



Published in final edited form as:

Drug Alcohol Depend. 2007 March 16; 87(2-3): 288–296.

Regardless of psychiatric severity the addition of contingency management to standard treatment improves retention and drug use outcomes

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Abstract

The relationship between psychiatric severity and substance use disorders treatment outcome was assessed in 393 individuals who received either standard treatment or standard treatment plus contingency management. The sample was divided into groups of low, moderate, and high psychiatric severity based upon baseline Addiction Severity Index psychiatric composite scores. Participants in the high psychiatric severity group reported a greater prevalence of psychiatric hospitalization, psychiatric medications, and suicide attempts, as well as poorer baseline psychosocial functioning. In terms of treatment outcome, a significant interaction between psychiatric severity and treatment modality was found in relation to treatment retention. Participants in the standard treatment condition were more likely to dropout of treatment earlier as psychiatric severity increased, while retention was similar across the psychiatric severity groups in the contingency management condition. Psychiatric severity was not linked to longest duration of abstinence achieved during treatment or adherence with contingency management procedures. Overall, these findings suggest contingency management is an efficacious and appropriate intervention for substance use disordered individuals across a range of psychiatric problems.

Keywords

psychiatric severity; substance use disorders; treatment; contingency management

1. Introduction

Over 50% of the 26 million Americans with a substance use disorder have co-occurring psychiatric problems (Grant et al., 2004; Kessler et al., 1996). Psychiatric severity, a measure of frequency and intensity of psychiatric problems, may negatively impact retention and outcome in substance use disorders treatment (Carroll et al., 1993; Greenfield et al., 1998; McLellan et al., 1983). Contingency management (CM), an efficacious treatment for substance use disorders (Lussier et al., 2006), has not been extensively evaluated with respect to psychiatric severity. Therefore, the aim of this study is to investigate the relationship between psychiatric severity and CM in regards to treatment retention and outcome using data gathered from three clinical trials.

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Psychiatric severity and substance use often have a harmful relationship in which each can influence the other. For example, substance use frequently exacerbates psychiatric symptoms (Hodgins et al., 1999), and conversely, psychiatric symptoms (e.g., negative affect) can precipitate substance use (Tate et al., 2004). As a result, compared to individuals with only a substance use disorder, psychiatrically ill substance abusers experience greater impairment (e.g., social, occupational, psychiatric), more frequent negative life events (e.g., trauma events, incarcerations, medical diseases, hospitalizations), and report greater substance use severity (Angst et al., 2002; Grella, 2003; Rosenberg et al., 2001). These findings suggest a complex clinical presentation when these individuals seek treatment.

Psychiatric severity also appears to be related to treatment outcomes in individuals with substance use disorders. A seminal study by McLellan et al. (1983) with over 700 participants found that psychiatric severity interacted with treatment modality with respect to outcome. Irrespective of treatment modality, patients with high psychiatric severity did poorly in treatment. Meanwhile, patients with low psychiatric severity showed the most improvement, regardless of treatment modality, and treatment outcome for patients with moderate psychiatric severity varied according to patient-treatment characteristics. More recent studies have replicated these findings, with higher psychiatric severity associated with poorer outcome (Charney et al., 2005; Compton et al., 2003; Greenfield et al., 1998). Psychiatrically ill participants in these studies were likely to drop out of treatment earlier and relapse to substance use sooner than less psychiatrically ill participants. Therefore, clinicians must adopt treatment strategies to improve efficacy with this challenging population.

Treatment paradigms based upon the principles of operant conditioning have been highly successful with psychiatrically ill patients (e.g., token economies; Dickerson et al., 2005). Contingency management is an application of operant conditioning in which tangible reinforcement is provided to patients when target behaviors are completed, such as providing drug-free urine samples. When used in conjunction with other therapies, CM has consistently been found to increase both treatment retention and continuous abstinence during treatment (Lussier et al., 2006). For example, in a recent eight site clinical trial, Petry et al. (2005a) found stimulant abusers receiving CM in addition to usual care remained in treatment longer, attended more counseling sessions, and were significantly more likely to achieve 4, 8, and 12 weeks of continuous abstinence than participants in the usual care condition.

Most patients entering substance use disorders treatment have concomitant psychiatric distress, yet the relationship between CM and psychiatric severity has rarely been investigated. Five studies investigated the feasibility of CM in individuals with severe psychiatric problems and found encouraging results. Most of these “proof of concept” studies used within-subjects designs in dual-diagnosis programs. Participants typically had at least one substance use disorder and a diagnosis of bipolar, major depression, schizophrenia, or schizoaffective disorder. Contingency management significantly improved therapy attendance (Carey and Carey, 1990; Helmus et al., 2003) and increased objectively verified drug abstinence (Drebing et al., 2005; Shaner et al., 1997; Sigmon et al., 2000). However, sample sizes were small (n ranged from 2 to 20), with only Carey and Carey (1990) including 53 individuals.

Moving beyond feasibility studies, only one study to date has assessed the relationship between psychiatric severity and CM in regards to treatment outcome (Tidey et al., 1998). In a sample of 123 cocaine dependent outpatients, psychiatric severity was assessed using Addiction Severity Index psychiatric composite scores (ASI; McLellan et al., 1992). Participants were divided into three psychiatric severity groups (i.e., low, moderate, and high). Results indicated that psychiatric severity was not associated with treatment retention or longest duration of cocaine abstinence in either the CM or usual care modalities. However, this study may have suffered from insufficient power to detect interactions between treatment conditions and

psychiatric status as the non-CM condition had only 34 participants divided across the three psychiatric severity levels.

The purpose of this study was to replicate and extend these findings to a larger sample of patients. We hypothesized that increased psychiatric severity may negatively influence retention and longest duration of abstinence for participants receiving standard treatment, as noted by McLellan et al. (1983). We also hypothesized that CM may be particularly effective in improving outcomes among participants with moderate and severe levels of psychiatric distress, as feasibility studies (Carey and Carey, 1990; Helmus et al., 2003; Shaner et al., 1997; Sigmon et al., 2000) have shown efficacy of CM in improving outcomes in dual diagnosis patients.

2. Method

Data for this study were collected during three separate randomized trials investigating the efficacy of CM in addition to standard intensive outpatient substance abuse treatment (Petry et al., 2004, 2005b, 2006). Two trials were multi-site with 2 and 3 community-based substance abuse clinics participating, respectively; the third trial was conducted at a single community-based substance abuse clinic. Study procedures were an adjunct to standard care and did not affect these services. All participants provided written informed consent, approved by the University of Connecticut Health Center's Institutional Review Board. See Petry et al. (2004), Petry et al. (2005b), and Petry et al. (2006) for main outcome results.

2.1 Participants

The sample consisted of 393 individuals. Participants were new admissions to intensive outpatient treatment for substance use disorders, age 18 or older, and met Diagnostic and Statistical Manual of Mental Disorders (DSM-IV; American Psychiatric Association, 1994) criteria for cocaine or opioid abuse or dependence. Exclusionary criteria for all studies were severe dementia, active psychotic disorder (e.g., schizophrenia or bipolar disorder) that was not being adequately controlled by medication, current suicidality, or in recovery for pathological gambling. This latter criterion was imposed because the CM prize reinforcement system has an element of chance that may be considered similar to gambling. Criteria for study entry were least restrictive to increase generalizability of findings.

2.2 Measures

Demographic questionnaire—Background information including age, ethnicity, annual income, marital status, and gender were collected.

Addiction Severity Index—The ASI assesses severity of problems in seven domains including medical status, family/social relationship status, legal status, employment status, psychiatric status, drug use, and alcohol use (McLellan et al., 1992). Composite scores of the seven domains range from 0.00 to 1.00 with higher scores indicative of more severe problems. Overall, interrater reliability, test-retest reliability, and concurrent and discriminant validity are adequate to good in all domains, in a variety of substance abusing populations (Cacciola et al., 1997; McLellan et al., 1992). Psychometric evaluations with severely mentally ill patients have found adequate to good reliability for the psychiatric composite score ($\alpha = .77$ to $.87$; test-retest $r = .71$) and also demonstrate concurrent validity (Appleby et al., 1997; Zanis et al., 1997).

Brief Symptom Inventory (BSI)—The BSI is a reliable and valid 53-item self-report scale assessing recent psychiatric symptoms (Derogatis, 1993). Items are rated on a 5-point scale and a Global Severity Index is derived (BSI-GSI).

Structured Clinical Interview for the DSM-IV (SCID)—Modules of the SCID were administered to assess past year substance use disorders and pathological gambling (First et al., 1996). Interviewers rate each symptom as absent, subclinical, or clinically present. Several studies report good to excellent reliability (e.g., Williams et al., 1992) as well as good concurrent and predictive validity for substance use diagnoses (Kranzler et al., 1996).

2.3 Procedures

Data collection procedures were identical across the three studies and four sites. Following informed consent, participants completed a 2-hour interview. Demographic data were collected, modules from the SCID were given, and the ASI was completed. Breath and urine samples were also collected and screened for alcohol using an Alco-sensor IV Alcometer (Intoximetrics, St. Louis, MO) and opioids and cocaine using OnTrak TesTstiks (Varian, Inc., Walnut Creek, CA), an onsite testing system.

2.3.1 Treatments—After completing the intake assessment, participants were randomly assigned to standard intensive outpatient substance abuse treatment, or the same treatment plus CM.

Standard Treatment: Standard intensive outpatient substance abuse treatment was similar across the clinics and trials. Treatment consisted of group therapy sessions that included relapse prevention, coping and life skills training, AIDS education, and 12-step treatment. Intensive care consisted of group sessions 3–5 days per week and lasted 2–4 weeks depending upon need, followed by gradual reductions in care. Aftercare consisted of 1 group per week for up to 12 months. In addition to standard treatment, all participants were scheduled to submit breath and urine samples 3 days/week during weeks 1–3 (e.g., Monday, Wednesday, Friday), 2 days/week during weeks 4–6 (e.g., Monday and Thursdays, or Tuesdays and Fridays) and 1 day/week during weeks 7–12. Specimens were screened for alcohol, cocaine, and opioids as described earlier. Up to 21 specimens were submitted over the 12-week treatment period. Samples were collected and screened by research staff, who congratulated patients whenever they tested negative and encouraged them to discuss use with clinical staff if they ever tested positive. However, all study samples were considered research data, and not shared with clinical staff.

Contingency Management: All CM participants received standard intensive outpatient treatment as described previously and were monitored for alcohol and drug use using the same urine and breathalyzer procedures. In addition, all CM participants were reinforced for completion of target behaviors. Reinforcement was in either the form of prizes or vouchers, exchangeable for retail goods and services. In each study, CM conditions provided reinforcement that ranged between \$80 and \$882 in prizes or vouchers, and sustained completion of target behaviors lead to increases in reinforcement. The two target behaviors reinforced in these studies were submission of negative toxicology screens for alcohol, cocaine, and opiates and completion of goal-related activities. Each behavior was reinforced independently, although not every CM condition in every study reinforced both behaviors (see below).

Drug abstinence, using urine toxicology and breathalyzer procedures described previously, was reinforced in five out of six CM conditions across the three clinical trials (Petry et al., 2004; 2005b; 2006). In the CM conditions that reinforced abstinence, participants had to test negative for all three substances (i.e., opioids, cocaine, and alcohol) in order to receive reinforcement. The reinforcement value escalated based upon consecutive abstinence, such that the first set of negative samples resulted in \$1 in vouchers (or one drawing from the prize bowl) and then increased with each subsequent negative sample.

Completion of goal-related activities was reinforced in five out of six CM conditions across the three trials (Petry et al. 2004; 2005b; 2006). Based upon a needs assessment, participants identified two to four goal areas from the following: Family, Recovery, Education, Social/Recreational, Transportation, Legal, Health, Personal Improvement, Employment, and Housing. Each week participants choose three specific goal-related activities to complete. They received reinforcement for each completed and objectively verified (e.g., receipt, doctor's note, completed job application) activity, and bonus reinforcement escalated weekly when all three activities were completed. (See Petry et al., 2001 for complete description.)

Petry et al. (2004; 2005b) arranged two CM conditions that reinforced both abstinence and completion of goal-related activities. The two CM conditions in Petry (2004) differed in magnitude of reinforcements: participants could receive either a maximum of \$240 in prizes or a maximum of \$80 in prizes. The difference between the two CM conditions in Petry (2005b) was the type of reinforcement: vouchers or chances to win prizes by drawing from a prize bowl. Petry et al. (2006) had two prize CM conditions in which one reinforced abstinence and the other only reinforced completion of goal-related activities, not abstinence. Hence, not all participants assigned to a CM condition were reinforced for both abstinence and goal-related activity completion. Of the 278 participants assigned to a CM condition, 187 were reinforced for both abstinence and completion of goal-related activities, 44 were reinforced for abstinence only, and 47 were reinforced for completing goal-related activities only.

2.4 Data Analysis

In this current study, based upon the distribution of baseline ASI psychiatric composite scores, participants were divided into tertiles (i.e., low, moderate, high). The low, moderate, and high psychiatric severity groups consisted of individuals with ASI psychiatric composite scores ranging from 0.000 to 0.090 ($n = 132$), 0.091 to 0.400 ($n = 129$), and 0.401 to 1.00 ($n = 132$), respectively. Previous studies investigating psychiatric severity have used this classification method, which resulted in similar cut-points on the composite scores to define psychiatric severity groups (Alterman et al., 1993; Petry and Bickel, 1999; Tidey et al., 1998).

Primary outcomes for each individual study and the present one were weeks retained in treatment and longest duration of continuous abstinence in weeks (LDA). A week of abstinence was defined as a 7-day period during which all breathalyzer and urinalysis samples tested negative for alcohol, cocaine, and opioids. Thus, during the early weeks in the study, more samples would need to be negative to constitute a week of abstinence (Monday, Wednesday, Friday, Monday). In the latter weeks of the study when only one sample per week was collected, samples collected on, for example, Tuesday of week 10 and Tuesday of week 11 would need to test negative to constitute a week of abstinence. Unexcused, missed or positive samples broke a period of abstinence. A secondary outcome investigated was the percent of abstinent samples provided out of 21, the total possible number of samples collected in each study.

Prior to analysis all variables were examined for fit between their distributions and the assumptions of multivariate analysis. The variables LDA, total value of CM reinforcement earned, BSI-GSI, and medical, alcohol, legal, and family ASI composite scores were found to violate the assumptions of multivariate analysis. Total value of CM reinforcement underwent Log 10 transformation. A square root transformation was used to normalize BSI-GSI scores. Longest duration of abstinence and the four ASI composite scores could not be normalized by transformation. A dichotomous variable was created for LDA (0–7 weeks abstinent vs. 8–12 weeks abstinent), and the four ASI composite scores remained untransformed.

The three psychiatric severity groups were compared on baseline variables using ANOVA for continuous measures, chi-square tests for categorical measures, and Kruskal-Wallis test with post hoc Mann-Whitney U tests for the four untransformed ASI composite scores. To determine

the effect of psychiatric severity on substance abuse treatment outcome, ANCOVA was used to investigate number of weeks retained in treatment and percent of abstinent samples provided. Binary logistic regression was used to investigate LDA during treatment (0–7 weeks abstinent vs. 8–12 weeks abstinent). For all of the substance abuse treatment outcome analyses the same independent variables were evaluated: treatment condition, psychiatric severity (low, moderate, and high), annual income, age, gender, ethnicity, DSM-IV alcohol and cocaine dependence, and study. Age and income were entered as continuous variables, and all others were entered as categorical variables. Treatment condition by psychiatric severity was also entered to determine if substance abuse outcome varied by treatment condition across the three levels of psychiatric severity. All analyses were conducted using SPSS 11.0[®] and a p -value of less than 0.05 was considered significant.

3. Results

Table 1 presents baseline demographic and clinical characteristics of the sample divided by psychiatric severity. The following variables differed significantly by severity groups: DSM-IV alcohol dependence, DSM-IV cocaine dependence, treatment study, treatment site, ethnicity, and the following ASI composite scores: medical, alcohol, drug, and family, $p < .05$.

As presented in Table 1, evidence for the criterion validity of the psychiatric severity groupings is supported by significant group differences on history of psychiatric medication prescription, past year inpatient psychiatric hospitalization, and lifetime history of suicide attempt, $p < .05$. Also, current psychological distress (BSI-GSI scores) differed significantly between the groups, $p < .001$. Tukey's post-hoc testing revealed all three groups differed significantly from each other, with participants in the low severity group reporting the least distress and the high severity participants reporting the greatest distress, $p < .001$.

An ANCOVA was performed with weeks retained in treatment as the dependent variable. As shown in Table 2, treatment condition was significantly associated with retention, $p < .001$. The adjusted weeks retained in treatment (\pm standard error [SE]) was 7.4 (0.3) for CM and 5.5 (0.4) for standard treatment. A significant interaction of treatment condition by psychiatric severity was also found for weeks retained in treatment, $F(2,378) = 4.04$, $p < .05$. As seen in Figure 1, as psychiatric severity increases the number of weeks retained in standard treatment decreases; conversely, as psychiatric severity increases, the number of weeks retained rose slightly for patients assigned to CM. No other independent variables were significantly associated with retention, $p > .05$. Although not shown, we also tested a model in which the continuous variable, ASI baseline psychiatric composite score, was substituted for the ordinal psychiatric severity variable. The results of this analysis were consistent with the previous analysis with a significant interaction between psychiatric severity and treatment condition, $F(1,380) = 8.01$, $p < .01$.

Consistent with group differences in retention, the total number of urine/breath samples provided differed between standard and CM treatment conditions, $F(1,380) = 16.8$, $p < .001$, and was on average (\pm SE) 9.3 (0.5) and 11.9 (0.4), respectively. However, the number of samples provided did not differ significantly by psychiatric severity groups, $F(2,380) = 0.7$, $p = .46$. The mean number of samples provided (\pm SE) was 11.0 (0.6), 10.1 (0.6), and 10.7 (0.6) for participants in the low, moderate, and high psychiatric severity groups, respectively.

Sequential binary logistic regression investigated the relationship between psychiatric severity and treatment condition with LDA (0–7 weeks abstinence vs. 8–12 weeks). Study, gender, age, ethnicity, annual income, and DSM-IV alcohol and cocaine dependence were entered in the first step, and then psychiatric severity, treatment condition, and the treatment condition by

psychiatric severity interaction were entered in the second step. The assumption of predictor variable linearity was tested via Box-Tidwell approach with age and annual income, and neither were found to violate this assumption. The Hosmer-Lemeshow goodness-of-fit statistic indicated that the model fit was adequate, $\chi^2(8, n = 392) = 1.53, p = .992$.

Table 3 provides a summary of the final model for LDA. Both steps of variables entered were significant (Step 1: $\chi^2(5) = 18.93, p = .002$; Step 2: $\chi^2(5) = 30.95, p = .001$) and the model correctly predicted classification group (i.e., 0–7 weeks LDA and 8–12 weeks LDA) in 72.2% of the sample. Study and treatment condition were the only variables significantly associated with LDA, $p < .05$. Participants in the Petry et al. (2005b) study were more likely to achieve 8 or more week of continuous abstinence than those in Petry et al. (2004;2006) studies. Participants in the CM conditions were more likely to achieve 8 or more weeks of abstinence than those in the standard treatment condition (see Figure 2). Although treatment condition had a substantial impact on achieving longer durations of abstinence, there was no effect of psychiatric severity on LDA. These analyses were re-run twice, first omitting the CM group that was not reinforced for abstinence (from Petry et al., 2006), and second using a median split of LDA (0–4 weeks abstinent vs. 5–12 weeks abstinent). In both cases, results were similar with study and treatment condition as the only significant variables associated with LDA, $p < .05$ (data not shown).

An ANCOVA was performed with percent of abstinent samples provided out of the total possible as the dependent variable. Independent variables significantly associated with percent of abstinent samples provided were study, $F(2,378) = 16.6, p < .001$, and treatment condition, $F(1,378) = 12.6, p < .001$. The adjusted percent of samples abstinent (\pm SE) was 49.2% (0.02) for CM and 37.8% (0.03) for standard treatment. For study, the adjusted percent of samples abstinent (\pm SE) was 33.3% (0.03) for Petry et al. (2004), 54.3% (0.03) for Petry et al. (2005b), and 42.8% for Petry et al. (2006). Psychiatric severity was not associated with percent of abstinent samples provided, $F(2,378) = 1.89, p = .152$, nor was the interaction between psychiatric severity and treatment condition, $F(2,378) = 1.47, p = .231$.

Within the CM treatment conditions that reinforced goal-related activity completion (N = 5 of 6 CM conditions), we evaluated the relation of psychiatric severity on number of activities completed. The same independent variables were included in the analyses. Treatment study was related to number of activities completed, $F(2,222) = 11.60, p < .001$, with Tukey's post-hoc testing finding that participants in Petry et al. (2005b) completed more treatment-related activities than participants in Petry et al. (2004) and Petry et al. (2006). Psychiatric severity was not significantly related to number of treatment-related activities completed, $F(2,222) = 0.57, p = .557$, which was on average (\pm standard error) 14.9 (1.63), 15.1 (1.81), and 17.0 (1.73) for the low, moderate, and high severity groups, respectively.

Finally, the total amount of CM reinforcement earned for completion of target behaviors (Log 10 transformation) was investigated across the psychiatric severity groups. Amount of CM reinforcement did not differ by psychiatric severity, $F(2, 269) = 2.31, p = .101$, with untransformed mean dollar amount (standard deviation) of \$171.34 (\$231.35), \$208.98 (\$277.67), and \$187.66 (\$267.72) for the low, moderate, and high severity groups, respectively.

4. Discussion

The relationship between psychiatric severity and treatment outcome was assessed in 393 substance use disordered individuals who received either standard treatment or standard treatment plus contingency management. Participants in the three psychiatric severity groupings differed with respect to other indices of lifetime and current psychiatric distress. These differences corroborate the severity of problems faced by these individuals and are

consistent with other reports of psychiatrically ill substance use disordered individuals (e.g., Carroll et al., 1993; Tidey et al., 1998).

A significant interaction between psychiatric severity and treatment modality was found in relation to treatment retention. Participants in the standard treatment condition were more likely to dropout of treatment earlier as psychiatric severity increased. Meanwhile, in the standard treatment plus CM modality, retention was similar across the psychiatric severity groups. Therefore, the addition of CM to standard treatment may assist in retaining individuals in substance use disorders treatment longer, especially for individuals with substantial psychiatric symptomatology, as they are least likely to remain in standard therapy.

The finding regarding weeks retained in treatment is consistent with the earlier prospective CM feasibility studies that report CM increased attendance in dual diagnosis programs (Carey and Carey, 1990; Helmus, et al., 2003). In contrast, Tidey et al. (1998) found weeks retained in treatment was positively associated with CM treatment but unrelated to psychiatric severity. That study paired CM with a different treatment modality, community reinforcement approach, which may have affected retention rates. Community reinforcement approach is an intensive behavioral intervention that typically involves significant others and addresses psychiatric problems that are related to substance use (e.g., mood disorders). It also tends to retain patients better than standard treatment in community settings (Meyers et al., 2005). These factors, plus the potential insufficient power to detect differences beyond main effects, may have minimized differences in outcome between the psychiatric severity groups that may otherwise have occurred in that study. Nevertheless, retention in treatment is important as it is positively related to outcome (Zhang et al., 2003), and CM appears efficacious in engaging individuals across a range of psychiatric severity in treatment longer than standard treatment.

Approximately 35% of participants in the CM condition achieved 8 or more weeks of abstinence while less than 10% of participants in the standard treatment achieved the same duration of abstinence. Severity of psychiatric symptoms did not affect this relationship. Thus, CM appears to retain patients in treatment longer, and minimizes differences in drug use outcomes, regardless of psychiatric severity. A note of caution is warranted as these analyses were based upon the dependent variable, LDA, being dichotomized, and drug use outcomes were confounded by differences in retention rates. Number of samples submitted and LDA are related in part to retention. To address this potential shortcoming, the percentage of negative samples submitted from the total possible collected was examined. Again, results indicate individuals who received CM fared better. Overall, CM improves retention and objective indicators of abstinence, two clinically relevant and face valid measures of treatment outcome (Higgins et al. 2000; Siqueland et al. 2002), in comparison to standard treatment alone, regardless of psychiatric severity status.

The ability of individuals to adhere to CM procedures does not appear to be related to psychiatric severity. Number of urine samples provided and treatment-related activities completed did not vary according to psychiatric severity. Adherence to CM procedures coupled with improved retention suggests that individuals across a range of psychiatric severity were able to comprehend and adhere to the procedures, and that the reinforcement offered was meaningful. Overall, the benefit of this treatment paradigm over the standard treatment, regardless of psychiatric severity, is due to its foundations in operant conditioning. The CM procedures implemented in these studies (i.e., escalating reinforcement for successful completion of the target behaviors, and a reset contingency; Roll et al., 2006) improve treatment outcome.

Psychiatric severity presumably represented a diversity of disorders and experiences in this study. Despite this heterogeneity, standard treatment with CM was more effective than standard

treatment alone in retaining individuals in treatment and promoting eight or more weeks of abstinence. Therefore, CM could be adapted and incorporated in other treatment modalities for the psychiatrically ill. For example, CM has been found efficacious in substance abusing outpatient populations for reinforcing adherence with medication, therapy attendance, and drug abstinence (Carroll et al., 2001; Rhodes et al., 2003) and may be useful in dual diagnosis programs. The application of CM to these target behaviors upon discharge from an inpatient setting could potentially decrease the “revolving door” phenomenon in which individuals have multiple psychiatric hospitalizations over a short period of time (Haywood, et al., 1995).

This study examined patients with a range of psychiatric symptoms and problems as indicated by baseline ASI scores, but the sample does not represent those patients with perhaps the most acute psychiatric problems. Although study criteria excluded individuals with uncontrolled active psychosis and/or current suicidality, only one potential participant was excluded for this reason. Standard clinical practice would most likely require individuals with active psychosis and/or acute suicidality to be stabilized before engaging in outpatient substance use disorders treatment. While this study used a psychometrically supported measure of psychiatric severity, having diagnostic information about other DSM-IV disorders would provide a greater level of detail for analysis of CM outcomes in comorbid individuals. In addition, long-term outcomes were not assessed in this study, so it is unclear if gains made during treatment were sustained. Other studies of substance use treatment have found retention and abstinence during treatment are significant predictors of long-term success (e.g., Bottlender, and Soyka, 2005; Higgins et al., 2000; Petry et al., 2005a).

The multiple treatment sites, broad substance use disorders inclusion criteria, and the differing CM procedures employed could be perceived as limitations of this study. However, these features also increased generalizability. The inclusion of a heterogeneous drug abusing population expands generalization of the findings to the typical type of patients entering non-methadone substance abuse treatment programs. Furthermore, as CM gets transported to community settings that serve diverse populations, it is likely to be implemented in different ways. Site differences were noted in the present study and are to be expected as standard therapy and patient populations vary across clinics (Etheridge et al., 1997). Additional strengths of the study include the relatively large sample of nearly 400 participants and the inclusion of several community-based clinics. The use of psychometrically supported measures and objective verification for substance use were also positive features of the design.

In summary, this study investigated whether psychiatric severity influenced CM treatment outcome in comparison to standard treatment. Individuals with greater psychiatric severity were likely to drop out of standard treatment earlier. Retention was improved when CM was added to standard treatment, and this effect was most pronounced in those with greater psychiatric severity. However, CM was equally effective with respect to engendering longer durations of abstinence, regardless of psychiatric severity level. These findings indicate that CM is an appropriate intervention for substance use disordered individuals across a range of psychiatric problems, and CM is particularly efficacious for improving retention in substance abusers with more severe psychiatric symptoms.

Acknowledgements

We thank the staff and patients at Alcohol and Drug Recovery Centers, Inc., BlueRidge Center, Carlson Recovery Center, and Morris Foundation, Inc. for their support of and participation in this project. This research and preparation of this report was funded in part by National Institutes of Health grants R01-DA13444, R01-DA016855, R01-DA14618, R01-MH60417-Suppl, P50-DA09241, P50-AA03510, T32-AA07290, and General Clinical Research Center Grant M01-RR06192. Additionally, we thank Tressa Hanson for her assistance with data management for this project.

References

- Alterman AI, McLellan AT, Shifman RB. Do substance abuse patients with more psychopathology receive more treatment? *J Nerv Ment Dis* 1993;181:576–582. [PubMed: 8245927]
- American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders*. 4. Author; Washington, DC: 1994.
- Angst J, Sellaro R, Merikangas KR. Multimorbidity of psychiatric disorders as an indicator of clinical severity. *Eur Arch Psychiatry Clin Neurosci* 2002;252:147–152. [PubMed: 12242574]
- Applyby L, Dyson V, Altman E, Luchins D. Assessing substance use in multiproblem patients: Reliability and validity of the Addiction Severity Index in a mental hospital population. *J Nerv Ment Dis* 1997;185:159–165. [PubMed: 9091597]
- Bottlender M, Soyka M. Outpatient alcoholism treatment: Predictors of outcome after 3 years. *Drug Alcohol Depend* 2005;80:83–89. [PubMed: 15878808]
- Cacciola JS, Alterman A, O'Brien CP, McLellan AT. The Addiction Severity Index in clinical efficacy trials of medications for cocaine dependence. *NIDA Research Monograph* 1997;175:182–191. [PubMed: 9467798]
- Carey KB, Carey MP. Enhancing the treatment attendance of mentally ill chemical abusers. *J Behav Ther Exp Psychiatry* 1990;21:205–209. [PubMed: 2086606]
- Carroll KM, Ball SA, Nich C, O'Connor PG, Eagan DA, Frankforter TL, Triffleman EG, Shi J, Rounsaville BJ. Targeting behavioral therapies to enhance naltrexone treatment of opioid dependence: Efficacy of contingency management and significant other involvement. *Arch Gen Psychiatry* 2001;58:755–761. [PubMed: 11483141]
- Carroll KM, Power ME, Bryant KJ, Rounsaville BJ. One-year follow-up status of treatment-seeking cocaine abusers: Psychopathology and dependence severity as predictors of outcome. *J Nerv Ment Dis* 1993;181:71–79. [PubMed: 8426174]
- Charney DA, Palacios-Boix J, Negrete JC, Dobkin PL, Gill KJ. Association between concurrent depression and anxiety and six-month outcome of addiction treatment. *Psychiatr Serv* 2005;56:927–933. [PubMed: 16088008]
- Compton WM, Cottler LB, Jacobs JL, Ben-Abdallah A, Spitznagel EL. The role of psychiatric disorders in predicting drug dependence treatment outcomes. *Am J Psychiatry* 2003;160:890–895. [PubMed: 12727692]
- Derogatis, LR. *Brief Symptom Inventory: Administration, Scoring, and Procedures Manual*. National Computer Systems, Inc; Minneapolis: 1993.
- Dickerson FB, Tenhula WN, Green-Paden LD. The token economy for schizophrenia: Review of the literature and recommendations for future research. *Schizophr Res* 2005;75:405–416. [PubMed: 15885531]
- Drebing CE, Van Ormer A, Krebs C, Rosenheck R, Rounsaville B, Herz L, Penk W. The impact of enhanced incentives on vocational rehabilitation outcomes for dually diagnosed veterans. *J Appl Behav Anal* 2005;38:259–372.
- Etheridge RM, Hubbard RL, Anderson J, Craddock SG, Flynn PM. Treatment structure and program services in the Drug Abuse Treatment Outcome Study (DATOS). *Psychol Addict Behav* 1997;11:244–260.
- First, MB.; Spitzer, RL.; Gibbon, M.; Williams, JBW. *Structured Clinical Interview for DSM-IV Axis I Disorders, Clinician Version*. American Psychiatric Press, Inc; Washington, DC.: 1996.
- Grant BF, Stinson FS, Dawson DA, Chou SP, Dufour MC, Compton W, Pickering RP, Kaplan K. Prevalence and co-occurrence of substance use disorders and independent mood and anxiety disorders. *Arch Gen Psychiatry* 2004;61:807–816. [PubMed: 15289279]
- Greenfield SF, Weiss RD, Muenz LR, Vagge LM, Kelly JF, Bello LR, Michael J. The effect of depression on return to drinking: A prospective study. *Arch Gen Psychiatry* 1998;55:259–265. [PubMed: 9510220]
- Grella CE. Effects of gender and diagnosis on addiction history, treatment utilization, and psychosocial functioning among dually diagnosed sample in drug treatment. *J Psychoactive Drugs* 2003;35:169–179. [PubMed: 12825760]

- Haywood TW, Kravitz HM, Grossman LS, Cavanaugh JL, Davis JM, Lewis DA. Predicting the 'revolving door' phenomenon among patients with schizophrenic, schizoaffective, and affective disorders. *Am J Psychiatry* 1995;152:856–861. [PubMed: 7755114]
- Helmus TC, Saules KK, Schoener EP, Roll JM. Reinforcement of counseling attendance and alcohol abstinence in a community-based dual-diagnosis treatment program: A feasibility study. *Psychol Addict Behav* 2003;17:249–251. [PubMed: 14498820]
- Higgins ST, Badger GJ, Budney AJ. Initial abstinence and success in achieving longer term cocaine abstinence. *Exp Clin Psychopharmacol* 2000;8:377–386. [PubMed: 10975629]
- Hodgins DC, el-Guebaly N, Armstrong S, Dufour M. Implications of depression on outcome from alcohol dependence: A 3-year prospective follow-up. *Alcohol Clin Exp Res* 1999;54:151–157. [PubMed: 10029217]
- Kessler RC, Nelson CB, McGonagle KA, Edlund MJ, Frank RG, Leaf PJ. The epidemiology of co-occurring addictive and mental disorders. *Am J Orthopsychiatry* 1996;66:17–31. [PubMed: 8720638]
- Kranzler HR, Kadden RM, Babor TF, Tennen H, Rounsaville BJ. Validity of the SCID in substance abuse patients. *Addiction* 1996;91:859–868. [PubMed: 8696248]
- Lussier JP, Heil SH, Mongeon JA, Badger GJ, Higgins ST. A meta-analysis of voucher based reinforcement therapy for substance use disorders. *Addiction* 2006;101:192–203. [PubMed: 16445548]
- McLellan AT, Kushner H, Metzger D, Peters R, Smith I, Grissom G, Pettinati H, Argeriou M. The fifth edition of the Addiction Severity Index. *J Subst Abuse Treat* 1992;9:199–213. [PubMed: 1334156]
- McLellan AT, Luborsky L, Woody GEO'Brien CP, Druley KA. Predicting response to alcohol and drug abuse treatments: Role of psychiatric severity. *Arch Gen Psychiatry* 1983;40:620–625. [PubMed: 6847331]
- Meyers RJ, Villanueva M, Smith JE. The community reinforcement approach: History and new directions. *Journal of Cognitive Psychotherapy* 2005;19:247–260.
- Petry NM, Alessi SM, Carroll KM, Hanson T, McKinnon S, Rounsaville B, Sierra S. Contingency management treatments: Reinforcing abstinence versus adherence with goal-related activities. *J Consult Clin Psychol* 2006;74:592–601. [PubMed: 16822115]
- Petry NM, Alessi SM, Marx J, Austin M, Tardif M. Vouchers versus prizes: Contingency management treatment of substance abusers in community settings. *J Consult Clin Psychol* 2005b;73:1005–1014. [PubMed: 16392974]
- Petry NM, Bickel WK. Therapeutic alliance and psychiatric severity as predictors of completion of treatment for opioid dependence. *Psychiatr Serv* 1999;50:219–227. [PubMed: 10030480]
- Petry NM, Martin B, Finocche C. Contingency management in group treatment: A demonstration project in an HIV drop-in center. *J Subst Abuse Treat* 2001;21:89–96. [PubMed: 11551737]
- Petry NM, Peirce JM, Stitzer ML, Blaine J, Roll JM, Cohen A, Obert J, Killen T, Saladin ME, Cowell M, Kirby KC, Sterling R, Royer-Malvestuto C, Hamilton J, Booth RE, MacDonald M, Liebert M, Rader L, Burns R, DiMaria J, Copersino M, Stabile PQ, Kolodner K, Li R. Effect of prize-based incentives on outcomes in stimulant abusers in outpatient psychosocial treatment programs. *Arch Gen Psychiatry* 2005a;62:1148–1156. [PubMed: 16203960]
- Petry NM, Tedford JAustin M, Nich C, Carroll KM, Rounsaville BJ. Prize reinforcement contingency management for treatment of cocaine abusers: How low can we go, and with whom? *Addiction* 2004;99:349–360. [PubMed: 14982548]
- Rhodes GL, Saules KK, Helmus TC, Roll JM, BeShears RS, Ledgerwood DM, Schuster CR. Improving on-time counseling attendance in a methadone treatment program: A contingency management approach. *Am J Drug Alcohol Abuse* 2003;29:759–773. [PubMed: 14713138]
- Roll JM, Huber A, Sodano RChudznyski JE, Moynier E, Shoptaw S. A comparison of five reinforcement schedules for use in contingency management-based treatment of methamphetamine abuse. *Psychological Record* 2006;56:67–81.
- Rosenberg SD, Goodman LA, Osher FC, Swartz M, Essock SM, Butterfield MI, Constantine N, Wolford GL, Salyers M. Prevalence of HIV, hepatitis B and hepatitis C in people with severe mental illness. *Am J Public Health* 2001;91:31–37. [PubMed: 11189820]

- Shaner A, Roberts LJ, Eckman TA, Tucker DE, Tsuang JW, Wilkins JN, Mintz J. Monetary reinforcement of abstinence from cocaine among mentally ill patients with cocaine dependence. *Psychiatr Serv* 1997;48:807–810. [PubMed: 9175190]
- Sigmond SC, Steingard S, Badger GJ, Anthony SL, Higgins ST. Contingent reinforcement of marijuana abstinence among individuals with serious mental illness: A feasibility study. *Exp Clin Psychopharmacol* 2000;8:509–517. [PubMed: 11127422]
- Siqueland L, Critis-Christoph P, Gallop R, Barber JP, Griffin ML, Thase ME, Frank A, Gastfriend DR, Blaine J, Connolly MB, Gladis M. Retention in psychosocial treatment of cocaine dependence: Predictors and impact on outcome. *Am J Addict* 2002;11:24–40. [PubMed: 11876581]
- Tate SR, Brown SA, Unrod M, Ramo DE. Context of relapse for substance-dependent adults with and without comorbid psychiatric disorders. *Addict Behav* 2004;29:1707–1724. [PubMed: 15530716]
- Tidey JW, Mehl-Madrona L, Higgins ST, Badger GJ. Psychiatric symptom severity in cocaine-dependent outpatients: Demographics, drug use characteristics, and treatment outcome. *Drug Alcohol Depend* 1998;50:9–17. [PubMed: 9589268]
- Williams JW, Gibbon M, First MB, Spitzer RL, Davies M, Bors J, Jowes MJ, Kane J, Pope HG Jr, Rounsaville BJ, Wittchen U. The structured clinical interview for DSM-III-R (SCID) II: Multisite test-retest reliability. *Arch Gen Psychiatry* 1992;49:630–636. [PubMed: 1637253]
- Zanis DA, McLellan AT, Corse S. Is the Addiction Severity Index a reliable and valid assessment instrument among clients with severe and persistent mental illness and substance abuse disorders? *Community Ment Health J* 1997;33:213–227. [PubMed: 9211041]
- Zhang Z, Friedmann PD, Gerstein DR. Does retention matter? Treatment duration and improvement in drug use. *Addiction* 2003;98:673–684. [PubMed: 12751985]

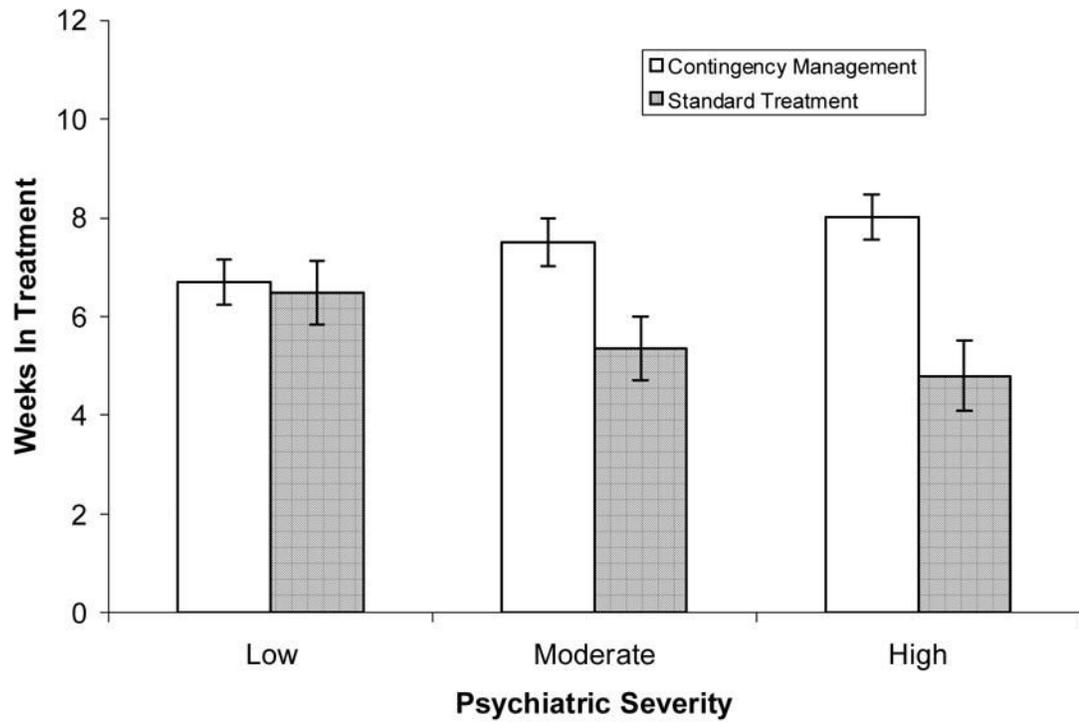


Figure 1. Weeks retained in treatment (\pm standard error) by psychiatric severity group and treatment condition.

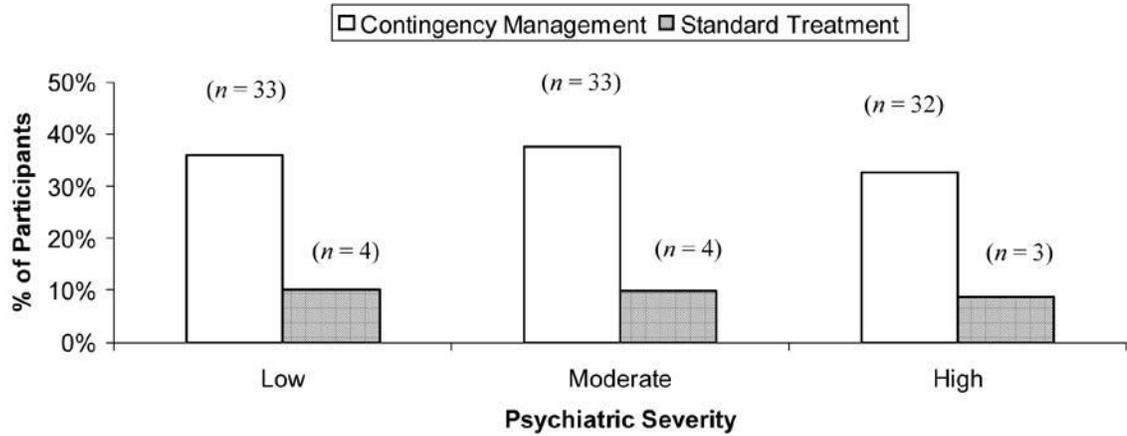


Figure 2.

Percentage of participants achieving eight or more consecutive weeks of abstinence by psychiatric severity group and treatment condition. Note: The n provided is number of participants within the psychiatric severity by treatment condition group associated with achieving eight or more weeks of abstinence.

Table 1

Baseline variables by psychiatric severity level.

Variable	Low Psychiatric Severity (n =132) n (%)	Moderate Psychiatric Severity (n =129) n (%)	High Psychiatric Severity (n =132) n (%)	Statistic (df), p-value
Study				
Petry et al. (2004)	45 (34.1%)	41 (31.8%)	34 (25.8%)	$\chi^2(4) = 13.2, p = .010$
Petry et al. (2005b)	45 (34.1%)	57 (44.2%)	40 (30.3%)	
Petry et al. (2006)	42 (31.8%)	31 (24.0%)	58 (43.9%)	
Treatment Site				
Clinic 1	43 (39.4%)	24 (23.8%)	21 (19.8%)	$\chi^2(6) = 32.5, p = .001$
Clinic 2	21 (19.3%)	31 (30.7%)	14 (13.2%)	
Clinic 3	3 (2.8%)	15 (14.9%)	13 (12.3%)	
Clinic 4	42 (38.5%)	31 (30.7%)	58 (54.7%)	
Treatment Condition				
Standard Treatment	40 (30.3%)	41 (31.8%)	34 (25.8%)	$\chi^2(2) = 1.2, p = .536$
Standard Treatment + CM	92 (69.7%)	88 (68.2%)	98 (74.2%)	
Gender - Male	71 (53.8%)	64 (49.6%)	62 (47.0%)	$\chi^2(2) = 1.2, p = .536$
Marital Status - Never married	76 (57.6%)	68 (52.7%)	67 (50.8%)	$\chi^2(4) = 4.6, p = .331$
Ethnicity				$\chi^2(4) = 17.7, p = .001$
Caucasian	36 (27.3%)	41 (31.8%)	59 (44.7%)	
African-American	80 (60.6%)	76 (58.9%)	50 (37.9%)	
Other	16 (12.1%)	12 (9.3%)	23 (17.4%)	
Employment Status - Full Time	59 (45.0%)	52 (40.6%)	66 (50.0%)	$\chi^2(4) = 3.4, p = .490$
Past-Year DSM-IV Substance Dependence				
Alcohol	55 (41.7%)	81 (62.8%)	72 (54.5%)	$\chi^2(2) = 11.9, p = .003$
Cocaine	103 (78.0%)	116 (89.9%)	117 (88.6%)	$\chi^2(2) = 9.0, p = .011$
Opioid	21 (24.1%)	26 (29.5%)	30 (30.6%)	$\chi^2(2) = 1.1, p = .586$
Prescribed Psychiatric Medication	33 (25.0%)	58 (45.3%)	83 (62.9%)	$\chi^2(2) = 38.4, p = .000$
Psychiatric Hospitalization (past year)	11 (8.3%)	17 (13.2%)	28 (21.2%)	$\chi^2(2) = 9.1, p = .010$
Attempted Suicide - Lifetime	18 (13.6%)	29 (22.5%)	58 (43.9%)	$\chi^2(2) = 32.7, p = .000$
Age (years)	M 36.3 (SD) (7.7)	M 37.3 (SD) (7.4)	M 35.4 (SD) (7.9)	$F(2,390) = 2.16, p = .117$
Annual Earned Income (\$)	9,581 (13,336)	8,431 (11,876)	9,274 (13,024)	$F(2,389) = 0.41, p = .664$
Brief Symptom Inventory - GSI*	0.5 ^a (0.5)	0.8 ^b (0.5)	1.4 ^c (0.8)	$F(2,390) = 68.40, p = .001$
Addiction Severity Index Scores				
Medical	0.13 ^a (0.27)	0.23 ^b (0.33)	0.31 ^b (0.37)	$\chi^2(2) = 20.4, p = .001$
Employment	0.75 (0.27)	0.74 (0.31)	0.71 (0.30)	$F(2,390) = 0.68, p = .51$
Alcohol	0.15 ^a (0.19)	0.25 ^b (0.23)	0.28 ^b (0.24)	$\chi^2(2) = 23.6, p = .001$
Drug	0.14 ^a (0.09)	0.15 ^a (0.08)	0.19 ^b (0.09)	$F(2,390) = 9.63, p = .001$
Legal	0.11 (0.18)	0.13 (0.19)	0.16 (0.24)	$\chi^2(2) = 0.7, p = .72$
Family	0.12 ^a (0.18)	0.17 ^b (0.22)	0.28 ^c (0.24)	$\chi^2(2) = 33.63, p = .001$

Note. Numbers do not always add up to group size due to missing data.

* Variable transformed prior to analysis, untransformed means and standard deviations reported. CM = Contingency Management.

Table 2
Analysis of Covariance of weeks retained in treatment (n = 392).

Source of Variance	<i>df</i>	Mean Square	<i>F</i>	<i>p-value</i>
Age	1	35.39	2.36	.126
Annual Income	1	3.56	0.24	.627
Gender	1	3.01	0.20	.655
Ethnicity	1	4.23	0.28	.596
Alcohol Dependence	1	0.78	0.05	.820
Cocaine Dependence	1	0.21	0.01	.905
Treatment Study	2	19.86	1.32	.268
Treatment Condition	1	279.13	18.57	.001
Psychiatric Severity Group	2	1.01	0.07	.935
Treatment Condition x Psychiatric Severity Group	2	60.74	4.04	.018

Table 3

Logistic regression: Eight or more consecutive weeks of objectively confirmed abstinence during treatment (n =392).

Predictor Variable	Beta	Standard Error	Wald χ^2	df	p	Odds Ratio	(95% CI)
Step 1							
Treatment Study			15.40	2	.001		
Petry et al. (2004)	0.03	0.34	0.09	1	.924	1.03	(0.53 – 2.02)
Petry et al (2005b)	1.00	0.31	10.55	1	.001	2.74	(1.49 – 5.04)
Gender	-0.65	0.26	0.06	1	.803	0.94	(0.56 – 1.56)
Age	0.02	0.02	0.79	1	.374	1.02	(0.98 – 1.05)
Income	0.00	0.00	0.21	1	.649	1.00	(1.00 – 1.00)
Ethnicity	0.08	0.28	0.08	1	.784	1.08	(0.62 – 1.88)
Alcohol Dependence	0.14	0.25	0.33	1	.568	1.15	(0.71 – 1.89)
Cocaine Dependence	-0.36	0.37	0.95	1	.329	0.70	(0.34 – 1.44)
Step 2							
Treatment Condition	-1.85	0.66	7.79	1	.005	6.34	(1.73 – 23.21)
Psychiatric Severity			0.21	2	.899		
Low Severity	0.37	0.83	0.20	1	.655	1.45	(0.29 – 7.28)
Moderate Severity	0.13	0.82	0.03	1	.874	1.14	(0.23 – 5.71)
Treatment Condition x Psychiatric Severity			0.14	2	.931		

Note. Reference groups: Non-Caucasian, Petry et al. (2006), Alcohol Dependence, Cocaine Dependence, Standard Treatment, and High Psychiatric Severity.