with other populations using culturally relevant incentives. Subjects in this and other studies we have conducted have responded very positively to receiving food, food vouchers, and especially cash, for completing research interviews. These and other incentives could be used to reinforce treatment attendance and abstinence behavior. Although these types of incentives may increase the cost of treatment, the long-term cost-benefit ratio could be greater and must be evaluated.

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