

**THERAPY DEVELOPMENT OF GROUP CONTINGENCY MANAGEMENT IN
METHADONE TREATMENT: PILOT 1 – THE APPLICATION OF
A PERCENTILE SCHEDULE TO ENHANCE ATTENDANCE
BEHAVIORS AND COCAINE ABSTINENCE**

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by

Beth J. Rosenwasser

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Beth J. Rosenwasser

ABSTRACT

In an effort to adapt a prize-based attendance and abstinence reinforcement program to the group therapy modality typically found in community substance abuse treatment, this study applied a contingency management (CM) procedure to behavior outcomes of the group as a whole. An algorithmic shaping percentile schedule was used to establish the outcome criteria determining group access to prize bowl drawings. Both the shaping schedule and hypothesized positive social support secondary to interdependent group contingencies aimed to initiate cocaine abstinence among cocaine abusing methadone-maintained participants having initial low rates of cocaine abstinence. In a multiple baseline across behaviors with reversals design, the procedure was applied to four target behaviors in sequence: incentive group attendance, urinalysis appointment attendance, opiate and cocaine abstinence. Results demonstrated clear improvement in group attendance during the shaping schedules. Effects on opiate abstinence were promising but not definitive; an increase in magnitude of reinforcement yielded a better response. There were no effects on cocaine abstinence using the percentile schedules tried. When shaping was conducted by an experienced psychologist in conjunction with an average 4-fold increase in reinforcer magnitude, 55% achieved some abstinence (compared to 18% in baseline). Participants were monitored for safety due to concern about coercion; no instances of physical violence occurred and infrequent instances of verbal negativity were managed using typical outpatient procedures. Results indicate that interdependent group CM is efficacious for attendance, and a feasible and acceptable procedure with appropriate monitoring. Future studies are needed to determine effective and

appropriate shaping and reinforcement schedules in group CM to increase drug abstinence.

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CHAPTER 1

INTRODUCTION

Substance Abuse in America

Who hath woe? Who hath sorrow? Who hath contentions? Who hath babbling? Who hath wounds with no cause? Who hath redness of eyes? They that tarry long at the wine. They that go to seek mixed wine. Look not though upon the wine when it is red... At the last it biteth like a serpent and stingeth like an adder. Thine eyes shall behold strange women, and thine heart shall utter perverse things. Yea, thou shalt be as he that lieth down in the midst of the sea, or as he that lieth on top of the mast. They have stricken me, shalt thou say, and I didn't know; they have beaten me, and I felt it not: when shall I awake? I will seek it yet again. (Proverbs, 23:39-35)

As can be inferred from this ageless passage, human behavior with regard to mood-altering chemicals has been unrelenting. From biblical admonitions to the Buddah's role-model of a man who turns away in disgust at drunken women to medieval penances for monks who became so drunk on alter wine that they vomited at Sunday Mass, the vast majority of cultures have struggled to supply social and tangible consequences designed to reduce the enduring and problematic consequences that accompany chemical ingestion. Contemporary American culture is no exception.

Researchers have consistently found a link between substance abuse and criminal behavior (Chaiken, 1986; Inciardi, 1979; Johnson, et al. 1985). Eighty-four percent of all crime is associated with drug or alcohol abuse or dependence (Office of National Drug Control Policy [ONDCP], 2003). In 2000, ONDCP estimated that crime-related costs of drug abuse were more than 100 billion (ONDCP, 2001) and treatment has been shown to reduce recidivism by as much as 64% (Wisdom, 1999). Even while incarcerated, 10% of substance abusers continue to use (US Department of Justice, 2007). More generally,

2006 data from the National Survey on Drug Use and Health indicate that addictive-related behavior is projected to cost over \$245 billion to the US economy annually including costs related to violence and property crimes, prison expenses, court and criminal costs, emergency room visits, healthcare utilization, child abuse and neglect, lost child support, foster care and welfare costs, reduced productivity, and unemployment (NIDA, 2005, 2006; Weintraub et al., 2001).

Substance Abuse Treatment is Cost Effective

How many does this affect? In 2006, 23.6 million Americans were designated to be in need of addiction treatment; 3.8 million people actually received treatment (NIDA, 2006). More optimistically, NIDA estimates that successful drug abuse treatment can help reduce costs like the above, and the spread of crime, HIV/AIDS, hepatitis, and other infectious diseases. In a study interviewing cocaine-abusing 12 years following treatment, they had difficulty using early information to predict who would achieve and maintain abstinence, but those who did achieve abstinence reported less criminal involvement, unemployment and psychiatric symptoms (Hsu et al., 2006). NIDA estimates that

NIDA presents information and a list of interventions, largely behavioral or pharmacological, or tested and used in combination, that have empirical support (updated in 2008). These include: Contingency Management, Community Reinforcement Approach, Motivational Interviewing, Cue Exposure, Behavioral Family and Behavioral Couples treatments, and Short-term Supportive-Expressive therapy in conjunction with Methadone maintenance, agonist therapy such as Methadone, LAAM, and

Buprenorphine, antagonist therapy including Disulfiram and Naltrexone. A cocaine vaccine is still in development. Although drug treatment is expensive, put into context, it is much less expensive the alternative. NIDA (2008) estimates that one year of methadone treatment costs \$4800 while one year of prison is \$18,400. Interestingly, coerced treatment is as effective as patient-requested treatment, treating injection drug-abuse is much less expensive than HIV treatment so that \$1.00 invested buys \$4-7 in criminal justice savings and \$12 when health care costs are factored in (NIDA, 2000).

Operant Theoretical Conceptualization and Treatment

Contingency management refers to a class of clinical interventions based on the behavioral principles of operant reinforcement (Higgins, Silverman, & Heil, 2008). Drug use is functional operant behavior, maintained by its immediate, certain, and often pleasurable consequences (e.g., drug high, relief from cravings or withdrawal symptoms, social contact and acceptance, improved mood, and relief from medical pain, stress, and other negative states). Because negative consequences of drug abuse (e.g., financial and legal problems, lack or loss of employment, loss of family support and friends, modeling poor coping skills for ones children, increased risk or violence and medical harm, becoming drug dependent and experiencing withdrawal symptoms) are delayed and uncertain, they are discounted by substance abusers. Some studies in hypothetical decision-making within the behavioral economics field, conceptualize addicts as having difficulty making decisions that take into account these future negative consequences and thereby fail to maximize their personal reinforcement (Rachlin, 2007).

Given that drug use is an operant, it can be influenced by environmental contingencies. Behavioral approaches to substance abuse either target natural contingencies in the environment of the substance abuser by exploring the function of the drug use and arranging competing attractive and fairly immediate positive consequences for not using and lack of these when drug use is occurring. This generally involves working with family or supportive others when available and not themselves using drugs, building skills in communication, employment, relationship enhancement, and sampling and increasing enjoyable and affordable activities (e.g., Community Reinforcement Approach; Hunt & Azrin, 1973; Meyers, Villanueva, & Smith, 2005).

On the other hand, when natural reinforcers are not immediately available, or when they are relatively weak, contrived reinforcers can be used to facilitate approaching activities that are not drug related. There is a long behavioral treatment tradition of successfully supplementing natural reinforcers with contrived reinforcers, typically conditioned generalized reinforcers such as money, gift cards, or the opportunity to select individually desirable prizes or activities. Within educational and family settings they are known as “token” systems. Within businesses and workplaces, they are known as incentive systems. When applied to substance abuse treatment as well as other problems, they have come to be known as Contingency Management (CM).

Contingency Management is Efficacious for Reducing Substance Abuse

Meta-analytic research over the past decade has found CM to be as effective as other individualized interventions based on a functional conceptualization of addiction

including both functional assessment and functional analysis (Gresham et al., 2004; Prendergast, Podus, Finney, Greenwell, & Roll; 2006; Schumacher et al., 2007).

Common to all operant incentive motivation interventions, reinforcers are provided to a participant contingent on the performance of a specific behavior and withheld when that goal is not achieved. Typically, the aim is to withdraw the contrived reinforcer system once new behavior patterns have been established and to allow natural contingencies of reinforcement to maintain the behavior (Petry, 2000). Contingency management for substance abuse has received considerable attention for more than 20 years. This has been assisted by the American Psychological Association's empirically-validated treatments list developed in the 1990's which listed CM as a probably efficacious intervention for cocaine abuse (Chambless, Baker, & Baucom, 1998).

Although the use of reinforcement-based interventions is common to a majority of behavioral interventions, among the first applications of CM *with substance-abusing populations* were a series of studies by Stitzer and colleagues (Stitzer, Bigelow, & Liebson, 1979; 1980; Stitzer, Bigelow, Liebson, & Hawthorne, 1982) demonstrating that take-home doses of methadone (which allow patients to self-administer their dose rather than attend daily clinic visits) could successfully function as reinforcers for reduced opiate and benzodiazepine abuse.

More recently CM has been extended beyond methadone take-home doses by providing *vouchers* contingent upon performance of target behaviors in substance-abusing populations. Such vouchers are exchangeable for retail items or gift cards from a variety of participant-suggested retail stores. In this way, the vouchers become

conditioned generalized reinforcers—reinforcers that are likely to influence behavior across time and with different individuals. Additionally, they enable different participants to receive comparable reinforcement values while allowing for individual preferences (Festinger et al., 2005; Kazdin & Bootzin, 1972). Money is the classic generalized reinforcer, but many treatment centers oppose the use of cash on the grounds that it may stimulate increased substance abuse. One study demonstrated that provision of cash as compared with gift card reinforcers did not result in new drug use verified by qualitative urine testing (i.e., abstinent or positive; Festinger et al., 2005).

The past 15 years has presented a compelling body of research using variations of CM to help substance-abusing populations. In a recent meta-analysis of this literature published between 1991 and March 2004, Lussier, Heil, Mongeon, Badger, & Higgins (2006) analyzed 40 randomized controlled trials involving CM interventions to change behaviors among substance-abusing populations. They conclude that among the 30 CM studies targeting abstinence, effect sizes range considerably from small (n=16) to moderate (n=8) to large (n=6) but as compared to control conditions (generally usual care), “there was overwhelming evidence of an overall positive effect.” Furthermore, Contingency Management (Behavior Therapy) was the only treatment identified by an independent task force from the American Psychological Association as an empirically-based treatment for *both* opiate and cocaine abuse (Chambless, 1999; Chambless & Ollendick, 2001).

CM is Efficacious for Increasing Treatment Attendance

A majority of CM interventions have focused on problematic substance abuse including cocaine, cigarettes, alcohol, opiates, marijuana, benzodiazepines, and other drugs or combinations of drugs (Budney, Higgins, Radonovich, & Novy, 2000; Jones, Haug, Silverman, Stitzer, & Svikis, 2001; Kirby, Marlowe, Festinger, Lamb, & Platt, 1998; Lamb et al., 2007; Petry & Martin, 2002; Petry, Martin, Cooney, & Kranzler, 2000; Piotrowski, Tusel, Sees, Reilly, Banyas, Meek, et al., 1999; Preston, Umbricht, Wong, & Epstein, 2001; Silverman, et al., 2007; Silverman, et al., 1998; Stitzer et al., 1982). However, CM has also been successfully used to promote improved treatment attendance, non-abstinence treatment goal achievement and medication adherence in substance-abusing populations (e.g., HIV medication adherence, Sorensen et al., 2007; other CM target studies summarized in Lussier et al., 2006; Petry, 2000). Successful CM for substance abuse has secondary benefits such as reducing negative behaviors associated with drug. For example, Grella, Wugalter and Anglin (1997), exploring predictors and solutions for opiate addicts at high risk for HIV, showed that while methadone treatment was helpful, drop-out rates prior to 90 day and 1 year time frames were high particularly for sub-populations. Enhanced treatment including CM predicted with early treatment retention which in turn predicted improved outcomes. More recently, Ghitza, Epstein and Preston (2008) demonstrated that CM was effective in reducing injection-related HIV- risk behavior.

Therapy session attendance is a general problem in drug abuse treatment with indications that poorer attendance is associated with alcohol or drug problems, somatic complaints, and fighting among attendees (MacNair-Semands, 2002). Although therapy attendance is a mandated part of methadone treatment, attendance can still be problematic (Kidorf, Stitzer, Brooner, & Goldberg, 1994; Svikis, Lee, Haug, & Stitzer, 1997). Poor attendance and drop-out are not only associated with continued drug use, but also impede public clinics' ability to provide high-quality care due to the loss of clinic income. In contrast, retention in methadone maintenance treatment is associated with positive outcomes such as reduced heroin use, criminal behavior, HIV risk, and mortality, as well as increased employment and earnings (Grella et al., 1997). Attendance is also important to treatment providers in methadone programs; when Kirby, Benishek, Dugosh and Kerwin (2006) convened an advisory panel of administrators and clinicians representing all of the methadone programs in a major northeastern US city, they selected attendance to treatment as a "top 5" concern needing a solution.

CM has been shown to successfully increase attendance in substance abuse treatment. A recent meta-analysis of the literature on voucher-based interventions identified six studies where the effect of vouchers to reinforce attendance could be isolated (Lussier et al., 2006). While two of the studies had negligible effects, the others showed small ($r = .16$ and $.19$) to low medium effect sizes ($r = .23$ and $.28$). Generally, effects appeared to be largest for the two studies that specifically targeted therapy attendance (Helmus, Saules, Schoener, & Roll, 2003; Sinha, Easton, Renee-Aubin, & Carroll, 2003).

Individual Responses to Contingency Management

The vast majority of research in addiction treatment is conducted as randomized clinical trials, and these are the studies addressed in the meta-analyses described above. The group effects achieved in these studies are typically produced when approximately half of the individuals in the group respond to the CM intervention and half do not. A recent study by Stitzer, Petry, Pierce, et al. (2007) demonstrated that initial urinalysis results predicted which participants in a multi-site clinical trial responded to CM for drug abstinence and which did not. Among participants who provided a cocaine negative sample at study intake, a clear reduction in cocaine-positive urine samples was seen for those receiving CM compared to those receiving standard treatment only. However, among patients who entered the study with a negative intake urine, no differences were seen between those receiving CM and those in standard treatment only. This finding is understandable given that reinforcement cannot be applied unless the behavior targeted for reinforcement occurs. A majority of these participants never achieved enough abstinence to contact the contingencies. Unfortunately, in most drug abuse treatment centers, urinalysis results are qualitative or binary in nature; indicating whether the drug metabolite is above (drug-positive) or below (drug-negative) a federally recommended specified “cut-off” concentration. While quantitative analysis that would allow shaping of drug abstinence is possible, this type of testing is very expensive and therefore impractical for community-based treatment programs. Quantitative analysis is also rarely used by researchers for the same reason (e.g., Preston et al., 2001).

Group Contingency Management Accepted in Other Settings

Despite over 25 years of data supporting its effectiveness in drug abuse treatment settings, CM largely has been a research-based intervention and is infrequently implemented by community-based clinics where the majority of substance abuse treatment takes place (Kirby, Benishek, Dugosh, & Kerwin, 2006; Petry, Martin, Cooney, & Kranzler, 2000). There have been multiple barriers to attracting community-based treatment providers to implement CM (see literature review). Among these barriers is the basic structure of most substance abuse treatment centers. *Group* therapy is the most common mode of treatment delivery in community treatment settings (McLellan, 2001), perhaps with monthly individual sessions, but like the majority of the behavior therapies that have been developed and tested in clinical trials, CM research in drug abuse treatment settings primarily has been delivered *individually*. The problem is quite entrenched in that the way that therapist time, number of patients, and care given is funded (often federally) and structured by funders and agencies, does not easily allow a shift to individually based care.

Fortunately, educational, work, and other settings have a long tradition of empirically validated techniques applied to enhancing the behaviors of people meeting or working in groups. Group-based CM has been used to initiate and maintain change in such things as academic or work performance, disruptive behavior, and attendance (Axelrod, 1973; Hayes, 1976; Honeywell-Johnson & Dickinson, 1999; Margolin & Gray, 1976; Meyers, Artz, & Craighead, 1976; Stage & Quiroz, 1997; Tingstrom, Sterling-Turner & Wilczynski, 2006). Within this literature, the performance of an individual, a

small subgroup of individuals, or the whole group determines the reward for the entire group. There are three variants of group CM procedures described in the literature: 1) Independent Group CM, 2) Interdependent Group CM, and 3) Dependent Group CM (e.g., Litow & Pumroy, 1975; Tingstrom, Sterling-Turner, & Wilczynski, 2006).

Independent Group CM: the same contingency (behavior, consequences and criteria) is operating for all members of a group, and each member of the group individually earns reinforcement (or not) based solely on his or her own behavior. Examples include excusing all students with 85% or above on an exam from additional practice worksheets or bonus of \$100 individually available to all sales representatives who meet a monetary goal established for all that week.

Interdependent Group CM: again, the same contingency is in effect for all members of the group, but in this intervention all members of the group must potentially contribute to a single outcome which either does or does not meet the criterion established for the whole group. The group's performance either meets the criterion, or not, together and therefore they all gain access to reinforcers as a group. Interdependent Group CM has several variations. In one variant all group members must meet the criterion of the contingency (individually and as a group) before any member earns the reward; for example, all students in a class must meet a minimum score on a test for the whole class to earn additional recess. In another more lenient alternative the *average* of the group members' performances must meet a minimum score for the whole group to access reinforcement or a *random selection* of a test score from all of the scores must meet a minimum to access reinforcement (Kelshaw-Levering, Sterling-Turner, Henry &

Skinner, 2000; Skinner, Williams & Neddenriep, 2004). In a hypothetical example of *interdependent* Group CM to treat substance abuse, all group members might be assessed for recent drug use or abstinence via biologically-verified urinalysis and if a specified proportion of the samples (e.g., 30%) tested drug-negative, everyone attending the group that day would receive some form of reinforcement. Alternately, an interdependent group contingency might specify that a randomly selected drug test result (either abstinent or not) from all of the results will determine if a reinforcer is accessed by all.

Dependent Group CM: as with interdependent group CM, the same *outcome* will apply for all members of a group (they win or lose as a group), however in this variant, the meeting of the criterion for reinforcement is dependent upon the behavior of only one or a few group members'. For example, in an inclusion classroom, in order to use classmates to facilitate pro-social behavior by a special needs child, each 5 minutes that the special needs child is playing appropriately and included with classmates, everyone earns points toward ice cream at Friday lunches. This type of group CM is less frequently used due to the potential for negatively targeting or stigmatizing those individuals' whose behavior determines the outcomes for the group; however, it can be useful in cases where the child whose behavior determines the outcome is already ignored or negatively targeted and the intervention is designed to improve interactions within the group.

Research has repeatedly demonstrated that Group CM interventions are superior to no contingencies and often as effective or nearly as effective as individual CM in producing positive change in the target behavior (Alric et al., 2007; Axelrod, 1973; Brown & Redmon, 1990; Coogan, Kehle, Bray, & Chafouleas, 2007; Fabiano et al.,

2008; Kelshaw-Levering, Sterling-Turner, Henry, & Skinner, 2000; Lew, Mesch, Johnson, & Johnson, 1986; Lloyd, Eberhardt, & Drake, 1996; Mawhinney & Fellows-Kubert, 1999; Pedalino & Gamboa, 1974; Popkin & Skinner, 2003; Shapiro & Goldberg, 1990; Slavin, 1991; Slavin, Wodarski, & Blackburn, 1981; Speltz, Shimamura, & McReynolds, 1982; Theodore, Bray, Kehle, & Jenson, 2001; Turco & Elliott, 1990; for exception see Gresham & Gresham, 1982). Group contingencies have many benefits including a reduction in the time to monitor and administer contingencies, a reduction in jealousy by others in a group toward those who access reinforcers, and a balancing of possible malignant competition in settings where individual contingencies are in place since they foster cooperative and helping behavior by linking the benefits of cooperation by making reinforcer access dependent on cooperation. Slavin (1991) hypothesizes that the effectiveness of group CM is explained by a two-step process in which the group contingency results in the rewarding of desired behavior by members of the group and that this in turn leads members of the group to apply social reinforcers and punishers toward each other to increase the chances that the group will be successful. It may be the emergence of these “nontargeted” cooperative and supportive behaviors, which have been noted in Group CM studies conducted with children and adults in a variety of settings, that sometimes boosts outcomes beyond individual contingencies (Hayes, 1976; Turco & Elliott, 1990).

Developing Group CM for Substance Abuse Treatment

Recently, researchers in substance abuse treatment have begun applying CM in group settings. Some of these applications have applied CM to individuals in a group

setting (*individual* GCM; Alessi, Hanson, Wieners, & Petry, 2007; Petry, Martin, & Finocche, 2001), while others have begun to explore the use of *interdependent* GCM such as those described above (Kirby, Kerwin, & Carpenedo, 2007; Kirby, Kerwin, Carpenedo, Rosenwasser, & Gardner, in press; Rosenwasser et al., 2007; Rosenwasser et al., 2008).

Group CM Offers Possibility of Shaping Initial Abstinence

While the primary reason for switching to group contingencies may be to make CM more compatible with typical community treatment, a group contingency also presents another interesting possibility. Shaping schedules are not easily applied to individual urinalysis results because these results are qualitative or binary (positive vs. negative based on a standard cut-off for drug metabolites). Sending the urine to a lab could offer quantitative results (a reading of the quantity of drug metabolite in the urine, if any), but then there would be a significant delay between obtaining the urine sample and delivering a reinforcer, if earned and this has been identified in meta-analyses to reduce the effectiveness of CM. However, the average of a group of individuals' urinalysis results is continuous (0% – 100%). As such, the use of group contingencies with criteria for the average group performance (abstinence) introduces the opportunity of shaping drug abstinence in the group. It possibly encourages a greater number of individuals to respond to the contingencies, including those that provide drug-positive samples at study intake – who have been found to respond less well to individual CM in several studies (e.g., Stitzer et al., 2007). Further, automation of the shaping procedure could preserve the benefits of percentile schedules more generally, in that the training of

clinical staff would be concrete and could be automatically generated with computer software typically available in clinics (such as Microsoft ACCESS or Excel).

CHAPTER 2

REVIEW OF THE LITERATURE

In 2004, 34.2 million Americans reported lifetime use of cocaine with an estimated two million Americans reporting current use of cocaine with one million being new users of cocaine in 2004 (NIDA, 2005). Approximately 40-60% of treatment opiate abusers also abuse cocaine (Avants et al., 1999). Rates of cocaine abuse have remained largely stable this decade. The present intervention, therefore, has the potential to benefit the large population of those with opiate dependent receiving methadone treatment who continue to abuse cocaine. Additionally, location of the intervention within an intensive outpatient methadone program reduces problems with participant drop-out since these participants already travel to the clinic on a daily basis for dosing and at least three days per week for their usual care group therapy.

Group contingency management (GCM) has the potential to assist this population. A meta-analysis of individual CM in outpatient methadone treatment settings based on 30 studies yielded a small to medium effect size ($r = .25$) for reduction of drug use (Griffith, Rowan-Szal, Roark, & Simpson, 2000). A more recent meta-analysis (Prendergast, Podus, Finney, Greenwell, & Roll, 2006) reported a larger effect size ($r = .65$) for reducing opiate use. Aspects of CM interventions that increase effect size include more immediate (vs. delayed) reinforcer delivery, targeting a single (vs. multiple) drug, collecting three (vs. ≤ 2) urine samples per week, and increased researcher involvement in the implementation of CM (Prendergast, Podus, Finney, Greenwell, & Roll, 2006).

When CM has been applied to attendance among the same population, the effect sizes were small to medium (Lussier et al., 2006).

The most commonly used voucher-based reinforcement treatment (VBRT) in drug abuse treatment is an *individual* treatment initially developed by Higgins and colleagues (1991) for use in drug-free clinics where methadone is not administered and therefore take-homes are not relevant. Participants earned vouchers exchangeable for retail items purchased by research staff by providing cocaine-negative urine drug screens under observation three times a week. The vouchers are earned on an escalating schedule – that is the voucher value begins at \$2.50 and for each consecutive cocaine-free urine the value increases by \$1.25 (e.g., \$2.50, \$3.75, \$5.00, \$6.25, etc.). If a drug-positive specimen is provided, no voucher is given and the value of the next voucher earned is *reset* to the initial level from which it can again escalate upon provision of consecutively drug-free specimens. The purpose of the escalating schedule is to differentially reinforce longer durations of continuous drug abstinence. This 1991 demonstration study led to a randomized control trial published in 1993 which also showed that behavioral therapy plus CM was both clinically and statistically significantly better than standard outpatient addiction treatment for both initiating cocaine abstinence and encouraging longer periods of consecutive days abstinent from cocaine (Higgins et al., 1993). Subsequent studies have demonstrated that the reset adds significantly to outcomes (Roll et al., 2006).

50% Probability Prize Bowl

Anticipating some of the specific concerns identified by Kirby and colleagues in a study of treatment provider attitudes and barriers to adopting individual CM (Gutierrez,

Walker-Smith, Wosak, Kerwin, & Kirby, 2003; Kirby et al., 2006), Petry and Martin (2002) introduced a variation in the schedule of reinforcement for target behavior achievement in order to substantially reduce costs to 1/5 of the cost of the Higgins et al. schedule. Instead of offering an escalating schedule of reinforcement where a voucher is earned *every* time a behavior occurs and a reset for non-occurrences, they offered an intermittent schedule of reinforcement whereby a participant earns a *chance* to win a voucher from a prize bowl indicating earnings at four levels (variable ratio schedule) with escalating bonus draws that reset when a positive sample is presented. When they achieve the goal behavior, they earn four draws from a prize bowl in which many (usually 50%) of the chits say “good job” but earn nothing and there are also chits (usually 43%) that earn low cost (\$1-\$3) goods while a fewer number (6%) offer large prizes and there is one chit for a jumbo prize. The average earning of each participant has varied across studies. The lottery-type method of CM developed by Petry and her colleagues ((\$100-\$240/participant as opposed to \$1,000; Petry & Martin, 2002; Petry et al., 2000) is still effective and reduced costs to about \$46/patient/month. Offering prizes versus vouchers as the reinforcer does not affect efficacy (Petry, Alessi, Hansen & Sierra, 2007) although in general the prize bowl methodology has not been as effective as the Higgins standard escalating schedule (Roll et al., 2006).

Three studies specifically demonstrate the benefit of using an intermittent 50% probability bowl to improve group therapy attendance among substance abusers. All three studies employed an individual CM approach, but did so within the group setting thereby addressing the need to make CM less expensive and implemented in the group setting,

the dominant treatment modality for addictions. To increase group therapy attendance and improve follow-through on treatment goals, Petry, Martin and Finocche (2001) used a small-N design to evaluate the use of an individual prize-bowl CM for drug abusing individuals in an HIV drop-in center. Incentives worked to increase attendance from one to an average of seven per session and when the weekday of the group changed, attendance maintained at 4-9 clients/session. Goal activity completion rates shifted from 25% at baseline to 65% during independent group CM. Sigmon and Stitzer (2005) sought to improve group counseling attendance within a methadone clinic. At a cost of \$160/client, the program significantly increased appointment attendance from an average of 52% to 76%. It also increased periods of continuous attendance. Petry, Martin, and Simcic (2005) implemented a similar 50% probability bowl to improve attendance and also cocaine abstinence among methadone maintained opiate addicts. At an average cost of \$117/client, the program had a significant effect on both cocaine abstinence and therapy attendance.

One of the problems in the above studies is the time it takes to complete the drawings for up to 12 participants in a group for each group. These studies targeted groups meeting once a week. Interdependent group CM theoretically offers a less time-consuming procedure (only one drawing procedure for the whole group each session) at an anticipated similar low-cost in the established treatment modality in most community substance abuse clinics. The questions are: (a) whether the procedure has efficacy, (b) is the procedure acceptable, and (c) can the procedure be implemented safely with this population.

Need to Shape Initial Abstinence Among CM Non-responders

Despite the repeated success of CM interventions, there is a need for procedural modifications to shape initial abstinence in the significant portion of the patient population that cannot achieve even one clean urine in order to contact reinforcement within the voucher schedules. Three studies have shown that providing a cocaine abstinence urine during baseline is a predictor of better outcomes than for those participants not able to provide a cocaine negative sample (Alterman, O'Brien, McLellan & McKay, 1997; Ehrman, Robbins & Cornish, 2001). More generally, Preston et al. (1988) demonstrated that less frequent cocaine during baseline predicts less overall cocaine use during the CM interventions. Recently, Carpenedo et al., (2007) extended prior research by demonstrating that participants who provide a cocaine-negative urine sample at intake have longer periods of abstinence during treatment and provide more cocaine-negative urine samples after contingent vouchers are minimized during an aftercare phase. Furthermore, as desired, those who provided more abstinent urines during treatment were able to maintain this success, providing more cocaine-free urines in aftercare. Clearly there is a need within the CM body of knowledge for studies exploring schedules of reinforcement that can shape initial target behavior when there are no instances of the behavior at treatment initiation (e.g., abstinence).

Percentile schedules offer a potential method for shaping initial abstinence among cocaine abusers who have not provided any clean urines. In the random sub-group CM schedule (Kirby et al., in press), even during the multiple behavior condition which itself allowed all members contact with reinforcement contingencies through the random

selection of more regularly attained (e.g., methadone compliance) did not appear to lead to progressively higher rates of cocaine abstinence. This suggests the need to specifically target cocaine abstinence while preserving some of the presumed benefits of the multiple behavior condition.

Percentile Schedules: Schedules With Potential For Shaping Abstinence

A powerful procedure in both the applied and experimental analysis of behavior is shaping. Over decades of research the initial definition of shaping (differential reinforcement of successive approximations to a target response) was itself shaped by successful variations that transformed an intuitive endeavor (Skinner, 1953) into a standard specification of parameters comprising percentile schedules (Platt & Bower, 1973). Shaping schedules are typically more sensitive and influence behavior more readily than is accomplished with schedules that establish a terminal criterion for a target behavior.

Heretofore, lowering the threshold for cocaine abstinence has been difficult because of the limitations of current technology available for drug testing. Reliable, available and affordable urinalysis drug test results are binary in that they simply indicate recent use or not. While it is theoretically possible to set different abstinence cut-offs, these are not yet affordable for most research or for clinical use. Therefore within individual CM procedures, percentile schedules of reinforcement have not been an option because the dependent variable is binary: either 0 (positive) or 1 (negative). Without a range of responses, there is insufficient variability to shape behavior from more frequent drug use to less frequent use, to abstinence.

The introduction of the group CM procedure (as compared with the individual CM procedure) provides an opportunity to apply a percentile shaping schedule to cocaine abstinence because the behavior of the group (percent of group who present cocaine abstinent urines) is no longer a binary variable. While any individual in the group contributes either a positive or negative cocaine urine sample, the group's abstinence falls along a range (e.g., 30%, 40%, 50%, 60% of the group are abstinent on any given day). Behavior presented across a range has the potential to be shaped.

Successes with the application of percentile shaping schedules to initiate tobacco abstinence in those not planning to quit further supports their use to shape cocaine abstinence within a group treatment setting (Lamb et al., 2004, 2005, 2007).

Basic Percentile Schedule Methodology

Galbicka's (1994) primer on the application of percentile schedules for clinical use defined the requirements for shaping into four rules adhered to in percentile schedules:

1. Start shaping behavioral responses that fall within the envelope of the baseline repertoire. Percentile schedules continue to set and change criteria relative to current behavior and change them in step with behavior changes.
2. Specify the terminal response to define the functional dimension along which shaping encourages responding and specify a series of relatively equally distant intermediate points along that dimension; the algorithm for shaping will use these intervals. Percentile schedules aim to provide sufficient reinforcement densities to maintain active responding while maintaining an effective combination of

differential reinforcement and extinction for shifting criteria along the designated response dimension.

3. Ensure contact between natural variations in responding and reinforced approximations by using small increments along the functional dimension as the basis for reinforcement and changing criteria. This is the most difficult of the shaping rules to follow.
4. Anchor criteria in behavior rather than position to increase the probability after a criterion shift of behavior changing again along the targeted direction.

By setting three parameters and shifting from cardinal to ordinal scaling along a shaping dimension, the algorithm used in percentile schedules enables requirement of equidistant, size-adjustable steps for reinforcement and criteria change. The first parameter specifies size of recent memory as the number of recent responses included in the current response envelope from which a current criterion is derived for a next response. For example, if distance run is the dimension and the memory parameter is set at four, the current criterion is based on having $m=4$. Ranking the four most recent distances run and taking an ordinal perspective yields the reasonable prediction that the next response will, with an equal probability, occur for a distance that is (1) shorter than any of the remembered four runs, (2) longer than shortest and shorter than the 2nd shortest distance in memory, (3) longer than the 2nd shortest but shorter than the 3rd shortest distance in memory, (4) longer than the 2nd longest but shorter than the longest distance, or (5) longer than any of the remembered four runs. Each of these five possibilities has a probability of $1/(m+1) = 1/(4+1) = 1/5 = 0.2$.

The second parameter is the rank that must be exceeded (k) to meet the reinforcement criterion. For example, a criterion of exceeding the fourth ranked response out of five (exemplified in # 4 above where $m=4$) is designated as $k=4$. The probability of not meeting the criterion when $k=4$ is $k * (1/m+1) = 4/5 = 0.8$. The complement $(1-k)/(m+1) = 1-4/(4+1) = 1-4/5 = 1/5$ specifies the third parameter: probability of exceeding the criterion (designated w). The k (rank to be exceeded) for a given value of w (probability of meeting criterion) is determined as $k = (m+1)(1-w)$. For example, with $m=9$, and $w=0.7$, $k = (9+1)*(1-0.7) = 10 * 0.3 = 3$. These parameters specify an example of a 70th percentile schedule in which the last nine responses are ranked and the next responses that are greater along the functional dimension (in the direction of the target value) than the response currently ranked 3rd in memory are reinforced. Whether criterial or not, the next response is added to *me*, the oldest of the 10 is dropped, the distribution is re-ranked, and criterion value is set to the current value of k .

When a response *matches* rather than exceeds a criterion value, Galbicka (1994) suggests that reinforcement should be delivered with a random probability = w or the overall schedule value (e.g., 0.7). When implemented in clinical settings, other rules have been implemented such as the requirement that the current response receives reinforcement when it *exceeds* the current criterion or that the schedule cannot set the criterion lower than a certain value after that value has been surpassed. A more lenient rule would be that it must only *match* the current criterion.

The Application of Percentile Schedules To Substance Abuse

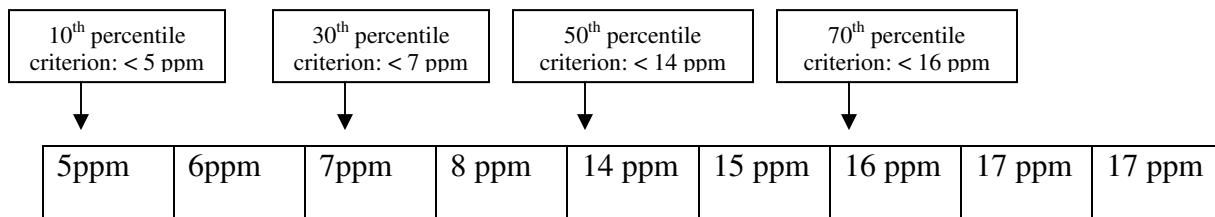
The application of percentile schedules to drug abuse rehabilitation began with an analysis of treatment failures in contingency management substance abuse treatment. For example, Morral, Iguchi, Belding, and Lamb (1997) reported that of 32 patients given abstinence-contingency management, 17 failed treatment and of these, 15 never contacted a single programmed incentive.

Lamb, Morral, et al. (2004) designed a study exploring the possibility that shaping with percentile schedules in conjunction with CM could achieve better outcomes than the usual fixed outcome criteria. The study presented four groups of smokers seeking to quit with four different (10th, 30th, 50th, and 70th) percentile parameters and looked at the effect on generating reduced CO levels. The effects of more and less demanding schedules were compared with respect to their effectiveness at treating participants whose recent smoking behavior was very different from the desired clinical outcome (hard to treat) in comparison with those participants whose early study behavior was closer to the desired clinical outcome (early successes).

One hundred and two participants were randomized to the four percentile conditions. In the initial study visit, participants were given \$2.50 for delivering a CO sample of < 4ppm – an amount that they had been educated was obtainable from a one day abstinence period. Following the next nine noncontingent baseline visits, participants were each randomized into one of four percentile schedule conditions. All schedules used a memory (m) of nine prior samples and compared the current sample value to the ranked values of the last nine samples (approximately behavior over two weeks). The

various percentile schedules require the current sample to be better than a varying number within that ranked window. In the more stringent 10th percentile schedule, reinforcement required a breath CO level outcome that fell *below* (i.e., was better than) the nine most recent samples (i.e., ranked first among 10, current sample included). Similarly for the 30th percentile, a current CO level had to outperform the lowest seven values of the ranked nine previous CO-level samples. For the 50th percentile schedules, a current CO level had to outperform the lowest five values of the ranked nine previous CO samples. Finally, the most lenient 70th percentile schedule required a CO level that outperform the only the lowest three values of the nine most recent ranked CO samples. In all cases, a CO level less than or equal to 4 ppm would receive the programmed incentive.

An additional example, not from the article mentioned, using a *mock* dataset is used here to demonstrate the application of the schedules used in the Lamb, Morral, et al. (2004) study. The numbers in the boxes represent a hypothetical participant's nine most recent (ranked) CO level samples. The reinforcement criteria resulting from the four percentile schedules are indicated. If a participant's current CO level is 10 ppm, a reinforcer *would* be delivered under either the 50th or 70th *but not* under the 30th or 10th percentile schedules.



In the Lamb, Morral, et al. (2004) study, the percentile schedules resulted in payoffs that started at \$2.50 and escalated by \$0.50 for each consecutive criterion CO sample (based on Higgins, et al., 1994). In addition, a \$10 bonus was provided for each consecutive run of five criterion samples (equivalent to one week). When a subcriterion CO level was obtained, the next criterion sample reset to \$2.50. Following a reset, a series of five consecutive criterion CO samples re-instated the highest past level achieved through escalation series (not including \$10 bonuses).

The results of Lamb, Morral, et al. (2004) indicate that the median percentage of visits that led to rewards was comparable across percentile groups. A defining feature of percentile schedules is that they ensure that reinforcement will be contacted at least as often as the percentile value indicates (e.g., a 60th percentile schedule will ensure reinforcement is delivered for 60% of performances). In this study (i.e., Lamb, Morral, et al., 2004), the percentile value's lowest percentage of reinforced visits were only slightly below the percentage predicted by the percentile schedule indicating that the percentile schedules functioned as intended. An exception was that four participants from the 10th percentile condition (the most demanding schedule) dropped out before contacting any reinforcement deliveries. The problem of presenting schedules that are too demanding, or do not start reinforcement for behavior that actually exists in the repertoire of the participants, is common in even relatively successful treatments for substance use disorders such as CM.

The main effects of Lamb, Morral, et al. (2004) were in CO-level changes over time and the interaction of those changes over time with percentile schedule condition.

Across conditions, CO levels dropped significantly over the 60 post-baseline sessions with the 70th percentile schedule controlling significantly better (lower) mean COs than the other three conditions. The 30th, 50th, and 70th percentile schedule conditions resulted in higher proportions of individuals achieving the <4 ppm CO target level than the 10th percentile condition. Differences in the proportion of individuals in a schedule condition who achieved the 4 ppm target arose after day five. More participants (9/25 = 37%) in the 10th percentile condition *never* reached the target CO level than in the other schedule conditions (6/77 = 8%). Similarly, five days after instituting the percentile schedules, fewer (2/10 = 20%) participants in the 10th percentile schedule than in the other percentile schedules (23/32 = 72%) achieved their first-time occurrence of the 4 ppm milestone.

Early success is said to predict later success. Participants who passed the initial baseline test, achieving a CO below 4 ppm on Day 1, indicating the ability to go one day without smoking (“early successes”), had a mean of 50 out of 60 (80%) visits with < 4ppm. In contrast the mean number of visits in which the CO < 4 ppm target was reached among the “hard to treat” participants who failed to meet the CO target during the 11 visit baseline was 24 out of 60 (40%). As well, in the last five days of the study, 61% of early successes maintained consecutive target CO levels compared to 36% of hard to treat participants. For the early success participants, there were no significant differences in the percentile schedule effects on treatment success; those who do not need shaping to reach a target behavior will fare well under a wide range of reinforcement contingencies. For the hard to treat, the 70th percentile schedule had a significantly greater beneficial impact on CO levels than the 10th percentile schedule. So early failure

only predicts later future failure when treatment involves a shaping schedule that is inappropriate to the participant's starting behavior.

Hard to treat patients are not difficult to identify. In a follow-up study, Lamb, Morral, Galbicka, Kirby, and Iguchi (2005) recruited participants who reported no plans to quit smoking over the next six months. In a similar procedure, this study evaluated the potential benefits of a more responsive percentile schedule by shortening the length of the behavior run on which the criterion was based from nine to four. Following a 10-day baseline, participants were randomly assigned to one of two generous 60th percentile schedule conditions differing only in the length of the percentile window. The study used the same payment amounts and escalation schedule described above (Lamb, Morral, et al., 2004). Across both groups, the number of cigarettes smoked during treatment was significantly less than during baseline. Although the four sample window group had consistently lower median CO levels than the nine sample group, these differences were not significant. Despite the effect of these schedules on smoking behavior, only six out of 71 participants had more than five consecutive visits in which smoking abstinence was reported. Of these six participants, five were in the 4-sample percentile schedule.

This review of percentile schedules suggests their potential to beneficially impact cocaine abuse treatment for those who have difficulty accessing reinforcers in standard individual contingency management programs. The extension of percentile schedules to substance abuse treatment, however, has been constrained by the fact that cocaine abuse treatment has lacked a graded measure of relative usage amount and abstinence duration comparable to the CO-level sample that has been used for smoking cessation programs.

A unique solution to this problem arises in group contingency management where the percentile schedule can be reasonably applied to the group as a whole rather than the individuals in it. Here the percent of the group urines that are negative becomes a graded measure that can be enabled and potentially be modified by the percentile schedule application.

The study presented here offered members within an existing study the opportunity to extend their stay in the study in order to test a variation on percentile schedules with the aim of improving outcomes on a number of addiction treatment related target behaviors for all members of the group.

Research Design for the Present Study

This study was designed to ask whether a percentile schedule used within the context of a group CM procedure can impact the behavior of a group of people with opiate and cocaine dependencies and, in particular, shape behavior among group members having initial low rates of behavior. A modified multiple baseline across behaviors with reversals design was selected to demonstrate experimental control and a percentile shaping schedule was applied to shape four target behaviors which were monitored simultaneously and continually throughout the study. Within behavior reversals were also used to test experimental control. The magnitude of reinforcers available when the criterion was met was also varied to improve behavioral outcomes. The four target behaviors included two attendance behaviors: attendance to the study-based incentive group and attendance to study-based urinalysis appointments, and two abstinence behaviors: opiate and cocaine abstinence.

CHAPTER 3

METHODOLOGY

Participants and Recruitment Strategy

Inclusion and Exclusion Criteria

Recruitment resulted in the enrollment of 16 opiate-dependent adult methadone maintenance patients receiving intensive outpatient treatment (IOP) at a community-based treatment program. Inclusion criteria were as follows: 18 years of age or older; use of cocaine (evidenced either by providing cocaine-positive urine at study intake or cocaine use as documented by clinic biological sampling records during the past 30 days); a diagnosis of cocaine abuse or dependence determined by the Psychoactive Substance Use Disorder section of the Structured Clinical Interview for DSM-IV-TR (American Psychiatric Association, 2000); a primary diagnosis of opiate dependence and receiving a stable daily dose of methadone ≥ 60 mg; enrollment in IOP therapy at the methadone clinic (3-hour session, 3 times weekly); plan to remain within IOP for the following 6 months (e.g., no *known* imminent hospitalization, incarceration, discharge from clinic or to weekly outpatient treatment); agreement to be videotaped during all study groups; and ability to fully participate in the study protocol (e.g., physically able to provide observed, urine specimens, available at the appointed CM group times).

Study Participants Recruited from Prior Group CM Study

During the first step of recruitment, study staff invited 15 individuals remaining at the conclusion of several phases of a previous group contingency management study (Kirby et al., in press) funded within the same National Institute of Drug Abuse behavioral

development grant. These participants had been assigned to two groups during a within-subject reversal design study that also focused on attendance and abstinence behaviors. At the end of that study, they had returned to a baseline phase and were invited to enroll in additional phases of the present redesigned study.

That study's procedure provided each group member an anonymous binary result based on whether or not they met the target performance (e.g., a "winner" chit for each cocaine abstinent participant and a "try again" chit for those who tested positive). These results were placed in a bowl and one result was randomly drawn during the incentive group. If "winner" was picked, then a series of four randomly selected group members drew four chits from a prize bowl which contained 500 chits with the following variable schedule of reinforcement: 250 no prize, 219 small prize (\$1-\$3), 30 large prize (\$20), and one jumbo prize (\$80; as described in the introduction, Petry & Martin, 2004; Pierce et al., 2006). Three consecutive session wins on a target behavior resulted in additional and escalating bonus draws in order to not only reinforce one instance of the target behavior, but to reinforce continuous improvements in the target behavior.

Targeted behaviors in that study were incentive group attendance, usual care IOP group attendance, methadone dosing adherence, and cocaine abstinence. Conditions included those targeting only cocaine abstinence for the duration of the condition and those targeting one of the four target behaviors selected randomly at the beginning of each incentive group meeting during the condition such that neither participants nor study staff knew ahead of the group meeting which behavior would be consequated. This version of group CM demonstrated the feasibility and acceptability of group CM within

this population and moderate efficacy of group CM for incentive group attendance within the multiple behavior condition, as compared to the cocaine-only condition.

To weaken potential control exerted by the characteristics of each participant's counselors (or by an absence of group interactions), participants in that study were recruited from 17 IOP groups at the same treatment site so as to distribute any variation among participants that might be due to their counselors' characteristics as well as to avoid having several participants who had prior relationships while others did not. Members of the two previous incentive groups did not have study-specific interactions *between* groups. Four of the 15 remaining participants from that study had graduated from their IOP treatment program to once weekly outpatient treatment toward the end of that study and therefore no longer met the eligibility requirement that they be receiving IOP; the remaining 11 consented to participate in the present study.

Anticipating additional attrition, the same eligibility requirements and methods as were used to recruit the 11 aforementioned participants, were again used to enroll an additional five participants. Specifically, research staff made presentations to IOP staff at the clinic regarding the study and clinic staff then referred interested patients who were thought to have abused cocaine recently. These potential participants were screened for inclusion in the study by research assistants. In addition to the eligibility requirements listed above, after the consent form was read aloud and reviewed with study staff, all potential participants completed an open-ended, informed-consent quiz to ensure their understanding of the study requirements, the risks and benefits, and their rights. When patients were unable to answer questions correctly the first time, the concept was re-

explained by study staff and the potential participants were given a second chance to answer correctly. All referred patients were able to pass the consent quiz. One of the exclusion criteria in place, psychiatric symptoms that contraindicate the planned intervention (e.g., untreated psychosis), did not become relevant during this round of recruitment. Pregnant women were not excluded since risk to the fetus is not greater than in usual care and there may be a direct benefit to the participant and fetus via the intervention.

During screening for additional participants for this study, staff concurrently recruited for another group CM study (in addition to this study) using the same eligibility requirements. All eligible participants were then assigned to one of the 2 CM studies based on their availability for the group times and then on a rotating basis to this study or to the concurrent study. During a two week period, 17 potential participants were referred and screened. Two were found ineligible because they were receiving methadone doses below 60 mg/day. Of the 15 eligible, only one did not complete enrollment due to discharge from the clinic before completing intake. Of the 14 eligible remaining, five were enrolled into this study and nine were enrolled into the alternative concurrent group CM study. Therefore, the addition of five new participants to the 11 participants recruited from the *prior* group CM study resulted in a total of 16 participants enrolled at the outset of the present study.

Study Setting

The treatment program is located in a large northeastern metropolitan area. It provides daily methadone medication to about 1000 total patients to block the effects of

illegal opiate use. About 35% of the program population abuses cocaine. The methadone maintenance program offers a range of services including individual and group therapy, addictions education, relapse prevention, HIV counseling, and case management. Of all methadone patients at the center, approximately 350 receive IOP group treatment having 15-20 members each meeting for 3 hours, three times weekly. Treatment is primarily based on psycho-educational and 12-step treatment models. The group CM intervention was implemented in a group room (11 x 17 ft) used exclusively for research purposes. Three authorized institutional review boards approved all study procedures.

Research Design and Data Analysis

After all participants experienced an initial group baseline phase, when *no* contingencies (detailed condition descriptions found below) were presented, four successive behavioral targets were introduced with scheduled reinforcers for behavioral improvement. The percentile schedule used recent prior rates of behavior to set a criterion that the group's aggregate data had to exceed in order to earn reinforcers. Once a behavior stabilized under an intervention condition, the intervention was applied to each next behavior for a period of at least one week, until the behavior stabilized under the new condition. As each successive behavioral target was introduced, the schedule was thinned on the former behavioral target so as to both maintain the former target(s) while focusing resources on the new target. Additionally, when behavior occurred at desirable levels for six out of nine sessions, a stable criterion of 75% replaced the percentile schedule.

All individual data were entered on the day they were collected into a Microsoft ACCESS database. The database was programmed to calculate aggregate group rates of all target behaviors and to calculate the percentile schedule criteria. The group's aggregate target behaviors were transferred to and graphed using Microsoft Excel after each session throughout the study. Data were analyzed by visual inspection by senior research staff.

Efficacy was determined by improvement in a target behavior following (in time) the application of the group CM intervention to the target. At points when the schedule proved unsuccessful, adjustments were made to improve the efficacy of the intervention by adjusting dimensions of the reinforcement contingency. These points are indicated on the graphs and include increasing the magnitude of the reinforcer or relative magnitude of reinforcement for the target behavior versus other behaviors, adjusting the shaping schedule, and improving the immediacy of the reinforcer delivery. In order to clarify experimental control by the intervention, embedded reversal (ABA) designs were conducted on two of the four target behaviors (opiate abstinence and incentive group attendance). Details of shifts in reinforcer dimensions and reversals within the multiple baseline study will be described in conjunction with a description of the results.

Additionally, *individual* opiate and cocaine abstinence data were also analyzed to assess any differential benefit of a percentile schedule for individuals with low versus moderate prior rates of the abstinence target behaviors.

Target Behaviors and Data Collection

Selection of Target Behaviors

The behaviors considered as target behaviors in this study, with the exception of urinalysis appointment attendance, were among the top priorities expressed by two community advisory board focus groups held in the early stages of the grant of which this study is a part. The focus groups consisted of administrative and clinical representatives from each of eight methadone treatment programs in the city where the study was conducted. These behaviors were subsequently approved by a research review committee and clinical staff at the treatment program that hosted the study. All were encouraged to select behaviors for their social and clinical importance as well for practicality of their observation and measurement in a community setting. Although attendance at usual care IOP therapy groups was initially considered an additional target behavior, baseline attendance to IOP was generally very high, likely because the clinic site had implemented clinic-wide contingencies such as withholding methadone dosing to improve IOP attendance. The four target behaviors selected were defined and measured as described in detail below.

Sequencing of Target Behaviors

Because it was anticipated that these target behaviors might not be completely independent of each other in that the increased rate of one behavior may influence the rate of another to some extent, intervention on behaviors was sequenced so as to reduce the possible influence of interdependency. Group attendance was targeted first as it could be performed independently of all other behaviors. Also, it had previously been shown to

respond to *individual* CM and was the only behavior, among four, targeted in the earlier study with this population, to respond to *interdependent group* CM (Kirby et al., in press). Urine appointment attendance was targeted second. Participants could attend the group without providing a urine specimen, but they could not receive incentives for either of the remaining drug use behaviors without providing a urine sample. Finally, opiate abstinence was sequenced prior to cocaine abstinence because all members of the group were already being treated for opiate dependence with Methadone and although the initial opiate abstinence rates left room for improved consistency, base rates of opiate abstinence were higher than cocaine abstinence. Studies of individual CM indicate that having provided an initial baseline abstinent urine or higher base rates of abstinent target behaviors predict stronger response to CM intervention (e.g., Ehrman, Robbins & Cornish, 2001; Stitzer et al., 2007). As such, it was anticipated that cocaine abstinence would be the most difficult behavior to affect.

Group CM Meeting Attendance

Study-based incentive group sessions were held on Mondays, Tuesdays, and Fridays at 1:15 pm. This session was scheduled to occur immediately before or after regularly scheduled group events or as soon as possible after methadone dosing to avoid scheduling conflicts and make meeting times convenient for participants. Upon arrival at the CM group meeting, two research staff recorded participant attendance; the facilitator marked off the participant's study number as present on an attendance form and then placed chits with the names of all participants present on the table in preparation for the drawing procedures. The total number present, along with any excused absences, were

entered into a Microsoft ACCESS database programmed to calculate the percent of participants in attendance and the next criterion in the percentile schedule. A reliability check was performed on a randomly selected 25% (n=23) of groups comparing the attendance for the day as entered into the database from group facilitator documentation on paper with videotapes from corresponding groups and found 91% agreement. In both cases of disagreement, the database *understated* the number in attendance by 1 and 2. This did not result in an error in the delivery of reinforcement as calculated by the percentile schedule on those days since the facilitator in conjunction with a coordinator always calculated the percentage in attendance by hand and it is these calculations that were used during the incentive group. However, the incorrect percent attendance entered into the database on those days had a small effect on subsequent calculations of the criterion for reinforcement for up to three sessions in one case. In both cases the criterion was set slightly *lower* than it should have been since those lower attendance rates were entered into the criterion calculations. Participants arriving after the presentation of the group's behavioral results had begun were not allowed into the group room and were counted as absent for the purposes of data collection and contingencies. Participants could let study staff know of planned absences in which case their data neither helped nor detracted from the group's behavioral outcome since they were subtracted from the denominator of the group outcome calculation. Upon return to the clinic the participant had to provide documentation of the reason given for the excused absence. Valid methods for verifications included a signed doctor's note, a letter from a probation officer regarding an official legal appointment, or study staff discussion with the site clinic

supervisor or nurse verifying that the clinic received official notice of that type of appointment or hospitalization, incarceration, or temporary ban or discharge from the clinic. Except in the case of clinic staff verification, if a participant failed to present valid excused absence documentation, an additional absence was calculated into the subsequent session data.

Urinalysis Attendance

Participants provided urine specimens in a private clinic bathroom under direct research staff observation three times weekly during baseline and throughout the study. Participants were paid \$2.00/visit throughout this study for submitting an unadulterated urine sample regardless of abstinence findings. Although \$2.00 payments provided an individual contingency for urine appointment attendance, the in-group baseline mean provision rate within this study was only 67% and it was desirable to increase this to near 100% in preparation for abstinence target behaviors. Two dollar payments were made throughout the present study in the form of gift certificates to local businesses, which were preferred over cash payments by the treatment site's treatment providers.

Initially urines were collected on standard sampling days of Monday, Wednesday, and Friday, designed to capture all drug use, particularly over weekends. Participants had all day to stop by the study office and deliver an observed urine sample. Urines were then counted toward the next possible incentive session drawing. For example, urines sampled on Mondays became the data for Tuesday's group, Wednesday's samples were used for Friday's group and Friday samples were used for Monday's group. Placing consequences on behavior from the previous session caused a delay in delivering the

consequence, but it was initially believed that it would be impossible to collect all 16 urine samples prior to the scheduled group session. In an effort to improve outcomes through increasing the immediacy of a consequence for the abstinence target behavior, beginning at session 45, staff began sampling urines on the *same* morning, prior to each incentive group: Mondays, Tuesdays and Fridays. Once same-morning urine sampling began, participants were encouraged to come any time in the morning and up to 15 minutes prior to the incentive group.

During phases targeting urine appointment attendance, missed urine samples (whether excused or not) that were collected *after* the group time, still resulted in the \$2.00 urine payment, but participants were ineligible for incentives for the urine attendance target behavior except in the case of a verified excused absence from their urine appointment. As well, urine appointments had to be timely in order to be counted toward the resulting percent *attendance* data.

All urine results were collected on paper as well as entered into the ACCESS database via a laptop computer kept on a cart that accompanied staff and the participant to the bathroom; when the bathroom was very busy, data were entered from the paper immediately in the bathroom and then entered into the ACCESS database later in the day. Excused absences were coded based on verified absence information and approved by the project coordinator. Any participants without urine results or verified absences were coded as missing urines. Missing urine results were counted as equivalent to missed urine attendance data. Reliability of the data entry comparing paper records with ACCESS database values were checked on a random 25% of all urine collection days for

each participant on those days resulting in 100% matching of all values. Excellent reliability is explained by there being several same-day cross-referencing procedures and the low number of participants. For example, the staff person entering the data always checked with all research staff to be sure that all participants who showed on that day were entered. As well, payment receipts for the urines that were entered daily into another database corroborated that an unadulterated urine had been received. Finally, because incentives and the percentile calculation itself required the urine data, these were checked by at least two staff, (one being the study coordinator or myself), before every group.

Opiate and Cocaine Abstinence

All urine samples were temperature and adulterant tested to ensure veracity and then immediately screened for opiate and cocaine abstinence by study staff using One Step® test strips. This type of urine screening test involves dipping each test strip into a *single* test cup with participant provided urine. Abstinent results are detected by the formation of a dark line matching the control line on the strip and can be typically read in less than five minutes. The tests use a monoclonal antibody to selectively detect elevated levels of the specified drug or its metabolite which competes with its drug-protein conjugate which comes painted onto the test strip. The urine migrates up the strip and the conjugate competes with the drug, if present, for the antibody binding site. Drug screening cut-off points described for each test below are recommended by the U.S. Department of Health and Human Services' Substance Abuse and Mental Health Services Administration (SAMHSA).

Opiate abstinence was determined by the presence of the metabolite morphine and detects the presence of morphine and codeine as well as semi-synthetic opiates such as heroin. Methadone, which all participants receive in their usual care treatment, is not detected by this test. Morphine remains in the urine for *several days* after a single opiate dose. This test identifies samples with morphine levels below 2000 ng/mL as *opiate-negative*. The reliability of the test itself and its reading are provided by the test manufacturer. At 50% above and below the 2000 ng/mL cutoff (i.e., 1000 and 3000ng/mL), the test correctly detects the presence or absence of morphine with 99% reliability (sensitivity). The percent agreement of the test strip with laboratory analysis (gas chromatography/mass spectrometry) is > 99% for capturing positive samples and 90% for accurately identifying negative samples (i.e., there is a small tendency for false positives). In studies with non-laboratory personnel using test strips (compared to trained lab technicians), at 50% above and below the cut-off, agreement with actual quantities were near 96% accurate with only a few false *negatives*.

Cocaine abstinence was determined by the presence of the cocaine metabolite benzoylecgonine. This metabolite is typically available in the urine for *24-48 hours* after drug exposure but may take *up to two weeks to clear* in heavy regular cocaine users. This test identifies samples with benzoylecgonine levels below 300 ng/mL as *cocaine-negative*.

The reliability of the test itself and its reading are provided by the test manufacturer. At 50% above and below the 300 ng/mL cutoff (i.e., 150 and 450ng/mL), the test correctly detects the presence or absence of morphine with 99% reliability (sensitivity).

The percent agreement of the test strip with laboratory analysis (gas chromatography/mass spectrometry) is > 96% for capturing positive samples and 90% for accurately identifying negative samples (i.e., there is a small tendency for false positives). In studies with non-laboratory personnel using test strips (compared to trained lab technicians), at 50% above and below the cut-off, agreement with actual quantities were near 98% accurate.

Participants were present during testing and were informed immediately of their urinalysis results. If a participant failed to attend the scheduled urine appointment or refused to provide a sample, the urine was considered to be *positive* for the purposes of administering contingencies unless the participant provided a verified excused absence by the clinic or study staff. The abstinence outcomes from urine samples that were collected *after* group were *included* in the outcome data, even though they were considered positive for the purposes of administering the contingency after the same day urine procedure was administered. Opiate data results were checked for the purpose of establishing reliability in data entry and also were determined to match on 100% of the 25% of dates randomly selected.

Group Leader Training and Procedural Integrity

One CM experienced bachelor level staff member facilitated a majority of the groups with occasional substitution by the study coordinator or another trained bachelor level staffperson. The main facilitator and a substitute had been trained to lead in a prior group CM study procedure using didactic instruction, passive observation, assisting, and then leading groups with feedback from senior staff and scientist feedback following taped

observation. Initially for this study a coordinator or myself was present for all sessions to review procedural integrity and later watched a majority of the videotapes from the incentive group sessions. Any concerns were discussed with the Principal Investigator for the grant of which this study was a part, with videotape review, if helpful. As the study progressed, the study coordinator or the facilitator was trained to recognize potential and actual problems and asked for assistance as needed. A senior coordinator or scientist observed groups or videotapes of the groups at condition changes, and as needed when a concern was raised by the facilitator or other study staff, or by participants.

All study staff (n=5) had been previously trained for other CM protocols in confidentiality, ethical recruitment and consenting, general lab procedures, urine collection, quality data collection, entry, and management, effective interaction with participants and adverse event reporting. The study coordinator had extensive experience working with a range of CM procedures.

General Group Procedures

Approximately 10 minutes prior to the scheduled beginning of group, study staff set up and turned on a digital video recorder stationed in the corner of the group room to capture facilitator behavior for purposes of quality assurance monitoring as well as to capture all participants when seated in an oval facing the facilitator. The door to the group meeting room was opened. Participants in the group room had the opportunity to interact and look at the prize selection while awaiting fellow group members. Following a 5-minute grace period, the group facilitator closed the door, called the room to order and implemented the specific contingencies associated with the scheduled group CM

condition. Those arriving after the door was closed were counted as absent and were unable to earn prizes that day. Groups lasted from 10 minutes to 35 minutes. Since the tape was also used to monitor any negative interactions, study staff stopped the video recorder only after all participants exited the group room.

Initial Baseline Groups

After consenting to the study, participants entered an individual baseline condition when they submitted urine specimens for testing, but did not attend any CM groups. When all participants had been recruited, participants transitioned to a baseline group condition which was held for a total of seven sessions until stability for the initial target behavior: incentive group attendance, was established. During these meetings, the group leader reviewed participant rights and consent documents, administered preference assessments for prizes, reviewed group behavior rules, including rules for excused absences, explained the percentile schedule, distributed guidelines for the group procedures and performed two sample drawings (without reinforcer delivery).

Explanation of the Group Procedures

On the final day of baseline, the facilitator revealed that the first target behavior would be attendance to the incentives group. The purpose of waiting until the last day of baseline was to collect baseline rates of the target behavior for determination of the percentile schedule without expectancy that might influence the behavior for some participants. The facilitator let them know that this program aims to help them with a range of behaviors, giving examples, indicating that other behaviors would be added after attendance in later phases. Participants were always informed ahead of time what

behaviors would be targeted and the criterion required for the target behavior to earn draws from the prize bowl at the next group session. This criterion was calculated by the ACCESS database program after data for the day had been entered. The facilitator encouraged participants to improve their chances of earning prizes by making the contingency concrete: “In this study, you can earn rewards based on how well you do as a whole group or team. The better each group member does, the better the chance that the whole group will earn prizes. You will win or lose as a group. The more of you that come to group, the better the chance that everyone will go home with prizes.”

Participants were encouraged to look for ways to support and assist each other as a means of increasing their likelihood of receiving reinforcement. The facilitator used the group rules such as “Be kind to your fellow group members! (No Negative Statements and Conversations)” or “Be Positive! (No Coercive Behavior or Comments)” with examples of each to model positive versus negative (critical) ways to encourage other group members on the target behaviors (Group Rules Handout can be found in the Appendices). Scripts for the group facilitator and handouts for participants were developed to assist group leaders in providing this explanation (see Appendix for samples).

Determination and Presentation of the Criteria by Percentile Schedule

Participants were introduced to the goal for the target behavior as the “criterion” or “number you have to beat.” A 60th percentile schedule with a four urine-sample window was instituted (Galbicka, 1994; Lamb et al., 2004; 2007). Since urines were collected 3/week, this four-sample schedule took into account behavior over approximately a week and a half. Each session the percentile schedule ranked the last four values of the target

behavior and compared the current value to 60th % ranked value. If the current value fell within the top three performances of the target (or exceeded the 2nd lowest value), then the group earned draws from the prize bowl.

The criteria and performance of the target behaviors were indicated to participants on a large foam core board with a large drawing of three thermometers. These indicated: the criterion they needed to exceed in order to earn draws from the prize bowl (which they had been told at the end of the prior group session), their current percent attendance and, after all prizes earned had been delivered, the criterion that they would have to exceed in order to earn draws at the next session. Each thermometer had a looped continuous sliding ribbon running up and down the middle which study staff could easily move to indicate criteria and behavioral outcomes. Different behaviors and outcomes were attached with Velcro. After the group was called to order, participant attendance was finalized and urine attendance and abstinence results were entered into the ACCESS calculator and usually hand-calculated as well by coordinators and study staff. The thermometers were prepared immediately prior to group as they reflected outcomes on behaviors occurring at that time (attendance and results of urines collected that morning and up to five minutes before group).

The facilitator or another staff prepared the board and covered it for suspense with a curtain and it was placed on a easel in front of the room. Then facilitator drew a chit from the “Draw Bowl” containing a chit with the name of all participants actually present at group that day. is the name drawn indicated the group member that would draw first from the prize bowl if the criterion were met. Subsequent prize bowls draws were made by

additional group members selected by the facilitator by drawing additional names from the draw bowl without replacing name chits within a day.

Example: Data from four previous sessions were ranked and the current outcome had to exceed the 2nd lowest value in order to take the 60% rank.

62%	73%	75%	77%
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If the group were to get 68%, they would see a board on which the leftmost thermometer would indicate the criterion for “today” which in this case was 73%. The current level would be indicated on the middle thermometer as 68% which they could see was lower than the “number to beat” and a label would say “Try Again” indicating that no draws had been earned for this behavior. The facilitator would then reveal the next criterion and give a message of encouragement. In this same example, were the outcome 76%, they would have exceeded the 73% criterion and the board would then state “Draw to Win!” The participant whose name had been drawn earlier would come up and draw for the group.

If the groups’ performance tied the criterion (73% in this example), then the board would have said “Tie Draw.” The first person the facilitator chose randomly would come up and draw from a bowl containing six ‘winner’ chits and four ‘try again’ chits, a random 60% chance at winning designed to match the scheduled outcomes (Galbicka, 1994). Then the prize bowl drawing procedure would be followed to determine the size of the prizes earned. If there were other behaviors targeted on that day, another board would be displayed and the procedure would be repeated.

Prize Bowl Composition

The “Prize Bowl” used in this study contained colorful plastic chits specifying different reinforcer magnitudes for use in a random drawing procedure. The bowl offered a variable magnitudes of reinforcement, altering the probability of selecting any given magnitude using 250 chits as follows: 219 small prize (\$2), 30 large prize (\$20), and one jumbo prize (\$80). These probabilities were modified from the original prize bowl developed by Petry and colleagues (2005) by removing all of the “Good Try” or no win chits. These were removed to ensure that behaviors were always reinforced when the criterion was met because in a previous group CM study with this population, desired abstinence behavior often went without reinforcement.

Draw Schedules

Once a behavior was initiated as a target under the percentile schedule, it continued to be reinforced by allowing two draws from the prize bowl until performance stabilized. When the first behavior stabilized, the intervention was applied to the next behavior and the schedule on the current behavior was thinned to one draw each time the group met the criterion. Additionally, during some “enriched” conditions in this study, the magnitude earned when the percentile schedule was met was increased by assigning all “small” chits a \$10 value; this was referred to as the “rich” bowl.

When the group failed to meet criterion, no draws occurred on that day and they were informed of the next criterion or criteria. When the phase shifted, participants earned one draw for continuing to meet the criterion for the last behavior(s) and began with two draws for the next phase’s targeted behavior. The group could earn two bonus draws on

the main target behavior on the last day of the week for behaviors for which they had met criterion on all meetings for that week. After six consecutive wins, the bonus draws were escalated to four draws and so on. Absent members did not earn prizes unless they provided evidence supporting an excused absence.

Drawing Procedures

Participants were required to follow standard drawing procedures used to discourage cheating (e.g., looking for specific tiles, palming desirable tiles to produce again in future “draws”). All chits were counted both before and after group to verify the correct proportions of prize chits and catch any cheating. Participants were asked to remove outer clothing and demonstrate that their hands were empty prior to making a draw. They looked away from the bowl when drawing and selected only one tile at a time. That tile was placed on the table in front of the group leader and then participants again demonstrated that their hands were empty. Subsequent draws were made by different participants in the same manner and without replacement of the drawn chits during subsequent draws.

After all drawings from the Prize Bowl were completed, the group leader and a research assistant distributed prize menus to participants. The prize menu listed possible options within each category of prize (small, large, jumbo) and generally allowed “write-in’s” for additional items. Participants were invited during baseline and regularly throughout the study to suggest things or store gift certificates that they wanted to see on the prize menu. Gift certificates to local restaurants and retail stores along with \$2 prizes (e.g., towels, toiletries, candles, cereal, pop tarts, candy and chips, disposable

cameras, socks, laundry detergent and other household supplies, etc.) were well stocked in a lockable cabinet in a secure location at the methadone maintenance program. In order to avoid the problem of having 10 individuals come to the prize cabinet at once, participants remained in their seats and handed in their order to study staff who also helped those with limited literacy.

Participants not in attendance at a meeting were not eligible for any prizes won unless they had an excused absence with valid documentation. Excused group members were eligible to select prizes at the next meeting.

Ethical Considerations

Reinforcement of Undesirable Behavior

Group contingencies have the possibility of delivering reinforcers based on those in the group with better performance of the behavior, to poor performers such that it may inadvertently reinforce an increase in undesirable behavior such as *increased* drug use or other undesirable outcomes as a function of participating in the Group CM intervention. Group CM has rarely been used with substance abuses. Drug use was monitored throughout the study to ensure that increases in drug use ($es > .20$ relative to baseline) did not occur.

Group Members May Present Coercive or Aggressive Pressure

A second concern was that group members would place negative pressures on other group members in effort to increase the chances of earning more for the whole group. Group rules were developed emphasizing support and respect and clarifying that group members were not to discuss their urine results or place negative pressures on each other

(see appendix). These rules were reviewed with all groups at the first meeting and again as needed.

The presence of negative peer pressure was monitored in two additional ways by a licensed psychologist or licensed professional counselor. Research staff, and scientists related to the larger grant of which this study was a part, monitored the research measures related to group interactions (i.e., Incentive Group Member Survey and the modified Conflict Tactics Scale-2) that were completed by participants weekly to identify instances of conflict between group members. When observed participants were observed to possibly experience negative side-effects potentially related to the procedures (via study staff report, weekly questionnaires, participant report or videotaped group interactions), the study coordinator or research assistant first interviewed the participant(s) involved privately and notes were made.

In addition to informing me, the principal investigator on the larger grant was always informed and the research team developed additional strategies to manage the situation and wrote new protocols as needed (e.g., to have the group leader more actively encourage cooperation, have participants exhibiting problematic behavior sign a non-coercion contract, modify the group rules to more specifically exclude asking about group members' urine results), and monitor for future occurrences. Ultimately a threatening or aggressive participant could have been removed from the study if verbal coaching and typical clinic interventions for negative behaviors were ineffective in changing behavior. For this study, verbal or physical threats of harm or actual harm

were defined as adverse events for the IRB. All events meeting the adverse event criteria or those that were related to the study protocol were reported to the relevant IRBs.

Measures Used in Addition to Behavioral Observation

Participant Assessment Schedule and Payments

Participants received \$20 for completing the intake assessment. In addition, there were both weekly and phase-change based assessments, given at least every 5 weeks, designed to monitor both positive and negative interactions regarding participation in the study. Participants received \$5.00 for each weekly assessment and \$10.00 for completing each phase-based assessment. All weekly and monthly assessments were collected on Thursdays, specifically chosen not to coincide with urine collection or incentive groups so that assessment payments did not additionally reinforce attendance target behaviors. All payments were made in the form of gift certificates to local businesses. Specific measures and assessment times are found below.

Intake Measures

Structured Clinical Interview (SCID) for Psychoactive Substance Use Disorders (PSUD)/DSM-IV version 2.0 (First, Spitzer, Gibbon, & Williams, 1995). The PSUD section of the SCID is a semi-structured clinical interview used to identify individuals who have diagnosable alcohol/drug abuse or dependence. The SCID has reasonable reliability and validity when staff have quality training (Williams et al., 1992). It was used at the screening interview for all participants in order to determine study eligibility.

Addiction Severity Index (ASI); McLellan et al., 1992; McLellan, Metzger, & Kushner, 1991). The ASI was administered at intake to gather descriptive information about the

participants, to determine study eligibility and problem severity in the seven areas assessed by the ASI: psychiatric status, physical health, employment status, legal status, alcohol use, drug use, and family/social functioning. The ASI is a 50 minute semi-structured interview that asks patients to provide data on the frequency of events indicative of adaptation or dysfunction in each domain. Interrater reliability coefficients for the seven severity indexes are exceptionally high (0.94 to 0.99 using Spearman-Brown formula; 0.74 to 0.91 using more conservative estimation techniques), and do not appear to be influenced by patient age, gender, or race (Allen & Litten, 1993). Test-retest reliability is 0.92 or greater, even with different interviewers (McLellan, Luborsky, Cacciola, & Griffith, 1985), and internal consistency ranges from 0.48 to 0.88 (Hodgins & El-Guebaly, 1992). Construct validity has been adequately established through correlations with other relevant, well-validated instruments and predicted criterion measures (McLellan et al., 1985). The seven severity indexes are minimally intercorrelated, indicating that they measure independent functional domains (Kosten, Rounsaville, Babor, Spitzer, & Williams, 1987; McLellan, Luborksy, Woody, O'Brien, & Kran, 1981).

Risk Assessment Battery (RAB). The RAB (Center for Studies of Addiction, 1995) is a self-report measure consisting of 29 items. This instrument focuses on HIV risk behaviors, including sex- and drug-related behaviors. It is included because studies have shown that smoking crack cocaine places individuals at increased risk of HIV infection (Chaisson et al., 1989). This was given at intake and every 3 months during the study.

Measures First Administered During the Initial Group Baseline

With the exception of the Incentive Group Member Survey which was administered every week, the following were administered at group baseline and whenever phase-based changes took place or at least every 5 weeks. Instruments constructed for the purpose of this grant are found in the Appendix.

Who Do You Know? This brief self-report instrument was constructed by the team in order to allow incentive group members to report on how many incentive group members they already knew at the outset of their entry into the incentive group. This was used only once at the outset to assist the group facilitator to monitor group relationships and interpret any supportive or conflictual interactions more accurately.

Modified Conflicts Tactics Scale (CTS-2) (Straus, Hamby, Boney-McCoy, & Sugarman, 1996). The CTS-2 is a widely used measure that assesses intimate partner aggression. For the purposes of this study, the CTS-2 items were modified to request information about conflict and cooperative styles between incentive group members in order to monitor the possible occurrence of negative group member interactions both during and outside of group meetings. Half of the items pertain to the participant's behavior and half to the behavior of the other group members. The coefficient alpha estimates for the CTS-2 range from .79 to .95, and there is extensive evidence to support its concurrent and construct validity (Straus, Hamby, Boney-McCoy & Sugarman, 1996). It takes about 10 min to administer 50 items verbally. They were checked immediately after completion by research assistant staff with a focus on 3 dimensions: physical assault, injury, and psychological aggression.

Perceived Social Support (PSS)- Friends (Procidano & Heller, 1983). The PSS-Fr is a 20 item scale reflects the extent to which friends fulfill an individual's need for support, information, and feedback. The participant responses to each item on a 4-point Likert-type scale. The instructions on the instrument were modified so that participants reported on their group members, rather than a wider array of relations, in order to monitor the possible occurrence of positive group member interactions both during and outside of group meetings. Internal consistency for the PSS is .88 and it has good convergent validity (Procidano & Heller, 1983). It takes approximately 3-5 min to complete. This was used at all phase-based assessment periods.

Group Climate Questionnaire (GCQ). The GCQ (MacKenzie, 1986) is a self-report measure designed to assess the perceptions of a group's therapeutic environment by individual group members. The GCQ contains 12 items rated on a 7-point Likert scale indicating extent of agreement ranging from "not at all" (0) to "extremely" (6). The GCQ takes approximately 5 to 10 min to complete. The GCQ consists of three factor-analytically derived subscales and a single item measure, each representing a descriptive dimension of group climate. The three subscales are Engaged (5 items), Avoiding (4 items), and Conflict (2 items). Reported alpha coefficients for the three GCQ subscales ranging from .88 to .94. This was used at all phase-based assessment periods or approximately every 5 weeks.

Incentive Group Member Survey. This brief self-report instrument was constructed by the research team in order to allow incentive group members to report on conflict related to the study intervention on a weekly basis. It could be taken by the participant or

administered verbally by study staff; answers were checked immediately by study staff.

Any report of distress received a follow-up discussion between study staff and the participant to explore the nature of the event and to problem-solve any needed interventions.

CHAPTER 4

RESULTS

Participant Characteristics

The characteristics of the 16 individuals recruited into the study are presented in Table 1. The group composition for the entire sample was similar to the demographic characteristics found at the treatment site generally. Mean age (45 years), gender composition (69% male), low income (63% under \$10,000), and predominantly single marital status (69%) are also characteristics commonly found in research and publically-funded methadone maintenance clinics around the country. Racial (69% Black) and ethnic (94% non-Hispanic) predominance is consistent with these characteristics in the neighborhood where the clinic is located.

Four of the 16 participants enrolled in the study discontinued participation. Two enrolled but became ineligible prior to the start of the baseline groups. Both became ineligible due to being discharged from the clinic, one for prolonged hospitalization following a car accident and one due to incarceration. Other than intake materials and pre-group baseline urinalyses, there were no data to include in the tables and figures, except participant characteristics. Therefore, the maximum participant number was 14 in Figure 1. Three additional participants were discharged from the treatment center during the study. The first was discharged from the clinic for not meeting the clinic's attendance requirements; their data are included in Figure 1 until they were discharged from the clinic, through session/urine 20. The second participant who became ineligible after starting in the group was discharged from the clinic after being accused of theft by the

clinic. This participant is included in all figures and graphs until their discharge, through session/urine 79. A third participant was hospitalized for medical reasons according to their counselor and they participated through session/urine 96.

All aggregate data were examined with these participants included and excluded from the final sample and no meaningful differences were detected in the results. Removing the 2 participants' data from all behaviors presented in Figure 1 tended to make a slight improvement in the group outcome on attendance and opiate abstinence, but followed nearly the same pattern of behavior. There was no appreciable difference for cocaine abstinence. Because the data contributed by these 3 individuals influenced the shifts in the percentile schedule itself, for the purposes of data analysis and presentation, I have included the data provided by these participants until each discontinued treatment. In all cases, this suggests that any shifts that appear across conditions are not a function of missing data or participants. Participant characteristics at intake are provided below in Table 1 for both the entire sample and without the 4 discontinued participants.

Table 1.

Participant Characteristics at Intake

	Entire Sample N = 16	Completers Only N = 12
Mean Age (range)	44.75 (26-60)	45.17 (30-60)
Female N (%)	5 (31.3%)	3 (25.0%)
Male N (%)	11 (68.8%)	9 (75.0%)
Education N (%)		
Less than HS	6 (37.5%)	5 (41.7%)
HS or greater	10 (62.5%)	7 (58.3%)
Marital Status N (%)		
Married/Cohabiting	1 (6.3%)	1 (8.3%)
Divorced/Separated	4 (30.8%)	3 (25.0%)
Single (*never married)	11 (68.8%)	8 (66.7%)
Employed N (%) (for wages or self)	0 (0%)	0 (0%)
Income N (%)		
Less than \$10,000	10 (62.5 %)	9 (75.0%)
\$10,000 or greater	6 (37.5%)	3 (25.0%)
Race N (%)		
Black	11 (68.8%)	9 (75.0%)
White	4 (30.8%)	2 (16.7%)
Other	1 (6.3%)	1 (8.3%)
Ethnicity N (%)		
Hispanic	1 (6.3%)	1 (8.3%)
Non-Hispanic	15 (93.8%)	11 (91.7%)
Mean Drug Use (range)		
Days of Cocaine Use in Month		
Prior to Intake	16.69 (3-30)	19.58 (4-30)
Years of Lifetime Cocaine Use	11.75 (1-28)	13.25 (3-28)
Years of Lifetime Heroin Use	13.06 (1-34)	15.42 (1-34)

Attendance

Incentive Group Attendance

Figure 1 displays the aggregate group results for all four behaviors within a modified multiple baseline *across* behaviors design with embedded *within* reversals. After an initial two week baseline during which the average aggregate percent of participants attending was 39%, attendance showed an increasing trend with a condition average of 57% when the 4-sample window, 60th percentile schedule earning two draws was instituted. At the point that the 2nd behavior, urine appointment attendance (UA), was concurrently targeted, group attendance received only one draw for exceeding the percentile set criterion (session 15); attendance dropped from 82% in a downward trend to 38% over four sessions, though the condition average remained at 57%. When the identical two draw condition was restored at session 19 in a brief reversal, the group attendance bounced back with an increasing trend and a condition average of a further improved 70%. The average cost per win day during the percentile schedule with two draws was \$10.

At session 28 the percentile schedule was applied to opiate abstinence (OA) but the same two draw schedule was maintained rather than the initially planned drop to one draw. The rationale was that group attendance dropped dramatically during the urine attendance condition and I wanted to increase the likelihood of maintaining group

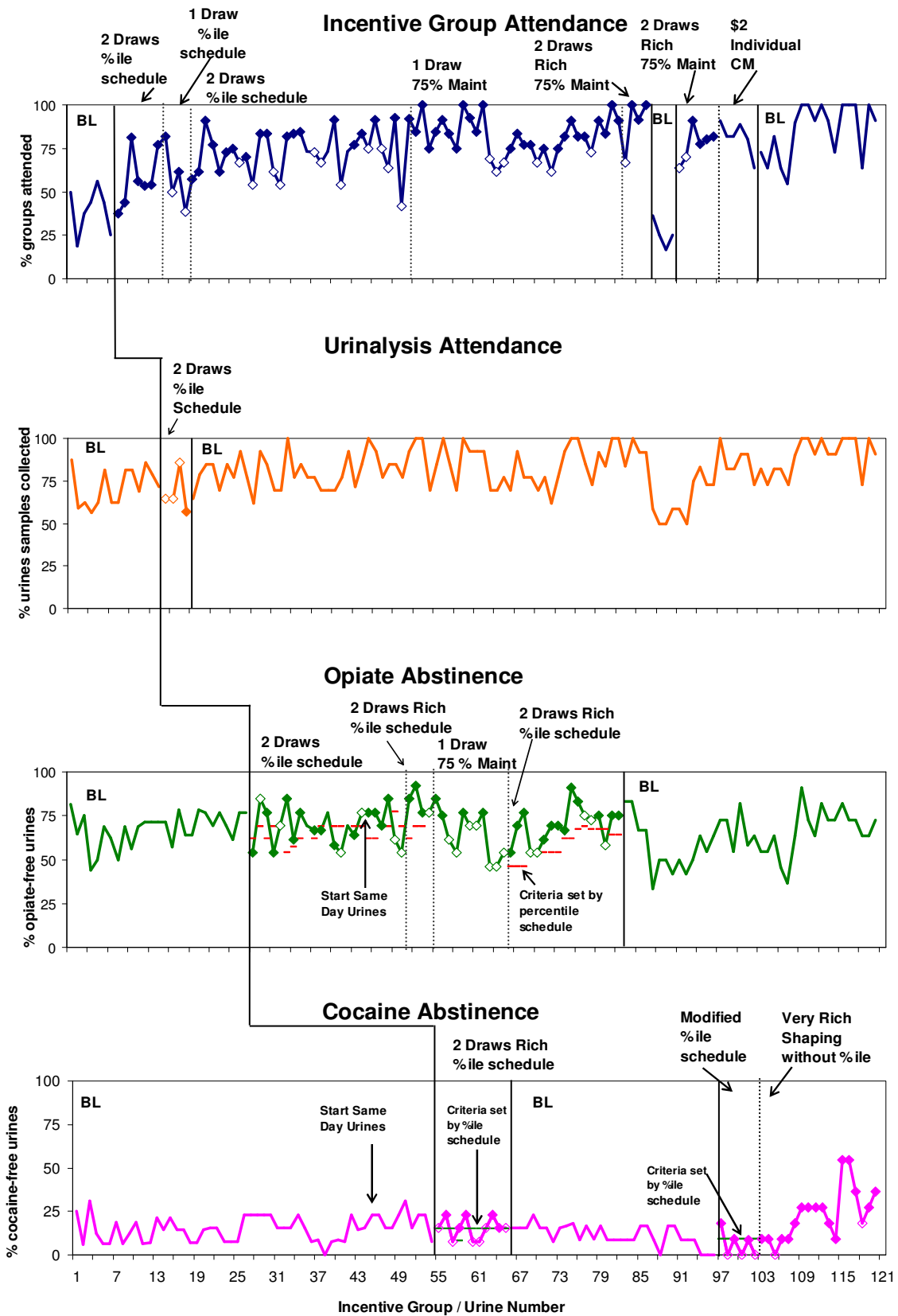


Figure 1. Percentile Schedule with Group Contingency Management

Across Four Behaviors

Aggregate group attendance (% attended), urinalysis appointment attendance (% urine samples collected), opiate abstinence (% opiate-free urines), and cocaine abstinence (% cocaine-free urines) results for participants (n = 14) throughout the study. Data are included for all participants until they became ineligible (n=3). Filled diamonds indicate sessions during which prizes were earned for meeting the criterion for the condition indicated. Hollow diamonds indicate sessions during which no prizes were earned. Missing urines are coded as positive. Prior to implementation of the “same day urine” procedure (session 45) prize bowl wins/losses reflect the target outcome from the prior urine collection day (MWF). Incentive study groups were consistently held 3 groups/week (MTF).

attendance. Group attendance was maintained with an overall increasing trend and a condition average of 74% and a continued average win costing \$10.

The maintenance criterion of a minimum desirable attendance rate of 75% on 6/9 consecutive sessions was first met at session 45; however, this corresponded to the introduction of consequences for opiate abstinence on the urine sample provided on the same day. As such, the shift to a maintenance schedule was delayed until session 51, when the magnitude of reinforcement was increased for the opiate attendance target condition by enriching the prize bowl. At this point group attendance was shifted from the percentile schedule to a 75% maintenance schedule. The graph shows that the group maintained good attendance meeting or exceeding the 75% target on 81% of sessions (numbered 51-82) over 11 weeks.

At this point, the multiple baseline design's ability to demonstrate control by the intervention was at risk due to the failure of the intervention on two of the four behaviors (discussed below). Therefore, a brief ABA reversal was implemented on group attendance beginning at session 83 for the initial A phase. Since attendance was at 100% and 91% just before making this shift (sessions 81, 82 respectively), use of a shaping percentile schedule for the attendance reinforcement intervention was inappropriate and therefore a 75% maintenance criterion was presented in conjunction with two draws from the enriched bowl. There were no other behaviors targeted during this reversal. During the first phase of the reversal, the rate of attendance was 90% (16% S.D.). During the following baseline (extinction) condition, group attendance fell to 26% (8%) and returned to 77% (10%). Looking across the approximately seven months duration of the study,

incentive group attendance (GA) shows a stable baseline, followed by an increasing trend until the return to baseline was implemented, and re-establishment of the behavior upon re-introduction of the maintenance reinforcement schedule. Therefore, this reversal was successful in that it was able to demonstrate that interdependent group CM can be effective with this population. However, because GA was on a maintenance schedule when the reversal occurred and re-established via the maintenance schedule, this does not demonstrate control by a percentile schedule in conjunction with GCM.

Figure 2 compares GA with the overall magnitude of the prize bowl schedule. The value of prizes won does not vary in direct correspondence to the % attended that day. Although the magnitude of the reinforcer delivered might be expected to impact attendance in the following sessions, this schedule involves both random components (the drawing from a variable magnitude prize bowl) and bonus draws which allow the session by session magnitude to vary considerably. It is planned and likely that the history of earning large and jumbo prize draws reinforces subsequent increases when the condition schedules are working effectively.

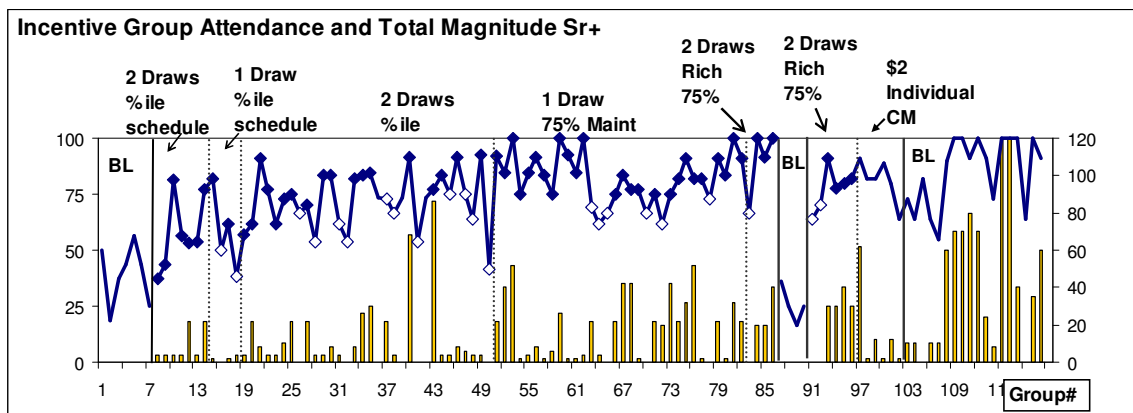


Figure 2. Incentive Group Attendance and Total Magnitude

Aggregate group attendance (%) results for all participants (n = 14) throughout the study (blue lines) shown in relation to the total value (\$) of prizes earned on the corresponding day (yellow bars). Data are included for all participants until they became ineligible (n=3). Filled diamonds indicate sessions during which prizes were earned for meeting the criterion for the *attendance* condition only. Hollow diamonds indicate sessions in which no prizes were earned for *attendance*. Prizes may have been earned for other behaviors, as indicated on Figure 1 with filled diamonds.

Urinalysis Appointment Attendance

Attendance to urine appointments was 71% during baseline measures taken up until intervention on UA (session 15). However, there was a slight upward trend in urinalysis appointment attendance during the GA reinforcement schedule prior to any intervention on UA. Attendance was especially high just before the UA condition began and the percentile schedule set the criterion at 79% to start. Over 4 sessions the group’s UA performance did not show overall improvement and the high base rates of behavior made it unlikely that I would be able to demonstrate control via the multiple baseline design. Wins or losses were based on the urine sample collected at the *previous* urine collection day; therefore on the highest UA day in this condition, the win was delayed possibly further reducing the likelihood of demonstrating control on this baseline. Finally, it

appears that UA attendance may not have been as independent of GA attendance as was originally theorized. During the programmed return to baseline for GA (sessions 87 – 90) there was a clear corresponding reduction in UA, followed by an increase in UA when the GA contingencies were re-instated.

Abstinence Behaviors

In graphing the abstinence data presented in the aggregate group figures and tables, I followed the procedures typically used in addictions research and made the conservative assumption that all missed urine sampling appointments were positive. I also graphed the abstinence data treating the missing urines as missing (i.e., the missing sample is eliminated from both the numerator and dominator in making calculations). For opiates the abstinence outcomes were generally somewhat higher when missing samples were calculated as missing, but they followed a similar pattern as the missing counted as positive display presented, with one exception as noted below. This suggests that any shifts that appear across conditions are not a function of missing data or participants.

Opiate Abstinence

Figure 1 shows no obvious trends in the baseline rates of opiate abstinence. Baseline responding remained stable, even during increased in GA responding when the percentile schedule was applied to that behavior, indicating that OA probably functioned

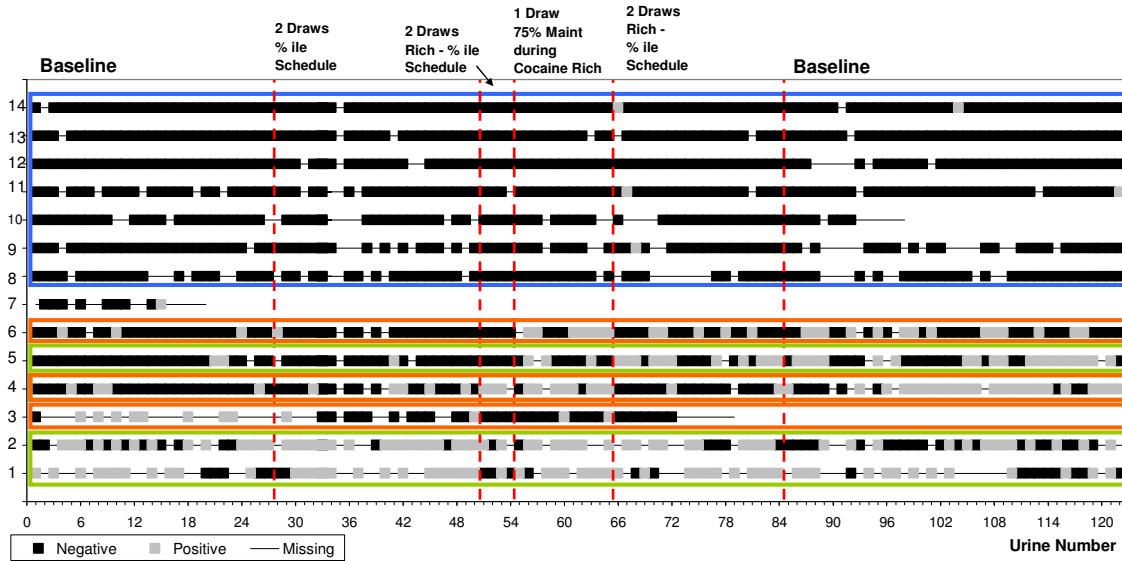


Figure 3. Individual Opiate Abstinence by Condition

Individual opiate abstinence results for all participants who experienced any opiate abstinence reinforcement conditions (n = 14). Each horizontal line represents one participant (1-14). Lines that terminate before reaching the right axis of the figure indicate the participant did not complete the study. Color coding for level of response to the intervention; see text for description.

independently of GA. Baseline OA mean and standard deviation were 68% and 10% respectively. Mean OA *during* the first opiate condition using a percentile schedule with 2 bowl draws remained unchanged (mean = 69%; standard deviation = 10%). At a group level this condition was ineffective toward changing OA. When same day urine collection was implemented beginning at session 51, no clear improvements in OA were noted.

In an effort to improve OA, I enriched the prize bowl in conjunction with the percentile schedule by increasing the value of the small prizes from \$1-\$3 to \$10. This resulted in the mean prize values shifting from \$4.50/winner session to \$30/winner session and

corresponded to an increase in OA to 83% with less variability (see Table 2; 7.4% S.D.).

The following condition focused resources on CA while OA was reinforced on a 75% criterion requirement maintenance schedule and a return to the lower magnitude small prize (i.e., \$1 - \$3) bowl. OA dropped during this condition; although the group achieved the 75% criterion on some days, there were some very low outcomes and the condition mean essentially returned to baseline (mean = 65%; 13% S.D.). Next, in order to see whether the reduction in responding truly was a reversal, the group was returned to the OA two draw enriched bowl condition. The response in OA this time was more delayed, but the criterion lines on Figure 1 indicate that the percentile schedule was effective in both demanding gradual improvements in OA which corresponded to gradually improving OA. During this reversal, participants received about the same amount as in the identical prior condition (\$29/winner session; Table 2). Group mean and standard deviation across the whole condition was unimpressive at a mean of 70% (10.5% S.D.); however, there was an increasing trend in the desired direction during this phase. The behavior closely tracked the criterion set by the percentile schedule, suggesting some control by that schedule. The mean OA during the last 9 sessions of this phase was 75% (9% S.D.).

Table 2.

Opiate Prize Distribution by Condition and Opiate Abstinence

Condition	% Sessions \geq 1 Prize	Mean \$ per Opiate Win Session	% Opportunities Individuals Attend & Receive \geq 1 Opiate Draw(s) when:		% Opportunities Individuals Opiate Abstinent w/ No Win
			Opiate-Abstinent	Opiate-Positive	
OA Percentile 2 draws	67	4.50	63	7	34
OA Percentile 2 draws Enriched	75	30	67	13	29
OA 75% Maint 1 draw	36	2	32	8	45
OA Percentile 2 draws Enriched	71	29	57	12	24

Note. Reinforcement contingency environments established by 4 successive conditions during which the incentive group's % opiate abstinence (OA) was reinforced. All percentile conditions established the criterion for earning prize bowl draws on a 4-window memory 60th percentile schedule. The variable magnitude prize bowl contained 219 small, 30 large, and 1 jumbo chit. Large chit value remained \$20 and Jumbo remained \$80 throughout. During conditions 1 and 3, smalls were valued at \$1-\$3 and \$10 during enriched conditions 2 and 4. When a shaping schedule resulted in 6/9 group performances at 75% or above, the percentile schedule was replaced by a 75% maintenance schedule with a reduction to 1 draw in the \$2 small bowl.

Column 1, Table 2 indicates that the percentile schedule functioned as planned. Percentile schedules offer reinforcement at approximately the value of the schedule; in this case 60%. During the first OA condition, the group earned prize draws for OA 67% of the time; however, during the second enriched OA condition and in the final enriched OA condition the rates were a little higher than programmed (75% and 71%, respectively). Column 3 in table 2 shows that individual participants who were actually abstinent appropriately received reinforcers 63%, 67% and 57% of the time during successive OA conditions; reinforcement rates that overall were a little closer to those programmed. Finally, it is a feature of all interdependent group contingencies that some group members earn rewards when their behavior is not at a desirable level. Column 4 demonstrates that this happened at low frequencies.

Figure 3 shows that of the 13 participants that experienced all OA conditions, seven out of 13 were already abstinent almost 100% of the time during baseline and throughout the study; these are highlighted by blue boxes. Of the six out of thirteen that could benefit from the intervention, three participants, as indicated by green boxes, did not respond. Two of them (lines 1 & 2) show no improvement in opiate abstinence over the course of the study, while one participant (line 6) entered the study doing fairly well and began to do poorly in synchrony with the shift 75% maintenance schedule (sessions 55) and never recovered. All three of these participants presented some clean urine samples during baseline, but the reinforcement conditions did not prove sufficient to improve their behavior..

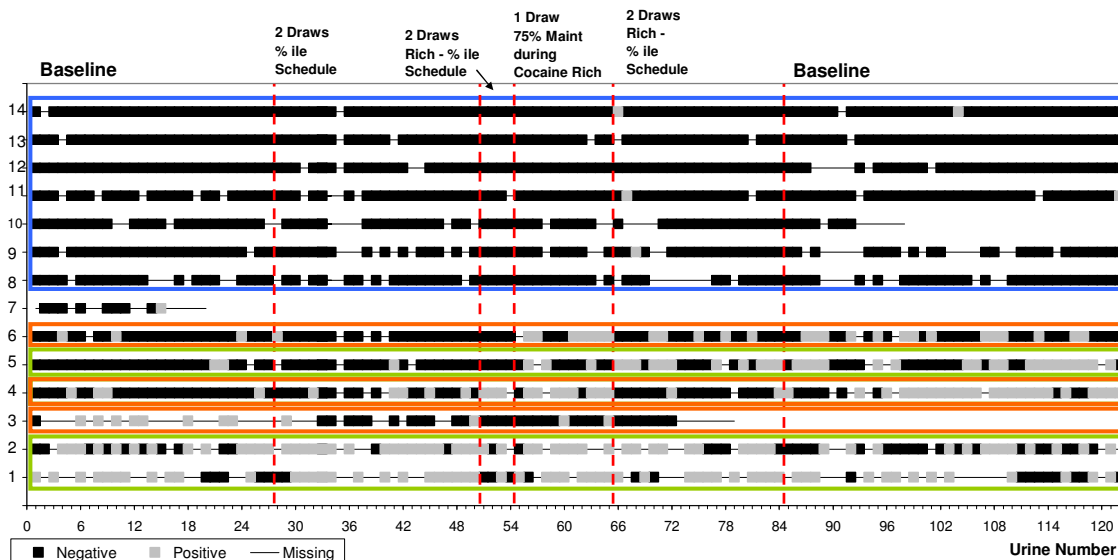


Figure 3. Individual Opiate Abstinence by Condition

Individual opiate abstinence results for all participants who experienced any opiate abstinence reinforcement conditions (n = 14). Each horizontal line represents one participant (1-14). Lines that terminate before reaching the right axis of the figure indicate the participant did not complete the study. Color coding for level of response to the intervention; see text for description.

Finally, three of six participants (highlighted in orange) did seem to respond to the conditions, one more markedly than the others. This participant (line 3) first showed increased periods of abstinence during the first OA percentile condition and responded with a sustained period of abstinence when the enriched prize bowl was introduced. When the maintenance schedule was introduced the participant began intermittent use of opiates and then during the return to the enriched schedule, re-established an extended period of abstinence before dropping out of the study for reasons unrelated to the study (as mentioned, the participant was discharged by the methadone clinic under allegations of theft). The other two participants (lines 4 and 6) demonstrated only occasional

intermittent use of opiates during baseline and during the first two percentile schedules, then appeared to increase opiate use during the maintenance schedule. One participant (line 6) continued to use intermittently for the remainder of the study. The other (line 4) showed increased abstinence during the return to the percentile schedule with the enriched prize bowl, with a gradual relapse to regular opiate use after a few weeks of return to baseline.

Cocaine Abstinence

Visual inspection of Figures 1 indicates that the combination of originally designed 60th percentile schedule and enriched prize bowl did not result in improvements in cocaine abstinence. Cocaine abstinence by individual (Figure 4) confirms this observation. Although five individuals demonstrated at least one abstinent urine during the phase, there were only 3 group members abstinent at the same group. The average earning during this phase per urine was \$11. After conducting interventions on other behaviors, the study concluded within the IRB specified maximum study duration (21 months) with two more attempts to initiate periods of cocaine abstinence in these “hard to treat” participants.

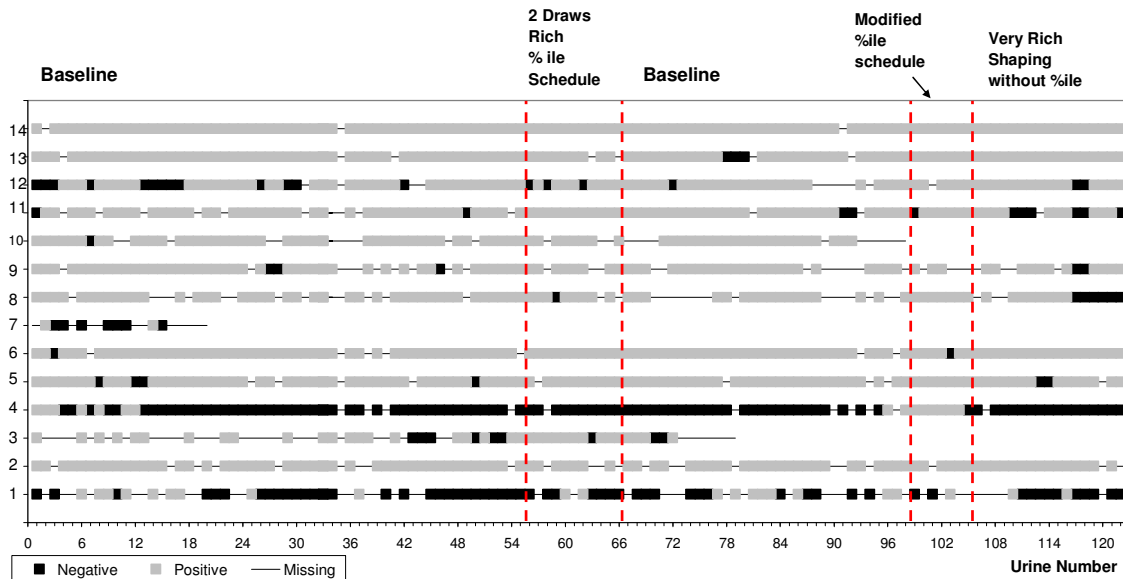


Figure 4. Individual Cocaine Abstinence by Condition

Each horizontal line represents one participant (1-14). Y-axis numbering is set to correspond to the sequence presented for individual opiate abstinence data (Figure 3) since opiate abstinence data were sorted by participant for density of opiate abstinence. Lines that terminate before reaching the right axis of the figure indicate the participant did not complete the study.

While two participants initiated periods of extended abstinence during the study (lines 1 and 4) none of the participants specifically responded to initial percentile condition.

During the initial CA enriched bowl condition, there were never more than 3 participants in a session who provided urine specimens that tested negative for cocaine metabolite. Because the percentile schedule initially set a low criterion, the group won 45% of the time moving up and down in a seesaw pattern. This percentile schedule in conjunction with the enriched prize bowl failed to produce a gradual increase in the criterion and instead was almost flat (see Figure 1). During the enriched bowl CA condition, the mean prize value was \$11 (as compared to \$30 during the enriched OA; in

part because bonuses were never earned). Finally, unlike the opiate conditions, Table 3 indicates that participants coming to group after giving a *positive* urine receive reinforcers specifically for meeting the CA criterion 33% of the time and received a prize for any behavior 75% of the time.

Table 3.

Prize Distribution during Initial Cocaine Abstinence Condition

	% Sessions ≥ 1 Prize Earned	Mean \$ per Win Session	% Opportunities Individuals Attend & Receive ≥ 1 Draw(s) when:		% Opportunities Individuals Cocaine w/ No Win
			Cocaine Abstinent	Cocaine Positive	
Draws for CA	45	11	10	33	8
Draws for All Behaviors	91	13	16	75	2.50

Note. During the initial cocaine abstinence condition, the criterion determining whether incentive group members earned draws from a prize bowl was set using a 4-window memory 60th percentile schedule. When the group’s current % cocaine abstinence (CA) results exceeded the criterion, they earned 2 draws from an enriched prize bowl of variable magnitude: 219 small (\$10 each), 30 large (\$20), and 1 jumbo chit (\$80). When they tied for the 60th percentile, 2 draws were earned on a random 60% of the time. During the CA condition, % attendance and opiate abstinence could each 1 draw from the same prize bowl but with smalls worth \$2 when the group outcome met or exceeded a 75% maintenance schedule.

Based on a review of recent literature on harder to treat participants (Ghitza et al., 2007; Roll et al., 2006) a new percentile schedule was implemented at session 97. This 66th percentile schedule had a shorter memory: three instances total accounting for a week of behavior; it compared the current behavior with the last two and it had to exceed the lowest of the last two. The point was to focus reinforcement on the more recent abstinence points. In addition, the prize bowl was set to a 78% probability bowl in order to introduce opportunities to weather some disappointment so that on days when the group does not meet the schedule requirements, extinction reactions are reduced and in addition, intermittent schedules produce more persistent behavior. In order to reinforce new abstinence, “newbie” points were instituted. Without breaking anonymity, the group earned \$20 (each) when a member was newly abstinent during the phase. This was only available 1 time during the phase. A final type of bonus was instituted in order to reinforce longer durations of abstinence, “endurance points.” The group earned one draw from the prize bowl for each individual (anonymous) that session who provided an abstinent sample for the second or more consecutive time. Figures 4 and 5 demonstrate that this schedule was ineffective in initiating abstinence. The average earning during this phase was \$13/session/group member. Finally, in the last phase, it was apparent that the magnitude would have to be increased significantly in order to initiate abstinence. Because of the investment, the percentile schedule was replaced with more flexible shaping procedure, the use of an experienced behavioral psychologist on the research team. The group was not given a criterion to meet; they were only told that they had to

do better to earn and that the better they did, the more they would earn. The research staff called the psychologist just before each group, after urine results were known and a decision was made as to whether and how much to reward. Decisions and magnitude are indicated on the third condition displayed in Figure 5.

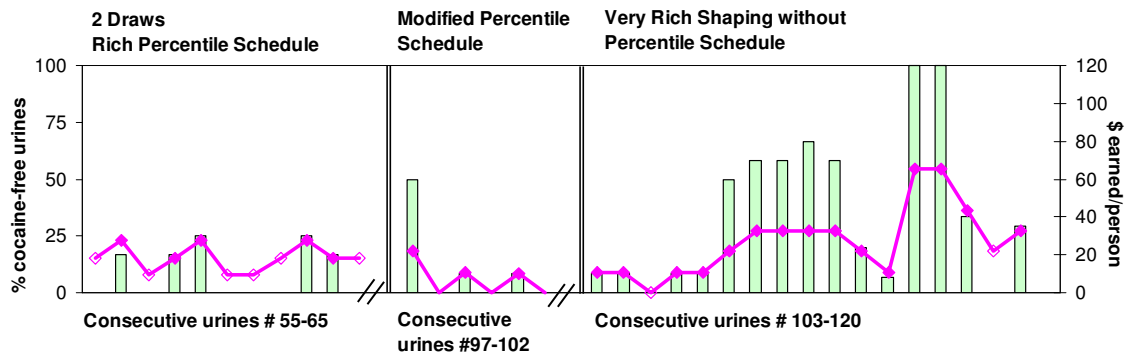


Figure 5. Cocaine Abstinence With Three Shaping Schedules

Safety

Safety and subjective participant discomfort were monitored closely and allowed study staff to identify negative behaviors and interactions that were both related and unrelated to the study. There were no acts of violence nor threats of aggression that were related to the protocol. The facilitator and their substitute did need additional training to manage this large group of participants who initially had minor spats unrelated to the study but which occurred while the group were gathering or waiting for prizes to be delivered. Once the facilitator more immediately and confidently enforced the group rules the incidence of these behaviors was arrested. Only one adverse event (AE) occurred during the study related to the group CM procedures. In this case a female

participant overheard a male participant making threatening statements to others from the study about anyone not cocaine abstinent (during that phase) and let study staff know that she had missed the previous 2 incentive groups because she felt intimidated by this. No specific act was named in the threatening statements and no one was named specifically. This AE was reviewed by 2 Institutional Review Boards and considered in conjunction with 2 related AEs in the concurrent group CM study within the grant which similarly involved verbal interactions that felt threatening to some group members but which did not result in violence. In response to this event and IRB concerns, the group rules were adjusted to specify that asking about others' urine results and making negative comments or threats about abstinence results is not allowed. The new rules were handed out, read by the facilitator. Additionally, a contract was presented individually and privately to all participants indicating receipt and review of the new rules and agreement to them. The rules were also reviewed whenever the study staff noticed minor irritability that risked escalation. The research team additionally implemented individually developed contracts to highlight rules that some individuals failed to understand or relate to their own behavior when identified by study staff, even if this did not meet the definition of an AE or was not related to the study procedures.

Table 3.

Prize Distribution during Initial Cocaine Abstinence Condition

	% Sessions ≥ 1 Prize Earned	Mean \$ per Win Session	% Opportunities Individuals Attend & Receive ≥ 1 Draw(s) when:		% Opportunities Individuals Cocaine w/ No Win
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CHAPTER 5

DISCUSSION

This study evaluated whether a percentile schedule (using a 4-sample memory at the 60th percentile) used to set criteria for prize bowl drawings within the context of an interdependent group CM procedure could improve attendance and abstinence behaviors among those with opiate and cocaine dependencies receiving methadone maintenance treatment. The findings demonstrated that this procedure can be used to improve and maintain group attendance. They were promising but not definitive when applied to opiate abstinence which began at fairly high baseline rates (mean = 68%), and did not prove efficacious for shaping cocaine abstinence which began with very low baseline rates (mean = 15%). There were also a number of treatment resistant individuals in this group that did not respond to a previous group CM intervention for cocaine abstinence. This is the second study demonstrating that *interdependent* group CM can be implemented with methadone-maintained adults dependent on cocaine while managing the potential coercive negative side effects that can arise in the context of interdependent group contingencies. Although mild to moderate coercive and cheating behaviors were reported during the study, they responded to typical outpatient conflict management strategies such as review of written rules and behavioral contracting with specified response costs. Therefore monitoring of these potential problems is important. Below, these outcomes are

discussed by target behavior in the context of the present state of empirical evidence for and problems with CM.

Attendance. Interdependent GCM was efficacious, feasible, and acceptable for improving *attendance* among methadone-maintained substance abusers. This study corroborates findings from one other study (Kirby et al., in press) where *interdependent* GCM was used with the same population, but a different schedule, to successfully, though modestly improve attendance. That study did not use a percentile or shaping schedule, but rather a schedule with randomly selected components including the target behavior for each session and the behavioral outcome among all group members' responses. Due to the failure of the present study procedure to improve 2 other planned targets (urinalysis attendance and cocaine abstinence), the multiple baseline design used could not demonstrate control by the 4-sample window 60th percentile schedule in setting appropriate criteria for reinforcement; control was instead demonstrated by implementing a reversal when attendance was high enough to earn reinforcement by simply continuing to meet or exceed the maintenance 75% criterion. The results from the reversal were not able to test the use of the percentile schedule to set criteria for the group, but looking across all phases, these results do not contradict the possible benefits of using the shaping schedule.

The successful use of *interdependent* GCM supports and extends the current literature demonstrating successful use of *independent* CM within group to improve attendance (e.g., Alessi et al., 2007; Petry, Martin, & Finocche, 2001; Petry, Martin,

& Simcic, 2005; Sigmon & Stitzer, 2005). Attendance and retention are valuable in deriving the benefits of methadone maintenance (e.g., medication compliance, attendance to group and individual therapy sessions), and arresting opiate use and improving treatment retention have been positively correlated with decreases in cocaine and alcohol use as well as social complications (Alessi et al., 2007; Grella, Wugalter, & Anglin, 1997; Villano, Rosenblum, Magura, & Fong, 2002).

This study sought to transfer benefits empirically demonstrated by the wide and effective dissemination of interdependent group contingency management systems in classrooms for more than 30 years (Tingstrom, 1994; Tingstrom, Sterling-Turner, & Wilczynski, 2006) to the treatment of substance abusers who are also largely served in group settings. One of the attractions cited in the schooling literature of *interdependent* GCM over independent GCM is the reduction in effort and administrative time to implement. Given descriptions of independent group CM for group attendance in substance abuse treatment settings (e.g., Alessi et al., 2007; Petry, Martin, & Simcic, 2005) which involve escalated numbers of draws for *each* individual in the group, it seems likely that 1 set of drawings for the whole group can be time-saving and yet maintain the anecdotally described excitement of the drawing procedure. In this study using interdependent GCM, there is one set of drawings for the whole group when the schedule has been met, and this typically takes about 5 minutes while the giftcard and prize exchanges take the bulk of time. Treatment sites wishing to use this intervention could offset the time involved in delivering rewards during group by setting up a clinic store from which tokens or vouchers earned in

group could be exchanged outside of group. Clients could then exchange their vouchers without using group time or could be filled by non-treatment level staff while group therapy continued.

There are additional potential benefits of interdependent group CM when extrapolating from the extant literature on its benefits in schools. When considering how large-scale dissemination of CM for attendance or other target behaviors could work, implementation with only those patients demonstrating problems with the target behavior presents the problem of jealousy and frustration by those who already perform the target at acceptable rates. In a survey of treatment provider attitudes toward individual CM, concerns regarding negative side-effects, including stealing and jealousy, were raised (Gutierrez et al., 2003). A related potential problem is that patients may attend less or increase substance abuse in order to gain access to contingency management programs. Interdependent group CM has been used to reduce this problem successfully with school children and has the potential to overcome this possible problem with substance abusers.

In addition to the benefits of improved attendance and potential to improve CM dissemination, GCM has potential to enhance group members to function as a community of reinforcement (Lieberman, 1977; Petry, Martin, & Finocche, 2001). This potential was suggested by data from the one other study (Kirby et al., in press) where *interdependent* GCM was used with the same population to address attendance and cocaine abstinence. Initial coding of videotaped social interactions during that study indicated a far greater percentage of positive social interactions than negative and the

existence of positive encouragement and support toward targeted behaviors (Gardner et al., 2007). Social reinforcement has the potential to maintain behavior or at least add to the value of contrived reinforcers. This may allow for the removal of contrived contingencies or at least a reduction in the magnitude of reinforcement, particularly when applied to an easier to achieve behavior improvements such as attendance.

Future research should explore this possibility.

Opiate Abstinence. Although not definitive, the effects of this schedule on group OA rates indicate that anonymous group abstinence behavior may be responsive to an interdependent contingency. It is particularly hopeful that aggregate behavior across individuals was handled by the percentile algorithm that has heretofore been used on populations of a single individual's behavior. Furthermore, particularly in the second opiate targeted, enriched magnitude condition, percent OA increased following and in step with the changing criterion. OA also reduced when prize value reduced.

Examining the individual data contributing to aggregate results, only half of those needing help with opiate abstinence seemed to respond, and even then, not as well as desired.

Cocaine Abstinence. Participants were recruited based on meeting criteria for concurrent cocaine dependence including recent use. The initial percentile schedule, as implemented in 2 iterations, did not result in improvements in cocaine abstinence. It is possible, based on the way that the percentile schedule functioned for opiate abstinence that a different schedule of reinforcement in conjunction with the percentile schedule might have been better. As well, magnitude of reinforcer in

conjunction with initial base rates of abstinence may be critical to successful transition of these procedures to interdependent group CM; there was some response with opiate abstinence where base rates of abstinence among all group members was higher.

This outcome, though disappointing, corroborates a large CM literature showing that individual CM has limited success with individuals that cannot produce an abstinent urine at baseline (e.g., Carpenedo et al., 2007; Stitzer et al., 2007) or who are “low-responders” during baseline of a CM procedure for smoking reduction (Lamb, Morral, et al., 2004). The present study was designed to address this problem by using contrived reinforcers in conjunction with social reinforcers in an effort to shape opiate and cocaine abstinence.

Recent studies comparing various magnitudes of reinforcer delivered for abstinence confirm in CM what is generally known in basic laboratory work, that higher magnitudes, especially if intermittent and focused on increasing rates or duration of the target, are more effective (e.g., Dallery, Silverman, Chutuape, Bigelow, & Stitzer, 2001; Ghitza et al., 2007; Wong et al., 2003). Other studies have demonstrated that the schedule of reinforcement as well as the magnitude of reinforcer affect the efficacy of CM interventions. In a recent study, Ghitza and colleagues (2007) conducted a study comparing use of the standard 50% probability prize bowl (Petry & Martin, 2002) with a richer, 78% probability prize bowl. They found that the 50% bowl was not similarly effective as in the Petry studies, for a demographically similar population. A closer look each study, however, showed that

initial cocaine abstinence rates were 15% in the Ghitza study whereas they were 53-61% abstinent in the Petry and Martin study (2002). Ghitza was able to achieve better outcomes among those with initial rates of 15% using the richer 78% probability bowl as compared to the 50% bowl. This study corroborates others in the CM literature showing that although CM procedures are generally effective, they are less effective with those considered low-responders (or having low baseline demonstration of targeted behavior), and that increasing the magnitude of the reinforcer improves outcomes.

Some studies mention other patient factors associated with better response to CM. Kidorf, Stitzer, and Brooner (1994) identified that in addition to lower baseline rates of drug abuse, those responding better to methadone take-home CM were more likely to be employed and less likely to live with a substance abuser. Nonetheless, 2 recent studies indicate that a wide range of typical substance abuse patients respond to CM regardless of other mental health issues (Neufeld et al., 2008; Weinstock, Alessi, & Petri, 2007). Efforts to adjust CM to better assist low-responders demonstrate enhanced outcomes with efforts to shape through initial lower behavioral demands coupled with assurance of reinforcement of movement in the desired direction (e.g., Kirby et al., 1998; Lamb, Morral et al., 2004).

The present study aimed to use a similar approach afforded by aggregate abstinence outcomes which turn the binary urinalysis results into a continuous variable thereby potentially amenable to shaping. In exploring a transition to interdependent group CM, a percentile schedule in conjunction with GCM may not

be desirable with very low base rate behaviors because it is a feature of all interdependent group contingencies that some group members earn rewards when their behavior is not at a desirable level. Figures 3 versus 4 indicate that this happened at low frequencies during the opiate abstinence conditions where base rates were higher, and nearly half the time (45%) during the cocaine abstinence condition. For this reason, it may be that interdependent group CM for abstinence is more fruitful either used in conjunction with individual CM, or following shaping procedures used during individual CM. There was no inadvertent reinforcement of undesirable target behavior during the group attendance conditions because those contributing negative results to the attendance calculation were necessarily not present to receive prizes. Although the present procedure was ineffective in shaping cocaine abstinence, other schedules varying reinforcer magnitudes and designed to allow those who do not initially present sufficient desired behavior will be important to the dissemination of CM in community-based substance abuse treatment settings.

Limitations of this Study

Perhaps the biggest limitation of this study was that it was not facilitated in the context of a group that met for any other reason than for determining the outcomes target behaviors, whether they earned reinforcers and delivering the reinforcers. Most known examples of GCM are an adjunct to groups that engage in other activities together and thereby create a community of reinforcement (when operating effectively). It is possible that by removing it for purposes of increasing scientific

control, that the social relationships that might be an important aspect of the effectiveness of the group were limited.

Additionally, these participants appeared to lack effective skills in encouraging each other using positive means. Gender composition may have played a role. There were some aggressive men in this group and only a few women. The one man who tried to rally the group together with verbal encouragement was treated as a 'teacher's pet' and he stopped this type of encouragement over time. Others attempted to influence each other using coercive talk and cheating (palming a large chit and handing it off to the person randomly selected to draw that day) in order to gain rewards. When these were effectively stopped using group rules and contracts, anecdotal staff reports indicated that most participant talk regarding the targeted abstinence behaviors also decreased. Had the present intervention been conducted for longer sessions in conjunction with supportive and problem-solving talk and role-plays about the target behaviors, perhaps coercive interaction could have been replaced with effective social influence rather than simply stopped. A related possibility, not able to be determined here, is that the contingencies, as implemented, operated on an individual level rather than the group level.

Theoretically, effective social group contingencies, (and possibly effective group CM), are established such that desired individual rates of behavior are reinforced at the same time as, or in concert with, desirable group outcomes; the group contingencies enhance those available when the individuals in the group behave in a way that is better for the whole group. In this group, only contrived contingencies

defined the benefit for the whole group and it is not clear that doing something good for the group developed or resulted in genuine social reinforcement for members having good behavior. It is possible that the anonymity itself hindered this development. Although this is possible, in classroom settings, Skinner and colleagues have successfully used group contingencies with anonymous and random components while discouraging discovery of individual contributions.

The majority of participants were recruited from another interdependent GCM and thereby had a history of GCM moderate rates of non-reinforcement due to the 50% probability bowl, particularly in conjunction with cocaine abstinence targeted behavior. These participants were in the study for up to 21 months and had tried several variations of schedules; this may help to explain why this group did not rally around each new phase since they had been through many. In addition, at the end of that study, those who were abstinent were graduated by the clinic to once weekly outpatient treatment and thereby were not eligible for this study; this selected for the cocaine dependent population that did not respond to the contingencies in the first study.

Finally, this group also responded, at some points, with a lack of enthusiasm when “only” \$20 was won (2 of the rich smalls). Although the percentile schedule was designed such that each behavior would receive reinforcers 60% of the time, Figure 2 shows that the overall procedures, because more than one behavior was being consequated simultaneously, resulted in an almost a continuous schedule of reinforcement. They appeared to have very little tolerance for low or no win sessions.

A remedy would be to be sure that the overall procedure presented a more intermittent schedule such as the 78% probability bowl tried recently by Ghitza and colleagues (2007).

Future Directions

This being the first study using a percentile schedule for human group aggregate behavior, it was difficult to anticipate exactly how the schedule would operate with these participants. Future iterations of an interdependent group CM procedure should attempt to vary the schedule of reinforcement bringing closer to the presumed effective variations that are present in the Higgins schedule for individual CM. For example, using a shorter sample window (e.g., 2 or 3 rather than 4) in conjunction with the omission of tie draws (so that the current outcome would have to exceed the lowest of the past 2 instances in order to gain draws in the bowl). A more intermittent prize bowl has the potential to build better tolerance for extinction which would help when the group did not earn draws due to low rates of abstinence on a particular day. In turn, this would possibly create a therapeutic pressure for another group member to become abstinent in order for the group to earn draws.

In order to assist those with low or no baseline performance of the desired behavior, shaping schedules that involve anonymous individual criteria that are reinforced at the group level might be tried. For instance, a large bonus could be offered when one more (anonymous) group member provided an abstinent sample. This criterion could be elevated with each new participant who delivered an abstinent sample. Alternatively, the procedure might start with an individual shaping

procedure and then transition successful individuals into a group CM procedure in order to enhance increasing durations of abstinence and maintain those gains.

As mentioned, group CM may benefit from the addition of an effective behavior therapy, Community Reinforcement Approach (Hunt & Azrin, 1973; Meyers, Villanueva, & Smith, 2005). This approach typically makes use of the familial and other natural contingencies to reinforce abstinence and related behaviors while using extinction for undesirable behavior. Components such as functional analysis of the substance use, problem-solving, general and relationship communication training, drug use refusal (assertiveness), and job skills training would be used in group and group CM could provide additional motivation via the CM procedure.

Finally, attention to group construction may be important. Perhaps using mixed groups of those who could provide a clean urine at intake (as positive predictor for CM response) would create more hopeful models of abstinence for those who did not provide a clean urine at intake, with mean group base rates at 50% or more suggested by the current literature. Finally, the use of quantitative or semi-quantitative urinalyses would allow for shaping at the individual level. Used either prior to, or within, an interdependent group CM procedure they would allow more graduated steps to be reinforced. This has been conducted only rarely due to the cost of these urinalyses. Although neither standard CM nor the more recent efforts to develop and test procedures both less costly and more effective in recruiting those with initial low base-rates of abstinence, have resulted in widespread acceptance of CM, they need to be seen in the context of the high cost of treatment as usual, which is expensive and

much less effective than CM. Efforts at funding and policy levels must be made so that CM variations can be explored in real settings with available treatment dollars.

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UNIVERSITY*

Office for Human Subjects Protections
Institutional Review Board
Medical Intervention Committees A1 & A2
Social and Behavioral Committee B

3400 North Broad Street
Philadelphia, Pennsylvania 19140
Phone: 215.707.3390 Fax: 215.707.8387
e-mail: richard.throm@temple.edu

Research Review Committee B

Recertification of Approval for a Project Involving Human Subjects

Protocol Number: 10710
PI: AXELROD, SAUL
Expires On: 07-Jan-2009
Committee: B BEHAVIORAL AND SOCIAL SCIENCES
Department: CUR, INSTR, & TECH (1902)
Sponsor: National Institute on Drug Abuse/NIH/DHHS
Project Title: THERAPY DEVELOPMENT OF GROUP CONTINGENCY MANAGEMENT IN
METHADONE TREATMENT: PILOT 1

Based on a review of your status report, the Institutional Review Board hereby re-approves protocol number 10710, originally approved on 09-Jan-2007, for the period ending 07-Jan-2009

* Original Review Date: 09-Jan-2007

* Re-Review Date: 18-Dec-2007

It is understood that it is the investigator's responsibility to notify the Committee immediately of any untoward results of this study to permit review of the matter. In such case, the investigator should call Richard Throm at 707-8757.

ZEBULON KENDRICK, Ph.D.
CHAIRMAN, IRB

Participant ID _____ Assessment # _____ Interviewer ID _____

Date: ____/____/____

Incentive Group Member Survey - Study 1

Instructions to be read by research staff to participant:

We care about how you are experiencing your group. This questionnaire asks about any conflict or support going on between you and other study group members. The support or conflict could have happened in group or outside of the group, but we are only asking about interactions with group members who are in *this* incentive group.

Think about your experiences with your study group members since the last time we asked you these questions (or in the past week if this is the 1st time). Then listen to each statement and let us know honestly if any of these things happened to you with one or more of your fellow study group members. Please do not consider comments from clients from other groups, or from counselors, supervisors, or other clinic staff.

Your answers will not be shared with the other members of your incentive group. Remember that there are no correct answers to these questions; the right answer is the one that is true for you.

NOTE:

If you have any conflict or feel intimidated by another study group members, at any time, do not wait for this questionnaire. Please contact any member of our research staff immediately, or let a clinic staff person know!

Since we last inquired:	Circle:
1. Did any incentives group member(s) encourage or support you? <i>If No, go to question #2.</i> <i>If Yes, was this to help you:</i>	Yes / No
1a Attend your treatment group?	Yes / No
1b Attend your incentives group?	Yes / No
1c Stop using drugs or stay clean?	Yes / No
1d Come in to give us a urine sample?	Yes / No
1e Other: _____	Yes / No
1f Description of event(s) or other comments:	

TRI IRB

Approval Date: 04-16-08
 Expiration Date: 04-15-09

2. Have you had a physical attack from any study group member(s)? <i>If No, go to question #3. If Yes, did they attack you to get you to:</i>		Yes / No
2a	Attend your treatment group?	Yes / No
2b	Attend your incentives group?	Yes / No
2c	Stop using drugs or stay clean?	Yes / No
2d	Come in to give us a urine sample?	Yes / No
2e	Other: _____	Yes / No
2f	Description of event(s) or other comments:	
3. Did any incentives group member(s) threaten or intimidate you? <i>If No, you are done!</i> <i>If Yes, did they threaten you to get you to:</i>		Yes / No
3a	Attend your treatment group?	Yes / No
3b	Attend your incentives group?	Yes / No
3c	Stop using drugs or stay clean?	Yes / No
3d	Come in to give us a urine sample?	Yes / No
3e	Other: _____	Yes / No
3f	Description of event(s) or other comments:	
4. Did any incentives group member talk to you harshly where you did NOT feel threatened or intimidated? <i>If No, you are done!</i> <i>If Yes, was this over:</i>		Yes / No
4a	Attending your treatment group?	Yes / No
4b	Attending your incentives group?	Yes / No
4c	Stopping using drugs or staying clean?	Yes / No
4d	Come in to give us a urine sample?	Yes / No
4e	Other: _____	Yes / No
4f	Description of event(s) or other comments:	

Participant ID _____

Pilot # _____ Group # _____

Date: ____/____/____

Who Do You Know?

Please write in the number that answers each question in the blanks provided.

- 1) How many other Parkside clients in this room have you spoken to in the past 14 days? _____
- 2) How many other Parkside clients in this room have you spent time with socially (for example, talking to on the phone or getting coffee together) in the past 14 days? This is time you spent together while NOT at Parkside. _____
- 3) How many other Parkside clients in this room have you been in IOP group with before (NOT including this group)? _____

TRI IRB

Approval Date: 04-16-08

Expiration Date: 04-15-09

TRI Incentive Group Rules

Incentive Group meetings should be safe and comfortable for all group members. If a meeting makes group members feel uncomfortable, then they might stop coming to the incentive group meetings, which could hurt the whole group's chances of winning prizes.

Be kind to your fellow group members! (No Negative Statements and Conversations)

Be considerate and understanding of your group members. Put-downs and discounting statements or actions are not allowed. While you are present for a TRI- research-related activity (for a urine or group or assessment), refrain from comments that may make others uncomfortable such as comments on others' race, religion or sexuality and the like. This also includes talk encouraging or glorifying drug and alcohol use. If a TRI staff person hears you act in a way that may make others feel uncomfortable, they will kindly ask you to stop. We encourage everyone to support each other toward staying clean and having a good experience with our studies.

Be Positive! (No Coercive Behavior or Comments)

Treat your group members with respect. No pressuring, intimidating, bullying or obscene statements/gestures.

Listen & Give others a chance to talk. (No interrupting and no monopolizing)

Everyone has a place here and a right to take part in discussions and activities.

Come on time & stay to the end! Group meetings will start at the scheduled time, so you should be sure to arrive *a little early*. Group members that are late will not be able to attend that day's meeting or have prizes that are earned that day (unless there is a documented excused absence).

Stay awake! (Just as in your treatment groups, continued nodding after efforts to rouse you will result in being asked to leave for the meeting – and you will not be able to win prizes for the day).

Consequences

The bowls are set up so that if you come and support others, then *everyone has the best chance* to make improvements in their goals and earn rewards for it.

If you do not follow the group rules, the following will occur:

- **Non-supportive or negative behavior** will result in verbal feedback from TRI staff. If the group member continues to be negative or non-supportive, then s/he will be asked to leave the group for that meeting and will not be able to win any prizes won by the group for that meeting. S/he will be welcome back at the next group meeting.
- **Aggressive/Violent Behavior** If a group member acts in an aggressive manner or becomes physically violent, then that participant will be asked to leave the meeting, and s/he will not get any prizes won by the group for that meeting. If the group member refuses to leave, or continues to act aggressively, then TRI staff will call security.
- **Continuous Violation of Group Rules** If a group member is asked to leave a meeting 3 times for violating group rules, then there may be further consequences that will be discussed with TRI staff supervisors.

TRI Incentive Group Rules

Incentive Group meetings should be safe and comfortable for all group members. If a meeting makes group members feel uncomfortable, then they might stop coming to the incentive group meetings, which could hurt the whole group's chances of winning prizes.

Be kind to your fellow group members! (No Negative Statements and Conversations)

Be considerate and understanding of your group members. Put-downs and discounting statements or actions are not allowed. While you are present for a TRI- research-related activity (for a urine or group or assessment), refrain from comments that may make others uncomfortable such as comments on others' race, religion or sexuality and the like. This also includes talk encouraging or glorifying drug and alcohol use. If a TRI staff person hears you act in a way that may make others feel uncomfortable, they will kindly ask you to stop. We encourage everyone to support each other toward staying clean and having a good experience with our studies.

Be Positive! (No Coercive Behavior or Comments)

Treat your group members with respect. No pressuring, intimidating, bullying or obscene statements/gestures.

Listen & Give others a chance to talk. (No interrupting and no monopolizing)

Everyone has a place here and a right to take part in discussions and activities.

Come on time & stay to the end! Group meetings will start at the scheduled time, so you should be sure to arrive *a little early*. Group members that are late will not be able to attend that day's meeting or have prizes that are earned that day (unless there is a documented excused absence).

Stay awake! (Just as in your treatment groups, continued nodding after efforts to rouse you will result in being asked to leave for the meeting – and you will not be able to win prizes for the day).

Consequences

The bowls are set up so that if you come and support others, then *everyone has the best chance* to make improvements in their goals and earn rewards for it.

If you do not follow the group rules, the following will occur:

- **Non-supportive or negative behavior** will result in verbal feedback from TRI staff. If the group member continues to be negative or non-supportive, then s/he will be asked to leave the group for that meeting and will not be able to win any prizes won by the group for that meeting. S/he will be welcome back at the next group meeting.
- **Aggressive/Violent Behavior** If a group member acts in an aggressive manner or becomes physically violent, then that participant will be asked to leave the meeting, and s/he will not get any prizes won by the group for that meeting. If the group member refuses to leave, or continues to act aggressively, then TRI staff will call security.
- **Continuous Violation of Group Rules** If a group member is asked to leave a meeting 3 times for violating group rules, then there may be further consequences that will be discussed with TRI staff supervisors.

CONTRACT TO FOLLOW GROUP RULES

This contract is to inform you that during and outside of group meetings you have repeatedly come close to crossing boundaries with joking and gestures that the research team is not comfortable with. Research staff has spoken to you twice about this behavior and the behavior has continued. The purpose of this contract is to let you know in writing that this behavior is not acceptable and needs to stop. If it does not stop, the following steps will be taken:

1. Suspension from one or more groups, depending on the nature of the violation, without the possibility of winning prizes.
2. Permanent dismissal from the research project.

Attached is a copy of the group rules. Everyone in group is responsible for staying positive and following the group rules. We are really happy to have you in group, you are doing really well. We hope you take this warning seriously, but understand that we encourage your continued participation.

My signature below indicates that I have received this information and a copy of the group rules.

Participant's name (please print)

Participant's Signature

Date

Staff Obtaining Contract

Staff's Signature

Date

Participant ID _____

Date _____

Your REWARDS Preferences!

Help us have in stock what you like best! PLEASE CIRCLE ALL THE SMALL PRIZES YOU ARE INTERESTED IN RECEIVING WHEN EARNING REWARDS IN THIS STUDY. *Thanks!*

Granola Bars (1box)	4 Stamps	Crossword Puzzle Book
Travel Mirror with Magnification	Socks (2 pack)	Tissues (Box)
Kool Aid Drink Mix	Wrapping paper or Gift bags (circle 1 or both)	Soap (2 bars)
Batteries AAA or AA (circle)	Small Photo Album	Can-opener
Towel	Grooming kit	Journal - Notebook
Febreze	Shampoo	Pocket calculator
Mascara (or list other make-up)	1 Bag of Candy (List some you like):	Nail Polish
Playing Cards	Disposable Camera	Flashlight with Batteries
Checkers	Candle	Pop Tarts
Chewing gum	Tote bag	Family Toothbrush Set (Includes 8 brushes, a holder, and a cup)
Coloring Book	Drinking Glasses (4 pack)	Umbrella
Puzzle (500 Piece)	Shower Poof	Hand sanitizer
Sketch Pad	Hairbrush	
Crayons	Mesh Standing Hamper	
Magic Markers	Serving/salad bowls	
1 Bag - assorted chocolate candy	Tupperware (3 pack bowls)	
Shower Gel/Body Wash	Pliers	
Small Can of Coffee	Laundry Detergent	
Travel Coffee mug	Tape Measure	
Baby Wipes (1 box, bag, or container)	Dry Cereal - list some you like:	

Continued, next page

GCM – Pilot _____

Participant Name _____ Date _____

Small Prize Menu

Please Indicate Which Prizes and How Many You Want on the Lines Provided

<p>Soap Dove, Ivory, Irish Spring</p> <p>_____</p>	<p>Shampoo Apple, Coconut, Tangerine, Regular</p> <p>_____</p>	<p>Cereal Frosted Flakes, H. N. Cheerios, Fruity Pebbles</p> <p>_____</p>	<p>Conditioner Fortified with a humectant</p> <p>_____</p>
<p>Socks – 2 prs. Men's or Women's</p> <p>_____</p>	<p>Planter's Peanuts</p> <p>_____</p>	<p>Butterfingers</p> <p>_____</p>	<p>Skittles</p> <p>_____</p>
<p>Body Lotion Soothing Aloe, Cocoa Butter</p> <p>_____</p>	<p>Kool-Aid Singles</p> <p>_____</p>	<p>Reese's Peanut Butter Cups</p> <p>_____</p>	<p>Travel Mirror</p> <p>_____</p>

Other (Write in) _____ How Many? _____

Other (Write in) _____ How Many? _____

Other (Write in) _____ How Many? _____

For TRI Use: (Consult Prize Cabinet Inventory for Total Cost)^b

Prize Selected: _____	Quantity _____	Total Cost _____
Prize Selected: _____	Quantity _____	Total Cost _____
Prize Selected: _____	Quantity _____	Total Cost _____
Prize Selected: _____	Quantity _____	Total Cost _____

Participant Signature _____ Date _____

Staff Signature _____ Date _____

Participant Name _____ Date _____

Small Prize Menu

Please Indicate Which Prizes and How Many You Want on the Lines Provide

<p style="text-align: center;">\$2 Rite-Aid Gift Card</p> <p style="text-align: center;">_____</p>	<p style="text-align: center;">\$2 Fresh Grocer Gift Card</p> <p style="text-align: center;">_____</p>	<p style="text-align: center;">\$2 CVS Gift Card</p> <p style="text-align: center;">_____</p>
<p style="text-align: center;">\$2 Dunkin Donuts Gift Card</p> <p style="text-align: center;">_____</p>	<p style="text-align: center;">\$2 McDonald's Gift Card</p> <p style="text-align: center;">_____</p>	

For TRI Use: *(Consult Prize Cabinet Inventory for Total Cost)*

Prize Selected: _____	Quantity _____	Total Cost _____
Prize Selected: _____	Quantity _____	Total Cost _____
Prize Selected: _____	Quantity _____	Total Cost _____
Prize Selected: _____	Quantity _____	Total Cost _____

Participant Signature _____ Date _____

Staff Signature _____ Date _____

Participant Name _____ Date _____

\$10 Small Prize Menu

Cocaine Abstinence

Please Indicate Which Prizes and How Many You Want on the Lines Provided

Pathmark \$10 Gift Card _____	CVS \$10 Gift Card _____	Wal-Mart \$10 Gift Card _____	Lowe's \$10 Gift Card _____
Gallery \$10 Gift Card _____	Kmart \$10 Gift Card _____	Fresh Grocer \$10 Gift Card _____	
Rite-Aid \$10 Gift Card _____	Septa \$10 Gift Card _____	Toys R Us \$10 Gift Card _____	

For TRI Use: *(Consult Prize Cabinet Inventory for Total Cost)*

Prize Selected: _____	Quantity _____	Total Cost _____
Prize Selected: _____	Quantity _____	Total Cost _____
Prize Selected: _____	Quantity _____	Total Cost _____
Prize Selected: _____	Quantity _____	Total Cost _____

Participant Signature _____ Date _____

Staff Signature _____ Date _____

GCM - Pilot _____

Participant Name _____ Date _____

Large Prizes

Pathmark \$20 Gift Card _____	CVS \$20 Gift Card _____	Wal-Mart \$20 Gift Card _____	Lowe's \$20 Gift Card _____
Gallery \$20 Gift Card _____	K-mart \$20 Gift Card _____	Fresh Grocer \$20 Gift Card _____	McDonald's \$20 Gift Card _____
Rite Aid \$20 Gift Card _____	Septa \$20 Gift Card _____	Toys R Us \$20 Gift Card _____	

Jumbo Prize

Pathmark \$80	CVS \$80	Wal-Mart \$80	Lowe's \$80
Gallery \$80	K-mart \$80	Fresh Grocer \$80	
Rite Aid \$80	Septa \$80	Toys R Us \$80	

For TRI Use: (Consult Prize Cabinet Inventory for Total Cost)

Prize Selected: _____	Quantity _____	Total Cost _____
Prize Selected: _____	Quantity _____	Total Cost _____
Prize Selected: _____	Quantity _____	Total Cost _____

Participant Signature _____ Date _____

Staff Signature _____ Date _____

Participant ID _____ Date _____

Reward Preferences, p. 2

PLEASE ADD ANY ADDITIONAL Small ITEMS NOT LISTED ABOVE. Try to think of 3-5 things. You can't lose by asking!

Please help us have in stock what you like best! **CIRCLE ALL THE LARGE PRIZES (\$20) YOU ARE INTERESTED IN RECEIVING WHEN EARNING REWARDS IN THIS STUDY.** Feel free to tell us other places you like to shop at the bottom.
Thanks!

Pathmark
\$20
Gift Certificate

CVS
\$20
Gift Certificate

Walmart
\$20
Gift Certificate

Septa
\$20
Gift Certificate

TARGET
\$20
Gift Certificate

Gallery
\$20
Gift Certificate

Rite Aid
\$20
Gift Certificate

Blockbuster
\$20
Gift Certificate

Acme
\$20
Gift Certificate

Movie Theatre
\$20
Gift Certificate

Home Depot
\$20
Gift Certificate

ShopRite
\$20
Gift Certificate

Kmart
\$20
Gift Certificate

Toys R Us
\$20
Gift Certificate

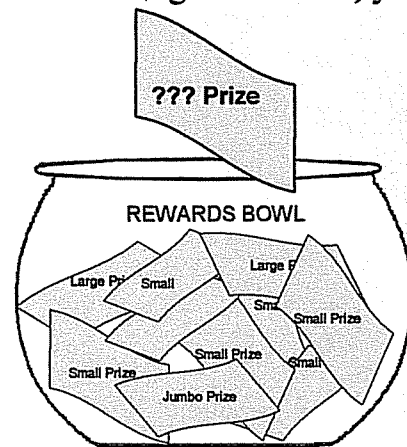
Long Distance Phone card
\$20
Gift Certificate

PLEASE ADD ANY ADDITIONAL PLACES or ITEMS NOT LISTED ABOVE
Try to think of 3-5 you like. You can't lose by asking!

TRI - Incentive Group Meetings – Study 1 Extension

A Guide to Understanding Our Group Procedures

1. In this study, you can earn rewards based on how well you do as a whole group or team. The better each group member does, the better the chance that the whole group will win rewards. You either win or lose as a group. How often you win depends on how well everyone in the group is doing.
2. We will try to help you with a range of behaviors. These behaviors may include:
 - Attending your IOP Groups
 - Attending these TRI Incentive Group Meetings
 - Coming in Mondays, Wednesdays, & Fridays to provide urine samples
 - Providing urine samples that test clean for cocaine every Monday, Wednesday, and Friday
 - Providing urine samples that test clean for opiates every Monday, Wednesday, and Friday
 - Taking your methadone medication
3. The target behavior we will start with is: Attending this TRI Incentives Group Meeting. We will add in other behaviors in the next phases and we will always tell you when there is a change in the target behaviors.
4. In this study you will be told how well you need to do as a group on the target behavior in order to win draws from the prize bowl. This is called “the number you will have to beat” or the criterion; it is your goal to beat this number each session. We will tell you how well you have to do ahead of time and you can work to beat goal number.
5. In this study, each time you beat the goal or criterion for the target behavior, you will earn 2 draws from the Rewards Bowl.



6. The Rewards Bowl contains only 3 types of colored plastic chits or squares that say “small,” “large,” or “jumbo.”
 - **Small** means *everyone* who is at the meeting wins a small prize: personal care items, clothing, candy & food, and handy items such as tools, laundry detergent, etc. A selection will be available each time the group wins. You can always make

TRI - Incentive Group Meetings – Study 1 Extension

suggestions for different items you'd like to see available. You may also choose a \$2 gift card from a variety of places.

- **Large** means everyone who is at the meeting wins a large prize: In the first phase these are \$20 giftcards from a wide variety of stores and restaurants. If this changes, we will always let you know ahead of time.
- The **Jumbo** chit is worth \$80 and you will choose a giftcard from one or more stores totaling \$80.

Beat the Criterion to Earn Draws From the Prize Bowl!

- A "Draw to Win!" thermometer earns the group 2 draws from the Rewards Bowl.
- A "Try Again" thermometer means there will be no drawing for that behavior that day because the criterion was not beaten.
- A "Tie Draw!" thermometer leads to a "tie draw." when the group performance on the target EQUALS the criterion. In this case, the group will draw from the "Tie Bowl" which has a better than average chance of winning. If a "winner" is drawn, then the group will earn the 2 draws from the Rewards bowl. If a "Try Again" chit is drawn, then there are no draws for that target behavior during the current session.

Bonus Draws

- Getting "Winner!" on the main target behavior for 3 meetings in a row earns the group a bonus. We really want to see you not only do well, but continue to do well. The bonus will be 2 bonus draws from the prize bowl used for the main target behavior.

Rules for Excused Absences

- Group members may be excused from one or more target behaviors if they have an approved written documented excuse demonstrating the group member's inability to meet the requirements. In order for a target behavior to be excused group members must call TRI staff at **215-879-6116 x 230** before the Incentive Group meeting time to inform them why they will not be able to attend or leave a urine sample.
- Acceptable documentation includes: a doctor's note, a hospital admissions slip, and a note from a funeral home director. All documentation must be on valid letterhead, and include a contact number for verification.
- If appropriate documentation or counselor approval cannot be obtained, then it will count against the group on the following session.
- Inability to meet one target behavior may or may not apply to other target behaviors. It will depend on the nature and timing of the excused absence.

Group CM Result Data Sheet

Group Leader: _____ Date: _____

Study: Pilot 1 Ext. Session Number: _____

**To Be Completed During Group by RA*

TRI Attendance	Result ___ <i>Winner</i> ___ <i>Good Try</i>		
Draw			
If Winner, Draw			
Prize Bowl			
Criterion (%)	Maintenance Criterion:	Result:	

Opiate Abstinence	Result ___ <i>Winner</i> ___ <i>Good Try</i>		
Draw			
If Winner, Draw			
Prize Bowl			
Criterion (%)	Maintenance Criterion:	Result:	

Cocaine Abstinence	Result ___ <i>Winner</i> ___ <i>Tie</i> ___ <i>Good Try</i>		
Draw			
Tie – TRI			
If Winner, Draw			
Prize Bowl			
Bonus Draws			
Prize Bowl			
Criterion (%)	Target:	Result:	Next:

Staff Signature: _____

Date: _____

**GCM Pilot 1
Incentive Group Meeting Attendance Form**

Date: _____

Pilot 1 Extension

Participant ID	Urine (Place prizes on hold if N)	Attend (Y or N)
104		
111		
113		
114		
115		
117		
123		
126		
129		
130		
137		
138		
139		