

Reinforcement-based therapy: 12-month evaluation of an outpatient drug-free treatment for heroin abusers

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Abstract

This controlled study examined the efficacy of reinforcement-based therapy (RBT) for producing enhanced abstinence outcomes over 12 months in opioid-dependent patients exiting a brief residential detoxification. Patients were randomly assigned upon completing their medically managed taper (i.e., detoxification) to RBT ($N = 66$) or usual care ($N = 64$) referral to community treatment programs. The 6-month RBT program offered an array of abstinence-based incentives including rent payment for recovery housing, program-led recreational activities and skills training for procuring employment. RBT produced significantly higher self-report and urinalysis-confirmed rates of abstinence from opioids and cocaine relative to usual care at 1 (42% versus 15%) and 3 (38% versus 17%) months during treatment but not at 6 or 12 months after enrollment. The RBT but not the usual care group showed significant increases in the number of days worked and the amount of legal income earned at 3, 6 and 12 months. The results of this randomized study suggest that an intensive reinforcement-based therapy that includes abstinence-based recovery housing is a promising approach; however, further research is needed to determine the role of treatment intensity and the specific efficacy of RBT's component parts.

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1. Introduction

Opioid-dependent individuals have a variety of treatment options available to them. This is in part because opioids are the one class of addictive drugs for which highly efficacious substitution therapies have been developed including methadone, LAAM and buprenorphine (Johnson et al., 2000; Strain and Stitzer, 1999). Naltrexone, although not widely utilized, is also a medication that is specifically targeted for the treatment of opioid addiction. However, there are many individuals dependent on opioids, who decide not to become involved in medication-based therapy (i.e., maintenance) (Cumberbatch et al., 2004). For these individuals, medically assisted taper (i.e., detoxification), is a commonly used intervention for controlling opioid withdrawal signs and symptoms while abstinence is initiated. Medically assisted

taper services may be offered in hospitals or residential facilities, particularly in urban areas, where heroin addiction is common, and may be offered as an inpatient or outpatient service.

Medically assisted taper services, especially residential services, are costly, and unfortunately, relapse rates are high following completion of this type of treatment. For example, relapse rates of 65% at 1 month and 70% at 6 weeks post-detoxification have been reported for patients addicted to opioids, who completed residential detoxification at programs in Great Britain (Gossop et al., 1989) and Switzerland (Broers et al., 2000). Another study from Baltimore found that 80% of inner-city, opioid-dependent patients relapsed to heroin-use within 1 month after completing a 3-day medically assisted residential taper (Chutuape et al., 2001).

Outcomes may be improved for those detoxified patients who enter outpatient aftercare, an event that is relatively infrequent under normal circumstances (Broers et al., 2000; Lash, 1998; McCusker et al., 1995; Sheffet et al., 1976). Thus, new

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and novel approaches are needed that can attract this population into aftercare treatment. One new and innovative strategy that may help attract and retain this special population of drug abusers into aftercare treatment is called reinforcement-based therapy (RBT). RBT was modeled after the community reinforcement approach (Budney and Higgins, 1998; Meyers and Smith, 1995; Roozen et al., 2004) but tailored to the needs of inner city heroin-dependent patients exiting brief residential detoxification programs. In the context of a day-treatment program, the therapy provides individual counseling supplemented by abstinence-contingent support for housing, food and recreational activities plus skills training for securing employment. The abstinence contingent housing feature is modeled after the work of Milby et al. (2000), and is one feature that may be especially well suited to an inner city heroin-dependent population.

In a short-term evaluation of RBT (Gruber et al., 2000), 61% of RBT subjects versus 17% of controls were enrolled in a treatment program at 1-month post-detoxification. Further, 50% of RBT versus 21% of control subjects were abstinent from both heroin and cocaine for the entire first month. However, once the abstinence-based incentives were no longer available, and treatment consisted of counseling only, retention in RBT dramatically declined. In a second small sample ($n = 37$) study employing the RBT model with additional abstinence-based voucher reinforcers (Katz et al., 2001), 43% of the sample completed 10 or more weeks of treatment while submitting 92% opioid- and cocaine-free urine samples, and 32% became employed during the program.

The purpose of the present study was to replicate and extend previous observations on treatment outcomes with the reinforcement-based therapy program. Specifically, this study employs a larger sample size, longer duration of follow-up and a greater clinical emphasis on specific elements of RBT therapy thought to be critical to maintaining drug abstinence (i.e., recovery housing and employment). To this end, opioid abusers enrolled in a short-term inpatient medical detoxification were invited into an aftercare research program and randomly assigned to RBT or usual care (referral to community outpatient-treatment programs). Outcomes were tracked for 6 months post-treatment in order to determine the extent and duration of any beneficial effects associated with the intensive aftercare program.

2. Method

2.1. Participants

Study participants were drawn from 268 individuals, who entered one of two local residential medically assisted taper programs at the Johns Hopkins Bayview Medical Center between April 2000 and March 2001. The medically assisted taper programs had treatment durations of 3 and 7–14 days, respectively. Eligible participants, between the ages of 18 and 60 years, met the Diagnostic and Statistical Manual IV

Table 1

Baseline characteristics of reinforcement-based therapy (RBT) vs. usual care participants

	RBT ($n = 66$)	Usual care ($n = 64$)	Total ($N = 130$)
Unemployed (%)	89.2	93.8	91.5
African-American (%)	71.9	69.8	70.9
Male (%) ^a	59.4	57.1	58.3
Age (mean years)	37.6	37.7	37.7
Education (mean years)	11.3	11.4	11.3
Current probation/parole (%) ^a	23.1	31.3	27.1
Cocaine positive urine sample at detoxification intake (%)	69.8	65.5	67.8
Needs housing (%) ^a	14.3	15.6	15.0

^a Indicates characteristic was a stratification criteria.

(DSM-IV) criteria for current opioid dependence and completed the taper program; they were not currently prescribed or discharged with a prescription for opioid medication or diagnosed with a serious medical or psychiatric illness and were not pregnant.

Of the 268 patients referred to the study, 69 individuals declined to sign informed consent. Of the 199 signing consent, 25 left the medically assisted taper program before completing an initial assessment battery; 44 left after completing the assessment battery but before randomization could take place, leaving a total of 130 participants.

As shown in Table 1, study participants were predominantly unemployed (92%) African-American (71%) males (58%), with an average age of 37 (S.D. = 8.4) years. They had completed an average of 11 years of education (S.D. = 1.8); 27% were currently on probation or parole. All participants (100%) had an opioid positive, and 68% also had a cocaine positive urine sample at detoxification program enrollment. Of randomized patients, 40% entered the study after completing the 3-day detoxification program and 60% entered after completing the longer 7- to 14-day detoxification. The overall mean time in the detoxification unit for all participants was 7.2 days with 2.9 days for the 3-day detoxification ($n = 52$) and 9.2 days for the 7- to 14-day detoxification ($n = 78$). Groups did not significantly differ on any of the variables examined.

2.2. Recruitment and instructions

Recruiting staff met with the patients residing on the detoxification unit and completed an initial eligibility screen. Patients who qualified for participation were invited to sign written informed consent using a Johns Hopkins Bayview Medical Center study specific consent form approved by the local Institutional Review Board. Participants were told that they would be randomly assigned (for example, by the flip of a coin) to one of two aftercare treatment conditions: (1) immediate enrollment in an intensive outpatient treatment called reinforcement-based therapy or (2) usual care that offered referral to other treatment and social service agencies, where

they could receive help. Participants were also informed that, independent of study assignment, they would be asked to complete paid follow-up interviews at 1, 3, 6 and 12 months after leaving detoxification. Finally, detailed contact information (e.g., multiple addresses, phone numbers) was obtained to facilitate follow-up tracking.

2.3. Baseline assessment

Participants completed an initial assessment battery prior to randomization while residing on the detoxification units. The initial assessment battery included the Addiction Severity Index (McLellan et al., 1992), a semi-structured interview that assesses both lifetime and recent (30 days prior to the interview) events and behaviors in seven domains of psychosocial functioning (medical, employment/support, alcohol, drugs, legal, family/social and psychiatric) and the E-module of the SCID, a semi-structured interview that uses a decision-tree method to determine lifetime and current DSM-IV substance abuse/dependence diagnoses for alcohol and illicit drugs (First et al., 1996). The abuse and dependence syndromes for psychoactive drugs (e.g., opioids) have good construct (Feingold and Rounsaville, 1995a,b), concurrent, (Kidorf et al., 1996) and predictive validity (Kidorf et al., 1998a). The 21-item Beck Depression Inventory II (BDI-II) (Beck et al., 1961, 1996) was used to screen for depressive symptomatology.

2.4. Randomization and stratification

On the day of discharge from the medically assisted taper program, research staff escorted participants to the outpatient aftercare program, where they were stratified on five variables considered to have potential for influencing treatment outcome: withdrawal program of origin (3 or 7–14 days), male (yes/no), Caucasian (yes/no), currently on probation or parole (yes/no) and needs housing (yes/no). Housing need was determined by asking participants if they had a place to live when they left the medically assisted taper program and if 'yes', whether other individuals who use drug lived there as well. Those answering 'no' to the former or 'yes' to the latter were considered in need of housing. Following stratification, a random assignment was generated using a modified dynamic balanced randomization (Signorini et al., 1993). The random assignment of participants to one of the two treatment groups was performed by a computer program and entered by staff, who did not have study participant contact. Participants were then given their random group assignment to either reinforcement-based therapy (RBT; $n = 66$) or usual care control ($n = 64$).

2.5. Treatment procedures

Specific procedures for the two intervention groups are described below.

2.5.1. Usual care control

The control procedures conducted at the outpatient program on the day of random assignment were designed to supplement the usual aftercare transition procedures routinely conducted by the medically assisted taper programs. Participants assigned to the control condition and who had not made any aftercare arrangements, were given a list of referral options for aftercare treatment and other resources available in the community. In consultation with the patient, two to three programs were selected as potential targets based on location and services offered. Specific information was provided to the patient on location, hours and intake procedures. Telephone contact with the preferred program was initiated at the referral session and an intake appointment made, if possible. If other social service needs were also identified (e.g., housing, food) an extensive referral booklet was provided to the participants, and they were given observed access to a telephone to schedule appointments or obtain resources.

2.5.2. Reinforcement-based intensive outpatient therapy

Participants assigned to RBT were escorted to the counseling suite, introduced to their assigned counselors and participated in the scheduled treatment activities that day. At the end of the treatment day, participants agreeing to live in a recovery house were escorted by treatment staff to a recovery house. Participants were also transported back to the treatment program the following morning to facilitate their treatment participation. All RBT participants were strongly encouraged to enter a drug-free living environment in order to facilitate their abstinence goals. The treatment program maintains a cooperative agreement with several privately owned and operated recovery houses in the community so that immediate housing is always available. The houses provide a structured and supportive drug-free environment. The treatment program pays rent directly to the recovery house manager or owner at a rate of US\$ 105/week. If drug or alcohol use is detected, either at the program or the house, the patient is removed and placed in an alternative living arrangement (e.g., with a relative or at a community shelter) until s/he once again tests negative for opioids and cocaine. At this time, the patient may re-enter the same house or more commonly, move to a different recovery house.

Whether or not they are living in a recovery house, all participants assigned to RBT were requested to attend the clinic 7 days a week during the first 3 weeks and 4 days/week in weeks 4–12 to provide urine samples under observation by a same-gender research assistant. Each time a participant attended the clinic, they provided a urine sample that was tested for heroin and cocaine. Clinic-attendance expectations were the same, regardless of whether participants were positive or negative for opioids and cocaine. In the RBT model, what differed between those who tested positive and those who tested negative on a given day was the duration and content of the counseling contact and activities available. Those participants testing negative for opioids and cocaine were allowed to participate in the full range of counseling activities,

described below. Those who tested positive only met with their counselor for an individual 1 h session. Transportation aid, in the form of bus tokens or parking passes for each session attended, was also provided during the first 3 months independent of urine test results.

On days Monday–Thursday, RBT included group counseling focused on skill building, lunch, job club and recreational activities. The content of these skills building sessions were derived from existing manualized treatments (Budney and Higgins, 1998; Carroll, 1998). Job club was based on a behavioral approach to vocational counseling (Azrin and Besalel, 1980). Patients participated in job club activities until they secured employment. Recreational activities included outings in the community, such as playing pool, attending movies and going to a local gymnasium. On Fridays, group skills building and social club were held. During social club, patients were served lunch and given the opportunity to interact with non-drug using peers. Patients could attend social club throughout treatment, if drug-negative. Individual counseling sessions were also scheduled two to three times a week.

In addition to the counseling described above, abstinent contingent benefits were in effect during the first 3 months of the program and were available to those testing negative for opioids and cocaine. Average expenditures per person per day on days, when patients participated in the designated activities were US\$ 15 for housing, US\$ 7.26 for recreation and US\$ 5.05 for meals for a total of US\$ 27.31/day in abstinent-contingent program benefits. Cost for an abstinent patient who participated daily in all available activities and benefits would be US\$ 2294. The average actual expenditure per person over 3 months for the intent-to-treat sample was US\$ 510.

When a patient provided a urine sample that tested positive for opioids and/or cocaine, a time-out from reinforcer availability and group contact was initiated. The patient met with his/her counselor individually for a relapse-focused session that included a functional analysis, detailed day planning and problem-solving strategies. The alternative housing plan was also reviewed, and any patient was removed living in the recovery house and placed in another safe housing situation (e.g., temporary shelters sponsored by local churches) until abstinence was re-established. The positive urine sample was also sent to an on-campus laboratory for quantitative testing in order to establish an initial concentration level of heroin and/or cocaine metabolite. The patient was encouraged to return to the clinic the next day for testing. If a 50% decrease in heroin and/or cocaine metabolite was found then this was deemed as no new use (e.g., Preston et al., 1997; Cone et al., 1991, 1993), and patients resumed all clinic activities. Quantitative results were generally available within 2 h after sample submission.

All RBT patients were offered the option of taking the opioid-blocking medication, naltrexone in order to help ensure continued abstinence. In addition, those judged to have a significant alcohol problem were offered the option of taking disulfiram (Antabuse). With either medication, staff helped

the patient obtain medical screening, a prescription, and asked the patient to ingest their medication at the clinic under observation. Although medications were available, few participants actually used them. Six RBT patients with alcohol problems received a prescription for disulfiram; they remained on the medication for a mean of 59 days (range = 6–90 days). Two participants who relapsed to opioid use received prescriptions for naltrexone; they remained on the medication for a mean of 41 days (range = 29–52 days).

In the final 3 months of treatment, contact was reduced to twice a week for all RBT participants, and incentives for housing, food and recreation were no longer offered. Patients were discharged from the program if they missed seven consecutive counseling sessions in weeks 1–3 (Phase I; 1 week with no contact), missed 14 consecutive sessions in weeks 4–12 (Phase II; 3.5 weeks with no contact) or had no contact for 21 consecutive days in weeks 13–24 (Phase III).

2.6. Counselors

Counselors providing the RBT were three master's level mental health professionals (one male and two females). All counselors participated in conducting both group and individual sessions. They received equal caseloads and 2 h of weekly supervision. Training consisted of having counselors read two texts: *Clinical Guide to Alcohol Treatment* (Meyers and Smith, 1995), a handbook that describes CRA treatment and *A Community Reinforcement Plus Vouchers Approach to Treating Cocaine Addiction* (Budney and Higgins, 1998), a manual describing CRA therapy and contingency management in the form of vouchers. Didactic presentations on concepts of the RBT therapy were given and role-play practice in the components of CRA were conducted. Counselors also received feedback on taped sessions.

2.7. Urine testing

A total of 2331 urine samples from RBT participants were tested. Observed urine samples were tested on-site for opioids and cocaine using on-track test sticks (Towt et al., 1995) with concentration cut-offs of 300 ng/ml. These results were used to provide immediate feedback and determined whether or not a participant was eligible to receive the contingent program benefits that day. Quantitative testing when deemed appropriate was conducted using a Toshiba 30R Biochemical System automated chemistry analyzer with the EMIT II PLUS Cocaine and Opioid Metabolite Assay Kits (Syva Corp., Palo Alto, CA) with dilution used as appropriate to bring sample concentrations into the linear range of the assay.

2.8. Follow-up procedures

Follow-up interviews were scheduled at 1, 3, 6 and 12 months following random assignment. At each interview, the ASI and BDI were administered and an observed urine sample was collected and sent to an off-site laboratory for EMIT

testing for the presence of opioids (morphine), methadone, cocaine (benzoylecgonine, BZE) and benzodiazepines (oxazepam) using the enzyme-multiplied immunoassay technique (EMIT; Syva Corp., Palo Alto, CA). A specimen was deemed positive if drug metabolite concentration was >300 ng/ml. Monetary compensation, in the form of a US\$ 25 check, was paid following each interview with a total of US\$ 100 available for completing all assessments. In order to maximize the likelihood of high follow-up interview completion rates, reminder letters were sent, phone calls were made, and interviews were conducted in the community when needed. These procedures resulted in a 96% interview completion rate (95% for the control group and 97% for the RBT group).

2.9. Measures

2.9.1. Primary outcome measure

The primary outcome measure for the between-group comparison was drug abstinence based on data from follow-up interviews and urine samples. For this measure, drug abstinence at all interviews was defined, as no reported drug use based on the recent drug use data from the follow-up ASI (30 days prior to the day of the interview) with a confirmatory drug negative urinalysis test.

2.9.2. Secondary outcomes measures

In order to provide ample perspective on outcome data, three secondary outcome measures for drug use and abstinence were also examined at each follow-up time point: *urine testing* independent of self-report; *opioid abstinence*: negative opioid urine test and no self-reported use of opioids during the previous 30 days and *cocaine abstinence*: negative cocaine urine test and no self-reported use of cocaine during the previous 30 days. The ASI also provided data on psychosocial outcomes; composite scores and specific quantitative outcomes from each assessment domain are reported. Total score from the BDI provides an additional perspective on depressive symptoms. Finally, patients were asked at each follow-up interview, whether they were currently enrolled in treatment and if so, what type of treatment (e.g., outpatient drug-free, inpatient detoxification, methadone maintenance). Participants also described their current housing situation using a number of options (e.g., private residence, shelter, recovery house, etc.). These questions provided a basis for between-group comparisons on key secondary outcome measures. Further, descriptive data were also collected for RBT participants to characterize the treatment. Data included duration of treatment participation, frequency of attendance in treatment elements, number of patients employed and length of stay in a recovery house.

2.10. Data analyses: between-group comparisons

Study outcomes were derived from between-group comparisons using modified intent-to-treat data collected at follow-up time points. For demographic data, study groups

(RBT versus control) were compared using chi-square for dichotomous variables and *t*-tests for continuous variables.

The four abstinence outcomes were first analyzed using generalized estimating equations (GEE) to determine, whether there were an overall group effect (Zeger and Liang, 1986). GEE is often used for the analysis of “correlated” data. Among GEE’s capabilities is that it permits analysis of binary outcomes and of subjects with partial data (Stokes et al., 2000). Effects are expressed using odds ratios (OR) for experimental versus control group differences with 95% confidence intervals (CI). GEEs were also used to examine time effects. No time effects were observed for any abstinence outcome measure.

To complement the GEE analysis, we also compared rates of abstinence at each time point for the two groups using simple cross tab analysis. Effects were expressed as odds ratios with 95% confidence intervals. Because no group differences were observed for any of the self-report measures at intake, self-report data were analyzed using repeated measures analysis of variance excluding the intake data. When significant group effects were observed, *t*-tests were used to compare groups at follow-up time points. Since repeated measures ANOVA deletes subjects with one missing data point, these analysis were repeated using GEE for continuous data. Results were comparable with either method. Data were analyzed using SAS Version 8.2., Cary, NC, SAS Institute, 2003.

3. Results

3.1. Between-group comparisons

3.1.1. Current treatment participation and housing

When participants were asked, “are you enrolled in a treatment program now?” RBT participants were significantly more likely to answer ‘yes’ than were control participants at 1 month (63.5% versus 11.9%; $p=0.000$), 3 months (49.2% versus 11.5%; $p<.001$) and 6 months (39.1% versus 21.3%; $p=.034$), respectively. The vast majority reported being in an outpatient drug-free program, which was consistent with the description of the RBT program. At 12 months, this effect reversed and RBT as compared to control participants were *less likely* to report being in treatment (14.5% versus 32.2%; $p=.021$). The vast majority (70%) of control participants reporting treatment were in an outpatient methadone program. When asked about their current living arrangement, RBT participants were significantly more likely than control participants to report living in a recovery house at 1 month (28.8% versus 7.8%; $p=.002$), 3 months (18.2% versus 6.3%; $p=.034$) and 6 months (16.7% versus 4.7%; $p=.026$), respectively. There was no difference observed at 12 months between RBT and control groups (8.1% versus 3.4%; $p=.271$), respectively.

3.1.2. Drug use and drug abstinence

GEE analysis, using data from 1, 3, 6 and 12 month follow-ups, revealed a significant effect of group on the primary out-

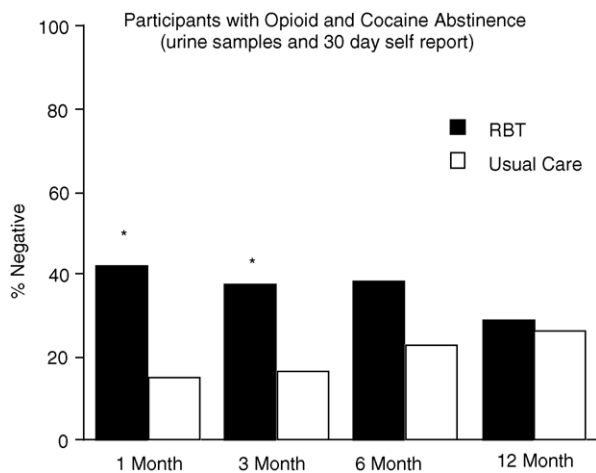


Fig. 1. This figure shows the results for reinforcement-based therapy (RBT) (black bars) and usual care (white bars) over 12 months on the measure of opioid and cocaine abstinence as verified with both negative urine toxicology and the absence of any self-reported use in the past 30 days. At 1 month, the odds ratio was 4.05 (CI=1.71–9.64; $p=.001$), missing values = 7; at 3 months, the odds ratio was 2.94 (CI=1.26–6.86; $p=.011$), missing values = 7; at 6 months, the odds ratio was 2.06 (CI=0.91–4.62; 0.079), missing values = 14; at 12 months, the odds ratio was 1.14 (CI=0.48–2.69; $p=.771$), missing values = 26. Data were analyzed using missing data coded as missing. Asterisk (*) indicates significant difference between groups at $p \leq .05$.

come variable, percent of participants who had both cocaine and opioid negative urine samples and reported no use of these drugs in the past 30 days. Fig. 1 shows that the RBT as compared to the control group evidenced higher levels of abstinence, when both self-report and urinalysis was included in the measure of abstinence (group effect OR = 2.43; CI = 1.27–4.63; $p=.007$). Significant between-group differences were seen at 1 (42% versus 15%, respectively) and 3 months (38% versus 17%, respectively) but were not longer apparent at 6 and 12 months.

Three other secondary measures of drug use and abstinence were also examined. The RBT group, compared to the control group, showed significantly more urine samples that tested negative for opioids and cocaine (OR = 2.23; CI = 1.25–4.00; $p=.007$) (data not shown), and in Fig. 2, the RBT group showed significantly higher overall levels of opioid (OR = 2.15; CI = 1.16–4.00; $p=.015$) but not of cocaine (OR = 1.67; CI = 0.93–3.00; $p=.088$) abstinence. Comparison of data from Fig. 2 with data presented in Fig. 1 indicates that the combined drug use outcome is highly dependent on opioid drug use outcomes in this sample. Significant between treatment group differences were found for opioid abstinence at 1- and 3-month follow-up time points, while significant differences on cocaine abstinence were apparent only at 1 month.

3.1.3. Behavioral and psychosocial outcome measures

Table 2 shows the ASI composite scores from each of the seven problem domains, days paid for work in the past 30 days and BDI scores. There was a significant main effect

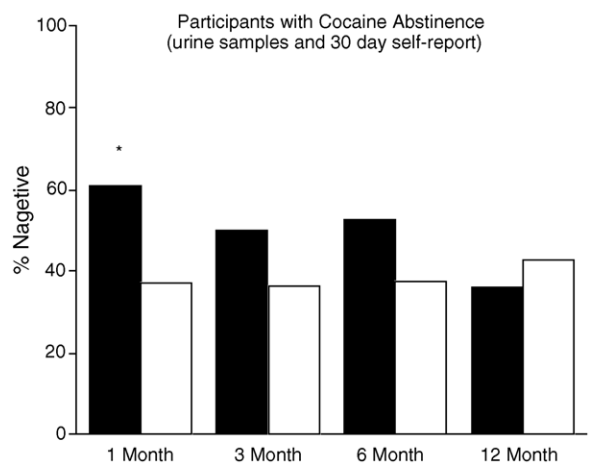
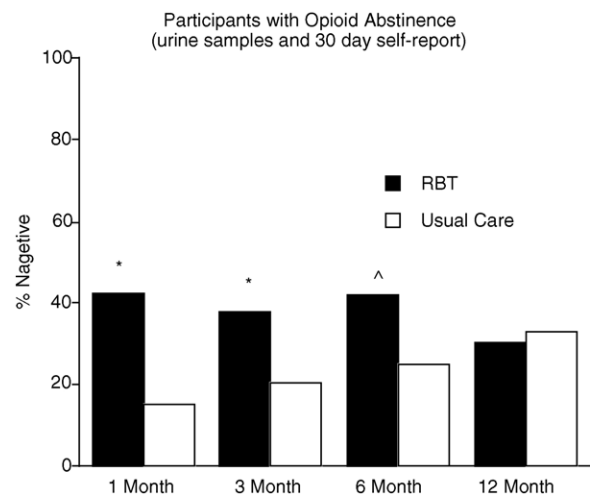


Fig. 2. The top panel shows the results for reinforcement-based therapy (RBT) (black bars) and usual care (white bars) over 12 months on the measure of opioid abstinence as verified with both negative urine toxicology and the absence of any self-reported use in the past 30 days. At 1 month, the odds ratio was 4.05 (CI=1.71–9.64; $p=.001$), missing values = 7; at 3 months, the odds ratio was 2.35 (CI=1.04–5.29; $p=.037$), missing values = 7; at 6 months, the odds ratio was 2.06 (CI=0.97–4.74; 0.058), missing values = 14; at 12 months, the odds ratio was .90 (CI=0.39–2.05; $p=.800$), missing values = 25. The bottom panel shows the results for reinforcement-based therapy (black bars) and usual care (white bars) over 12 months on the measure of cocaine abstinence as verified with both negative urine toxicology and the absence of any self-reported use in the past 30 days. At 1 month, the odds ratio was 2.62 (CI=1.27–5.44; $p=.009$, missing values = 7; at 3 months, the odds ratio was 1.76 (CI=0.85–3.64; $p=.125$), missing values = 8; at 6 months, the odds ratio was 1.85 (CI=0.88–3.88; 0.105), missing values = 15; at 12 months, the odds ratio was 0.75 (CI=0.34–1.65; $p=.469$); missing values = 28. Data in both panels were analyzed using missing data coded as missing. Asterisk (*) indicates significant difference between groups at $p \leq .05$. The (^) indicates $p=.057$.

of group condition for employment ($p=.01$) and drug use ($p=.04$) composite scores. No significant group by time interactions were observed. Both mean days worked and mean legal income was significantly higher for RBT than for usual care controls at 3, 6 and 12 months. There were also significant effects of time with both groups showing reductions

in the ASI domains of alcohol, drug, family/social and legal problem severity.

3.2. Descriptive results of RBT

Description of the behaviors of those assigned to RBT is presented in this section based on program records rather than patient self-report. Treatment retention was 60, 46 and 37% at 1, 3 and 6 months, respectively. This corresponds well to self-report data from the follow-up interviews with RBT patients (Section 3.1.1). Among the RBT participants, 43% stayed at least one night in a recovery house. Of those initiating a recovery house stay, 75% (or 37% of the modified intent-to-treat group) stayed longer than 7 days. Among those who initiated a stay, the average stay in the recovery house was 54 days. On average, the modified intent-to-treat sample attended 12% of job club sessions, 22% of skills group sessions, 23% of lunches, 21% of the recreational activities and 52% of Friday Social Club sessions, they were eligible to receive. Service utilization was also examined for the periods of time, when patients were eligible (i.e., abstinent) the sample attended 56% of skills training, 54% of lunches, 49% of recreations, 26% of job club sessions and 82% of Friday Social Clubs. Overall, 39% of RBT participants were employed at some point in their treatment episode.

4. Discussion

Reinforcement-based therapy, an intensive outpatient-treatment program modeled after the community reinforcement approach, produced significantly better 1- and 3-month outcomes than usual care referral to outpatient community treatment following brief residential opioid detoxification. Although not significantly different from control, the 40% abstinence rate noted at the 6-month follow-up with RBT is as good or better than 6-month abstinence rates reported for other intensive outpatient programs treating primarily cocaine abusers (e.g., Higgins et al., 2003; Guydish et al., 1998; Hoffman et al., 1994; Rawson et al., 1995; Simpson et al., 1997). Whether better or worse rates should be expected for the present target population of primary opioid abusers is unknown, since there are no studies to date that have specifically reported on outpatient psychosocial treatment outcomes for this population.

Outcomes for the usual care group that received no formal treatment as part of this project are also notable, with follow-up abstinence rates of between 15 and 43% across the follow-up time point and abstinence measure examined. It is clear that the lack of significant between-group differences at 6- and 12-month time points was due primarily to the improved abstinence outcomes of the control group at these times rather than to deterioration of experimental group outcomes (Figs. 1 and 2). The improved outcomes for the control group corresponded to an increase in numbers of these patients who reported being enrolled in treatment. This em-

Table 2
Addiction Severity Index and Beck Depression Inventory results for the reinforcement-based therapy (RBT) and usual care conditions at study intake and four follow-up time points

Mean (S.D.)	RBT (n = 66)					Usual care (n = 64)				
	Intake	1 months	3 months	6 months	12 months	Intake	1 months	3 months	6 months	12 months
ASI composite scores and selected items										
Alcohol	0.193 (0.241)	0.050 (0.118)	0.079 (0.184)	0.090 (0.208)	0.094 (0.190)	0.181 (0.210)	0.073 (0.168)	0.085 (0.175)	0.071 (0.177)	0.067 (0.162)
Drug	0.358 (0.088)	0.146 ^a (0.130)	0.174 (0.148)	0.151 ^a (0.137)	0.183 (0.158)	0.385 (0.077)	0.210 (0.144)	0.225 (0.154)	0.213 (0.166)	0.171 (0.161)
Employment	0.795 (0.196)	0.809 (0.193)	0.758 ^a (0.220)	0.746 ^a (0.222)	0.737 ^a (0.244)	0.829 (0.209)	0.812 (0.218)	0.846 (0.205)	0.854 (0.190)	0.861 (0.218)
Days Worked	7.5 (9.3)	6.0 (9.1)	11.0 ^a (10.6)	10.8 ^a (10.3)	10.3 ^a (10.4)	6.2 (9.6)	4.7 (7.7)	4.8 (8.1)	5.9 (8.3)	5.4 (9.1)
Family/social	0.173 (0.226)	0.090 (0.173)	0.106 (0.205)	0.102 (0.201)	0.080 (0.172)	0.223 (0.257)	0.106 (0.191)	0.087 (0.184)	0.104 (0.186)	0.109 (0.205)
Legal	0.288 (0.290)	0.140 (0.231)	0.162 (0.247)	0.076 (0.170)	0.063 (0.128)	0.343 (0.259)	0.185 (0.246)	0.180 (0.247)	0.126 (0.210)	0.144 (0.230)
Legal income	220.3 (380.2)	216.7 (371.5)	497.8 ^a (601.2)	650.6 ^a (730.2)	629.4 ^a (777.0)	218.6 (379.4)	228.0 (441.9)	239.9 (471.9)	325.5 (589.8)	280.5 (585.4)
Medical	0.165 (0.282)	0.256 (0.334)	0.234 (0.348)	0.230 (0.363)	0.170 (0.325)	0.255 (0.336)	0.219 (0.340)	0.264 (0.355)	0.281 (0.393)	0.226 (0.376)
Psychiatric	0.054 (0.125)	0.050 (0.121)	0.042 (0.102)	0.042 (0.106)	0.059 (0.135)	0.104 (0.176)	0.069 (0.152)	0.048 (0.108)	0.025 (0.072)	0.063 (0.142)
BDI	14.2 (11.4)	12.1 (11.06)	11.8 (12.4)	11.6 (11.8)	14.1 (13.04)	16.2 (12.06)	16.7 (12.7)	16.8 (12.3)	14.9 (11.4)	13.9 (12.2)

Note: The Addiction Severity Index composite scores for the seven domains and selected individual items to better characterize employment of participants are shown. Higher ASI composite scores indicate more severe problems. Total Beck Depression Inventory is also presented. There were low rates of missing data, and missing data never exceeded five observations per measure. The superscript (^a) indicates significant difference between groups at $p \leq 0.05$.

phasizes the important role that treatment plays in long-term outcomes of opiate abusers (Hser et al., 2001). It is also noteworthy that the treatment modality in which control patients were most commonly enrolled was methadone maintenance. This suggests that acceptance of methadone treatment may change over time among heroin abusers accessing medically assisted taper services as they realize the difficulties associated with remaining drug-free in the absence of medication support.

The present study replicated key findings of two previous studies that examined outcomes with the RBT model. Similar to the studies by Gruber et al. (2000) and Katz et al. (2001), rates of treatment retention were about 60% at 1-month post-detoxification. Retention over 6 months was similar in this study (37%) and the study by Katz et al. (2001) (43%). Over all three studies, approximately, 40% of patients entered recovery housing at some point and about 30% of patients obtained employment at some point during treatment.

Additional research would be needed, including intensity-matched treatment comparisons and dismantling studies, to determine whether the intensity of the program was necessary to produce the outcomes observed and which features of the RBT were active versus inactive elements. The outcomes obtained are nevertheless promising for this difficult patient group, and suggest that additional research on this model of treatment is warranted. Although these findings are encouraging, it is also sobering to realize that the incentive-rich treatment was inadequate to prevent relapse for over half the study participants. The relapse rates in this population highlight the difficulties in finding effective treatment for the intractable illness of heroin dependence.

Findings of this and the previous studies of RBT emphasize the important role that patient adherence plays in treatment outcome for drug abusing populations. It is notable and can be viewed as another limitation of the present study that only 50% of the detoxification patients eligible for this program actually entered the aftercare treatment outcome study. Thus, interventions that are more attractive to drug abusing patients may be needed to enhance adherence with treatment entry and participation. Recovery housing may be beneficial to recovering drug abusers by removing stimuli associated with drug use while providing monitoring and social support for abstinence; however, it is not always viewed as an attractive option due to the rules and restrictions imposed by the recovery house lifestyle. Since previous research has also shown that drug-free housing promotes treatment retention (Hitchcock et al., 1995; Miescher and Galanter, 1996; Sosin et al., 1995), but not necessarily drug abstinence (Gruber et al., 2000; Moos et al., 1994; Sosin et al., 1995; Stahler et al., 1995), additional controlled research to determine efficacy of housing alone relative to the therapy package will be of particular interest. Further, it may be beneficial in the future to explore other models of supported housing (e.g., Milby et al., 2000) that might retain efficacy while being more attractive to individuals recovering from addiction.

The beneficial role of employment in drug-abuse recovery has been previously discussed (Platt, 1995; Kidorf et al., 1998b), although there is little evidence from controlled research about the role of treatment components that emphasize job finding and job retention. It seems clear that employment could be a critical element in returning the drug abuser to a more responsible and socially stable lifestyle. Further, a return of drug abusers to the workforce could dramatically improve the cost–benefit to society of providing treatment services. The potentially positive economic impact of this intervention is supported by the observation that both days worked and amount of legal income earned were both twice as high in RBT as compared to usual care participants at 3, 6 and 12 months follow-ups (Table 4) and by the relatively high rate of employment among RBT participants (39%). In addition, it is notable that this impact on employment was maintained even at 12 months, full 6 months after the therapy had ceased. However, there are numerous barriers that drug abusers face in attempting a return to the workplace including poor work histories and criminal backgrounds. Fortunately, there are excellent training programs that have been developed to help drug abusers to learn the skills needed to obtain employment (Azrin and Besalel, 1980; Hall et al., 1984), and the data from the present study show that many can be successful in this regard. Future treatment research should explore strategies for further improving during-treatment rates of employment, enhancing the duration of sustained employment and for advancing patients from temporary and low-paying work, such as telemarketing and housekeeping to more stable and higher paying areas of employment.

In summary, this controlled random assignment study demonstrated the efficacy of reinforcement-based therapy in relation to usual care referral to community treatment programs for producing enhanced abstinence outcomes in opioid-dependent patients exiting a brief residential detoxification. The treatment program offered was intensive and unique in several respects, offering a rich array of abstinence-based incentives including rent payment for recovery housing, program-led recreational activities and skills training for finding a job. The RBT group had significantly higher rates of abstinence from opioids and cocaine and less relapse to opioid use relative to usual care participants at 1 and 3 months and improved employment functioning at 3, 6 and 12 months. The results of this randomized study suggest that an intensive reinforcement-based therapy that includes abstinence-based recovery housing and job finding skills training is a promising approach. Additional controlled research is needed to further determine the role of treatment intensity, treatment context, the specific efficacy of RBTs component parts and its cost effectiveness.

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