Published in final edited form as:

Exp Clin Psychopharmacol. 2008 December ; 16(6): 547–554. doi:10.1037/a0014042.

Contingency Management is Efficacious for Cocaine Abusers with Prior Treatment Attempts

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Abstract

Contingency management (CM) is an efficacious treatment of substance use disorders (SUD), and efforts are underway to detect subgroups who may be more or less responsive to CM. A history of prior SUD treatment attempts is associated with greater substance use severity and poor treatment outcomes. This study examined the impact of prior treatment attempts on treatment retention, longest duration of continuous abstinence (LDA), proportion of negative samples submitted, and posttreatment abstinence in a combined sample of cocaine abusers randomized to standard care SUD outpatient treatment (SC) or SC plus CM from 3 published trials. Participants ($N = 393$) were categorized according to self-reported prior treatment attempts (0–1 prior attempts, ≥ 2 prior attempts). Participants with multiple prior treatment attempts were older, had more severe alcohol and cocaine use disorders, and had greater employment-related problems. Participants with 0–1 prior treatment attempts had comparable treatment retention, regardless of treatment condition; however, among participants with multiple prior treatment attempts, retention was greater for CM than SC. A similar, but nonsignificant ($p = .08$) pattern was evident for LDA in which LDA was longer for individuals in CM compared to SC, and this effect was more pronounced for individuals with multiple prior treatment attempts. LDA was a significant predictor of negative (for cocaine, alcohol, and opiates) specimen results at Month 9. The results provide support for CM as an advantageous option for individuals with multiple prior treatment attempts, as well as for substance abuse treatment patients in general.

Keywords

contingency management; cocaine abuse; treatment career; treatment outcome; treatment repeater

Growing awareness of the chronic nature of substance use disorders (SUDs) has led to increased attention to the course of addiction and lifetime treatment trajectories. In a large, heterogeneous sample of 1291 treatment-seeking substance abusers, Dennis, Scott, Funk, & Foss (2005) found a median length of 9 years (interquartile range [IQR] = 4–18) and 3–4 treatment episodes lapsed between first treatment entry and attainment of at least one year of sustained abstinence. Among cocaine abusers presenting for treatment, 50–63% report a history of SUD treatment with an average number of 1–4 prior treatment episodes (Ferri, Gossop, Rabe-Hesketh, & Laranjeira, 2002; Hser, Joshi, Anglin, & Fletcher, 1999; Roberts & Nishimoto, 1996). The above studies suggest that multiple SUD treatment attempts are common and expected given the cyclical nature of the addiction and recovery process (see also Scott, Foss, & Dennis, 2005; McLellan, Lewis, O'Brien, & Kleber, 2000).

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Compared to individuals with no prior treatment attempts, cocaine abusers reporting repeated treatment attempts are typically older, have more extensive and severe cocaine use histories, are more likely to use and to be dependent on other substances, and have more extensive criminal histories (Ferri et al., 2002; Hser, Grella, Hsieh, Anglin, & Brown, 1999). While the profiles of treatment repeaters indicate greater severity compared to treatment naive individuals, the literature is somewhat mixed regarding the impact of prior treatment attempts on current treatment outcomes. In an intensive day treatment setting, Roberts and Nishimoto (1996) found a 6% increase in the odds of treatment dropout for cocaine abusing women with prior treatment attempts compared to those with no prior treatment attempts. However, this association was not present when examined in traditional outpatient or residential treatment programs (Roberts & Nishimoto, 1996). Results of another study (Hser et al., 1999b) in a residential treatment setting suggest that the negative impact associated with prior treatment attempts may dissipate as time retained in treatment increases. The number of prior treatment attempts was negatively associated with 1-year posttreatment abstinence among cocaine abusers. However, this relationship was no longer significant when examining only those participants who completed at least 5 months of treatment (Hser et al., 1999b).

Hser et al. (1999a) investigated treatment process characteristics (e.g., rapport) and psychosocial variables (e.g., social support) associated with prior treatment attempts in outpatient treatment programs. Treatment repeaters were less program compliant according to self-ratings, had lower individual therapy attendance, and had more unmet needs (e.g., health/medical, employment). At the 1-year follow-up, treatment repeaters were more likely to have participated in additional drug treatment programs, reported more criminal activity, and evidenced lower abstinence rates than those without prior treatment attempts. Greater individual therapy attendance and self-rated program compliance were positively associated with cocaine abstinence rates at 1 year, and these associations were stronger among individuals with prior treatment attempts compared to those without prior attempts (Hser et al., 1999a).

The results of the above studies (Hser et al., 1999a; Hser et al., 1999b) suggest that interventions effective in promoting attendance and treatment involvement may be particularly beneficial in yielding improved outcomes for substance abusers with prior treatment attempts. Contingency management (CM) is one such behavioral intervention that has repeatedly demonstrated efficacy in increasing treatment retention and sustaining longer periods of abstinence in cocaine abusers (Lussier, Heil, Mongeon, Badger, & Higgins, 2006; Prendergast, Podus, Finney, Greenwell, & Roll, 2006). Typically applied as an adjunct to standard care (SC), CM typically involves reinforcement of target behaviors through vouchers (exchangeable for retail goods or services) or prizes (Higgins, Budney, & Bickel, 1994; Petry, 2000). Common behavioral targets include abstinence, attendance, and goal-related activities. One study examined the impact of prior treatment history on outcomes in CM treatments. In a secondary analysis of 410 stimulant abusers from eight community-based treatment programs randomized to SC or the same SC plus CM, Killeen and colleagues (2007) compared treatment outcomes based on self-reported history of SUD treatment episodes (0–1 versus ≥ 2) and treatment condition. The primary study findings (Petry et al., 2005b) indicated that participants randomized to CM had more consecutive stimulant-free and alcohol-free drug screens and longer treatment retention than those randomized to SC. The secondary analysis results (Killeen et al., 2007) suggested that multiple prior treatment attempts did not add to or attenuate the these benefits of CM for treatment outcomes, despite the greater severity of addiction problems present in participants with multiple prior treatment attempts.

Because little data are available investigating the impact of prior treatment attempts on treatment outcomes with CM, additional investigation is warranted. For the current study, we sought to examine potential prior treatment attempts by treatment conditions interaction effects on primary treatment outcomes in a large, cocaine abusing sample randomized to either SC or

CM. Extending beyond the Killeen et al. (2007) report, we also evaluated the interaction between treatment history and treatment condition on posttreatment abstinence outcomes.

We hypothesized that individuals with multiple prior treatment attempts would be older and evidence greater severity in baseline psychosocial problems. For proximal treatment effects, we hypothesized that individuals who received CM would achieve longer retention and longer durations of abstinence. Although the Killeen et al. (2007) study did not find significant effects of prior treatment on treatment outcomes, results of two studies (Hser et al., 1999a; Hser et al., 1999b) suggest that interventions effective in increasing participation and compliance may be beneficial for individuals with extensive prior treatment attempts. Thus, we hypothesized that treatment history and treatment condition would interact significantly such that individuals with multiple prior treatment attempts may benefit to a greater degree (longer durations of abstinence and longer treatment retention) from CM than SC than those with 0–1 prior treatments. Last, we examined posttreatment abstinence (Month 9), predicting a significant prior treatment by treatment condition interaction parallel to that expected for the primary treatment outcomes.

Method

Participants

The overall sample consisted of 393 treatment-seeking cocaine abusers who participated in one of three randomized clinical trials conducted at four community SUD treatment clinics between 1998 and 2004 (Petry et al., 2004; Petry, Alessi, Marx, Austin, & Tardiff, 2005; Petry et al., 2006). Age, education level, years of cocaine use, and treatment history were comparable across clinics (all p 's > .05). All studies were similar in the targeted population, treatment intensity and duration, follow-up structure, assessment and outcomes measures, procedures, and clinic setting. Eligibility was established at initiation of intensive outpatient SUD treatment services, and presence of past year cocaine abuse or dependence per the *Diagnostic and Statistical Manual of Mental Disorders (DSM-IV)*; American Psychiatric Association, 1994). All participants were 18 years of age or older. Exclusion criteria included medically uncontrolled mania or psychosis, an inability to understand study procedures, active suicidal ideation, and in recovery for pathological gambling. Research assistants approached 482 clinic patients, of whom 433 consented. After exclusions [unmet study criteria ($n = 26$), refusal to participate ($n = 25$), failure to return to clinic or incomplete evaluation ($n = 38$)], 393 participants remained and were randomized to SC or CM.

Procedure

Data collection procedures were consistent across studies and clinics. Demographic data were collected during an initial 2-hour interview, which included administration of the Addiction Severity Index (ASI; McLellan et al., 1985) and modules (substance use disorder and pathological gambling) of the Structured Clinical Interview for the DSM-IV (SCID-I; First, Spitzer, Gibbon, & Williams, 1996). The number of self-reported lifetime prior alcohol and drug treatment attempts (not limited to the primary drug, but exclusive of 12-Step participation) was gathered from the ASI at study intake. Detoxification attempts not followed by a traditional substance abuse treatment program were not included in this calculation. For the entire sample, the number of prior treatment attempts varied widely (Range = 0–210, IQR = 2–8). The variable was highly skewed ($M = 9$, $Mdn. = 4$, $Mode = 2$). However, this was not the result of a few extreme outliers, and more than 10% of the sample reported 20 or more prior treatment attempts. With the highly skewed nature of the variable in mind, we examined the distribution of the prior treatment variables and explored possible thresholds to dichotomize participants, specifically, 0 versus 1+ and 0–1 versus 2+. The first threshold was rejected due to a limited number of participants (13%) reporting no prior treatment attempts. The modal value of 2 prior

treatments provided a natural threshold, and categories represented individuals with 0–1 prior treatment attempts ($n = 87$) and ≥ 2 prior treatment attempts ($n = 306$). Among individuals with multiple prior treatment attempts, the median number of prior treatment attempts was 5 (IQR = 3.0–11.0).

Breath samples were screened for alcohol (Alco-sensor IV Alcometer; Intoximetrics, St. Louis, MO) and urine samples were screened for opioids and cocaine (OnTrak TesTstiks; Varian Inc., Walnut Creek, CA) at intake and throughout the study intervention. The specimen sample collection schedule was identical across all studies and conditions; however, the total number of sample submitted during treatment differed by treatment condition, (SC: $M = 9.25$, $SD = 5.30$; CM: $M = 11.90$, $SD = 6.00$), $F(1, 391) = 16.91$, $p < .001$, and study (Petry et al., 2004: $M = 9.34$, $SD = 6.09$; Petry et al., 2005a: $M = 12.66$, $SD = 5.83$; Petry et al., 2006: $M = 11.09$, $SD = 5.43$), $F(2, 390) = 10.73$, $p < .001$. Thus, we present data with respect to proportion of negative samples out of total samples submitted, calculated for 100% of the sample. Sample submission rates were comparable across treatment attempt groups (0–1 attempts: $M = 10.33$, $SD = 5.88$; ≥ 2 attempts: $M = 11.35$, $SD = 5.93$), $t(391) = -1.41$, $p = .16$.

Participants provided additional urine and breath samples at the months 1, 3, 6, and 9 following treatment initiation and received payments of \$15–\$35 for completing these evaluations. Self-report measures were also collected at these follow-ups. For the present paper, we focus on data from the most distal follow-up, Month 9. Completion rates for the Month 9 follow-up were 69%, with no differences in the number of completed follow-up evaluations across prior treatment status, treatment conditions, or studies (all p 's $> .05$). The university's Institutional Review Board approved all study procedures, and all subjects provided written informed consent.

Treatments

Following the intake interview, participants in all three trials were randomized into SC or one of two CM conditions. The SC treatments were similar in intensity, structure, and therapeutic orientation across studies and clinics. CM conditions are briefly described below. Additional details on the CM procedures are available from the primary papers (Petry et al., 2004; 2005a; 2006).

Standard Care—SC consisted of group therapy sessions involving psychoeducation, skills-based instruction, and 12-step treatment in an intensive-outpatient SUD treatment format. Treatment intensity and frequency were structured according to the needs of the client (up to 5 hours per day, 3–5 days per week), and gradually reduced over time. Participants were expected to attend one aftercare group session per week for up to 12 months.

Up to 21 sets of breath/urine samples were collected and screened during the 12-week study intervention period. Samples were collected 3 days per week during weeks 1–3, 2 day per week during weeks 4–6, and 1 day per week during weeks 7–12. All study data (including breath/urine sample results) were considered confidential and were not shared with clinic staff; however, participants with positive samples were encouraged to discuss their substance use with counselors.

CM Treatment—CM participants received the same SC described above. In addition, participants received reinforcement for verified abstinence and/or goal-related activity completion. The six CM conditions (2 CM conditions per study) differed in the magnitude of available reinforcement for each target behavior (range = \$80–\$874), reinforcement delivery system (prizes or vouchers), and target behaviors (abstinence and/or goal-related activities; see Table 1). Reinforcement for abstinence was provided when breath/urine samples were negative for alcohol, cocaine, and opioids. Reinforcement for activities was provided when participants

submitted verification that up to 3 activities previously agreed upon with research staff were completed each week (see Petry, Tedford, & Martin, 2001).

Data Analytic Procedure

We compared individuals with multiple versus 0–1 treatment attempts for differences in baseline and substance use characteristics using *t*-tests and Chi-square tests. Nonnormal variables were analyzed using nonparametric tests and similar results were obtained; however, we chose to report the parametric procedures given the robust nature of *t*-tests to normality violations when sample sizes are large (Lumley, Diehr, Emerson, & Chen, 2002). Corrected *t*-values and degrees of freedom are reported when heterogeneous variances were present.

Primary treatment outcome variables (available for 100% of participants) were treatment retention (range = 0–12 weeks), longest duration of objectively-verified continuous abstinence achieved (LDA; range = 0–12 weeks), and proportion of negative samples submitted (out of total number of submitted samples by each participant). LDA was defined as the greatest number of consecutive weeks in which all samples submitted in a given week were negative for alcohol, cocaine, and opioids. Unexcused absences, missed, or positive samples (for one or more drugs) interrupted the sequence of abstinence. Heterogeneous variances across groups were present for the primary treatment outcomes, and although analyses using untransformed variables are reported, analyses were completed using transformed variables (to stabilize variances) with comparable results.

The relation between prior treatment attempts and primary treatment outcomes was examined using separate univariate analyses of covariance (ANCOVA's) due to high correlation between the dependent variables. For the ANCOVA's, prior treatment attempts (0–1 episodes, ≥ 2 episodes) and treatment condition (SC, CM) were entered as independent variables. Baseline variables differing significantly between groups and those known to be associated with substance abuse treatment outcomes were examined as potential covariates. Variables were excluded as covariates if no association with the dependent variables was present, resulting in the exclusion of several variables that differed significantly between groups, including employment status, cocaine and alcohol dependence diagnoses, years of alcohol use, ASI employment scores, and ASI alcohol scores. As recommended by Tabachnick and Fidell (2001), we also excluded potential covariate variables that were strongly correlated with one another, and breath/urine specimen results (positive/negative) collected at study intake was highly correlated with study. Thus, age, years of cocaine use, and study were covariates included in all multivariate analyses. Two multivariate outliers were excluded from the primary treatment outcome analyses.

Logistic regression examined predictors of posttreatment abstinence using Month 9 urine/breath specimen results (negative for alcohol, cocaine, and opioids) as the dependent variable. Covariates (age, years of cocaine use, and study), prior treatment attempts status, treatment condition, and the prior treatment attempts status by treatment condition interaction were entered into the equation at Step 1. Based on prior findings suggesting LDA is a reliable predictor of later abstinence (Higgins, Badger, & Budney, 2000; Petry et al., 2005a), we entered the LDA variable (mean-centered to reduce multicollinearity) and the mean-centered LDA by prior treatment attempts status interaction at Step 2. We conducted the logistic regression twice, first using the available data ($n = 244$), and second with all missing samples coded as positive specimens ($N = 393$). One case (standardized residual > 3.29) was excluded from the missing coded positive analysis. Analyses were conducted using SPSS for Windows (v.15).

Results

Baseline Characteristics

Table 2 presents descriptive data by prior treatment attempt categories. The groups were not equally distributed by study, $\chi^2(2) = 27.12, p < .001$, with an under-representation of participants with 0–1 prior treatment attempts in the Petry et al. (2005a) study. Individuals with ≥ 2 prior treatment attempts were significantly older, were significantly less likely to be employed, had higher rates of alcohol dependence and cocaine dependence, and reported more years of alcohol use and more years of cocaine use than individuals with 0–1 prior treatment attempts. Participants with multiple prior treatment attempts evidenced significantly greater alcohol- and employment-related problems, but were otherwise similar to those with 0–1 prior treatments on baseline ASI variables.

Prior Treatment Attempts and Primary Treatment Outcomes

Table 3 presents primary treatment outcomes by prior treatment status and treatment condition. While controlling for age ($p = .07$), years of cocaine use ($p = .88$), and study ($p = .11$), no main effect of prior treatment attempts was present for the number of weeks retained in treatment, $F(1, 384) = 0.48, p = .49, \eta_p^2 = 0.001$. Compared to SC, CM was associated with longer treatment retention, $F(1, 384) = 6.27, p = .01, \eta_p^2 = 0.016$. A significant prior treatment status by treatment condition interaction was also present, $F(1, 384) = 4.46, p = .04, \eta_p^2 = 0.011$. For individuals with 0–1 prior treatment attempts, treatment retention was comparable for both treatment conditions (Cohen's $d = 0.10$); however, among individuals with multiple prior treatment attempts, CM was associated with improved treatment retention (Cohen's $d = 0.60$).

Results for LDA were similar. While controlling for age ($p = .28$), years of cocaine use ($p = .32$), and study ($p < .001$), no differences in LDA were present between individuals with 0–1 versus multiple prior treatment attempts, $F(1, 384) = 0.56, p = .45, \eta_p^2 = 0.001$. Compared to SC, CM was associated with longer durations of continuous abstinence, $F(1, 384) = 10.30, p = .001, \eta_p^2 = 0.026$. A trend was present for the prior treatment attempts by treatment condition interaction for LDA, $F(1, 384) = 3.12, p = .08, \eta_p^2 = 0.008$. For individuals with 0–1 prior treatments, LDA was 1 week longer for CM compared to SC (CM = 4.19 versus SC = 3.25 weeks; Cohen's $d = 0.26$). However, among those with multiple prior treatment episodes the effect of CM on LDA (CM = 6.12 versus SC = 4.19 weeks; Cohen's $d = 0.67$) was numerically larger compared to the increase observed for participants with 0–1 prior treatments.

For the proportion of negative samples submitted, no significant main effects of prior treatment attempts, $F(1, 384) = 0.87, p = .35, \eta_p^2 = 0.002$, or treatment condition, $F(1, 384) = 0.24, p = .63, \eta_p^2 = 0.001$, were present while controlling for age ($p = .55$), years of cocaine use ($p = .28$), and study ($p < .001$). The treatment attempts by treatment condition interaction was not significant, $F(1, 384) = 2.48, p = .12, \eta_p^2 = 0.006$.

Prior Treatment Attempts and 9 Month Posttreatment Outcomes

Table 3 presents the unadjusted percentages of negative samples submitted at Month 9 by prior treatment attempts and treatment condition for the available data and when all missing samples were coded as positive samples. We describe the results of the logistic regression predicting abstinence at Month 9 using the available data here, but note that either approach yielded similar results. Step 1 (age, years of cocaine use, study, treatment condition, prior treatment status, and prior treatment status by treatment condition interaction) of the logistic regression was statistically significant, $\chi^2(7, n = 244) = 16.23, p = .023$. The addition of Step 2 (mean-centered LDA and the mean-centered LDA by prior treatment status interaction) improved the model, $\chi^2(2, n = 244) = 31.01, p < .001$, and yielded acceptable model fit, Hosmer and Lemeshow goodness-of-fit $\chi^2(8) = 4.63, p = .80$. Classification accuracy for the overall model was 79%.

Significant predictors included years of cocaine use and the centered LDA variable. For each additional year of cocaine use, odds of submitting a negative specimen at the Month 9 follow-up decreased by 5%, 95% Odds Ratio Confidence Interval: 0.908–0.995. LDA was positively associated with negative urine/breath sample results at Month 9. For every 1 week increase in LDA, odds of submitting a negative specimen increased by 21%, 95% Odds Ratio Confidence Interval: 1.10–1.33. Prior treatment attempt status was not associated with Month 9 specimen results using available data as a main effect, nor as an interaction with treatment condition or with LDA (all p 's > .05).

Discussion

As previously established, CM was associated with improved treatment retention and longer durations of abstinence compared to SC. Our focus for the present analyses centered on the impact of prior treatment attempts on treatment outcomes in 393 cocaine abusing participants, and potential interactions between prior treatment and treatment conditions. In contrast to previous work (Killeen et al., 2007) suggesting equivalent benefits of CM treatment regardless of treatment history, our study noted a significant interaction between prior treatment attempts and treatment condition, suggesting a potential benefit of CM over SC for individuals with multiple prior treatment attempts with respect to retention. In contrast to participants with 0–1 prior treatment attempts who achieved similar retention lengths regardless of treatment condition, participants with multiple prior treatment attempts achieved longer retention rates when randomized to CM compared to those in SC and compared to participants with 0–1 prior treatments in either treatment condition. Participants with multiple prior treatment attempts had slightly shorter retention relative to participants with 0–1 prior attempts when in SC. This finding for the SC condition is consistent with previous studies (Hser et al., 1999a; Roberts and Nishimoto, 1996), which suggest substance abusers with multiple treatment episodes respond more poorly to usual care treatment than those without prior treatment.

The improved primary treatment outcomes demonstrated by participants with multiple prior treatment attempts receiving CM are clinically encouraging, as CM may protect against the expected losses in retention for these individuals. A similar pattern (although only a trend) was present for CM to extend the durations of continuous abstinence in participants with multiple prior attempts. These benefits are noteworthy given that extensive treatment history is associated with a host of negative prognostic indicators. Consistent with prior research (Ferri et al., 2002; Hser et al., 1999a), participants with multiple prior treatment attempts in this study were older, evidenced several indicators of more severe substance use disorders, and had more employment-related problems compared to participants with 0–1 treatment attempts. Given the greater severity of problems, treatments, such as CM, that provide consistent feedback and reinforcement for progress may supply the additional parameters necessary for success and retention during primary treatment among individuals who otherwise respond poorly to SC.

Neither prior treatment attempts nor treatment condition were statistically associated with posttreatment abstinence, and contrary to our hypothesis, the interaction between prior treatment attempts and treatment condition was not significant. However, similar to other CM studies (Higgins et al., 2000; Petry et al., 2005a), LDA was a significant predictor of negative specimen results at Month 9. We find these results encouraging, in that a history of multiple treatment attempts does not interfere with the long-term benefits associated with periods of abstinence during treatment. CM studies are not unique in finding an association between duration of abstinence and abstinence at later timepoints. Data from a large heterogeneous sample of substance abusers suggests that the length of abstinence achieved in the first 7 years posttreatment predicts abstinence at the 8th year (Dennis, Foss, & Scott, 2007). The odds of 8th year abstinence increased as the duration of abstinence lengthened up to 3 years (Dennis et al., 2007).

The results of this study are limited by the secondary nature of the analyses, as participants were not randomized to treatment conditions on the basis of treatment history. In addition, self-reported prior treatment attempts may be subject to error, and we did not have objective data available for the duration of stay, type of SUD treatment programs, or prior program completion. The prior treatment attempt categories were chosen based on examination of the distribution of the data and consistency with prior reports (Killeen et al., 2007). The presence of significant differences in substance use disorder severity variables suggests the distinction is clinically meaningful. Future studies may wish to examine additional subgroups, such as individuals with no prior treatment attempts or individuals with high numbers of repeated treatment attempts, as distinct categories.

This study is strengthened by the use of a large, heterogeneous sample of treatment-seeking cocaine abusers recruited from multiple community-based treatment clinics. However, the inclusion of multiple randomized clinical trials may be viewed as both a strength and a weakness of the paper. The use of multiple trials extends generalizability of the findings and implies that the findings are not limited to one trial or one specific CM protocol. On the other hand, the variability across trials in terms of patients and CM conditions requires replication of these effects before conclusive practice guidelines can be drawn from these analyses.

Given evidence that treatment for addictive disorders is best viewed as a long-term and multiply repeated event (Scott et al., 2005; McLellan et al., 2000), patients may need sufficient exposure and opportunity to practice skills that may eventually lead to successful abstinence. Whether CM results in increased coping skill execution or otherwise contributes to treatment-related change processes remains to be seen. This is a topic likely to receive attention in future CM studies as the field moves toward identifying mechanisms of change within specific treatments.

While CM is an efficacious treatment for SUDs in general, detection of subgroups that may benefit from CM to a greater degree, or that typically do not benefit from SC treatments, may enhance the dissemination of CM into routine clinical practice. As noted by Witkiewitz and Marlatt (2008), identification of subgroups for whom SC may not be the best option is necessary, and may advance understanding and effective application of addiction treatments. The present findings suggest that CM may result in improved treatment retention, and possible longer durations of abstinence, for individuals with multiple prior treatments. Overall, the present results provide support for the use of CM with substance abusing individuals with multiple prior treatment attempts.

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Table 1

Features of Contingency Management Conditions by Studies

	Petry et al. (2004)		Petry et al. (2005a)		Petry et al. (2006)	
	CM Group A	CM Group B	CM Group A	CM Group B	CM Group A	CM Group B
Reinforcement						
Maximum Available	\$240	\$80	\$874	\$882	\$455	\$460
Average Earnings	\$68	\$36	\$295	\$335	\$118	\$60
Reinforcement Delivery	Prizes	Prizes	Prizes	Vouchers	Prizes	Prizes
Targeted Behavior	ABS & ACT	ABS & ACT	ABS & ACT	ABS & ACT	ABS Only	ACT Only

Notes: When reinforcement was provided for both verified abstinence and goal-related activity completion, the schedules were independent. CM = Contingency Management, ABS = Abstinence, ACT = Activities.

Table 2

Baseline Characteristics for Individuals by Prior Treatment History

Baseline Variables	Number of Prior Treatment Attempts		<i>p</i>
	0–1 Attempts (<i>n</i> = 87)	≥ 2 Attempts (<i>n</i> = 306)	
Study (%)			<.001
Petry et al. (2004)	51	25	
Petry et al. (2005a)	16	42	
Petry et al. (2006)	33	33	
% Randomized to CM	68	72	.50
% Male	53	49	.56
Ethnicity (%)			.09
African American	42	56	
Caucasian	41	33	
Hispanic	14	10	
Other	3	1	
% Never Married	60	52	.07
% Employed Full/Part-time	75	55	.009
% Cocaine Dependent	77	88	.01
% Alcohol Dependent	31	59	<.001
% Positive Sample at Intake [†]	25	17	.07
Age	33.06 (8.86)	37.25 (7.06)	<.001
Years of Education	11.63 (1.29)	11.60 (1.72)	.90
Years of Cocaine Use	7.63 (7.08)	11.79 (7.42)	<.001
Years of Alcohol Use	11.89 (9.45)	17.16 (9.96)	<.001
Alcohol Severity Index			
Alcohol	0.15 (0.19)	0.25 (0.23)	<.001
Drug	0.17 (0.10)	0.16 (0.09)	.13
Medical	0.17 (0.30)	0.24 (0.34)	.10
Employment	0.62 (0.33)	0.76 (0.27)	<.001
Legal	0.12 (0.20)	0.13 (0.20)	.60
Family/Social	0.20 (0.23)	0.19 (0.23)	.82
Psychiatric	0.25 (0.23)	0.29 (0.24)	.14

Notes. Values listed are means (standard deviations) unless otherwise noted.

[†]To be considered negative, samples tested negative for alcohol, cocaine, and opiates.

Table 3
Treatment Outcomes by Treatment Condition and Prior Substance Abuse Treatment Attempts

Primary Treatment Outcomes	0-1 Prior Treatment Attempts		≥2 Prior Treatment Attempts		Effect Size (η_p^2)			
	SC (n = 28)	CM (n =59)	SC (n = 87)	CM (n = 219)	Prior Treatment	Treatment Condition	Interaction	
Weeks in Treatment	6.18 (3.64)	6.56 (4.09)	5.31 (3.63)	7.59 (3.94)	0.001	0.016*	0.011*	
Longest Duration of Abstinence	3.25 (2.95)	4.19 (4.18)	3.61 (2.99)	6.12 (4.41)	0.001	0.026*	0.008	
Proportion of Negative Samples	0.81 (0.35)	0.75 (0.35)	0.84 (0.30)	0.88 (0.24)	0.002	0.001	0.006	
Month 9 Specimen Results	95% Odds Ratio Confidence Interval							
					Prior Treatment	LDA	Interaction	
	% Negative (Available Samples)	79 (n = 19)	76 (n = 34)	71 (n = 53)	71 (n = 138)	0.26-6.37	1.10-1.33*	0.91-1.62
	% Negative (Missing = Positive)	54 (n = 28)	41 (n = 59)	46 (n = 82)	45 (n = 219)	0.60-4.83	1.13-1.29*	0.97-1.37

Notes. Values represent unadjusted means and standard deviations, unless otherwise specified. SC = Standard Care. CM = SC plus Contingency Management, LDA = Longest Duration of Abstinence (weeks).
* $p < .05$.