Article

Community reinforcement approach for combined opioid and cocaine dependence
Patterns of engagement in alternate activities

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Abstract

We compared outcomes for agonist-maintained patients with combined opioid and cocaine dependence who were treated in an earlier clinical trial with group drug counseling (DC; \( n = 57 \)) or in a current trial with the Community Reinforcement Approach (CRA; \( n = 60 \)). The association between engagement in nondrug-related activities and abstinence was also evaluated. There were no significant differences between the treatments in retention or drug use. The total number of hours and average hours per week engaged in nondrug-related activities was significantly higher for CRA-treated patients who achieved abstinence from opioids, cocaine, or both combined than for those who never achieved abstinence. Although CRA was not more effective overall than DC, the finding that engagement in reinforcing community activities unrelated to drug use (e.g., planned pleasurable events or parenting activities) was associated with abstinence suggests that the planning and reinforcement of specific nondrug-related social, vocational, and recreational activities is a crucial component of CRA. © 2000 Elsevier Science Inc. All rights reserved.

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1. Introduction

Despite a substantial decline nationally since the late 1980s in the number of recreational users of cocaine, the rate of regular users has remained at .3% of the population since 1985 (National Institute on Drug, 1996), pointing to the endemic nature of the problem and to the difficulty of treating drug dependence once it develops. To date, the efficacy of pharmacologic treatments for cocaine dependence alone (Meyer, 1992) or when combined with opioid dependence, has been disappointing (Foltin, Christiansen, Levin, & Fischman, 1995; Rosen et al., 1993; Schottenfeld, Pakes, Oliveto, Ziedonis, & Kosten, 1997; Strain, Stitzer, Liebson, & Bigelow, 1994; Teoh et al., 1994). In addition, there has been inconsistency in the reported efficacy of psychosocial treatments for cocaine abuse (Carroll, 1997; Carroll et al., 1994; Higgins et al., 1994; Silverman, Higgins, & Brooner, 1996).

One psychosocial treatment of cocaine abuse that appears to hold particular promise is the Community Reinforcement Approach (CRA; Budney & Higgins, 1998). In recent clinical trials in Vermont, the multifaceted CRA has led to the highest rates of patient retention in treatment and sustained abstinence of any behavioral or pharmacologic treatment (Higgins et al., 1994), especially when CRA was combined with contingency management (CM), using vouchers worth a monetary value to reward abstinence (Bickel, Amass, Higgins, Badger, & Esch, 1997; Budney, Higgins, Delaney, Kent, & Bickel, 1991; Higgins et al., 1991, 1993, 1994). CRA is based on a theoretical view that drug dependence is maintained by drug-related reinforcers and the relative lack of alternative reinforcers unrelated to drug use. In this view, development of alternative rewarding activities in the community that are incompatible with drug use (e.g., involvement in nondrug-related family, social, religious, vocational, and recreational activities) is essential to initiate and maintain abstinence. In addition to providing coping skills (e.g., assertion training, drug refusal training) and relapse prevention counseling (e.g., instruction in avoiding antecedents and recognizing consequences of drug use), CRA utilizes (a) structured behavioral techniques (e.g., problem-solving, behavioral rehearsal) to foster development of rewarding activities and social roles and networks that compete with continued cocaine use; (b) educa-

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tional and vocational counseling, and assistance with practical needs; and (c) reciprocal relationship counseling.

In the initial studies, CRA led to significantly greater retention in treatment and higher rates of documented, sustained abstinence when compared to traditional drug counseling. Subsequent studies documented that contingency management, using the voucher procedure, is an active component of CRA (Higgins et al., 1994). The efficacy of contingency management using the voucher procedure has also been documented by Silverman et al. (1996) in a different patient population (predominantly minority patients in Baltimore with concurrent opioid and cocaine dependence) and treatment setting (methadone maintenance program) using a somewhat different research design (comparison of contingency management with provision of noncontingent vouchers yoked in value and frequency to the vouchers received contingent on abstinence). The efficacy of the specific counseling components of CRA (e.g., use of behavioral techniques to foster development of alternative community reinforcers), however, has not been thoroughly established.

To explore the efficacy of CRA for treating patients with combined opioid and cocaine dependence, we compared treatment outcome for patients enrolled in clinical trials comparing buprenorphine and methadone maintenance, who were treated in one clinical trial with group drug counseling (DC) emphasizing development of coping skills \( (n = 57) \) or in a second trial with CRA \( (n = 60) \). Maintenance doses of methadone (daily oral doses of 65–85 mg) and buprenorphine (daily sublingual doses of 12–16 mg) in the two studies were similar. Additionally, to explore whether engagement in nondrug-(CRA) related activities are associated with treatment outcome, we compared reported hours CRA patients engaged in various activities during treatment for those who did or did not achieve periods of documented abstinence from opioids or cocaine. Our research hypotheses were that (a) CRA would be more effective than DC, as measured by the rates of opioid- and cocaine-positive urine toxicology tests and rates of abstinence from opioids and cocaine; and (b) engagement in CRA activities would be associated with improved outcome.

2. Method

2.1. Subjects

Subjects were included in the current study if they had been maintained on comparable daily doses of oral methadone (65–85 mg) or sublingual buprenorphine (12–16 mg) as part of one of two consecutive clinical trials comparing buprenorphine and methadone maintenance for the treatment of combined opioid and cocaine dependence or abuse. Both study protocols were approved by the Human Investigation Committee of the Yale University School of Medicine. The first protocol enrolled patients from January 1991 to February 1993, while enrollment for the second protocol began in February 1995 and is still ongoing. Criteria for entry into the two trials were identical. Patients over age of 18 years who met criteria for current opioid dependence and cocaine dependence or abuse as indicated by the Diagnostic and Statistical Manual of Mental Disorders (3rd ed., rev.) (DSM-III-R; American Psychiatric Association, 1987) were eligible for the study so long as they were not psychotic or at high risk for suicide, were able to read and understand the research instruments, and were not pregnant. Women of child-bearing potential were included if they agreed to use adequate contraception during the studies and to have monthly pregnancy testing.

2.2. Treatments

2.2.1. Drug counseling

In the first clinical trial, patients attended weekly, 1-hour group DC sessions (Mercer et al., 1992). The group sessions focused on motivation for abstinence; the importance of abstinence from all drugs and alcohol; the value of 12-step programs; and instruction in cognitive and behavioral strategies, including skills training to: cope with shame and guilt, manage strong affect, avoid relapse, establish a support system, and maintain recovery. Counselors in the first study had baccalaureate degrees and/or advanced training in drug counseling techniques.

2.2.2. Community Reinforcement Approach

In the second trial, patients met in individual sessions with a CRA therapist twice weekly during the first 12 weeks and then weekly during the following 12 weeks. None of the CRA patients received standard drug counseling. Sessions followed the CRA manual developed by Budney and Higgins (1998). Therapists in the second study had advanced degrees (M.S.W. or Ph.D.) and received training in behavioral treatments and CRA. Patients in the second study were also randomly assigned to receive either vouchers contingent on negative urine toxicology results for both opiates and cocaine or to a no-voucher control. The voucher system in the current CRA study followed the procedures reported in Higgins et al. (1994) and Silverman et al. (1996), except for the fact that the patients were required to test negative for both opioids and cocaine in order to receive a voucher. In this article, we will present data on all CRA subjects combined, since the voucher component is part of an ongoing clinical trial. In both studies, attendance at counseling sessions was required, and patients were subject to termination for failing to attend three consecutive counseling sessions or for failing to come for maintenance medication on three consecutive days.

2.2.3. Medication

Maintenance medications were dispensed daily and ingestion was observed by nursing staff. Induction and dosing schedules differed somewhat in the two clinical trials. In the first trial, induction to the full maintenance dose occurred during the first 2 weeks and patients were subsequently...
maintained at a fixed daily dose of oral methadone (65 mg) or sublingual buprenorphine (12 mg). In the second trial, induction to daily oral methadone 65 mg or sublingual buprenorphine 12 mg occurred during the first week. Subsequently, patients received up to two dose increases during the first 12 weeks of the study, up to a maximum daily maintenance dose of methadone 85 mg or buprenorphine 16 mg, contingent on persistent illicit opioid use, as documented by urine toxicology testing.

2.3. Assessments

Baseline assessments included the Addiction Severity Index (ASI; McLellan et al., 1992); sections of the Structured Clinical Interview for DSM-III-R (SCID; Spitzer, Williams, Gibbon, & First, 1990) that assessed substance use, mood, and antisocial personality disorders; and urine toxicology testing. Supervised urine samples were collected from the subjects two times per week during the first 9 months of the first study and then three times per week for the remainder of the first study and for the entire second study. Urine samples were tested for opioids and the cocaine metabolite, benzylicocaine, using the Abbott Tdx system (Abbott Diagnostics Division of Abbott Laboratories, Abbott Park, IL). Cut-offs for opioid positive samples were set at 200 ng/ml and for the cocaine metabolite at 300 ng/ml. Weekly self-report ratings of drug use were collected by research staff using standardized rating forms (available from the authors on request). In addition, CRA therapists kept weekly records (activity logs) of their patient’s reported hours of involvement in planned social, recreational, vocational, and educational nondrug-related CRA activities. Appropriate activities were planned and discussed in CRA sessions and were required to be (a) incompatible with drug use and (b) socially, financially, or otherwise reinforcing. Specifically, activities were classified as pertaining to pleasurable events (e.g., a family picnic), religious activity (e.g., going to mass, bible study), recreation (e.g., gym, weight training, jazzercize; hobbies, such as crocheting; going to a theater), education (e.g., attending GED classes), Narcotics Anonymous (e.g., going to meetings, calling one’s sponsor), parenting (e.g., visiting or playing with children), reading, watching television, visiting friends or family, or chores (e.g., cleaning one’s house). Activity logs were available for 50 of the CRA subjects.

2.4. Statistical analyses

2.4.1. Drug use

Baseline demographic factors and ASI measures for the DC and CRA groups were compared using a chi-square statistic for categorical variables and Student’s t-tests for continuous measures. Results of urine toxicology testing were aggregated into successive 3-week periods to provide a continuous outcome measure for the proportion of tests positive for illicit opioids or cocaine during each successive 3-week period. Random regression models, available in BMDP 5V, were used to compare the proportions of urine toxicologies positive for illicit opioids or cocaine for the DC and CRA groups. To evaluate whether baseline differences in race, employment status, and length of cocaine use between DC and CRA patients might affect the results, we also analyzed the data using random regression models with race, employment, and historical cocaine use treated as covariates.

We also calculated the proportion of subjects in each condition achieving three or more consecutive weeks of abstinence from illicit opioids or cocaine as documented by urine toxicology testing, and used a chi-square statistic to compare DC and CRA. The total number of weeks abstinent from illicit opioids or cocaine was also calculated for each subject, and independent t-tests were used to compare the mean weeks abstinent for the two conditions.

2.4.2. Alternative activities

The total number of reported nondrug-related activities and the total number of hours engaged in these activities were calculated for the 50 CRA subjects mentioned above. Analyses using t-tests were conducted to compare the total number of activities and hours engaged in by these subjects who either did or did not achieve three or more consecutive weeks of abstinence from illicit opioids or cocaine. Chi-square analyses were used to assess the association between type of CRA-activity engagement (e.g., hobbies, educational activities) and abstinence from illicit opioids or cocaine.

3. Results

3.1. Baseline comparability of patients treated with drug counseling or the Community Reinforcement Approach

The two groups were generally comparable at baseline on most important demographic, social, drug use, or psychiatric features (Table 1). As noted, however, a significantly lower proportion of CRA patients were White or employed, and CRA patients had significantly longer histories of cocaine use than DC patients.

3.2. Efficacy of Community Reinforcement Approach compared to drug counseling

There were no statistically significant differences in retention between DC and CRA during the two 24-week clinical trials (Wilcoxon χ² .0627, df = 1, p = .80). The rate of completion was 59.6% for the DC group and 61.7% for the CRA group, and the mean (SD) of weeks of completed treatment was 18.93 (1.02) for DC and 16.75 (1.02) for CRA.

As shown in Fig. 1, rates of opioid-positive urine tests declined significantly over time (Wald’s χ² = 267, df = 8, p < .001) for both treatment groups, but there were no significant effects of treatment group (Wald’s χ² = .49, df = 1, p = .48) or of the interaction between treatment condition and time (Wald’s χ² = 1.82, df = 8, p = .99). Rates of illicit opioid-positive tests averaged 43% and 47% for the DC and CRA.
As shown in Fig. 2, rates of cocaine-positive urine tests also declined significantly over time (Wald’s $\chi^2 = 27.49$, $df = 8$, $p < .001$), but there was no significant effect of treatment group (Wald’s $\chi^2 = .645$, $df = 1$, $p = .42$), although there was a significant treatment condition by time interaction (Wald’s $\chi^2 = 26.82$, $df = 8$, $p < .001$). Rates of cocaine-positive tests averaged 59% and 62% for the DC and CRA groups, respectively. Entering race, employment status, and length of cocaine use as co-

| Table 1: Baseline characteristics of sample ($N = 117$) $^a$ |
|---------------------------------|-----------------|-----------------|
| Variable                        | Drug counseling ($n = 57$) | Community Reinforcement Approach ($n = 60$) |
| Age (years)                     | 32.58 (4.99)     | 34.53 (5.94)    |
| Gender (male)                   | 36 (63.16)       | 36 (60)         |
| Race (White)                    | 44 (77.19) $^b$ | 31 (51.67)      |
| Married                         | 10 (17.86)       | 10 (16.67)      |
| Employed, past 3 years          | 37 (66.07) $^c$ | 26 (43.33)      |
| Education (years)               | 11.91 (1.49)     | 11.72 (1.64)    |
| Years of heroin use             | 8.30 (6.82)      | 9.43 (7.77)     |
| Years of cocaine use/last 30 days | 4.38 (5.05)     | 9.25 (6.76) $^c$ |
| Lifetime depression             | 46 (85.19)       | 57 (95)         |
| Antisocial personality disorder | 11 (21.15)       | 18 (30)         |

$^a$ Values expressed as mean (SD), except for gender, race, marital status, employment, lifetime depression, and antisocial personality disorder, for which the number (%) of subjects is given.

$^b$ Significant differences compared with the Community Reinforcement Approach ($p < .05$).

$^c$ Significant differences compared with drug counseling ($p < .001$).

Table 2 compares the reported hours of engagement in nondrug-related activities for the 50 CRA subjects with available activity logs who either achieved or did not achieve three or more consecutive weeks of abstinence from illicit opioids, cocaine, or both. Because the distribution of the total number of hours subjects engaged in CRA activities was not normal, statistical analyses for this variable were conducted on square-root transformed data. However, to simplify interpretation of the data, Table 2 presents the nontransformed values. The total number of hours engaged in CRA activities was significantly higher for subjects who achieved abstinence from opioids, cocaine, or both combined than for those who never achieved abstinence. Similarly, subjects who achieved abstinence from opioids, cocaine, or both combined engaged in a significantly higher average number of hours per week of CRA activities than did those who never achieved abstinence (see Table 2).

A review of the activities engaged in by patients in CRA who achieved sustained periods of abstinence from illicit drug use suggests that these patients developed consistent...
patterns of engagement in one or more highly rewarding activities, as demonstrated by their repeated participation in selected activities throughout the course of treatment. Analyses of the data suggested that some CRA activities were more associated with abstinence than others. For example, subjects who reported that they engaged in any planned pleasurable events (e.g., picnics, going to the circus) achieved a significantly higher rate of abstinence from opioids (77%; $\chi^2 = 5.22, df = 1, p < .05$) and cocaine (63%; $\chi^2 = 7.07, df = 1, p < .01$), than did those who did not engage in such activities (45% and 25%, respectively). Educational activities also appeared to be related to abstinence, as significantly more subjects who engaged in such activities achieved abstinence from cocaine (78%; $\chi^2 = 3.90, df = 1, p < .05$) than did those who did not engage in educational activities (41%). The rate of abstinence from cocaine was also significantly higher among subjects who reported that they engaged in hobbies, such as journal writing, crocheting, and carpentry (63%; $\chi^2 = 3.89, df = 1, p < .05$) or parenting activities, such as visiting with children or taking them to the library (64%; $\chi^2 = 5.08, df = 1, p < .05$), than did those who did not report engaging in such activities (35% and 32%, respectively). Subjects who reported engaging in planned, pleasurable parenting activities also achieved a significantly higher rate of abstinence from both opioids and cocaine combined (60%; $\chi^2 = 5.20, df = 1, p < .05$), than those who did not (28%).

4. Discussion

The results of this study do not support the hypothesis that CRA is more effective than DC for treating agonist maintenance patients with combined opioid and cocaine dependence. The results do support the hypothesis, however, that among CRA-treated patients, greater engagement in nondrug-related recreational, social, vocational, or parenting activities is associated with improved outcome. Thus, although overall CRA was not superior to DC, it appears that the persistency of engagement in nondrug-related activities is critical for successful outcome in CRA and that some CRA activities are more related to achievement of abstinence than others. Planned pleasurable events and activities were related to abstinence from illicit opioids and cocaine, and educational and parenting activities and engaging in hobbies were associated with abstinence from cocaine.

Table 2

<table>
<thead>
<tr>
<th>Substance</th>
<th>Total hours</th>
<th>Average hours/week</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opioids</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never abstinent ($n = 18$)</td>
<td>129.2 (229)</td>
<td>4.8 (3.7)</td>
</tr>
<tr>
<td>Abstinent ($n = 32$)</td>
<td>249.4 (210.2)**</td>
<td>8.8 (7.6)*</td>
</tr>
<tr>
<td>Cocaine</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never abstinent ($n = 26$)</td>
<td>123.3 (173.8)</td>
<td>5.3 (4.2)</td>
</tr>
<tr>
<td>Abstinent ($n = 24$)</td>
<td>295.9 (237.8)****</td>
<td>9.5 (8.2)*</td>
</tr>
<tr>
<td>Combined</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never abstinent ($n = 28$)</td>
<td>149.9 (219.3)</td>
<td>5.3 (4.0)</td>
</tr>
<tr>
<td>Abstinent ($n = 22$)</td>
<td>277.7 (210.1)***</td>
<td>9.9 (8.4)*</td>
</tr>
</tbody>
</table>

* Values expressed as means (SD).

** Statistical analyses were conducted on square-root transformed data for this variable.

* Significant difference compared with individuals who were never abstinent ($p < .05$); **significant difference compared with individuals who were never abstinent ($p < .01$); ***significant difference compared with individuals who were never abstinent ($p < .005$); ****significant difference compared with individuals who were never abstinent ($p < .001$).
The lack of superiority of CRA compared to DC is notable, especially considering the reported superiority of CRA compared to traditional drug counseling in other studies and the greater intensity of CRA counseling compared to DC in this study. In this study, CRA was provided in twice weekly individual sessions for the first 12 weeks and then in weekly individual sessions, while DC was provided in weekly group sessions. The discrepant findings regarding the efficacy of CRA compared with DC between this study and prior studies (Higgins et al., 1991, 1993, 1994) may reflect a number of differences between the studies, including differences in the comparison treatment (DC), patient population, or execution of CRA. In this study, the drug counseling condition included many of the components used in CRA, including cognitive-behavioral skills training; discussion of the positive and negative consequences of drug use, and triggers and plans for avoiding or coping with them; encouragement of engagement in nondrug-related activities; and provision of other relapse prevention strategies. Thus, the differences between the CRA and DC treatments in the current study may have been too small to detect differential effects. Notably, retention and drug use outcomes were substantially better in the DC group in this study than the outcomes reported for DC in the prior studies. In this study, retention over the 24-week trial averaged 59.6% for patients in DC, while 24-week retention rates for the trials reported in Vermont averaged 20% (Bickel et al., 1997) and 11% (Higgins et al., 1993). The CRA retention rate of 61.7% for the current study is slightly higher than the rates (53–58%) reported for CRA by Bickel et al. (1997) and Higgins et al. (1993, 1994).

Differences in patient populations and in the manner in which the CRA and DC treatments were provided in the two settings may also account for the inconsistent findings. Patients in this study were more ethnically and racially diverse than those in previous studies (e.g., Bickel et al., 1997) and the severity of patients’ drug use in current study may have been greater given that they were concomitantly opioid- and cocaine-dependent. Despite all of the above differences in patient composition, retention for both treatments in the current study was higher than in most previous trails in which CRA was compared to DC.

The finding that patients who achieved periods of abstinence from illicit opioids or cocaine engaged in significantly more total hours, as well as average hours per week, of nondrug-related social, educational, and recreational activities than patients who did not achieve such abstinence suggests that activity planning is a crucial component of CRA outcomes. Iguchi, Belding, Morral, Lamb, and Husband (1997) and Bickel et al. (1997) have recently investigated the effectiveness of a voucher system that rewards verified participation in treatment plan-related activities, and their findings suggest the potential efficacy of the approach. Future studies would do well to focus efforts on increasing engagement in the specific type of activities identified as being associated with abstinence and to identify other components that may be equally important to successful outcomes with CRA.

Some limitations of this exploratory study should be noted. First, patients were not randomly assigned to therapy conditions, and the two treatments were provided in different time periods. Differing time frames for sampling CRA and DC patients may have been associated with changes in the availability of drugs in the community, patient characteristics, or in the extent of community drug control activities or tolerance/intolerance for drug trafficking, and these factors may have affected response to treatment. Baseline differences in race, employment status, and length of cocaine use between DC and CRA patients might also account for the lack of differences found in treatment outcome, but the lack of differential outcome persists even controlling for these variables in the data analyses. Additionally, somewhat higher maintenance doses of buprenorphine and methadone were administered to CRA patients than to DC patients, but the higher doses would be expected to lead to even better outcomes for CRA patients and thus do not account for the findings that CRA was not more effective than DC. Third, the procedural overlap between the two treatments limited the possibility of finding differential treatment effects. Since DC and CRA were not the experimental variables in the two clinical trials, therapist competence and adherence to manuals was not systematically monitored during the studies, and thus data on what components or processes occurred and with what frequency in either treatment, for example, are not available. Although the study design limits our ability to draw firm conclusions, it does provide an opportunity to begin exploring the comparative efficacy of CRA for combined opioid and cocaine dependent patients and the potential mechanisms of action of CRA.

5. Conclusions

Although in this study CRA was not more effective than DC for agonist-maintained patients with combined opioid- and cocaine-dependence, the study results do suggest that the efficacy of CRA is associated with enhanced involvement in particular social, recreational, and educational activities that serve as alternate reinforcers to drug use, namely those related to pleasurable events (e.g., picnics, outings), education, parenting, and hobbies. These findings point to the importance of clearly defining critical elements of CRA and of monitoring therapist proficiency and patient behavior during sessions. The results of this study may also have broader applicability and underscore the importance of promoting greater engagement in drug-free community activities in drug treatment generally, and not only in behavioral treatments such as CRA.
Acknowledgments

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References


