



Published in final edited form as:

J Subst Abuse Treat. 2014 August ; 47(2): 168–174. doi:10.1016/j.jsat.2014.03.001.

Contingency Management for Cocaine Treatment: Cash vs. Vouchers

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Abstract

The efficacy of contingency management (CM) for treating drug abuse is well supported. The most widely used form of CM is voucher-based reinforcement therapy (VBRT), where clients receive an escalating schedule of vouchers that can be redeemed for goods and services for meeting treatment goals. Though generally rejected due to concerns about potential harms to drug using participants, research suggests that cash may be a more effective reinforcer. This three-group randomized trial compared the efficacy of cash-based reinforcement therapy (CBRT) to VBRT and a non-CM condition on cocaine abstinence and treatment attendance; and examined whether CBRT resulted in greater levels of harm than VBRT. Findings indicated that the CBRT was as effective as VBRT when compared to the non-CM condition and that it did not increase rates of drug use, cravings, or high-risk behaviors. Future research should examine potential cost savings associated with a cash-based CM approach as this could have important implications for the wider adoption of the CM model.

Keywords

contingency management; voucher-based reinforcement therapy; cash-based reinforcement; cocaine; substance abuse treatment

1. Introduction

The contingency management approach is among the most-supported strategies for increasing treatment retention and drug abstinence (see Petry, 2000). Its efficacy has been demonstrated in a wide range of clinical substance-using populations, including cocaine and opiate -dependent outpatients (Higgins et al., 1993, 1994; Kirby, Marlowe, Festinger, Lamb, & Platt, 1998; Silverman, Chutuape, Bigelow, & Stitzer, 1996a; Silverman et al., 1996b; Silverman et al., 1998; Silverman, Chutuape, Bigelow, & Stitzer, 1999; Stitzer, Bigelow, &

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Liebson, 1980), marijuana users (Budney, Moore, Rocha, & Higgins, 2006), cigarette smokers (Roll, Higgins, & Badger, 1996; Stitzer, Rand, Bigelow, & Mead, 1986a), and alcoholics (Barnett, Tidey, Murphy, Swift, & Colby, 2011). In a recent meta-analysis, CM interventions significantly outperformed other behavioral interventions and treatment as usual (Lussier, Heil, Mongeon, Badger, & Higgins, 2006).

According to behavioral theory, drug use is viewed as a specific operant behavior that is maintained by the reinforcing effects of the drug. As such, drug use can be changed using procedures such as CM that provide alternate reinforcers to compete with the reinforcing properties of drugs (Bigelow, Stitzer, Griffiths, & Liebson, 1981). To accomplish this, CM protocols arrange the client's environment so that drug use can be readily detected, and provide sufficiently potent alternate reinforcers only when abstinence is verified (Higgins et al., 1994; Petry & Martin, 2002). The key to the effectiveness of these reinforcement-based interventions is the reinforcer. To be an effective reinforcer, an item delivered contingent upon a specific behavior must increase the frequency of the behavior not only in isolation, but in the context of the other reinforcers available for alternate behaviors.

Research has examined the use of a wide selection of reinforcers in CM. These reinforcers have included privileges such as take-home doses of methadone (e.g., McCaul, Stitzer, Bigelow, & Liebson, 1984; Stitzer, Bigelow, Liebson, & Hawthorne, 1982; Stitzer, Iguchi, & Felch, 1992), changes in medication dose and counseling requirements (e.g., Stitzer & Bigelow, 1984; Stitzer, Bickel, Bigelow, & Liebson, 1986b; Stitzer et al., 1992), housing (e.g., Milby et al., 2000, 2003, 2004; Schumacher, Usdan, Milby, Wallace, McNamara, 2000), employment (e.g., Silverman, Svikis, Robles, Stitzer, & Bigelow, 2001), and support for practical needs such as food and recreational activities (e.g., Gruber, Chutuape, & Stitzer, 2000). These studies have provided consistent support for the effectiveness of various reinforcers (see Petry, 2000, for a review). Although each of these reinforcement mediums demonstrates effectiveness, overall they do not have universal applicability due to the circumscribed nature of these populations. For example, although take-home methadone privileges have been found to be a highly effective reinforcer, they are only applicable to methadone maintenance patients. Similarly, CM interventions providing housing, employment opportunities, food, or recreational activities may not be of utility for patients who already have access to these things.

One of the most widely studied CM approaches for treating substance abuse, which may have more universal applicability, is voucher-based reinforcement therapy (VBRT). In VBRT, clients earn vouchers redeemable for goods and services contingent upon proof of drug abstinence (Higgins & Budney, 1993; Higgins et al., 1994; Kirby, Marlowe, Festinger, Garvey, La Monaca, 1999; Silverman et al. 1996a, 1996b; Svikis, Lee, Haug, & Stitzer, 1997). With this schedule, typically tested over 12-week intervals of outpatient treatment, clients provide three urine specimens weekly and receive an escalating schedule of vouchers for successive drug-negative specimens (Higgins et al., 1993, 1994).

Studies using this escalating schedule have achieved impressive results in terms of initiated drug abstinence, treatment retention, and sustained drug abstinence. For example, this schedule of reinforcement has promoted cocaine abstinence initiation in 80% of patients,

retained 60% of patients for 6 months or more, and significantly improved rates of sustained abstinence compared to usual care (Higgins et al., 1991, 1993). Studies have reported that 75% to 85% of patients achieved at least 3 weeks of continuous abstinence (e.g., Higgins et al., 1993, 1994).

A potentially more effective and practical, but understudied, mode of reinforcement is cash payments. Cash reinforcers may have at least two distinct advantages over VBRT and other forms of contingent reinforcement. First, there is evidence to suggest that money may be perceived as more rewarding than other reinforcers. Second, cash incentives may be more cost-effective than vouchers because they do not require maintenance of a “prize store” or exchanges, so they may be more practical for community treatment programs.

Several studies that asked participants to compare or rank their choice of various reinforcers show that cash is typically the most preferred reinforcer (e.g., Amass, Bickel, Crean, Higgins, & Badger, 1996; Reilly, Roll, & Downey, 2000; Schmitz, Rhoades, & Grabowski, 1994; Stitzer & Bigelow, 1978). Moreover, recent findings suggest that cash may be perceived as having more worth than vouchers of the same value. For example, Rosado, Sigmon, Jones, & Stitzer (2005) found that when given a series of hypothetical choices participants consistently selected cash payments at 80% to 90% of the voucher face values. Because it is widely established that reinforcer magnitude affects the efficacy of reinforcer procedures (e.g., Dallery, Silverman, Chutuape, Bigelow, & Stitzer, 2001; Silverman et al., 1999), this suggests that cash may be a potentially more effective mode of reinforcement than vouchers; or alternatively, that one could achieve the same effect size at a lower cost by using cash.

In a series of studies designed to examine the efficacy of cash incentives for increasing study follow-up rates researchers randomly assigned drug abusing outpatients to receive different payment amounts in either cash or gift certificate for attending a research follow-up appointment scheduled 6 months post-admission (Festinger et al., 2005; 2009). In both studies the higher-magnitude *cash* payments led to more attendance, greater study satisfaction, and increased willingness to participate in future studies.

One possible explanation for the greater desirability and potency of cash reinforcers is that cash payments avoid the *exchange delay* inherent in most voucher CM interventions. There is a negative correlation between the efficacy of reinforcement and the delay between the target behavior and the delivery of the reinforcer (Roll, Reilly, & Johanson, 2000). Because the vouchers earned in a typical CM protocol must be exchanged for goods and services, there is typically a delay in exchanging the voucher. Alternatively, cash can be delivered with a very short delay following the behavior (e.g., drug-free urine) and can be exchanged by the participant for a wide variety of goods or services almost immediately.

It is also possible that vouchers may not function as a conditioned reinforcer until they have actually been exchanged for goods or services. That is, vouchers may function as little more than “toy money” or slips of paper until they have actually been transformed into something desired by the participant. All clients have had the experience of using cash to purchase what they desire, which has the effect of making cash a nearly universally conditioned

reinforcer. Similar experiences with vouchers may be required for them to take on comparable conditioned reinforcement properties. Along these lines, some research suggests that cash may function very similarly to a primary or natural reinforcer (e.g., Elliot, Newman, Longe, & Deakin, 2003).

Finally, cash incentives may be more highly valued than vouchers because they can be exchanged with greater flexibility and freedom. In a recent study comparing the effectiveness of cash versus gift certificates for attending a 6-month follow-up, individuals greatly preferred cash to gift certificates (Festinger et al., 2005), reporting that they had greater flexibility and selection with cash, and they were more likely to use it to pay for necessities, such as bills, rather than buying entertainment and luxury items.

Despite their potential benefits, cash incentives have received relatively scant attention in the CM literature (see Rothfleisch, Elk, Rhoades, & Schmitz, 1999). Monetary incentives have been used in CM protocols designed to reduce cigarette smoking (e.g., Alessi, Badger, & Higgins, 2004; Corby, Roll, Ledgerwood, & Schuster, 2000; Lamb, Morral, Galbicka, Kirby, & Iguchi, 2005; Roll & Higgins, 2000; Roll, Higgins, Steingard, & McGinley, 1998; Tidey, O'Neill, & Higgins, 2002); however, their use with illicit drug abusers has been virtually nonexistent (e.g., Reilly et al., 2000; Rothfleisch et al., 1999; Sigmon, Steingard, Badger, Anthony, & Higgins, 2000). Among cigarette smokers, results did not allow for comparisons of the effects of monetary incentives versus non-monetary incentives, because they did not include these comparison groups. As such, comparisons of the effectiveness and safety of providing cash incentives versus vouchers or gift certificates could not be made.

One possible reason for the field's avoidance of this potentially useful and cost-efficient approach to CM is concerns about the ethics and safety of providing cash incentives to substance abusers. This view has been suggested by a number of researchers who have argued that offering cash incentives to drug abuse clients might trigger a relapse to drug use (Fry & Dwyer, 2001; Koocher, 1991; Shaner et al., 1995). Rothfleisch et al. (1999) conducted one of the few studies that examined how drug-dependent clients spent cash incentives. The study examined 48 cocaine-dependent outpatients' self-reports of how they used earned cash incentives. The 48 participants were randomized to earn different amounts of cash. Only 2% of the subjects who earned cash incentives reported spending the money on drugs or alcohol. These findings were further supported by the two Festinger et al. studies discussed above which revealed that the mode of the incentive (cash vs. gift-certificate) had *no* effect on rates of new drug use or perceptions of coercion even when receipt of payment was not contingent upon drug abstinence.

A few studies provide indirect support for the proposition that cash may affect clients' experiences of drug cravings. Two studies reported that employment paychecks produced self-reported cravings for drugs among opiate- and cocaine-dependent individuals (Childress, McLellan, Ehrman, & O'Brien, 1988; O'Brien, Childress, McLellan, & Ehrman, 1990). Similarly, survey studies have revealed that substance abusers commonly rate cash as being a "moderate" or "potent" trigger for relapse to drug use (Kirby, Lamb, Iguchi, Husband, & Platt, 1995; Marlatt & Gordon, 1985; McKay et al., 1997). Several studies have examined a phenomenon termed the "check effect" (see Rosen, 2011 for a review).

According to the check effect, individuals are more likely to use drugs or alcohol around the time that they receive disability checks or other types of payments and they show higher levels of use than individuals who do not receive such payments. Although findings from these studies have generally shown that payments may impact the timing of substance use, they have not demonstrated that payments increase overall levels of drug or alcohol use. Importantly, these studies generally lacked experimental control or a suitable comparison condition involved monetary amounts of several hundred dollars, and examined this issue among psychiatrically impaired patients. The fact remains that there is no empirical evidence that cash actually induces substance use or relapse. Furthermore, there is no research examining the influence of lesser-magnitude cash incentives on relapse potential among drug abusers in a CM study where payment is contingent upon abstinence and drug use reduces future earnings.

Another common objection to the use of cash is that it may be used irresponsibly or might increase high-risk or reckless behaviors. While similar to the belief that cash rewards will lead to new drug use or relapse, the additional concern is related to other or harmful behaviors, such as alcohol use, gambling, or high-risk sexual behavior (e.g., Kirby, Kerwin, & Stahler, 2004). However, such effects have not been empirically studied.

Thus, the major reasons for not using cash reinforcements despite their efficiency and potency have been the assumed ethical improprieties associated with providing money to drug dependent individuals. Such assumptions are pervasive both within the treatment provider and scientific communities, thus many who might actually propose a test of cash reinforcement have been dissuaded even from proposing this to IRBs and treatment programs. For example, in a recent survey conducted with 383 community drug and alcohol treatment providers, about one-third expressed concern that incentives would lead to new drug use, even if they were contingent upon providing drug-free urines (Kirby, Benishek, Dugosh, & Kerwin, 2006). One-third expressed concern that incentives could compromise the treatment process and 24% believed they would undermine clients' intrinsic motivation for abstinence. The current study extends this experimental evaluation of the effectiveness and safety of cash by explicitly testing the comparative effectiveness of cash and voucher reinforcement relative to a non-CM control condition – as well as the comparative incidence and severity of untoward or negative side-effects of cash incentives on clients participating in a CM protocol for cocaine dependence. We hypothesized that cash incentives would be more effective than voucher incentives at helping participants maintain abstinence and attendance within a traditional CM protocol, and that cash incentives would result in no greater rates of engagement in high-risk behaviors.

2. Materials and Methods

2.1 Participants and Procedures

Study participants were recruited from consecutive admissions to an inner city methadone maintenance program located in Philadelphia, Pennsylvania who presented with co-occurring cocaine dependence. Upon entry to the program all clients met with the program intake worker and completed a standard intake assessment and received a medical examination. At this time, all clients who identified themselves as cocaine users or who

tested positive for cocaine use were asked if they would be interested in being contacted by our research group about participation in a clinical research study, and if so to sign a release form. All interested clients who provided written release were approached by our trained onsite research staff within 1-week of entry. At this time, our research staff conducted a brief screen to determine potential participants' eligibility for the study and obtain written informed consent from all eligible individuals. To be eligible for the study clients had to be (1) a new admission to the treatment program (> 2 weeks since admission), (2) meet DSM-IV diagnostic criteria for current cocaine dependence as assessed by the Substance Use Disorders section of the Structured Clinical Interview for DSM-IV (SCID-I), and (3) be capable of providing informed consent.

A total of 222 participants consented and were randomly assigned to one of three study conditions: (1) a voucher-based contingency management condition (VBRT, $n = 71$), (2) a cash-based contingency management condition (CBRT, $n = 73$), and a non-contingency management control condition ($n = 78$). Participants in all three conditions were asked to complete a brief demographics questionnaire to obtain information on age, race, gender, ethnicity, and drugs of choice, and the Recent Behavior Scale which measures engagement in high-risk behavior.

All participants were required to report to a designated research office in the clinic 3 times per week to provide a urine specimen that was directly observed by a same-gender RA. All specimens were temperature and adulterant tested to ensure veracity, and then immediately tested. Participants were immediately informed of their results. When specimens tested positive for cocaine, the RAs informed the individuals, thanked them for attending the appointment, reminded them of their next appointment, and encouraged them to remain abstinent. When specimens were tested drug-negative, the RAs would congratulate the participants, deliver incentives (as appropriate to the assigned condition), and remind them of their next appointment.

2.2 Study Conditions

2.2.1 Voucher-Based CM Condition—Participants in the voucher condition earned voucher incentives according to the schedule developed by Higgins et al. (1993, 1994). This schedule has consistently produced better abstinence initiation as compared to no CM (e.g., Higgins et al. 1993, 1994) and to non-contingent delivery of vouchers (e.g., Higgins, Wong, Badger, Ogden, & Dantona, 2000). It involves a 12-week escalating schedule of reinforcement to initiate cocaine abstinence. We decided to place the contingency on cocaine alone, because requiring that urine specimens be free of multiple drugs reduces the probability that participants will receive vouchers and therefore reduces the effectiveness of CM (Griffith, Rowal-Szal, Roark, & Simpson, 2000; Lussier et al., 2006). Data suggest that when vouchers are delivered contingent upon cocaine-free specimens, there are also reductions in other drug use (e.g., Higgins et al., 1993, 1994, Kirby et al., 1998).

In accordance with the traditional CM schedule first developed by Higgins et al. (1993, 1994) the value of the vouchers began at \$2.50 for the first negative specimen, and increased in value by \$1.25 for each subsequent consecutive negative specimen (i.e., \$2.50 then \$3.75 then \$5.00, etc.). Bonus vouchers worth \$10 were awarded for each three consecutive

cocaine-negative specimens. Specimens that tested positive for cocaine and failures to provide scheduled specimens reset the value of the vouchers to \$2.50, from which they would escalate again according to the same schedule. Submission of five consecutive cocaine-negative samples after the provision of a positive sample returned the value of the voucher to the point they were at prior to the reset. Earned vouchers were never revoked. Participants were reminded that they could hold on to their vouchers or arrange to exchange them at any time. Research staff used a computer program to calculate and track the reward amounts to be delivered.

Research participants could exchange their earned vouchers at any time following their regularly scheduled research appointments. Vouchers could be exchanged for any of a variety of merchandise contained in our research office prize cabinet (e.g., food, cleaning supplies, toys, and small electronics), gift-cards to a variety of local stores, or any of an extensive number of other products divided by category and price pictured in our CM catalogue. In addition, vouchers could be redeemed to pay outstanding bills (e.g., rent, electric, phone). In these cases, clients provided research staff with a copy of the particular bill and staff paid the bill on the client's behalf. Importantly, participants were not able to sell their vouchers to other clients because all voucher receipts were recorded and voucher exchanges could only be redeemed by the rightful participants in the amounts they had earned according to the research record. Because it was possible for some participants to potentially sell the merchandise they obtained in exchange for the voucher, we confidentially asked voucher participants weekly about whether they traded or sold their merchandise.

2.2.2 Cash-Based CM Condition—Participants in the cash CM condition were assigned to an identical 12-week escalating schedule of reinforcement, except that the contingencies were provided in cash rather than vouchers. For both the voucher- and cash-based conditions, a specially designed computer program was utilized to maintain a record of all participants' urine results and the earned rewards. RAs were also trained to calculate the voucher and cash values, as a backup in case of computer or power failures.

2.2.3 Non-CM Control Condition—Participants in the non-CM control condition provided urine specimens during the 12-week period in a similar manner as those in the two experimental conditions, but received no contingent rewards other than praise from the RAs.

Importantly, participants in all three conditions also received the standard drug counseling and other services routinely provided at the treatment program. In addition to methadone maintenance, the primary treatment modality offered was group therapy focused on skill enhancement and some of the components of relapse prevention (e.g., avoiding people, places, and things that trigger drug use), although these components are not administered with the detail and structure typically found in randomized trials of relapse prevention. Treatment was offered three times per week with an average of 4 to 5 hours of direct clinical contact per week. Clients were also encouraged to attend Cocaine Anonymous or other self-help groups as a method of reinforcing treatment and providing continuing support after treatment had terminated.

2.3 Measures

2.3.1 Abstinence—Three urine specimens were collected and tested each week during the 12-week research trial. Urine samples were screened for the presence of benzoylecgonine, a cocaine metabolite, using Biotechnostix E-Z integrated test cups. Abstinence was operationalized by calculating the longest duration of continuous urinalysis-confirmed cocaine abstinence. Unexcused missed drug screens were counted as drug positive, but excused samples did not interrupt the chain of consecutive abstinence.

2.3.2 Attendance—Participants were scheduled to attend three research appointments per week during the 12-week intervention period for a total of 36 appointments. The research appointments which were held in the treatment program were generally scheduled to coincide with their days of clinical appointments. In most cases, participants who attended their research appointments did so following their scheduled individual or group treatment sessions.

2.3.3 Cocaine Craving—Cocaine craving was assessed using the Cocaine Craving Questionnaire-Brief version (Sussner et al., 2006). This self-report instrument measures current cocaine craving among treatment-seeking cocaine abusers. It was derived from a 45-item version (CCQ-Now; Tiffany, Singleton, Haertzen, & Henningfield, 1993) and consists of 10 items that loaded heavily on the general craving factor of the scale during the initial validation of the full measure (Sussner et al., 2006). Participants were asked to indicate their level of agreement with each item – from “strongly agree” to “strongly disagree”. In a recent study, Sussner et al. (2006) examined the psychometric properties of the CCQ-Brief and reported that it is significantly correlated with the CCQNow ($r = .85, p < .01$), and has high construct and convergent validity and strong internal consistency ($\alpha = .90$). Participants completed the CCQ at the baseline and the monthly follow-up appointments.

2.3.4 Engagement in high-risk behavior—The Recent Behavior Scale (RBS; Festinger, et al., 2005; 2009) is an 8-item, self-report assessment that inquires about the number of days participants engaged in drug and alcohol use and other high-risk behavior (i.e., gambling and solicitation) in the past 30 days. These behaviors were selected for inclusion based on expert consensus. Items for the RBS were taken from several well-validated existing instruments including the Addiction Severity Index (ASI) – for the drug and alcohol items, the Risk Assessment Battery (RAB) – for items regarding sexual solicitation, and the Structural Clinical Interview for the DSM-IV (SCID-I) – for gambling behavior. The RBS was administered at baseline and monthly throughout the intervention.

2.4 Data analysis

As a check on randomization, participants in the three groups were compared on demographic and baseline status variables using analyses of variance for continuous variables (i.e., age, years education, cocaine craving score) and chi-square analyses for binary variables (i.e., race (white vs. other), gender, any days paid for working (past 30 days), gambling (past 30 days), solicitation (past 30 days), alcohol use to intoxication (past 30 days) and cocaine free baseline urine (yes/no).

Our primary outcomes were maximum duration of continuous abstinence and attendance at research appointments during the 12-week intervention period. Maximum duration of abstinence was calculated treating missing data as positive. For each of these cross-sectional outcomes, a one-way analysis of variance and Tukey's HSD post-hoc tests were performed to compare the three groups. Secondary outcomes were assessed at weeks 4, 8, and 12. These self-reported outcomes included cocaine craving score (continuous) and engagement in high risk behaviors [i.e., any gambling in the past month (binary) and any alcohol use to intoxication in the past month (binary)]. Rates of solicitation in the sample were too low to analyze as only one control group participant reported engaging in this behavior at any of the follow-up interviews. A linear mixed effects model was used to compare craving scores for participants in the three groups and a series of generalized estimating equations (GEE) were used to compare rates of engagement in high-risk behaviors. In both types of analyses, models included terms for condition, time, and the condition by time interaction as well as the baseline variable as a covariate. Models specified a compound symmetry covariance structure. In addition, effect sizes (i.e., Cohen's *d* and odds ratios) were calculated for all analyses. All analyses were performed using SAS 9.1.3.

3. Results

A total of 222 participants were randomly assigned to one of three conditions: (1) CBRT ($n = 73$), (2) VBRT ($n = 71$), and (3) Non-CM control ($n = 78$). Overall, participants were primarily white (58%) and male (69%) with an average age of 37.20 ($SD = 9.91$). The majority of participants were high school educated (57%) and almost all (98%) were not paid for working in the past 30 days. Approximately 62% provided cocaine-free urine at baseline. Demographic characteristics of participants are presented in Table 1 below. There were no group differences on any of these demographic and baseline status variables (all p 's $> .27$).

3.1 Maximum duration of abstinence (weeks)

Results indicated a main effect for condition ($F(2, 219) = 7.50, p = .0007$). Participants in the cash and voucher groups displayed a significantly longer duration of abstinence than those in the control group (d 's = .58 and .44, respectively), but the cash and voucher groups did not differ significantly from one another ($d = .02$).

3.2 Attendance at research appointment

While the overall ANOVA revealed a main effect for condition, ($F(2, 219) = 3.26, p = .04$), results of the post hoc tests did not reach statistical significance. There was a trend (p 's $< .10$) for participants in the cash ($M = 28.49, SD = 9.05$) and voucher ($M = 28.28, SD = 9.78$) groups to attend more research appointments than participants in the control group ($M = 24.83, SD = 10.79; d$'s = .37 and .33, respectively). Attendance rates for both CM groups were approximately equal ($d = .02$).

3.3 Craving scores

Craving scores at the 4-, 8-, and 12-week assessments were relatively low among participants in all three groups given that scores could range between 10 (no craving) to 50

(high degree of craving). Results indicated that craving scores did not differ significantly between participants in the three conditions, $F(2, 204) = .96, p = .38$ (cash vs. voucher $d = .23$; cash vs. control $d = .06$; voucher vs. control $d = .17$). There was a main effect of time, ($F(2, 341) = 3.14, p = .04$, with participants displaying significantly lower scores at week 12 than week 4 ($p = .02$; $d = .25$) and baseline craving score was significantly related to during-treatment scores ($F(1, 204) = 53.83, p < .0001$).

3.4 Gambling

Rates of self-reported gambling at weeks 4, 8, and 12 are presented in Table 2. The mixed effects model indicated no main effect of condition ($X^2(2) = 1.29, p = .54$), time ($X^2(2) = .32, p = .85$), or their interaction ($X^2(4) = 1.97, p = .74$). Odds ratios group contrasts were as follows: 1.44, 95% CI = .74-2.81 (cash vs. voucher); 1.09, 95% CI = .55-2.13 (cash vs. control); and .75, 95% CI = .37-1.52 (voucher vs. control). Baseline gambling was not related to rates of gambling during the intervention period, ($X^2(1) = .47, p = .50$).

3.5 Alcohol use to intoxication

Rates of drinking alcohol to intoxication as reported at weeks 4, 8, and 12 are presented in Table 2. The mixed effects model indicated no main effect of condition ($X^2(2) = .62, p = .73$), time ($X^2(2) = 1.33, p = .51$), or their interaction ($X^2(4) = 3.13, p = .54$). Odds ratios for the group contrasts were as follows: 1.65, 95% CI = .43-6.33 (cash vs. voucher); 1.34, 95% CI = .45-4.01 (cash vs. control); and .81, 95% CI = .20-3.25 (voucher vs. control). In addition, baseline use was related to use during the intervention period, ($X^2(1) = 9.34, p = .002$).

4. Discussion

The study is the first to experimentally compare the efficacy and ethics of cash versus a traditional voucher-based CM protocol for cocaine dependent clients in outpatient treatment. Findings indicated that CBRT was just as effective as VBRT in achieving longer durations of cocaine abstinence when compared to the non-CM condition. In addition, there was a trend indicating that participants in both CM groups attended more research appointments than the non-CM group. Contrary to our primary hypothesis, the cash-based CM procedure was found to be no more effective than the voucher-based CM procedure.

Importantly, contrary to many widely held assumptions about the potential risks associated with providing cash incentives to substance abusers, participants in the cash CM condition experienced no higher level of self-reported cocaine cravings, gambling behavior, or alcohol use to intoxication during the intervention period than participants in the voucher-based and non-CM conditions. Similar to our prior studies (Festinger et al., 2005, 2009) examining the use of cash remuneration to substance abusing research participants, these data provide additional support for the safety of cash payments. This is particularly important given the potential reductions in staff burden and associated costs (e.g., voucher printing, stocking of prize cabinets, inventory counts) that could be realized in a cash-based CM procedure.

There are several potential explanations for why cash was not found to be a more potent reinforcer than vouchers. First, the IRB overseeing the study required that we allow cash

participants the opportunity to “bank” their payments out of concerns for their safety (e.g., prevents them from purchasing drugs and engaging in other high-risk behaviors and prevents them from victimization). Among participants in the cash-CM condition, 43% chose to bank their earnings more than half of the time. When banking occurred, participants did not come into direct contact with the cash which could have limited its potency as a reinforcer. In future research, it may be important to require participants to receive the cash each time it is earned.

Second, participants were permitted to redeem vouchers for gift cards. Although gift cards may have been a novel reinforcer at one time, today they may be viewed as similar to cash in many ways. For instance, gift cards can be used immediately to purchase a wide variety of goods and services at virtually any retailer. It is even possible that gift cards may be perceived as superior to cash as they are often earmarked for a specific type of purchase (e.g., clothes, electronics, food, toys) rather than more mundane uses such as paying bills. Future research could examine these perceptions and more precisely compare cash to gift card payments.

There are several limitations to this study. First, although the secondary analyses involving the potential negative effects of cash payments (i.e., craving, gambling, and use of alcohol to intoxication) demonstrated no significant differences between the cash and voucher conditions, they do not establish their equivalence (i.e., “prove the null hypothesis”). However, given the small effect sizes for these measures, it is reasonable to conclude that there are no meaningful differences in risk between the use of cash and vouchers. Second, the study was conducted within the context of a single treatment program serving a relatively homogenous population of impoverished inner-city residents. As such, the findings may not be generalizable to other treatment-seeking populations. Finally, the clinic was not able to provide records of attendance at counseling sessions which precluded us from examining group differences in treatment attendance. Future research could address these issues.

Despite these limitations, this controlled study demonstrated that cash-based CM was as effective as traditional voucher-based CM in reducing cocaine use and improving attendance. Importantly, the use of cash reinforcement resulted in no greater risk to substance abusing clients than voucher-based or non-CM. Future research should examine the potential cost savings of the cash-based CM procedure to determine whether it is a more cost-effective strategy. The establishment of cost savings for the procedure could improve the acceptance and implementation of the evidence-based CM approach.

Acknowledgements

This project was funded by a grant from the National Institute on Drug Abuse R01-DA021621. None of the authors represent any interests that could be interpreted as influential in this research. Dr. Festinger presented the preliminary findings of this study at the 72nd Annual Scientific Meeting of the College on Problems of Drug Dependence in June 2010 in Scottsdale, Arizona and the final results at the 75th Annual Scientific Meeting of the College on Problems of Drug Dependence conference in June 2013 in San Diego, California. We gratefully acknowledge the collaboration of NHS Parkside Recovery in Philadelphia, Pennsylvania. We also thank Adam Christmann, Yvette Haigler, and Douglas Boyd for their assistance with project management and data collection.

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Table 1

Demographic characteristics and baseline status by group.

Variable	CBRT (n = 73)		VBRT (n = 71)		Non-CM Control (n = 78)	
	M/N	SD/%	M/N	SD/%	M/N	SD/%
Age	37.79	10.55	37.47	9.69	36.24	9.52
White	43	59.72%	43	64.18%	40	51.28%
Male	52	72.22%	44	65.67%	53	67.95%
Years education	11.28	1.58	11.06	1.77	11.18	2.04
Paid for working (past month)	2	2.78%	2	2.99%	1	1.28%
Craving score	24.96	8.34	24.08	7.92	22.83	7.98
Gambling (past month)	20	27.40	17	23.94	20	25.64
Solicitation (past month)	1	1.37	3	4.23	4	5.13
Alcohol to intoxication (past month)	12	16.44	8	11.27	9	11.54
Cocaine negative baseline urine	42	57.53%	43	60.56%	53	67.95%

Table 2

Group means for each outcome measure.

Variable	CBRT		VBRT		Non-CM Control	
	M/N	SD/%	M/N	SD/%	M/N	SD/%
Maximum Duration of Abstinence (0-12)	6.33	4.37	6.23	4.61	3.96	3.84
Attendance (0-36)	28.49	9.05	28.28	9.78	24.83	10.79
Craving (0-50)						
Week 4	18.50	5.48	16.43	5.38	16.98	6.26
Week 8	17.21	6.06	16.68	7.33	15.78	5.87
Week 12	16.78	5.18	15.44	6.18	17.26	6.72
Gambling (%)						
Week 4	16	23.53	14	21.54	13	18.57
Week 8	18	27.69	16	24.62	11	16.18
Week 12	16	25.00	16	25.81	11	18.33
Solicitation (%)						
Week 4	0	0	0	0	1	1.43
Week 8	1	1.54	2	3.08	1	1.47
Week 12	0	0	0	0	0	0
Alcohol use to intoxication (%)						
Week 4	4	5.88	3	4.62	4	5.71
Week 8	5	7.69	4	6.15	4	5.88
Week 12	5	2.69	4	2.15	1	1.67