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CONTINGENCY MANAGEMENT INTERVENTIONS: EFFECTS ON TREATMENT OUTCOME DURING METHADONE DETOXIFICATION

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We examined the effectiveness of a contingency management program in preventing relapse to illicit opiate use and increasing treatment retention during outpatient methadone detoxification treatment. Twenty male opiate addicts were randomly assigned to an experimental or control group. Following a 3-week methadone stabilization period, men in both groups received identical gradual methadone dose reductions during Weeks 4 through 9 and were maintained on placebo during Weeks 10 through 13. Beginning in Week 4, control patients received $5.00 for providing a specimen twice weekly. Experimental patients received $10.00 and a take home methadone dose for each opiate-free urine specimen but forfeited the incentives and participated in more intensive clinic procedures when specimens were opiate positive. The contingency management procedure slowed the rate of relapse to illicit opiate use. Experimental patients provided significantly more opiate-free urines during the methadone dose reduction in Weeks 4 through 9 than control patients, although the difference between groups was no longer significant during placebo administration in Weeks 10 through 13. In addition, the contingency management program improved treatment retention and reduced symptom complaints during the detoxification. The usefulness and limitations of contingency management procedures for outpatient methadone detoxification are discussed.

DESCRIPTORS: contingency management, drug abuse treatment, incentives, reinforcement, relapse prevention

Although substance abuse disorders are often depicted as clinical problems intractable to standard treatment procedures, contingency management interventions have been applied successfully in treating several types of substance abuse. One of the most widespread applications is in smoking cessation programs; typically, portions of a monetary security deposit are returned contingent on reduced levels of smoking or smoking cessation (Tighe & Elliot, 1968; Winett, 1973). Using a similar strategy in the treatment of chronic alcoholics in an outpatient setting, Bigelow, Strickler, Liebson, and Griffiths (1976) returned portions of a security deposit contingent on regular, clinic supervised disulfiram ingestion. Time-out and social isolation procedures have also been used to reduce alcohol consumption in chronic alcoholics in an experimental inpatient setting (Bigelow, Cohen, Liebson, & Faillace, 1972; Bigelow, Liebson, & Griffiths, 1974; Griffiths, Bigelow, & Liebson, 1977). Finally, Stitzer and colleagues have used urinalysis-contingent incentive programs to successfully reduce either illicit opiate use or nontherapeutic, high dose benzodiazepine use in methadone maintenance patients (Stitzer, Bigelow, & Liebson, 1979, 1980; Stitzer, Bigelow, Liebson, & Hawthorne, 1982). In these studies, patients who provided drug-free urine specimens were offered a choice from a menu of reinforcers including money, take-home methadone privileges, and methadone dose increase privileges. Other contin-

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gency management programs have used incentives such as reductions in treatment time or parole and probation time in contracts for decreased drug use and increased treatment participation (Polakow & Doctor, 1974). One area of application in which contingency management procedures are potentially useful but have received relatively little evaluation is in outpatient methadone detoxification treatment (detox) of opiate addicts.

Short-term outpatient methadone detoxification is a frequently used treatment for street addicts dependent on illicit opiate drugs. At the start of the detox, patients are typically stabilized on a moderate dose of oral methadone to suppress withdrawal distress following termination of illicit opiate use; the methadone dose is then decreased gradually until the patient is opiate free. Although the FDA guidelines recommend 21 days as an appropriate detox duration, detoxes have ranged from 7 days to 6 months. Unfortunately, such detoxifications are generally unsuccessful. Clients typically drop out prior to treatment completion or relapse to illicit opiate use while still receiving methadone at the clinic (Canada, 1972; Wilson, Elms, and Thomson, 1974). For example, in a recent comparison of three outpatient methadone detoxification procedures, Stitzer, Bigelow, and Liebson (1981) found that overall mean length of participation was approximatly 68 days in a 90-day treatment program and that 75% of the participants had relapsed to their illicit drug use prior to the end of their treatment participation. In their study, 80% of the subjects were found to be opiate positive at a short-term follow-up 2 to 3 weeks following treatment termination.

Hall, Bass, Hargreaves, and Loeb (1979) introduced contingent payment in combination with verbal feedback during a 16-day outpatient methadone detoxification program. In comparison to a standard treatment control, this contingent payment procedure resulted in significantly more drug-free specimens and more consecutive drug-free days during the detox; treatment retention was not significantly different for the two groups. Our study extended this analysis of contingency management procedures during outpatient methadone detoxification to a relatively long-term gradual dose reduction procedure and explored the usefulness of providing a variety of incentives to patients who remained opiate free during the detox as evidenced by urinalysis results.

METHOD

Patients

Thirty-three patients dependent on illicit opiates and not currently participating in treatment were enrolled in a 90-day or 13-week detoxification program; they qualified for enrollment by providing three consecutive opiate-positive urines and by having physical evidence of recent intravenous drug use. During the first 3 weeks of the program, urine specimens were collected on Mondays and Fridays and analyzed on an EMIT system for the presence of opiates. Patients were selected for the present study if they provided at least three opiate-free urines out of the six specimens collected during the screening period. Twenty patients met this criterion; thirteen were excluded from further participation in this study. Thus, patients were chosen because they provided evidence of discontinuing or at least reducing their use of illicit opiates during the initial 3 weeks of treatment enrollment. The characteristics of the study participants are summarized in Table 1. There were no significant differences between the experimental and control patients for any of the demographic variables. All patients provided written informed consent for participation in this study.

Procedures

General clinic procedures. Patients reported to the clinic 7 days a week to drink their methadone under nursing supervision. All doses of methadone were mixed with cherry syrup and administered under double-blind conditions; that is, neither patients nor clinic staff were informed of the rate or duration of dose reduction during the detox. During the first 3 weeks, patients were stabilized on 30 mg per day of methadone. Beginning in Week 4, all patients began a dose reduction schedule

Table 1
Demographic Characteristics of Patients

	Contingency management (n = 10)	Control (n = 10)
Age	29.6	29.4
(*SD*)	(5.7)	(3.5)
Race (%)		
Black	70.0	50.0
White	30.0	50.0
Years of continuous opiate use	7.0	8.1
(Range)	2–14	2–12
Legal status (%)		
Free	70.0	70.0
Parole/probation	30.0	30.0
Months employed in last 2 years	16.0	15.5
(*SD*)	(5.6)	(7.0)
Currently employed (%)	30.0	30.0
Years of education	10.5	10.8
(*SD*)	2.4	2.4

under which the methadone dose decreased every 4 days in alternating 2-mg and 3-mg steps. Patients reached 0 mg at the end of the 9th week of the 13-week detox and received only the cherry syrup for the remaining 4 weeks. Patients were terminated from treatment when they missed 3 consecutive days at the clinic.

Urine specimens were collected on Mondays and Fridays and immediately tested using an on-site EMIT system for the presence of a variety of opiate drugs including heroin, morphine, demerol, and codeine. In addition, a weekly specimen, randomly selected from the Monday and Friday samples, was sent out to an independent laboratory for each patient throughout the detox. These samples were tested using thin layer chromatography (TLC) analysis for both opiate and nonopiate drugs. TLC testing served as a reliability check for opiate-positive EMIT results and also permitted detection of a wide vareity of nonopiate drugs. The TLC test produced an opiate-positive result if heroin, morphine, codeine, demerol, or propoxyphene (Darvon) was detected in the urine sample. Nonopiate drug-positive results included barbiturates, benzodiazepines, phenothiazines, tricyclic anti-depressants, and stimulants such as cocaine or preludin. All specimens were collected under observation and checked for temperature to prevent patients from providing bogus samples. Alcohol use was not systematically monitored during the detox.

At least twice each week during the detox, patients completed a 60-item self-report questionnaire (the PSQ), rating each item on a scale of increasing severity from 0 to 3. The questionnaire included withdrawal complaints, such as muscle cramps, aching joints, nausea, yawning, insomnia, and drug craving, as well as more general items such as nervousness, loss of interest in sex, less friendly and social than usual, and bothered by noises.

Contingency management procedure. At the start of Week 4, patients were randomly assigned to an experimental or control condition and were asked to sign a contract agreeing to participate in the appropriate program for the remaining 10 weeks of their detox. Control patients received $5.00 for providing a specimen on Monday or Friday regardless of the EMIT test result. Patients in the experimental group received $10.00 and a single take-home medication privilege for each opiate-free specimen they provided on Monday or Friday. The take-home methadone dose freed them from having to report to the clinic the following day. In addition, experimental patients participated in the minimum level of clinic procedures during weeks in which they provided opiate-free specimens; these procedures included twice weekly urine testing, twice weekly completion of the symptomatology questionnaire (the PSQ), and a single weekly counseling session.

When experimental patients provided an opiate-positive specimen, they forfeited the $10.00 and the take-home dose of methadone and had to complete the PSQ and provide a urine specimen daily. They also received daily directive counseling—that is, a staff member questioned patients as to when and why they had supplemented with an illicit opiate and reminded them of both the immediate and long-term consequences of continuing their supplemental drug use during the detox.

Data analysis. The detox was divided into three periods for data analysis purposes: baseline during Weeks 2–3; dose reduction during Weeks 4–9; and placebo administration during Weeks 10–12. Week 1 was excluded from data analyses because patients were required to be opiate-positive on admission into the detox and results were not representative of any treatment effects; Week 13 is excluded because of the small number of control patients remaining in treatment. EMIT results were analyzed separately during the three periods of the detox using a *t* test to compare the proportion of opiate-free urines for experimental and control patients; proportional data were adjusted using an arc-sine transformation. For this analysis, missed urine specimens were treated as opiate-positive results. There were no significant differences between the two groups in the number of missed clinic days, so this procedure should not have influenced the results. An additional analysis of EMIT results during the dose reduction period was conducted using a chi-square test for the number of consecutive opiate-free specimens provided by experimental and control patients (data presented in Figure 2).

PSQ scores were analyzed using a similar technique to that described for the EMIT data; symptom complaints for experimental and control patients were analyzed separately during the three periods of the detox using a *t* test to compare mean symptom scores. Attendance and retention during the detox also were analyzed using *t* tests; groups were compared for mean number of missed clinic days and mean number of days prior to treatment termination. In addition, a test for the difference between proportions was conducted on the number of experimental and control patients who completed the 90-day detox.

RESULTS

The effectiveness of the contingency management program was assessed on the target behavior of illicit opiate use as well as a variety of nontargeted outcomes including nonopiate drug use, treatment retention, and symptomatology complaints. Figure 1 summarizes the percentage of opiate-free urine tests (EMIT system) obtained during Weeks 2 through 12 of the detox for the experimental and control groups. During baseline Weeks 2 and 3, approximately 90% of specimens were opiate-free in both groups, $t(18) = 0.42$, n.s. During Weeks 4 through 6, when the contingency management program was first implemented and the methadone dose was still above 15 mg, patients in the experimental group continued to provide 90% or more opiate-free specimens per week while the control group provided 60 to 70% opiate-free urine tests. During subsequent weeks, the percentage of clean urines decreased gradually for both groups and the differences between the two groups diminished; however, the experimental group consistently provided a higher percentage of opiate-free urines than did the control group throughout the intervention. Overall, during the

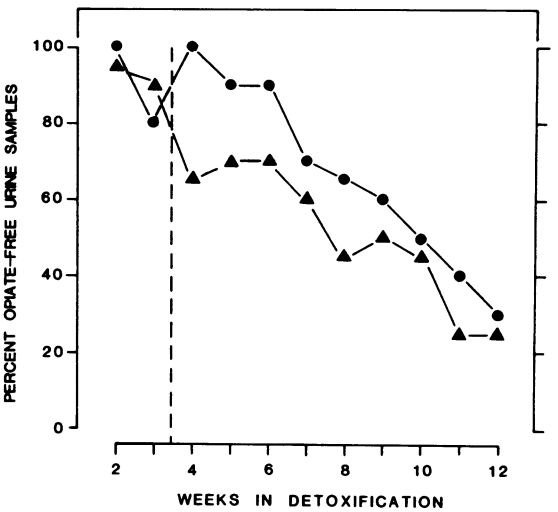

Figure 1. The percentage of opiate-free EMIT urine tests for experimental (●) and control (▲) patients during Weeks 2–12 of the detox. Data points represent the total number of opiate-free specimens provided on Monday and Friday of each week divided by the total number of specimens possible (2 specimens per week × 10 patients = 20 specimens per week). A missed specimen was treated as an opiate-positive result; also, specimens not collected as a result of treatment termination were counted as opiate-positive. The broken line following Week 3 represents the introduction of the contingency management program.

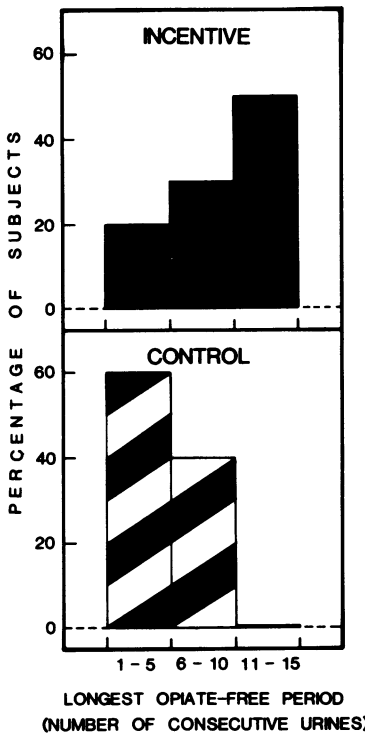

Figure 2. The longest opiate-free period achieved by patients in the experimental and control conditions, expressed as the number of consecutive opiate-free urine specimens. Patients provided two specimens per week during the 10-week intervention period; thus, patients could achieve a maximum of 20 consecutive opiate-free specimens.

methadone dose reduction protocol in Weeks 4 through 9, almost 80% of the specimens from experimental patients were opiate free compared with 60% from control patients, $t(18) = 2.11$, $p < .05$. When patients were ingesting only the cherry syrup during Weeks 10 through 12, the frequency of opiate-free urines was low for both groups and the difference between groups was no longer significant. Only 35% of specimens from the experimental group were opiate free and 25% from the control group, $t(18) = 0.95$, n.s. EMIT results were obtained for a final specimen at the end of the 90-day program for nine patients in each group; two and three specimens were opiate free for the experimental and control groups, respectively.

The differential effectiveness of the contingency

Table 2

Proportion of Specimens with Positive Thin Layer Chromatography (TLC) Urinalysis Results for Opiate and Nonopiate Drugs during Three Periods of the Detox

Weeks in detox	TLC analysis			
	Opiate		Nonopiate	
	Incentive	Control	Incentive	Control
2–3	0.10	0.11	0.05	0.22
4–9	0.14	0.36	0.08	0.30
10–12	0.50	0.73	0.18	0.54

Note. Data represent the number of positive results divided by the total number of samples tested during the indicated weeks for each group.

management program during different periods in the detox is more explicitly illustrated in Figure 2, which shows the longest opiate-free period achieved by each patient in the experimental and control conditions. Because patients provided two specimens per week, a patient remaining opiate free during all 10 weeks of the contingency management program could achieve a maximum of 20 consecutive opiate-free specimens. Five of the 10 patients in the experimental condition provided 11 or more consecutive opiate-free specimens; that is, they remained consistently opiate free during the entire 6-week dose reduction period. These patients did not provide an opiate-positive specimen until their methadone dose had decreased to 0 mg. Of the remaining five patients, three relapsed after the methadone dose had dropped below 15 mg, and only two relapsed during the initial phases of the methadone dose reduction. In contrast, 60% of the patients in the control group provided five or fewer consecutive opiate-free specimens, relapsing prior to their dose reaching 15 mg. None of the control patients provided more than 10 consecutive opiate-free specimens; all had relapsed to their illict opiate use while still receiving methadone at the clinic. A chi-square analysis of this distribution of consecutive opiate-free urines for the two groups was significant, $\chi^2(2, N = 20) = 7.14$, $p < .05$.

Table 2 summarizes the proportion of specimens with positive thin layer chromatography

(TLC) results for opiate and nonopiate drugs during the three periods of the detox. The pattern of TLC opiate-positive test results is consistent with the pattern of EMIT test results presented in Figure 1; overall the TLC and EMIT tests yielded different outcomes for less than 1% of the specimens analyzed for opiates on both systems. There were baseline differences in nonopiate drug use between the two groups of patients; only one patient in the experimental group had a nonopiate positive test result during Weeks 2 and 3, whereas three patients in the control group had a positive test result during this period. Nonopiate drug use remained at baseline levels in both groups during Weeks 4 through 9 of the methadone dose reduction and increased only during the final weeks of the detox when patients were no longer receiving active methadone at the clinic. For both groups, nonopiate drug use was largely confined to benzodiazepines, which accounted for 79% of the nonopiate drug positive results.

Additional indicators of the effectiveness of an intervention are clinic attendance and retention. Seven patients in the experimental condition and only two patients in the control condition remained active at the clinic for the entire 90-day program (test for the difference between proportions; $z = 2.25$; $p < .05$). Nevertheless, differences between the groups on average number of days in treatment were not large; experimental patients completed an average of 85.1 days and control patients stayed an average of 78.8 days, $t(18) = 1.93$, $p < .10$. There were no significant differences in missed clinic days during the baseline and dose reduction periods for the experimental and control patients, $t(18) = 0.41$, n.s.; analysis of attendance during Weeks 10–12 is confounded by the differences in retention between the two groups.

On admission to the program, symptomatology scores for all patients were generally high; withdrawal discomfort then decreased during Weeks 2–3 of the stabilization period. Figure 3 summarizes the symptomatology changes for experimental and control patients throughout the dose reduction period. For both groups, symptomatology scores remained relatively stable during Weeks 5–7 of the detox. Beginning in Week 8, when the dose of methadone had decreased to approximately 10 mg, symptomatology scores increased steadily for the control group; the slight downturn in symptom score during Week 12 resulted from high complaint patients having dropped out. In contrast, patients in the experimental group did not show

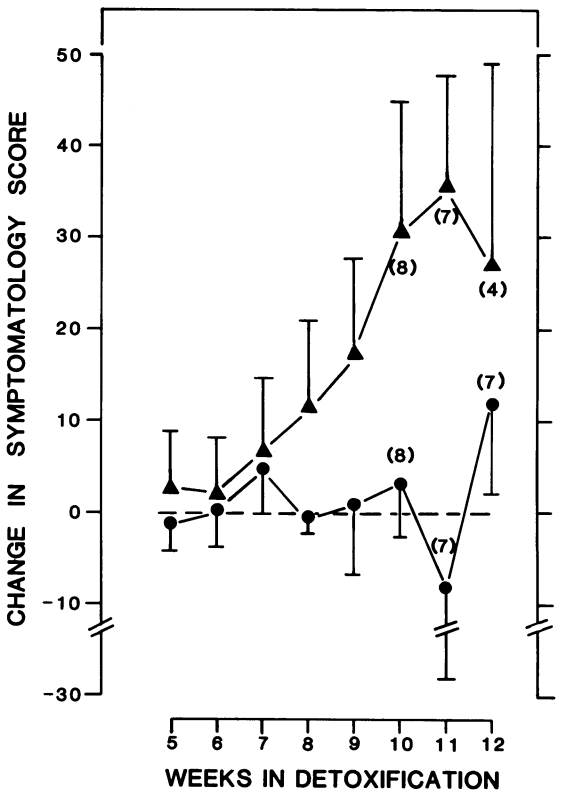

Figure 3. Change in symptomatology score for experimental (●) and control (▲) patients during the contingency management program. At least twice each week, symptomatology scores for individuals were obtained by summing the severity ratings (0–3) of the 60 items of the questionnaire. A change in symptomatology score was calculated for each patient during Weeks 5 through 12 by subtracting the mean symptomatology score in Week 4 (at the start of the dose reduction) from the mean symptomatology score in each successive week. Two patients in each group who did not report any symptoms throughout the entire 90-day period were excluded from the group analysis. Data points represent mean change score for eight patients in each group; vertical lines indicate ±*SEM*. Numbers in parentheses represent the number of patients contributing to the mean score during the last 3 weeks of the detox.

this orderly increase in symptomatology. During Week 11, three of the remaining seven subjects in the experimental group completed the entire PSQ with zeros, resulting in a decreased mean symptomatology score and high variability for the group. In Week 12, these patients once again filled out their PSQs to reflect their current symptoms, resulting in a slight increase in group mean symptomatology score. Symptomatology scores for experimental and control patients were not significantly different during any period of the detox as a result of the wide range of scores and small number of patients in each group.

DISCUSSION

A contingency management program for opiate-free urine specimens slowed the rate of relapse to illicit drug use during outpatient methadone detoxification in comparison to a standard treatment control. The majority of patients in the experimental group remained opiate free during the initial weeks of the dose reduction schedule when the methadone dose was greater than 15 mg. Indeed, half of the experimental patients were opiate free throughout the entire dose reduction period. In contrast, the majority of the patients in the control group relapsed to their illicit drug use prior to their methadone dose reaching 15 mg and none of these patients completed the entire dose reduction period without using additional opiate drugs. These results are similar to those of Hall et al. (1979) in that patients in the incentive condition provided a higher percentage of opiate-free urines and remained opiate free for a longer period of time than subjects in the control condition. Further comparisons are difficult because of the large differences in the length of the detoxification program in the two studies (90 days versus 16 days) and in subject selection criteria.

The contingency management program was effective only as long as patients continued to receive methadone at the clinic; all patients relapsed to their street drugs once methadone was discontinued regardless of the available incentives. This finding has both practical and theoretical implications. On a practical level, the diminishing effectiveness of this program over time represents a limitation in the utility of these procedures to control drug use during detoxification. More research is needed to determine how contingent reinforcement procedures can be combined with other therapies to prevent relapse to illicit drug use. For example, by suppressing illicit opiate use until methadone has been discontinued, incentive procedures provide an opportunity to initiate treatment with naltrexone, a long-acting opiate antagonist which may further postpone or prevent relapse.

On a theoretical level, these results demonstrate that drug use is a function of both the inherent biological reinforcement of drugs and the environmental consequences associated with drug self-administration (Bigelow, Stitzer, Griffiths, & Liebson, 1981; Griffiths, Bigelow, & Henningfield, 1980; Schuster, Renault, & Blaine, 1979). Any single instance of drug self-administration is determined by the relative reinforcing efficacy of the available type and dosage of drug and the efficacy of competing reinforcers and punishers. The present results suggest that the effectiveness of nondrug reinforcers and punishers used in contingency management procedures depends on the relative reinforcing potency of engaging in the targeted behavior, opiate self-administration. As long as patients were maintained on an active methadone dose, the incentives were relatively successful in suppressing illicit opiate use; however, when methadone was no longer provided, the incentives were no longer an effective deterrent to relapse. This suggests that the reinforcing efficacy of illicit opiates decreased during methadone administration. Such an interpretation is supported by research demonstrating that methadone decreases the euphoria associated with supplemental opiate administration (Dole, Nyswander, & Kreek, 1966; Jones & Prada, 1975; McCaul, Stitzer, Bigelow, & Liebson, 1983). However, it is also possible that the potency of the alternative nondrug reinforcers had simply diminished with continued exposure over time.

In our study, we provided a variety of incentives for opiate-free urines, including money, take-home

methadone privileges, and reduced clinic requirements. This "package" of reinforcers was chosen to maximize the impact of the program on a behavior that has traditionally been difficult to manage. With the present design, the relative effectiveness of the various components of this package can not be assessed. Indeed, it seems likely that different components were effective with different patients. For example, the opportunity to receive money may have been most effective with the unemployed patients whereas the take-home methadone dose may have been most effective with the employed patients. Additional research is needed to determine the specificity of the impact of the components of this program.

It is often a concern in clinical interventions that when a single problem behavior is targeted for management, patients will substitute a different, equally problematic behavior for the targeted activity. For example, in the present contingency management program, a decrease in the use of opiate drugs might result in an increase in the use of other nontargeted classes of drugs. The results of our experiment do not support a symptom substitution model in that for experimental patients, rates of nonopiate drug use did not increase during the intervention when opiate drug use was suppressed. Furthermore, for both groups, the pattern of nonopiate drug use was similar to the pattern of opiate use during the detox; nonopiate drug use did not increase substantially until the final weeks of the detox when patients were no longer receiving methadone at the clinic. This outcome is consistent with previous observations for methadone maintenance patients in a number of studies. Use of nontargeted drugs did not increase during contingency management procedures that decreased use of alcohol, illicit opiates, or benzodiazepines (Liebson, Tommasello, & Bigelow, 1978; Stitzer et al., 1981; Stitzer et al., 1982).

In addition to slowing the rate of relapse to illicit opiate use, the contingency management program improved treatment retention. The majority of patients in the experimental group completed the entire 90-day program at the clinic, whereas few patients in the control condition were equally successful. Experimental patients occasionally received the incentive package for providing opiate-free urines during Weeks 10–12. Thus, this persistence in clinic attendance by the experimental patients may be a demonstration of the effectiveness of intermittent reinforcement in maintaining behavior, although other factors may also have operated, such as increased attention from counseling staff for those patients who were more successful in the detox.

Symptomatology scores for patients in the control condition progressively increased following Week 7 of the detox. In contrast, patients' scores in the experimental condition did not increase until the final 2 weeks of the detox. Although these differences were not significant because of the variability in patients' symptom complaints, this differential symptomatology pattern was of interest because patients in both conditions received an identical methadone dose reduction. In an earlier comparison of blind vs. informed clinic-controlled detoxification, Stitzer, Bigelow, and Liebson (1981) also found a different pattern of symptomatology in two groups of subjects receiving identical dose reduction schedules. Symptomatology increased for subjects in the blind condition but not for subjects in the informed condition. These findings suggest that a variety of clinic interventions, such as providing incentives or providing information on the dose reduction schedule, can reduce complaints of withdrawal distress during detoxification. It is possible that this reduction in symptom complaints in our study also contributed to the improved treatment retention for the experimental patients.

Thus, contingency management programs appear to be useful for both experimental and therapeutic applications. For example, it has typically been difficult to determine the effects of pharmacological manipulations during detoxification of an outpatient population because of the high rates of illicit opiate use. By using an incentive procedure to reduce the frequency of extra drug use, extend the length of opiate-free periods, and increase treatment retention, it should be possible to assess the effects of such pharmacological interventions as different dose reduction schedules or the effective-

ness of adjunct medications during detoxification. Perhaps of most importance, by slowing the rate of relapse to illicit opiate use, contingency management programs could provide an opportunity to initiate more long-term preventive treatment for a chronic disorder such as opiate use.

REFERENCES

Bigelow, G. E., Cohen, M., Liebson, I., & Faillace, L. A. (1972). Abstinence or moderation? Choice by alcoholics. *Behaviour Research and Therapy,* **10,** 209–214.

Bigelow, G. E., Liebson, I., & Griffiths, R. R. (1974). Alcoholic drinking: Suppression by a brief time-out procedure. *Behaviour Research and Therapy,* **12,** 107–115.

Bigelow, G. E., Stitzer, M. L., Griffiths, R. R., & Liebson, I. A. (1981). Contingency management approaches to drug self-administration and drug abuse: Efficacy and limitations. *Addictive Behaviors,* **6,** 241–252.

Bigelow, G. E., Strickler, D., Liebson, I., & Griffiths, R. (1976). Maintaining disulfiram ingestion among outpatient alcoholics: A security-deposit contingency contracting procedure. *Behaviour Research and Therapy,* **14,** 378–381.

Canada, A. T. (1972). Methadone in a 30-day detoxification program for narcotic addicts: A critical review. *International Journal of the Addictions,* **7,** 613–617.

Dole, V. P., Nyswander, M. E., & Kreek, M. J. (1966). Narcotic blockade. *Archives of Internal Medicine,* **118,** 304–309.

Griffiths, R. R., Bigelow, G. E., & Henningfield, J. E. (1980). Similarities in animal and human drug-taking behavior. In N. K. Mello (Ed.), *Advances in substance abuse* (pp. 1–90). Greenwich, CT: JAI Press.

Griffiths, R. R., Bigelow, G. E., & Liebson, I. A. (1977). Comparison of social time-out and activity time-out procedures in suppressing ethanol self-administration in alcoholics. *Behaviour Research and Therapy,* **15,** 329–336.

Hall, S. M., Bass, A., Hargreaves, W. A., & Loeb, P. (1979). Contingency management and information feedback in outpatient heroin detoxification. *Behavior Therapy,* **10,** 443–451.

Jones, B. E., & Prada, J. A. (1975). Drug seeking behavior during methadone maintenance. *Psychopharmacology,* **41,** 7–10.

Liebson, I. A., Tommasello, A., & Bigelow, G. E. (1978). A behavioral treatment of alcoholic methadone patients. *Annals of Internal Medicine,* **89,** 342–344.

McCaul, M. E., Stitzer, M. L., Bigelow, G. E., & Liebson, I. A. (1983). Intravenous hydromorphone: Effects in opiate-free and methadone maintained subjects. In L. Harris (Ed.), *Problems of Drug Dependence, 1982, National Institute of Drug Abuse Monograph* (pp. 238–244). Washington, DC: U.S. Government Printing Office.

Polakow, R. L., & Doctor, R. M. (1974). A behavioral modification program for adult drug offenders. *Journal of Research in Crime and Delinquency,* 63–69.

Schuster, C. R., Renault, R. F., & Blaine, J. (1979). An analysis of the relationship of psychopathology to nonmedial drug use. In R. W. Pickens & L. L. Heston (Eds.), *Psychiatric Factors in Drug Abuse* (pp. 1–19). New York: Grune & Stratton.

Stitzer, M. L., Bigelow, G. E., & Liebson, I. A. (1979). Reducing benzodiazepine self-administration with contingent reinforcement. *Addictive Behaviors,* **4,** 245–252.

Stitzer, M. L., Bigelow, G. E., & Liebson, I. A. (1980). Reducing drug use among methadone maintenance clients: Contingent reinforcement for morphine-free urines. *Addictive Behaviors,* **5,** 333–340.

Stitzer, M. L., Bigelow, G. E., & Liebson, I. A. (1981). Comparison of three outpatient methadone detoxification procedures. In L. Harris (Ed.), *Problems of Drug Dependence, 1981, National Institute of Drug Abuse Monograph No. 41* (pp. 239–245). Washington, DC: U.S. Government Printing Office.

Stitzer, M. L., Bigelow, G. E., Liebson, I. A., & Hawthorne, J. W. (1982). Contingent reinforcement of benzodiazepine-free urines: Evaluation of a drug abuse treatment intervention. *Journal of Applied Behavior Analysis,* **15,** 493–503.

Tighe, T. J., & Elliot, R. (1968). A technique for controlling behavior in the natural life setting. *Journal of Applied Behavior Analysis,* **1,** 263–266.

Wilson, B. K., Elms, R. R., & Thomson, C. P. (1974). Low-dosage use of methadone in extended detoxification, *Archives of General Psychiatry,* **31,** 233–236.

Winett, R. A. (1973). Parameters of deposit contracts in the modification of smoking. *Psychological Record,* **23,** 49–60.

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Final acceptance June 13, 1983