



Short communication

A randomized study of contingency management in cocaine-dependent patients with severe and persistent mental health disorders

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ABSTRACT

Background: Contingency management (CM) is efficacious for reducing drug use, but it has rarely been applied to patients with severe and persistent mental health problems. This study evaluated the efficacy of CM for reducing cocaine use in psychiatric patients treated at a community mental health center.

Methods: Nineteen cocaine-dependent patients with extensive histories of mental health problems and hospitalizations were randomized to twice weekly urine sample testing with or without CM for 8 weeks. In the CM condition, patients earned the chance to win prizes for each cocaine-negative urine sample. Patients also completed an instrument assessing severity of psychiatric symptoms pre- and post-treatment.

Results: Patients assigned to CM achieved a mean (standard deviation) of 2.9 (1.7) weeks of continuous cocaine abstinence versus 0.6 (1.7) weeks for patients in the testing only condition, $p = .008$, Cohen's effect size $d = 1.35$. Of the 16 expected samples, 46.2% (27.5) were cocaine negative in the CM condition versus 13.8% (27.9) in the testing only condition, $p = .02$, $d = 1.17$, but proportions of negative samples submitted did not differ between groups. Reductions in psychiatric symptoms were noted over time in CM, but not the testing only, condition, $p = .02$.

Conclusions: CM yielded benefits for enhancing durations of abstinence in dual diagnosis patients, and it also was associated with reduced psychiatric symptoms. These findings call for larger-scale and longer-term evaluations of CM in psychiatric populations.

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1. Introduction

Cocaine use is prevalent in patients with severe and persistent mental illnesses (Mueser et al., 1992; Shaner et al., 1993; Swartz et al., 2006) and negatively impacts outcomes. Substance use in patients with schizophrenia and bipolar disorder has been associated with non-adherence with psychiatric medications (Olsson et al., 2000; Owen et al., 1996), criminal behavior, homelessness, and suicide (Dixon, 1999; Mullen et al., 2000; Wallace et al., 2004).

Contingency management (CM) is efficacious in reducing cocaine use. In CM interventions, patients earn vouchers exchangeable for goods and services or chances to win prizes for submitting negative urine specimens. Controlled studies (Higgins et al., 2003, 2007; Petry et al., 2004, 2005a,b,c, 2007a; Peirce et al., 2006) and meta-analyses (Lussier et al., 2006; Prendergast et al., 2006) demonstrate that CM is efficacious in enhancing abstinence in patients seeking substance use treatment. The vast majority of CM studies, however, exclude patients with significant and acute mental illnesses.

Although CM has not been evaluated extensively in patients with severe mental health problems, the limited data suggest potential benefits. Ries et al. (2004) found positive effects of a CM approach that used direct access to disability payments as a reinforcer for drug-negative samples. Bellack et al. (2006) randomized dual-diagnosis patients to a group-based behavioral intervention that included vouchers for submitting drug-negative samples or supportive group therapy. Patients in the behavioral intervention reduced drug use compared to those in the supportive therapy group, but the content of the therapy also differed, making it difficult to disentangle the impact of CM.

Several studies have employed reversal designs to isolate the effects of CM on reducing illicit drug use in patients with severe mental health problems. Sigmon et al. (2000) and Sigmon and Higgins (2006) found that the proportion of marijuana negative samples increased from about 10% during a baseline phase to 45% when dual-diagnosis patients were reinforced with large magnitude vouchers. In three patients with schizophrenia, Roll et al. (2004) found that only about 8% of samples were cocaine negative during baseline but 23% tested negative when patients earned vouchers for abstinence.

The purpose of this study was, for the first time, to examine the efficacy of CM for reducing cocaine use in dual-diagnosis patients

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at a community mental health center. Patients in both groups were reinforced for submitting samples so attendance was expected to be similar between groups. The hypothesis was that CM would decrease cocaine use, as well as psychiatric symptoms.

2. Methods

2.1. Participants

Participants were 19 patients receiving treatment at an outpatient mental health clinic between December 2011 and June 2012. Inclusion criteria were age ≥ 18 years, cocaine dependence, and English speaking. Potential patients were excluded if they were in recovery from pathological gambling due to potential similarity with the reinforcement procedures (but see Petry et al., 2006).

2.2. Assessments

A research assistant obtained written informed consent, approved by the University's Institutional Review Board, and conducted study procedures. Demographic and treatment history data were abstracted from clinical records. Patients were administered modules derived from the Structured Clinical Interview for the DSM-IV (First et al., 1996), and the Brief Symptom Inventory (BSI; Derogatis, 1993), which evaluates severity of past week psychiatric symptoms on a 5-point scale. The Global Severity Index averages overall severity of symptoms, with scores of 0–4; the mean in healthy controls is 0.30 (SD=0.31; Derogatis, 1993). Participants received a \$10 gift card for completing the baseline evaluation and a \$20 gift card for the post-treatment evaluation. All but one patient per group completed the post-treatment evaluation (see Supplementary materials).

2.3. Randomization

Patients were randomized to one of two 8-week treatments described below after the baseline evaluation. A computerized program stratified patients on opioid dependence and baseline urine sample result.

2.3.1. Standard care. All patients received usual care at the clinic, including individual and group-based psychiatric treatment; substance use treatment was also offered, but not all patients accessed it. In addition, patients were asked to provide urine samples twice per week (e.g., Tuesday and Friday), which were screened for cocaine using iCup (Instant Technologies, Inc., Norfolk, VA). Patients received a \$1 item (e.g., bus token, gift card) for each sample submitted.

2.3.2. Standard care plus CM. These patients received the same care outlined above, including a \$1 item for each sample submitted, regardless of results. Additionally, these patients received draws from an urn, with chances of winning prizes, for each cocaine-negative specimen. Number of draws increased by one for each consecutive negative sample, such that the second consecutive negative sample earned 2 draws, the third 3, etc., up to a maximum of 8 draws. In total, patients could earn up to 100 draws. Draws reset to 1 if a cocaine positive sample was submitted or if no sample was provided on a scheduled testing day. After a reset, draws could again escalate for sustained abstinence.

The urn contained 500 cards. Fifty-percent were winning; 250 stated "Good job!" but were not associated with a prize, and 209 were small prizes (choice of \$1 McDonald's coupons, food items, or bus token). Forty were large prizes, worth up to \$20 (movie tickets, CDs, watches, etc.), and one was a jumbo prize worth up to \$100 (stereo, television, ipod). Cards were replaced following each draw.

A variety of prizes in each category were available, and patients were encouraged to suggest desirable prizes.

2.4. Data analysis

Initially, differences in baseline characteristics were evaluated between conditions. The primary dependent measures were percent cocaine-negative samples and longest duration of cocaine abstinence. A week of abstinence was defined as a 7-day period during which all scheduled samples tested negative; if a patient refused or missed a sample, the string was broken. Proportions of negative samples were analyzed in two ways: first, including submitted samples in the denominator (assuming missing samples missing and hence negative), and second, using anticipated samples in the denominator (e.g., 16 samples, assuming missing samples positive). These analyses allow consideration across the full range of possibilities regarding the impact of missing samples. Univariate analyses of variance evaluated group differences in drug use outcomes, controlling for baseline toxicology result, which is known to impact treatment response (Stitzer et al., 2007; Petry et al., 2004, 2012a).

Hierarchical linear models (HLM) evaluated changes in BSI scores from pre- to post-treatment, taking into account within-participants (Level-1) and between-participants (Level-2) values in estimating missing values. Partial regression coefficients estimated intercept and slopes at each level. Models below predicted outcome variable Y from the Level-1 predictor Time and Level-2 predictor Group:

$$\text{Level-1 model : } Y = \beta_0 + \beta_1 \times (\text{Time}) + R$$

$$\text{Level-2 model : } \beta_0 = \gamma_{00} + \gamma_{01} \times (\text{Group}) + u_0$$

$$\beta_1 = \gamma_{10} + \gamma_{11} \times (\text{Group}) + u_1$$

Group was initially coded 0 for standard care, so a significant effect of Intercept (γ_{10}) would indicate that the slope of individuals receiving standard care differed significantly from 0. Models were re-run with CM coded 0 such that significant effects of γ_{10} indicate changes over time differed significantly from 0 in that condition, and significant effects of slope (γ_{11}) reveal that slopes of the two groups differed. Predictor variables were treated as fixed and entered uncentered, and final estimation of fixed effects (with robust standard errors) is presented.

3. Results

On average, patients were 41.7 ± 9.3 years old with 11.5 ± 4.2 years of education. Forty-two percent were female and 26.3% Hispanic, 68.4% White, and 5.3% multiple races/ethnicities. Primary diagnoses were major recurrent depression (with or without psychotic features) for 47.4%, bipolar disorder for 36.8%, and schizophrenia/schizoaffective disorder in the remaining 15.8%. On average, 6.3 ± 11.3 inpatient hospitalizations for psychiatric disorders were documented, and 63.2% were receiving psychiatric disability payments. In addition to cocaine dependence (100%), 36.8% were alcohol dependent, 15.8% marijuana dependent, and 57.9% opioid dependent, all of whom were receiving methadone or buprenorphine/naloxone maintenance. The two groups did not differ on any baseline characteristics, $ps > .28$.

Number of samples submitted did not differ between groups (Table 1), but less than half the expected samples were remitted. Of submitted samples, about 60% tested cocaine negative, regardless of group. However, CM participants left significantly higher proportions of cocaine negative samples when expected samples were considered, and they achieved significantly longer durations

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