

A comparison of contingency management and cognitive-behavioral approaches for stimulant-dependent individuals

Richard A. Rawson¹, Michael J. McCann², Frank Flammino¹, Steven Shoptaw¹, Karen Miotto¹, Chris Reiber¹ & Walter Ling¹

UCLA Integrated Substance Abuse Programs, Los Angeles¹ and Matrix Institute on Addictions, Los Angeles, CA, USA²

ABSTRACT

Aims Previous research has reported that both contingency management (CM) and cognitive-behavioral therapy (CBT) are efficacious interventions for the treatment of stimulant abusers. The present study sought to directly compare the effectiveness of (CM) and (CBT) alone and in combination in reducing stimulant use. **Design** Randomized clinical trial. **Participants** Stimulant-dependent individuals ($n = 171$). **Intervention** CM, CBT or combined CM and CBT, 16-week treatment conditions. CM condition participants received vouchers for stimulant-free urine samples. CBT condition participants attended three 90-minute group sessions each week. **Measurements** Participants were interviewed at baseline and weeks 17, 26 and 52. Measures included psychiatric disorders and alcohol and drug use and concomitant social problems. **Findings** CM procedures produced better retention and lower rates of stimulant use during the study period. Self-reported stimulant use was reduced from baseline levels at all follow-up points for all groups and urinalysis data did not differ between groups at follow-up. While CM produced robust evidence of efficacy during treatment application, CBT produced comparable longer-term outcomes. There was no evidence of an additive effect when the two treatments were combined. **Conclusions** This study suggests that CM is an efficacious treatment for reducing stimulant use and is superior during treatment to a CBT approach. CM is useful in engaging substance abusers, retaining them in treatment and helping them achieve abstinence from stimulant use. CBT also reduces drug use from baseline levels and produces comparable outcomes on all measures at follow-up.

Keywords Cocaine, cognitive behavioral therapy, contingency management, methamphetamine.

Correspondence to: Richard Rawson, UCLA ISAP, 1640 S. Sepulveda Blvd, Suite 200, Los Angeles, CA 90025 USA. E-mail: rrawson@mednet.ucla.edu

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INTRODUCTION

Psychostimulant (cocaine and methamphetamine) dependence is a significant public health problem in the United States [1]. During the past decade, progress has been made in the area of psychological/behavioral treatments for individuals with cocaine dependence [2] and to a much lesser degree for those with methamphetamine (MA) dependence [3,4]. Several studies suggest that MA and cocaine users have comparable responses to psychosocial treatments [3,5,6]. Therefore, the development of psychosocial treatments may be more expeditious if treatments are assessed concurrently with both MA and cocaine users.

The two approaches with the strongest empirical support for the treatment of cocaine users are contingency management techniques, founded on the principles of operant conditioning [7], and cognitive behavioral strategies, based upon social learning principles [8–10]. Stitzer and colleagues [11,12] have documented the efficacy of establishing a contingent relationship between a desired response (e.g. a urine sample free of drug metabolites) and the delivery of a positively reinforcing event (e.g. money or some desired item) as a method for reducing illicit drug use. The delivery of a reinforcer that is contingent upon the reduction of drug use has become known as ‘contingency management’ (CM). Higgins and colleagues [13–16] and Heil and colleagues [17] have

demonstrated that the use of CM contributed to significant reductions in cocaine use when used as part of a behavioral treatment package. They also found sustained positive effects of CM at 6 and 12 months [18,19]. Their work, as well as that of others [20,21], has established CM as a powerful technique for reducing cocaine use.

Marlatt & Gordon [22] introduced the concept of using cognitive-behavioral strategies in treating substance use disorders. Carroll and colleagues conducted studies establishing the efficacy of cognitive behavioral therapy (CBT) for the treatment of cocaine dependence [23,24]. These studies demonstrated that the use of their CBT manual reduced cocaine use over a 1-year period. In fact, their report suggests that CBT produces especially efficacious results at follow-up points. These and other studies [25,26] provide empirical support for use of CBT in treating cocaine dependence. In addition, several reports by the authors and colleagues have provided support for the usefulness of a CBT protocol with MA users [3,6].

In a previous report by the authors [27], a group of methadone-maintained individuals who were also cocaine-dependent were randomized into one of four conditions: CM, CBT, combined CM + CBT and methadone treatment alone. The targeted behavior was cocaine use. This design allowed for the comparison of standardized CM and CBT protocols, alone and in combination, with a no-treatment control group (maintained on methadone, but with no additional treatment for cocaine). Results of this study indicated that the CM procedure produced a substantial reduction in cocaine use during the 16-week intervention period that was sustained over a 52-week post-admission follow-up period. The CBT intervention produced a reduction in self-reported cocaine use during treatment, but urinalysis results and self-reports suggested a less robust in-treatment effect than that produced by CM. However, at the follow-up interviews, especially at the 52-week point, the results suggested that CBT intervention produced equivalent cocaine reductions to the CM technique. While the combined CM + CBT condition did not demonstrate an additive effect, the overall study results clearly provided strong support for the CM approach during and after the treatment period and for the CBT approach at follow-up points.

The present study is an attempt to compare the efficacy of CM and CBT protocols for the treatment of cocaine and MA dependence with a group of individuals whose primary diagnosis is stimulant dependence (i.e. not methadone-maintained for opiate use). The study design and procedures are identical to the previously referenced study with methadone participants, with the following exceptions: (a) the study compares three active treatment conditions CM, CBT and CM + CBT (there is no untreated control); (b) individuals were admitted to the

study for the treatment of both cocaine or MA dependence; and (c) were not concurrently in a methadone-maintenance treatment program.

METHOD

Participants

Participants for this study were 177 stimulant-dependent individuals who met the following inclusion criteria: (a) currently diagnosed as being dependent on cocaine or MA based on Diagnostic and Statistical Manual version IV (DSM-IV) criteria and (b) showing evidence of cocaine or MA use (at least one cocaine- or MA-positive urine sample) during the 2-week screening period. Individuals were ineligible if they were also dependent upon alcohol or benzodiazepines to the point of requiring medically supervised withdrawal, or if they were court-mandated to treatment.

Over the 3-year study period, 420 individuals attended one screening session and signed a consent form. Of this group, 177 individuals completed the 2-week data collection process and were assigned randomly into the study using a preselected random numbers table. This table was locked in the desk of the study director (McCann) and when an individual had completed all baseline data and was ready for randomization, their assignment was given according to this table. Of the 177 study participants, 160 were admitted with a diagnosis of cocaine dependence and 17 with a diagnosis of MA dependence.

After a complete description of the study was given to the participants, written informed consent was obtained. The 177 study participants were assigned randomly into one of the three study conditions: contingency management (CM; $n = 60$), cognitive-behavioral therapy (CBT; $n = 58$) or combined CM and CBT (CM + CBT; $n = 59$). Figure 1 shows the number of participants who were included at all time-points in the study. There were no significant group differences in follow-up rates at any time point.

All interventions lasted 16 weeks. Although a detailed methodology for this study has been reported previously [28], it is summarized below. The CBT therapist had a master's degree in Marriage and Family Therapy and the CM technician had a BA degree. All study activities were conducted under the approval of the Institutional Review Board of the Friends Research Institute, Inc.

Study measures

The baseline data consisted of the Structured Clinical Interview for DSM-IV (SCID) [29], Beck Depression Inventory (BDI) [30] and Addiction Severity Index (ASI) [31]. At weeks 17, 26, and 52 after study initiation, all

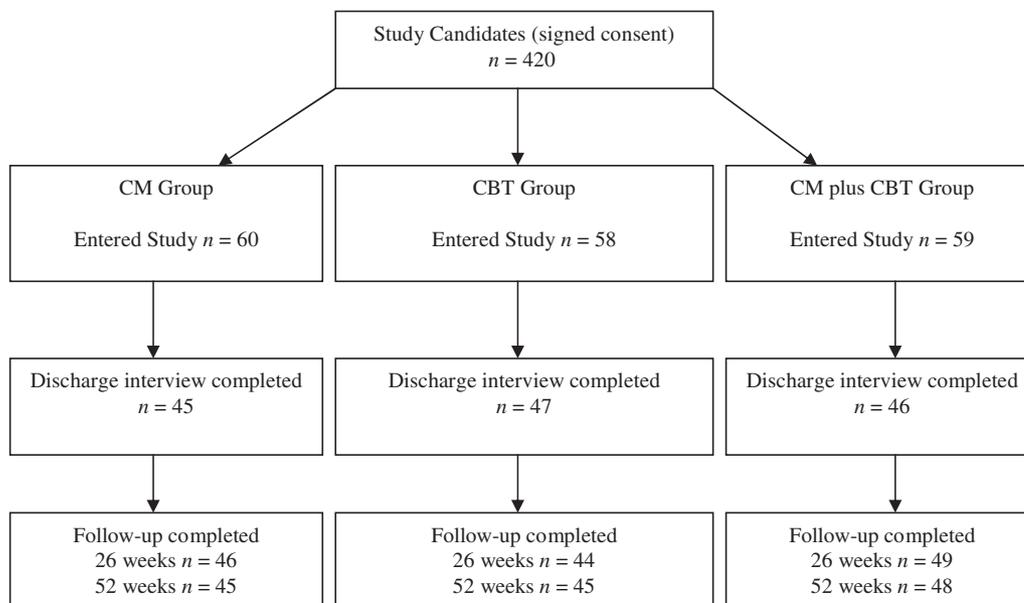


Figure 1 Participant flow—recruitment through follow-up

participants were contacted for assessments using the BDI and ASI.

Urine testing

All participants were required to give three monitored urine samples per week throughout the treatment intervention phase (16 weeks) and at three follow-up interviews. All samples were analyzed immediately for metabolites of cocaine and MA (300-ng cut-off) using EMIT (SYVA) reagent test procedures. If urine samples were missed or refused, the sample was considered positive for the purposes of the CM intervention procedures. One sample each week was also analyzed for opiates, benzodiazepines and marijuana.

Treatment interventions

CM group procedures

Participants in the CM condition were required to provide three urine samples per week and meet briefly (2–5 minutes) with the CM technician. The voucher value was based upon an escalating schedule [13,32]. The voucher value started at \$2.50 per stimulant-negative sample, increasing in value by \$1.25 with each successive negative sample; participants received a \$10 bonus for three consecutive stimulant-negative samples. The maximum voucher value was \$20 per sample. When samples were missed or positive for cocaine or methamphetamine, the value of the voucher was 'reset' to a lower level [13,32]. Participants were encouraged to 'spend' their savings on items that supported drug-free activities.

CBT group procedures

The CBT procedure consisted of 48 group sessions (three per week for 16 weeks). The 90-minute groups had four to eight participants, and each session was guided by a worksheet from a manual [33]. Each worksheet presented a concept or a brief exercise that explained or illustrated an aspect of CBT. All sessions were audiotaped and reviewed by a counseling supervisor on a weekly basis, and feedback was given to the therapist to ensure consistency with the protocol. While there was no quantitative measure of therapist adherence, the session taping and supervision sessions appeared to produce a standardized treatment experience.

CM + CBT group procedures

Individuals in this treatment condition participated in both the CM procedure and the CBT groups. The CBT and CM procedures were delivered in parallel, and no attempt was made to integrate the CM techniques with the CBT therapy.

Termination from the study could be a result of: (1) study completion; (2) missing two consecutive weekly data collection visits; or (3) missing either six consecutive CBT groups or six consecutive urine samples. Therefore, a consistent 2-week absence from protocol participation was the criterion for study termination across all study conditions.

Data analyses

The primary outcome measure was the number of urine samples free of the cocaine/MA metabolite provided over

the course of the trial. In-treatment drug use measures were analyzed using multivariate analyses of variance (MANOVA) techniques. To control for experiment-wise error rates, the Tukey–Kramer honestly significant difference statistical tests were used for all *post-hoc* comparisons.

The second urine toxicology evaluation method employed a criterion of whether study participants achieved 3 consecutive weeks of cocaine/MA abstinence during the active treatment period. Percentages for each group achieving this criterion were compared using χ^2 tests. Pairwise contrasts between groups were conducted using χ^2 tests using alpha levels determined by dividing the conventional alpha of 0.05 by the number of pairwise comparisons made.

Finally, the mean number of days in which the patient reported using cocaine/MA as well as other domains of functioning during the preceding month were contrasted between study groups. Four retrospective 30-day reporting periods occurring at baseline and at the 17-, 26- and 52-follow-up points were analyzed via repeated-measures MANOVA and subsequent Tukey–Kramer tests.

Participant characteristics

The majority of the participants were male (76%), and the mean age was 36.2. Whites accounted for 55% of the sample, African Americans –32%, Hispanics –11% and ‘other’ ethnicities –2%. Almost all the participants had a high school degree or its equivalent (96%) and only 9% reported that they had usually been unemployed over the previous 3 years. None of the between-group differences in participant characteristics was statistically significant, nor were there observed variations in substance use between groups. The MA and cocaine users did not differ significantly on any demographic characteristics. MA users were distributed approximately equally across the three conditions (CM = 7; CM + CBT = 5; CBT = 5). SCID data indicated that all participants met criteria for stimulant dependence and 50% had an Axis I or II diagnosis in addition to stimulant dependence. There were no differences between the three study conditions in the prevalence of psychiatric disorders, with the exception of mood disorders, which were more common among participants in the CBT + CM condition (29%) than in either of the other two conditions (CM = 9%, CBT = 13%).

RESULTS

Treatment retention

There was a significant association between study condition and the mean number of weeks that participants remained in treatment ($F = 6.4$, $df = 2$, 176 , $P < 0.01$), with participants in the CM (mean = 12.6 weeks;

SD = 5.2) and CBT + CM (mean = 12.0 weeks; SD = 5.6) conditions remaining in treatment significantly longer than those assigned to the CBT-only condition (mean = 9.0 weeks; SD = 6.5; Tukey–Kramer P -values were 0.003 and 0.02, respectively). As expected from these retention differences, the number of individuals completing the full 16 weeks of the trial were significantly higher for the CM and CM + CBT groups (63% and 59%, respectively) than for participants in the CBT group (40%; $\chi^2 = 8.37$; $P < 0.02$).

Participation in intervention activities

Participants in the CBT + CM condition attended more CBT sessions (mean = 26.5; SD = 15.3) over the course of the trial than did participants in the CBT-only condition (mean = 19.0; SD = 15.4; $F = 7.0$, $df = 1$, 116 , $P < 0.01$). Participants in CM and CM + CBT groups earned approximately equal amounts from their voucher earnings (\$572 versus \$601, respectively, $P = \text{NS}$).

In-treatment performance

Figure 2 illustrates the mean number of stimulant-free samples by participants’ group assignment. As this figure illustrates, the two groups that received the CM procedure gave more stimulant-free samples during the 16-week trial than did the CBT-only group.

A one-way ANOVA comparing the mean number of stimulant-free samples in each condition across the 16-week trial was statistically significant ($F = 10.0$, $df = 2$, 176 , $P < 0.0001$). Tukey–Kramer *post-hoc* comparisons revealed that the means for both the CM and CBT + CM treatment conditions were significantly higher than for the CBT-only condition (P -values were 0.0008 and 0.0003, respectively).

The percentage of participants achieving abstinence from stimulants for 3 or more consecutive weeks was also associated with treatment condition ($\chi^2 = 15.5$, $df = 2$, $n = 177$, $P < 0.0001$). Pairwise comparisons of the per-

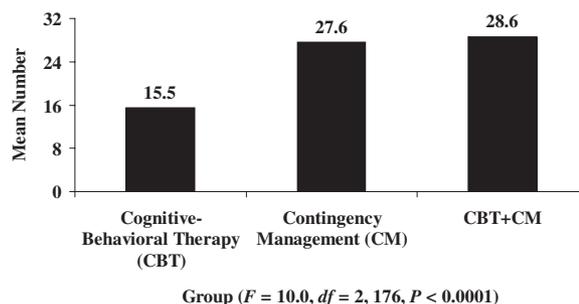


Figure 2 Mean number of stimulant-free urine samples provided during the 16 weeks of treatment, by group

percentages achieving the 3-week criterion revealed significant differences between the CBT (34.5%) versus CM (60.0%; $\chi^2 = 14.9$, $df = 1$, $n = 97$, $P < 0.0001$) and CBT versus CBT + CM conditions (69.5%; $\chi^2 = 18.4$, $df = 1$, $n = 97$, $P < 0.0001$). In comparing the CM and CM + CBT conditions, no significant differences in abstinence were found.

Self-reported stimulant use (baseline versus weeks 17, 26, and 52 ASI data)

Figure 3 illustrates the comparison of the baseline and weeks 17, 26 and 52 self-reports of stimulant use during the month prior to the ASI interviews. These data are taken from the ASI items that record number of days of MA and cocaine use in the previous 30 days.

ANOVA results indicated a significant main effect for all three treatment groups with regard to the reduction in the mean number of days participants reported using cocaine or MA from the month preceding admission interviews to the month preceding the treatment-end (week 17) interviews ($F = 3.9$, $df = 3$, $n = 106$, $P < 0.01$). However, *post-hoc* comparisons revealed that none of the observed differences between treatment groups were statistically significant.

ASI composite scores from baseline to weeks 17 and 52

Finally, in addition to comparing the baseline with week 17 cocaine/MA-use measures, seven ASI composite scores were compared for reductions. A repeated measures ANOVA revealed a significant decline (i.e. improved functioning) in five of the seven ASI domains between the baseline and 17-week follow-up interviews. Specifically, study participants showed statistically significant overall reductions in problems related to employment, alcohol, drugs, family/social, and psychiatric domains. (There were no significant differences in the legal or medical scales.) The only observed between-group effect was for

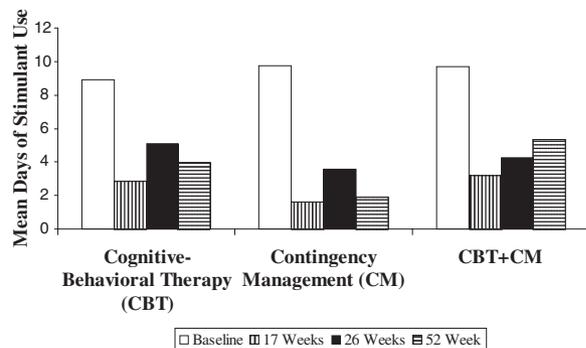


Figure 3 Mean number of days of stimulant use in the previous 30 days at baseline versus at the 17-week, 26-week and 52-week follow-up interviews

psychiatric problems, with CM group participants having significantly lower scores at week 17 than those in the CBT or CBT + CM conditions (CM: 0.12 ± 0.2 ; CBT: 0.22 ± 0.2 ; CBT + CM: 0.24 ± 0.02 ; $P_{group} < 0.05$). There were no significant time \times group interactions. To determine if the ASI composite improvements persisted until week 52, baseline composite scores were compared with week 52 composite scores. (The analysis of week 26 follow-up data paralleled week 52 data.) Out of the seven ASI domains, three domains indicated sustained treatment effects. While the baseline to week 17 improvements in employment and alcohol composite scores were not found at week 52, there was evidence of sustained improvement in drug use, psychiatric severity and family composite scores. There were no significant group or group \times time differences.

Drug use during the follow-up period

At the 17-, 26- and 52-week follow-ups, the urinalysis results no longer showed significant variations by study condition. Figure 4 illustrates the percentages of the stimulant-free samples (of the total collected samples) for the three study groups. (Percentages calculated on total possible samples showed the same relationship.) As illustrated, all three groups had between 67% and 79% stimulant-free samples across all time-points. None of the group comparisons was statistically significantly different.

Combined measures of drug use

We performed a set of point prevalence analyses on follow-up data, as suggested by the work of Higgins and colleagues [19]. They defined point prevalence as a self-report of no cocaine use in the 30 days prior to follow-up assessments, with a corresponding urine sample free of cocaine metabolites. χ^2 tests failed to reveal any statistically significant differences between treatment modalities at any of the follow-up assessments. Repeated-measures categorical modeling (PROC CATMOD) [34] confirmed these findings.

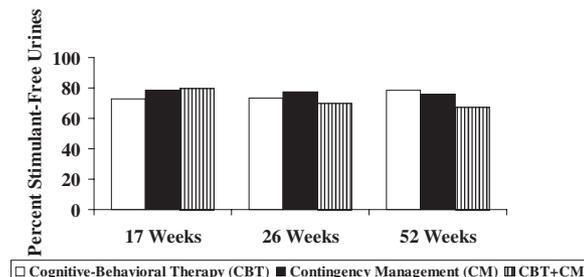


Figure 4 Stimulant-free urine samples as a percentage of collected samples at weeks 17, 26 and 52

DISCUSSION

The results of this study provide support for the efficacy of CM for the treatment of stimulant dependence, both during its 16-week application and at post-treatment follow-up. During the treatment phase, those participants in the two CM treatment arms exhibited greater abstinence as measured by urinalysis and self-report than did the group receiving CBT. The CM groups also remained in treatment longer than the group that received CBT alone, and they substantially reduced their stimulant use from baseline and sustained the reduction to the 52-week follow-up.

Conclusions for the efficacy of CBT are slightly more complex. During the 16-week treatment intervention period there was a higher drop-out rate for CBT group members than for the two groups receiving CM. As a result, the number and percentage of stimulant-free urine specimens during treatment for the CBT group were significantly lower for CBT group members than for the two CM groups. However, self-reported stimulant-use days at week 17 and urinalysis results indicate comparable reductions in stimulant use by all three groups. These measures also indicate that at the 26- and 52-week follow-up points, the CBT group's performance was not significantly different than the performance of CM participants.

The effectiveness of these two treatment modalities in reducing stimulant use during post-treatment periods of up to 1 year confirms the results of earlier studies. Carroll *et al.* [24] found lower cocaine use as measured by the ASI in participants 1 year after receiving CBT versus participants treated with clinical management. Higgins *et al.* [19] found participants who received vouchers contingent on cocaine-negative urine samples plus the community reinforcement approach (CRA) had higher rates of cocaine abstinence in the post-treatment follow-up period than did those individuals who received CRA alone.

ASI composite scores suggest that reductions in stimulant use were associated with sustained reductions in the ASI drug scale and improvements in family and psychiatric scales across all treatment groups. In no instance did there appear to be any additive effect when participants received both the CM and CBT interventions.

The most remarkable finding from these results is the comparability of the findings to those from the previous parallel study with the methadone-maintained group of cocaine-dependent individuals [27]. Although the procedures in both studies were designed to be identical, the samples in the two studies were quite different. At baseline, the methadone-maintained group was almost 10 years older and had considerably less education, much poorer employment status, more medical problems, more severity on almost all ASI composite scales, a

Table 1 Comparable findings between the Rawson *et al.* [27] study and the present study.

1	The CM + CBT group participants attended more CBT sessions than did those in the CBT group
2	Amounts earned by the two groups receiving CM were comparable
3	CM provided comparable numbers of stimulant-free urine samples and percentages of those achieving 3 consecutive weeks of abstinence
4	CBT provided fewer stimulant-free urine samples and lower percentages of those achieving 3 consecutive weeks of abstinence than did CM
5	There were significant and comparable baseline-to-follow-up reductions in self-reported drug use in all conditions
6	Urinalysis results at follow-up were comparable
7	There was no evidence of any additive effect of combining the CM and CBT interventions

history of heroin addiction requiring a daily dose of methadone and a much higher rate of psychiatric comorbidity. In spite of these apparent substantial differences in the two samples and sites in both studies, several of the findings were comparable (see Table 1).

The basic question of efficacy for CM and CBT as treatments for stimulant-dependent populations appears to be answered similarly from the results of the two studies. The in-treatment impact of the CM procedure is profound and produces a greater reduction in illicit stimulant use as measured by urinalysis than did the CBT procedure. The reduction in stimulant use produced by CM is a durable effect that lasts until at least 52 weeks following treatment admission. However, on all self-report measures and on all follow-up measures, CBT appears to produce significant baseline to post-treatment reductions in stimulant use and post-treatment outcomes that are comparable to those produced by CM. When delivered as parallel interventions, there is no additive effect.

The comparability of the study findings with those of the parallel study that included an untreated control group add support to the prior research that supports the efficacy of these two very different psychosocial treatments for the treatment of stimulant dependence. One way to view these results is to say that there are two components to these drug treatments: incentives and information. The CM vouchers provide the incentives for participants to abstain from drugs and are useful in engaging and retaining participants in treatment. CBT provides the information participants may find useful for relapse prevention. Although the manner in which the CM and CBT interventions were combined did not produce an additive effect, it may be necessary to integrate the two procedures in some way to produce an additive effect.

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References

- Office of National Drug Control Policy. *The national drug control strategy, 1998: a ten year plan*. Washington, DC: Office of National Drug Control Policy; 1998.
- Higgins ST, Katz JL. *Cocaine abuse: behavior, pharmacology, and clinical applications*. San Diego: Academic Press; 1998.
- Huber A, Ling W, Shoptaw S, Gulati V, Brethen P, Rawson RA. Integrating treatments for methamphetamine abuse: a psychosocial approach. *J Addict Dis* 1997;16: 41–50.
- Rawson RA, Marinelli-Casey P, Huber A. A multisite evaluation of treatment of methamphetamine dependence in adults. In: Herrell J, Straw R, editors. *Conducting multiple site evaluations in real-world settings*, vol. 94. San Francisco, CA: Jossey-Bass; 2002, pp. 73–87.
- Copeland AL, Sorenson JL. Differences between methamphetamine users and cocaine users in treatment. *Drug Alcohol Depend* 2001;6: 91–5.
- Rawson RA, Huber A, Brethen PB, Obert JL, Gulati V, Shoptaw S, et al. Methamphetamine and cocaine users: differences in characteristics and treatment retention. *J Psychoact Drugs* 2000;3: 233–8.
- Skinner B. *The behavior of organisms: an experimental analysis*. Englewood Cliffs, NJ: Prentice Hall; 1938.
- Bandura A. Self-efficacy: toward a unifying theory of behavioral change. *Psychol Rev* 1977;8: 191–215.
- Bandura A. Self-referent thought: a developmental analysis of self-efficacy. In: Flavell JH, Ross L, editors. *Social cognitive development: frontiers and possible futures*. Cambridge: Cambridge University Press; 1981, pp. 200–39.
- Bandura A. Self-efficacy mechanism in human agency. *Am Psychol* 1984;37: 122–47.
- Stitzer M, Bigelow G, Leibson I. Reducing drug use among methadone maintenance clients: contingent reinforcement for morphine-free urine urines. *Addict Behav* 1980;4: 245–52.
- Stitzer M, Bigelow G, Leibson I, Hawthorne J. Contingent reinforcement for benzodiazepine-free urines: evaluation of a drug abuse treatment intervention. *J Appl Behav Anal* 1982;15: 493–503.
- Higgins T, Budney J, Bickel K, Hughes R, Foerg F, Fenwick W. A behavioral approach to achieving initial cocaine abstinence. *Am J Psychiatry* 1991;148: 1218–24.
- Higgins T, Budney J, Bickel K, Foerg F, Donham R, Badger J. Incentives improve outcome in outpatient behavioral treatment of cocaine dependence. *Arch Gen Psychiatry* 1994;51: 568–76.
- Higgins ST, Alessi SM, Dontona RL. Voucher-based incentives: a substance abuse treatment innovation. *Addict Behav* 2002;27: 887–910.
- Higgins ST, Sigmon SC, Stacey C, Budney AJ. Psychosocial treatment for cocaine dependence: the community reinforcement approach. In: Hofmann SG, Tompson MC, editors. *Treating chronic and severe mental disorders: a handbook of empirically supported interventions*. New York: Guilford Press; 2002, pp. 296–313.
- Heil SH, Higgins ST, Wong CJ, Sigmon SC, Donham R, Anthony S, et al. Further observations on the role of CRA in the CRA and vouchers treatment for cocaine dependence. *Drug Alcohol Depend* 2002;66: S77.
- Higgins ST, Budney AJ, Bickel WK, Foerg FE, Ogden D, Badger J. Outpatient behavioral treatment for cocaine dependence: one year outcome. *Exp Clin Psychopharmacol* 1995;3: 205–12.
- Higgins ST, Wong CJ, Badger GJ, Ogden DE, Dantona RL. Contingent reinforcement increases cocaine abstinence during outpatient treatment and 1 year of follow-up. *J Consult Clin Psychol* 2000;68: 64–72.
- Petry NM, Petrakis I, Trevisan L, Wiredu G, Boutros NN, Martin B, et al. Contingency management interventions: from research to practice. *Am J Psychiatry* 2001;58: 694–702.
- Silverman K, Wong CJ, Higgins ST, Brooner RK, Montoya ID, Contoreggi C, et al. Increasing opiate abstinence through voucher-based reinforcement therapy. *Drug Alcohol Depend* 1996;41: 157–65.
- Marlatt A, Gordon R. *Relapse prevention: maintenance strategies in the treatment of addictive behaviors*. New York: Guilford Press; 1985.
- Carroll KM, Rounsaville BJ, Gordon LT, Nich C, Jatlow P, Bisighini RM, et al. Psychotherapy and pharmacotherapy for ambulatory cocaine abusers. *Arch Gen Psychiatry* 1994;51: 177–87.
- Carroll KM, Rounsaville BJ, Nich C, Gordon LT, Wirtz PW, Gawin FH. One year follow-up of psychotherapy and pharmacotherapy for cocaine dependence: delayed emergence of psychotherapy effects. *Arch Gen Psychiatry* 1994;5: 989–97.
- Shoptaw S, Rawson RA, McCann M, Obert JL. The Matrix model of outpatient stimulant abuse treatment: evidence of efficacy. *J Addict Dis* 1994;13: 129–41.
- Rawson R, Shoptaw S, Obert J, McCann M, Hasson, A, Marinelli-Casey P, et al. An intensive outpatient approach for cocaine abuse treatment: the Matrix model. *J Subst Abuse Treat* 1995;12: 117–27.
- Rawson RA, Huber A, McCann M, Shoptaw S, Farabee D, Reiber C, et al. A comparison of contingency management and cognitive-behavioral approaches for cocaine dependent methadone maintained individuals. *Arch Gen Psychiatry* 2002;59: 817–24.
- Rawson RA, McCann M, Huber A, Shoptaw S. Contingency management and relapse prevention as stimulant abuse treatment interventions. In: Higgins ST, Silverman K, editors. *Motivating behavior change among illicit drug abusers*. Washington, DC: American Psychological Association; 1999, pp. 57–74.
- Spitzer RL, Williams JB, Gibbon M, First MB. *The structured clinical interview for DSM-IV*. Washington, DC: American Psychiatric Press; 1995.
- Beck A. *Depression: causes and treatment*. Philadelphia: University of Pennsylvania Press; 1967.

31. McLellan AT, Kushner H, Metzger D, Peters R, Smith I, Grissom G, et al. The fifth edition of the Addiction Severity Index. *J Subst Abuse Treat* 1992;9: 199–213.
32. Higgins T, Budney J, Bickel K, Hughes R, Foerg F, Badger J. Achieving cocaine abstinence with a behavioral approach. *Am J Psychiatry* 1993;15: 763–9.
33. Rawson RA, Obert JL, McCann MJ, Smith DP, Scheffey E. H. *The neurobehavioral treatment manual*. Beverly Hills, CA: Matrix Institute; 1989.
34. SAS Institute. *SAS user's guide: statistics*, version 8. [Computer software manual]. Cary, NC: Author; 1999.