

# Motivation and Contingency Management Treatments for Substance Use Disorders

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**Abstract** Contingency management (CM) is a highly efficacious psychosocial treatment for substance use disorders based on the principles of behavioral analysis. CM involves delivering a tangible positive reinforcer following objective evidence of submission of a drug-negative urine sample. Although CM interventions primarily involve applying extrinsic rewards, a patient's intrinsic motivation to change substance use behavior may also be impacted by CM. This chapter provides an introduction to CM interventions for substance use disorders and examines the impact of CM on intrinsic motivation. It also addresses applications of this intervention to other conditions and patient populations.

**Keywords** Psychosocial treatments · Substance use disorders · Contingency management · Intrinsic motivation

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## 1 Preface

Contingency management (CM) is a highly efficacious psychosocial treatment for substance use disorders that applies extrinsic motivators to change patients' substance use behaviors (Petry 2012). Based on the principles of behavioral analysis, CM involves delivering a tangible positive reinforcer following objective evidence of submission of a drug-negative urine sample (Petry 2012). The hope is that patients will be more motivated to obtain the therapeutic reinforcer than the positive effects derived from drug use. Although CM interventions primarily involve applying extrinsic rewards, a patient's intrinsic motivation to change substance use behavior may also be impacted by CM.

The aim of this chapter was twofold: first, to provide an introduction to CM interventions for substance use disorders and second, to examine the impact of CM on intrinsic motivation. The first section presents the fundamentals of CM interventions and an overview of the empirical evidence demonstrating the efficacy of CM interventions for substance use disorders in psychosocial treatment settings. The second section examines the differing perspectives on the influence of external rewards on intrinsic motivation and then discusses research on the effects of CM on substance use disorder patients' intrinsic motivation. The chapter concludes by suggesting future research directions on CM and intrinsic motivation.

## 2 Overview of Contingency Management

There is a wealth of empirical evidence demonstrating the efficacy of CM for improving substance use disorder treatment outcomes (Lussier et al. 2006; Prendergast et al. 2006). It is included in the National Institute for Health and Clinical Excellence (NICE 2007) guidelines in the UK and is being implemented nationwide throughout the Veterans Administration in the USA (Petry et al. 2014). However, for CM to be effective in changing substance use behaviors, it is critical that it is appropriately implemented with careful attention to behavioral principles (Petry 2012). The three key principles of CM interventions are (1) monitoring behavior frequently, (2) providing tangible positive reinforcers immediately following the behavior, and (3) withholding the positive reinforcer if the behavior does not occur. This section will provide an overview of the fundamentals of CM interventions for substance use disorders followed by a discussion of the empirical evidence of its efficacy in substance use disorder populations. A more comprehensive explanation of each component of CM and specific information about designing and implementing CM interventions can be found in Petry (2012).

## ***2.1 Fundamentals of Contingency Management***

### **2.1.1 Monitoring of Behavior**

CM interventions for substance use disorders most commonly reinforce abstinence. During the monitoring and reinforcement period, it is critical that abstinence, typically verified by a drug-negative sample, be monitored regularly, reinforced as immediately as possible, and objectively quantified (Petry 2012). Frequent monitoring increases the chance that each period of abstinence is reinforced and also helps the patient to learn the connection between abstinence and the reinforcer. Most drug urine tests can assess use over 48–72 h, and in these cases, samples should be collected and tested every two to three days. The reinforcer also should be delivered immediately following the drug test. For example, if the patient submits a drug-negative sample, he/she should receive the reinforcer as soon as the test reads negative. If the patient submits a drug-positive sample, reinforcement should be withheld until the next negative sample is submitted. Empirical evidence has shown that immediate reinforcement is associated with better treatment outcomes than delayed reinforcement, e.g., the reinforcer is not provided the same day as the drug test (Lussier et al. 2006).

Monitoring of drug use should involve objective assessments that provide immediate results rather than patients' self-reports of drug use. The monitoring schedule should be based on the frequency of drug use and the test's ability to detect the drug. On-site drug tests should be utilized such as urine toxicology kits (e.g., OnTrak TesTstiks), alcohol breathalyzers (e.g., Intoximeter Breathalyze), or exhaled breath carbon monoxide monitors (e.g., Bedfont Somkerlyzer). On-site drug tests are important because they allow for immediate reinforcement, which is critical because the behavior is less likely to be altered if there is a delay between the behavior and the reinforcer (Rowan-Szal et al. 1994; Roll et al. 2000). The monitoring and reinforcement schedule should be set up according to test's ability to detect drug use. For example, the monitoring schedule for cocaine testing should be three days a week because on-site urine toxicology kits can detect cocaine use over the past two to three days, while the monitoring and reinforcement schedule when using exhaled breath carbon monoxide monitors for cigarette smoking should be several times a day because exhaled carbon monoxide monitors can detect smoking only over the past few hours.

### **2.1.2 Types of Reinforcers**

CM interventions for substance use disorders typically use either vouchers exchangeable for goods and services (Higgins et al. 2008) or chances to win prizes of varying magnitudes (Petry 2012) to reinforce abstinence. Vouchers are similar to monetary incentives, but money is not directly given to patients. Instead, the vouchers are worth a specific monetary amount, and each time a patient provides a

drug-negative sample he/she is given a voucher that is deposited in a “clinic bank account.” When the patient earns enough vouchers, he/she can exchange them for an item he/she desires such as restaurant gift certificates, clothing, bus tokens, electronic equipment, or movie tickets.

The prize reinforcement system involves earning draws from a prize bowl following submission of a drug-negative sample. The prize bowl contains slips of paper labeled with prizes of various magnitudes (e.g., small prizes worth \$1, large prizes worth \$20, and jumbo prizes worth \$100). About half of the slips do not result in a prize and instead say “Good job!” Most of the prize slips are for small prizes worth \$1 and only one strip is labeled with a jumbo prize. Thus, the prize system is less costly than the voucher system because not every draw results in a prize, and the most frequently won prizes are inexpensive.

Both the voucher and prize systems typically use an escalating reinforcement schedule, which promotes longer periods of abstinence during treatment (Roll et al. 1996; Roll and Higgins 2000). Increasing the duration of abstinence is important because longer durations of abstinence are associated with long-term abstinence after the reinforcers are removed, i.e., after the CM intervention ends (e.g., Higgins et al. 2000a, 2002; Petry et al. 2005a, 2007). Escalating reinforcement schedules involve increasing the voucher amounts or number of prize draws as the number of consecutive negative urine samples increase. For example, patients earn one dollar or one draw for their first negative sample, two dollars or two draws for their second consecutive negative sample, and so forth. Additionally, voucher amounts and prize draws are reset back to the lowest value when the patient provides a drug-positive sample or fails to submit a scheduled sample.

## ***2.2 Research Evidence***

Multiple clinical trials have demonstrated the efficacy of voucher-based and prized-based CM interventions in reducing drug use in a variety of research- and community-based settings (Higgins et al. 1994; Petry et al. 2005b; see also Lussier et al. 2006; Prendergast et al. 2006). Although a majority of the studies have focused on decreasing cocaine use, studies have also found that CM is effective in reducing cigarette smoking (Roll et al. 1996; Hunt et al. 2010; Alessi and Petry 2014), alcohol (Petry et al. 2000), opioids (Silverman et al. 1996; Petry and Martin 2002), marijuana (Budney et al. 2006; Kadden et al. 2007), and benzodiazepines (Stitzer et al. 1992). Results of two meta-analyses comparing CM interventions to control conditions found CM to be efficacious in decreasing drug use (Lussier et al. 2006; Prendergast et al. 2006). Furthermore, a meta-analysis of all psychosocial treatments for substance use disorders found that CM interventions had the largest effect size,  $d = 0.58$ , while the next largest effect size was for relapse prevention interventions,  $d = 0.32$  (Dutra et al. 2008).

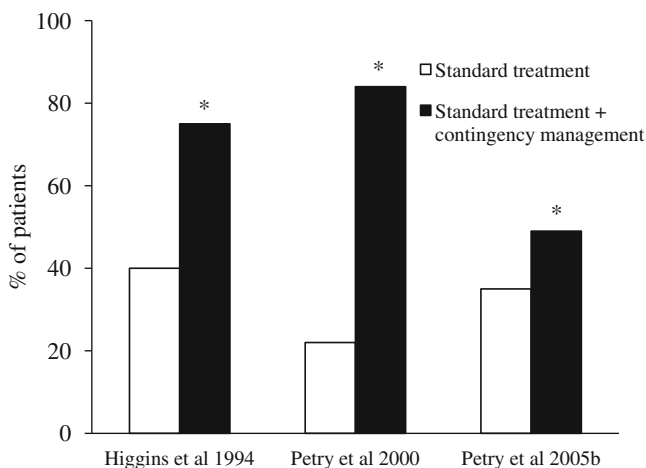
As previously mentioned, the CM literature is extensive and this chapter will only discuss a few examples of CM interventions for substance use disorders

conducted in psychosocial treatment settings, the most common and generalizable settings. In one of the earliest well-designed studies, Higgins et al. (1994) randomized 42 cocaine-dependent patients to either standard treatment or standard treatment plus voucher-based CM. The standard treatment in this study was based on the community reinforcement approach, which involved relationship counseling, employment counseling, behavioral skills training, relapse prevention, and social and recreational skills counseling. Results showed that 55 % of patients in the CM condition achieved at least 10 weeks of continuous abstinence, but only 15 % of the patients in the standard treatment condition achieved at least 10 continuous weeks of abstinence. Furthermore, the rates of treatment completion at 3 and 6 months for patients in the CM condition were 90 and 75 %, compared to 65 and 40 % for patients in the standard treatment condition.

In the largest CM study conducted in the National Drug Abuse Treatment Clinical Trials Network, Petry et al. (2005b) randomized over 400 patients with cocaine or methamphetamine use disorders to either standard treatment at the patients' clinics, consisting primarily of group counseling, or standard treatment plus prize-based CM. Compared to patients in the standard treatment condition, patients in the CM condition achieved longer durations of continuous abstinence (4.4 vs. 2.6 weeks, respectively) and stayed in treatment longer (19.2 vs. 8.0 weeks, respectively).

Most studies of CM in psychosocial treatment settings reinforce abstinence explicitly, but these studies also find that CM improves treatment retention along with abstinence outcomes, such as staying in treatment longer and attending more therapy sessions (Higgins et al. 1994, 2000b; Petry et al. 2000, 2005b). Improving treatment retention is important because attrition from substance abuse treatment programs is extraordinarily high and length of time in treatment is a stable predictor of treatment outcomes (Simpson and Sells 1982; Hubbard 1989; Hubbard et al. 1997). Overall, when CM is added to standard care, patients remain in treatment longer (e.g., Higgins et al. 1994; Petry et al. 2000, 2005b). Figure 1 shows the percentage of patients completing treatment in the standard treatment and CM conditions from three representative studies: Higgins et al. (1994), Petry et al. (2000, 2005b).

It is clear that CM interventions targeting substance use are effective at improving treatment outcomes, especially during the treatment period. However, there is inconsistent evidence on the long-term efficacy of CM. Some studies have found CM maintains statistically significant post-treatment benefits on abstinence (e.g., Higgins et al. 1995, 2000b) while others have not (Rawson et al. 2006; Sigmon and Higgins 2006). However, in no study have patients who received CM demonstrated worse outcomes compared to their non-CM counterparts. Thus, applying extrinsic reinforcers to substance use treatment patients does not ever reduce their long-term likelihood of abstinence. The underlying mechanisms involved in the post-treatment maintenance effects of CM, as well as other psychotherapies are not clear and multiple factors likely play a role in long-term outcomes beyond the treatment period. Intrinsic motivation to remain abstinent is one possible factor that may contribute to the long-term effects of psychotherapies, and the next section will discuss the influence of CM on patient motivation.



**Fig. 1** Percentage of patients completing treatment in the standard treatment and contingency management conditions from Higgins et al. (1994) and Petry et al. (2000, 2005b). The *asterisks* indicate statistically significant differences between groups,  $p < 0.05$

### 3 Patient Motivation and Contingency Management

Because both intrinsic and extrinsic motivation appears to play important roles in substance use disorder treatment and recovery (Miller 1985; DiClemente 1999), it is important to consider how treatments targeting extrinsic motivational processes, such as CM, also affect intrinsic motivation to change behavior and remain abstinent. This section provides an overview of the differing perspectives on the influence of external rewards on intrinsic motivation to change behavior and then reviews research on the effects of CM interventions targeting substance use behavior on intrinsic motivation.

#### 3.1 External Rewards and Intrinsic Motivation

Substance use behavior is influenced by intrinsic and extrinsic motivation. Intrinsic motivation is the internal desire to do something because it is self-fulfilling and is influenced by feelings of autonomy, self-determination, and competence; extrinsic motivation involves doing something for reasons external to the individual, such as to receive rewards or avoid punishment (DiClemente 1999; Ryan and Deci 2000). There are conflicting perspectives regarding the effects of rewards on intrinsic motivation (Deci et al. 1999; Cameron et al. 2001; Promberger and Marteau 2013). Some argue that there is clear evidence that rewards undermine intrinsic motivation (Deci et al. 1999), while others suggest that the evidence is inconclusive and

in certain situations, external rewards can actually enhance intrinsic motivation (Cameron et al. 2001; Promberger and Marteau 2013).

Much of the research in psychological literature on the effects of rewards on intrinsic motivation is grounded in the cognitive evaluation theory, which proposes that intrinsic motivation is necessary for sustained behavior change and that external rewards undermine intrinsic motivation (Deci and Ryan 1985; Ryan and Deci 2000). According to the cognitive evaluation theory, feelings of competence, autonomy, and self-determination are essential to behavior change and factors that increase these feelings enhance intrinsic motivation, while factors that decrease these feelings decrease intrinsic motivation (Deci and Ryan 1985; Ryan and Deci 2000). Cognitive evaluation theorists argue that external rewards reduce feelings of competence, autonomy, and self-determination because they shift the locus of causality from factors internal to the individual to factors external to the individual (Deci and Ryan 1985; Ryan and Deci 2000). Furthermore, they reason that although rewards can change behavior initially, once they are removed, behavior will return to baseline levels because individuals are not intrinsically motivated to maintain the behavior change (Deci et al. 1999).

Numerous studies in the cognitive evaluation theory literature have investigated the effects of rewards on behavior changes in non-clinical settings. Results of a meta-analysis revealed that external rewards undermine intrinsic motivation (Deci et al. 1999). However, in a similar meta-analysis, Cameron et al. (2001) concluded that rewards do not always undermine intrinsic motivation and actually may enhance intrinsic motivation in certain situations, such as when initially the behavior rarely occurs. One explanation for the disparate findings is that the two meta-analyses included different studies. Deci et al. (1999) only included studies with high-interest tasks, such as playing a game, and excluded studies with low-interest tasks, for example proofreading a paper. They only investigated high-interest tasks because the cognitive evaluation theory field was primarily concerned with the effects of rewards on intrinsic motivation for interesting activities (Deci et al. 1999). Cameron et al. (2001) believed a comprehensive assessment of rewards' effects on intrinsic motivation should include studies with high-interest and low-interest tasks.

Another difference between the two meta-analyses was the procedure used to categorize studies by reward contingency. Deci et al. (1999) classified studies as task non-contingent, engagement-contingent, completion-contingent, or performance-contingent. A potential issue with this classification system was that the categories were too broad, and studies with different procedures were included in the same category (Cameron et al. 2001). For example, the performance-contingent category included studies that provided rewards for doing well, each problem solved, achieving a certain score, or exceeding a norm. Cameron et al. (2001) used a more specific classification system and created separate categories for providing rewards for doing well, doing a task, finishing or completing a task, each unit solved, surpassing a score, and exceeding a norm.

The results from these meta-analyses, however, are not easily generalizable to health-related behaviors such as substance use in treatment seeking populations,

e.g., substance abusers who have at least some motivation to initiate treatment. In general, the early studies included in the meta-analyses tested the effects of rewards on time spent in simple activities such as completing puzzles or drawing pictures, and participants in these studies typically were college students or children (Cameron et al. 2001; Deci et al. 1999), not adults with serious physical and mental health problems who were receiving extrinsic reinforcers for health-related behavior changes.

Few studies have specifically examined the effects of rewards on intrinsic motivation to change health-related behavior. Promberger and Marteau (2013) reviewed studies examining the effects of rewards on health behaviors and concluded that there is little evidence that supports the hypothesis that rewards undermine intrinsic motivation in these contexts. In fact, for health-related behaviors that depend on self-control, rewards may actually increase intrinsic motivation because they enhance feelings of competence (Promberger and Marteau 2013). However, most of the studies did not explicitly assess motivation to change health-related behaviors. These studies found that patients receiving the rewards were more likely to change their behavior compared to patients in the non-reward group, but they did not assess internal motivation to change explicitly (e.g., Paul-Ebhohimhen and Avenell 2008; Volpp et al. 2008, 2009).

The results from previous studies indicate that rewards used in CM interventions do not necessarily undermine intrinsic motivation. This might occur for several reasons. First, CM interventions for substance use disorders typically reinforce abstinence, which initially occurs at low levels, and according to the cognitive evaluation theory literature, rewards are less likely to be associated with reductions in intrinsic motivation when the initial levels of the behavior are low. Second, the escalating reinforcement schedule typically used in CM interventions may actually enhance intrinsic motivation by increasing perceived self-determination and competence. The following section will further discuss the impact of CM on intrinsic motivation.

### ***3.2 Contingency Management and Intrinsic Motivation***

Only two CM intervention studies conducted in psychosocial treatment settings have specifically assessed the influence of CM on substance use disorder patients' intrinsic motivation to change substance use, as measured by the University of Rhode Island Change Assessment (URICA) (Budney et al. 2000; Ledgerwood and Petry 2006). The URICA is a self-report measure of intrinsic motivation that assesses readiness to change substance use behavior (Prochaska et al. 1992; DiClemente et al. 2004). It contains four subscales that coincide with the URICA's stages of change: precontemplation, contemplation, action, and maintenance (DiClemente et al. 2004). Patients respond to each item using a five-point Likert-type scale ranging from 1 (strongly disagree) to 5 (strongly agree), and higher scores are suggestive of higher perceived readiness to change and intrinsic motivation.



Budney et al. (2000) conducted a randomized trial comparing three psychosocial treatments for cannabis dependence: Motivational enhancement therapy that involved motivational interviewing techniques to promote changes in marijuana use; motivational enhancement plus behavioral coping-skills therapy that included additional sessions focusing on coping skills related to maintaining abstinence; and motivational enhancement plus behavior coping-skills therapy and voucher-based CM. Results indicated that CM had no effect relative to other conditions on impacting readiness to change substance use, as measured by the URICA. Ledgerwood and Petry (2006) assessed intrinsic motivation to change substance use in drug-dependent patients who were enrolled in a randomized clinical trial of prize-based CM. They also did not find that CM interventions positively or negatively affected patients' readiness to change substance use assessed by the URICA relative to standard care.

A possible limitation of these studies is that the measure of intrinsic motivation, the URICA, may not be a valid measure of intrinsic motivation in patients who are engaged in or recently completed CM treatment. Although the URICA is one of the most commonly used measures of motivation to change substance use behavior, studies assessing its psychometric properties have produced mixed results (DiClemente and Hughes 1990; Willoughby and Edens 1996; El-Bassel et al. 1998; Edens and Willoughby 2000; Blanchard et al. 2003; Field et al. 2009). Further and perhaps most importantly in terms of assessing the impact of CM on motivation to change, changes in URICA scores in the context of treatment do not reliably parallel changes in substance use behavior (Callaghan et al. 2008; Field et al. 2009). Most psychometric validation studies of the URICA were either cross-sectional studies evaluating construct and concurrent validity (e.g., DiClemente and Hughes 1990; El-Bassel et al. 1998; Siegal et al. 2001) or longitudinal studies assessing the predictive validity of pre-treatment URICA scores on subsequent treatment outcomes (e.g., Willoughby and Edens 1996; Edens and Willoughby 2000; Pantaloni et al. 2002; Blanchard et al. 2003). Cross-sectional and predictive validity studies do not provide information about the validity of using the URICA to assess the effects of a treatment on intrinsic motivation, i.e., change in intrinsic motivation throughout treatment.

Several items on the maintenance and action subscales of the URICA may be problematic and confusing for patients who have experienced sustained periods of abstinence. Many of the items are more relevant to a patient's feelings about substance use before beginning treatment such as these items from the maintenance subscale: "It worries me that I might slip back on a problem I have already changed, so I am here to seek help" and "I'm not following through with what I already changed as well as I had hoped, and I'm here to prevent a relapse of the problem." Patients who have successfully completed treatment cannot respond appropriately to these items. Problematic action subscale items include: "Even though I'm not always successful in changing, I am at least working on my problem," and "I have started working on my problems, but I would like help." Hypothetically, patients experiencing sustained periods of abstinence may respond that they "strongly disagree" or "disagree" to these items because they have experienced some degree of treatment success and are not seeking additional help.

Taken together, the findings from the two previous studies do not indicate that CM affects patients' intrinsic motivation, but because of potential issues with the URICA it is difficult to determine if the results from previous studies investigating the effects of CM or other treatments on intrinsic motivation are valid. Future research should develop measures of intrinsic motivation that are more appropriate for patients in treatment or who have successfully completed it and include more items that relate to maintaining behavior change with less emphasis on pre-contemplation and contemplation issues. Ideally, a comprehensive instrument that can address a range of behaviors and motivation related to them would be useful, especially because CM interventions are now being applied to a multitude of health behavior issues, including enhancing weight loss efforts (Volpp et al. 2008; Petry et al. 2011), increasing exercise (Petry et al. 2013; Andrade et al. 2014), and improving medication adherence (Petry et al. 2012, 2015).

## 4 Summary

Intrinsic motivators, such as feelings of competence and self-determination, and extrinsic motivators, such as financial incentives and legal pressures, influence patients' desire to change substance use behavior and maintain abstinence. Intrinsic motivation to remain abstinent is a possible factor that may contribute to the long-term effects of CM as well as other psychotherapies, but there has been little research on this topic. Studies that have examined CM's impact on intrinsic motivation did not find evidence that CM affects patients' intrinsic motivation, but these studies may not have used an instrument that sensitively or accurately assesses intrinsic motivation in patients who have maintained periods of sustained abstinence. Clearly, additional research is needed before definitive conclusions can be made regarding CM's positive or negative effects on intrinsic motivation. Future research should focus on developing measures of intrinsic motivation that are better able to assess intrinsic motivation to maintain abstinence for patients engaged in treatment and who have already experienced sustained periods of behavior change. Greater understanding of mechanisms involved in the efficacy of CM and its impact on motivation to change ultimately may assist in improving treatments for substance use disorders as well as other health care conditions.

## References

- Alessi SM, Petry NM (2014) Smoking reductions and increased self-efficacy in a randomized controlled trial of smoking abstinence-contingent incentives in residential substance abuse treatment patients. *Nicotine Tob Res Off J Soc Res Nicotine Tob* 16:1436–1445. doi:[10.1093/ntr/ntu095](https://doi.org/10.1093/ntr/ntu095)
- Andrade LF, Barry D, Litt MD, Petry NM (2014) Maintaining high activity levels in sedentary adults with a reinforcement-thinning schedule. *J Appl Behav Anal* 47:523–536. doi:[10.1002/jaba.147](https://doi.org/10.1002/jaba.147)

- Blanchard KA, Morgenstern J, Morgan TJ et al (2003) Motivational subtypes and continuous measures of readiness for change: concurrent and predictive validity. *Psychol Addict Behav* 17:56–65. doi:[10.1037/0893-164X.17.1.56](https://doi.org/10.1037/0893-164X.17.1.56)
- Budney AJ, Higgins ST, Radonovich KJ, Novy PL (2000) Adding voucher-based incentives to coping skills and motivational enhancement improves outcomes during treatment for marijuana dependence. *J Consult Clin Psychol* 68:1051–1061
- Budney AJ, Moore BA, Rocha HL, Higgins ST (2006) Clinical trial of abstinence-based vouchers and cognitive-behavioral therapy for cannabis dependence. *J Consult Clin Psychol* 74:307–316. doi:[10.1037/0022-006X.4.2.307](https://doi.org/10.1037/0022-006X.4.2.307)
- Callaghan RC, Taylor L, Moore BA et al (2008) Recovery and URICA stage-of-change scores in three marijuana treatment studies. *J Subst Abuse Treat* 35:419–426. doi:[10.1016/j.jsat.2008.03.004](https://doi.org/10.1016/j.jsat.2008.03.004)
- Cameron J, Banko KM, Pierce WD (2001) Pervasive negative effects of rewards on intrinsic motivation: the myth continues. *Behav Anal MABA* 24:1–44
- Deci EL, Ryan RM (1985) *Intrinsic motivation and self-determination in human behavior*. Plenum, New York
- Deci EL, Koestner R, Ryan RM (1999) A meta-analytic review of experiments examining the effects of extrinsic rewards on intrinsic motivation. *Psychol Bull* 125:627–668. doi:[10.1037/0033-2909.125.6.627](https://doi.org/10.1037/0033-2909.125.6.627)
- DiClemente CC (1999) Motivation for change: implications for substance abuse treatment. *Psychol Sci* 10:209–213. doi:[10.1111/1467-9280.00137](https://doi.org/10.1111/1467-9280.00137)
- DiClemente CC, Hughes SO (1990) Stages of change profiles in outpatient alcoholism treatment. *J Subst Abuse* 2:217–235
- DiClemente CC, Schlundt D, Gemmell L (2004) Readiness and stages of change in addiction treatment. *Am J Addict* 13:103–119. doi:[10.1080/10550490490435777](https://doi.org/10.1080/10550490490435777)
- Dutra L, Stathopoulou G, Basden SL et al (2008) A meta-analytic review of psychosocial interventions for substance use disorders. *Am J Psychiatry* 165:179–187. doi:[10.1176/appi.ajp.2007.06111851](https://doi.org/10.1176/appi.ajp.2007.06111851)
- Edens JF, Willoughby FW (2000) Motivational patterns of alcohol dependent patients: a replication. *Psychol Addict Behav J Soc Psychol Addict Behav* 14:397–400
- El-Bassel N, Schilling RF, Ivanoff A et al (1998) Stages of change profiles among incarcerated drug-using women. *Addict Behav* 23:389–394. doi:[10.1016/S0306-4603\(97\)00036-1](https://doi.org/10.1016/S0306-4603(97)00036-1)
- Field CA, Adinoff B, Harris TR et al (2009) Construct, concurrent and predictive validity of the URICA: data from two multi-site clinical trials. *Drug Alcohol Depend* 101:115–123. doi:[10.1016/j.drugalcdep.2008.12.003](https://doi.org/10.1016/j.drugalcdep.2008.12.003)
- Higgins ST, Budney AJ, Bickel WK et al (1994) Incentives improve outcome in outpatient behavioral treatment of cocaine dependence. *Arch Gen Psychiatry* 51:568–576
- Higgins ST, Budney AJ, Bickel WK et al (1995) Outpatient behavioral treatment for cocaine dependence: one-year outcome. *Exp Clin Psychopharmacol* 3:205–212. doi:[10.1037/1064-1297.3.2.205](https://doi.org/10.1037/1064-1297.3.2.205)
- Higgins ST, Badger GJ, Budney AJ (2000a) Initial abstinence and success in achieving longer term cocaine abstinence. *Exp Clin Psychopharmacol* 8:377–386
- Higgins ST, Wong CJ, Badger GJ et al (2000b) Contingent reinforcement increases cocaine abstinence during outpatient treatment and 1 year of follow-up. *J Consult Clin Psychol* 68:64–72. doi:[10.1037/0022-006X.68.1.64](https://doi.org/10.1037/0022-006X.68.1.64)
- Higgins ST, Alessi SM, Dantona RL (2002) Voucher-based incentives: a substance abuse treatment innovation. *Addict Behav* 27:887–910. doi:[10.1016/S0306-4603\(02\)00297-6](https://doi.org/10.1016/S0306-4603(02)00297-6)
- Higgins ST, Silverman K, Heil SH (2008) *Contingency management in substance abuse treatment*. Guilford Press, New York
- Hubbard RL (1989) *Drug abuse treatment: a national study of effectiveness*. University of North Carolina Press, Chapel Hill
- Hubbard RL, Gail S, Flynn PM et al (1997) Overview of 1-year follow-up outcomes in the drug abuse treatment outcome study (DATOS). *Psychol Addict Behav* 11:261–278. doi:[10.1037/0893-164X.11.4.261](https://doi.org/10.1037/0893-164X.11.4.261)

- Hunt YM, Rash CJ, Burke RS, Parker JD (2010) Smoking cessation in recovery: comparing 2 different cognitive behavioral treatments. *Addict Disord Their Treat* 9:64–74. doi:[10.1097/ADT.0b013e3181bf0310](https://doi.org/10.1097/ADT.0b013e3181bf0310)
- Kadden RM, Litt MD, Kabela-Cormier E, Petry NM (2007) Abstinence rates following behavioral treatments for marijuana dependence. *Addict Behav* 32:1220–1236. doi:[10.1016/j.addbeh.2006.08.009](https://doi.org/10.1016/j.addbeh.2006.08.009)
- Ledgerwood DM, Petry NM (2006) Does contingency management affect motivation to change substance use? *Drug Alcohol Depend* 83:65–72. doi:[10.1016/j.drugalcdep.2005.10.012](https://doi.org/10.1016/j.drugalcdep.2005.10.012)
- Lussier JP, Heil SH, Mongeon JA et al (2006) A meta-analysis of voucher-based reinforcement therapy for substance use disorders. *Addiction* 101:192–203. doi:[10.1111/j.1360-0443.2006.01311.x](https://doi.org/10.1111/j.1360-0443.2006.01311.x)
- Miller WR (1985) Motivation for treatment: a review with special emphasis on alcoholism. *Psychol Bull* 98:84–107. doi:[10.1037/0033-2909.98.1.84](https://doi.org/10.1037/0033-2909.98.1.84)
- National Institute for Health and Clinical Excellence (2007) NICE clinical guideline 51: drug misuse: psychosocial interventions. 2007. <http://www.nice.org.uk/guidance/cg51>. Accessed 29 Dec 2014
- Pantalon MV, Nich C, Franckforter T, Carroll KM (2002) The URICA as a measure of motivation to change among treatment-seeking individuals with concurrent alcohol and cocaine problems. *Psychol Addict Behav* 16:299–307. doi:[10.1037/0893-164X.16.4.299](https://doi.org/10.1037/0893-164X.16.4.299)
- Paul-Ebhohimhen V, Avenell A (2008) Systematic review of the use of financial incentives in treatments for obesity and overweight. *Obes Rev Off J Int Assoc Study Obes* 9:355–367. doi:[10.1111/j.1467-789X.2007.00409.x](https://doi.org/10.1111/j.1467-789X.2007.00409.x)
- Petry NM (2012) Contingency management for substance abuse treatment: a guide to implementing this evidence-based practice. Routledge, New York
- Petry NM, Martin B (2002) Low-cost contingency management for treating cocaine- and opioid-abusing methadone patients. *J Consult Clin Psychol* 70:398–405
- Petry NM, Martin B, Cooney JL, Kranzler HR (2000) Give them prizes, and they will come: contingency management for treatment of alcohol dependence. *J Consult Clin Psychol* 68:250–257
- Petry NM, Martin B, Simcic F (2005a) Prize reinforcement contingency management for cocaine dependence: integration with group therapy in a methadone clinic. *J Consult Clin Psychol* 73:354–359. doi:[10.1037/0022-006X.73.2.354](https://doi.org/10.1037/0022-006X.73.2.354)
- Petry NM, Peirce JM, Stitzer ML et al (2005b) Effect of prize-based incentives on outcomes in stimulant abusers in outpatient psychosocial treatment programs: a national drug abuse treatment clinical trials network study. *Arch Gen Psychiatry* 62:1148–1156. doi:[10.1001/archpsyc.62.10.1148](https://doi.org/10.1001/archpsyc.62.10.1148)
- Petry NM, Alessi SM, Hanson T, Sierra S (2007) Randomized trial of contingent prizes versus vouchers in cocaine-using methadone patients. *J Consult Clin Psychol* 75:983–991. doi:[10.1037/0022-006X.75.6.983](https://doi.org/10.1037/0022-006X.75.6.983)
- Petry NM, Barry D, Pescatello L, White WB (2011) A low-cost reinforcement procedure improves short-term weight loss outcomes. *Am J Med* 124:1082–1085. doi:[10.1016/j.amjmed.2011.04.016](https://doi.org/10.1016/j.amjmed.2011.04.016)
- Petry NM, Rash CJ, Byrne S et al (2012) Financial reinforcers for improving medication adherence: findings from a meta-analysis. *Am J Med* 125:888–896. doi:[10.1016/j.amjmed.2012.01.003](https://doi.org/10.1016/j.amjmed.2012.01.003)
- Petry NM, Andrade LF, Barry D, Byrne S (2013) A randomized study of reinforcing ambulatory exercise in older adults. *Psychol Aging* 28:1164–1173. doi:[10.1037/a0032563](https://doi.org/10.1037/a0032563)
- Petry NM, DePhilippis D, Rash CJ et al (2014) Nationwide dissemination of contingency management: the veterans administration initiative. *Am J Addict Am Acad Psychiatr Alcohol Addict* 23:205–210. doi:[10.1111/j.1521-0391.2014.12092.x](https://doi.org/10.1111/j.1521-0391.2014.12092.x)
- Petry NM, Alessi SM, Byrne S, White WB (2015) Reinforcing adherence to antihypertensive medications. *J Clin Hypertens Greenwich Conn* 17:33–38. doi:[10.1111/jch.12441](https://doi.org/10.1111/jch.12441)
- Prendergast M, Podus D, Finney J et al (2006) Contingency management for treatment of substance use disorders: a meta-analysis. *Addiction* 101:1546–1560. doi:[10.1111/j.1360-0443.2006.01581.x](https://doi.org/10.1111/j.1360-0443.2006.01581.x)

- Prochaska JO, DiClemente CC, Norcross JC (1992) In search of how people change: applications to addictive behaviors. *Am Psychol* 47:1102–1114. doi:[10.1037/0003-066X.47.9.1102](https://doi.org/10.1037/0003-066X.47.9.1102)
- Promberger M, Marteau TM (2013) When do financial incentives reduce intrinsic motivation? Comparing behaviors studied in psychological and economic literatures. *Health Psychol* 32:950–957. doi:[10.1037/a0032727](https://doi.org/10.1037/a0032727)
- Rawson RA, McCann MJ, Flammino F et al (2006) A comparison of contingency management and cognitive-behavioral approaches for stimulant-dependent individuals. *Addict Abingdon Engl* 101:267–274. doi:[10.1111/j.1360-0443.2006.01312.x](https://doi.org/10.1111/j.1360-0443.2006.01312.x)
- Roll JM, Higgins ST (2000) A within-subject comparison of three different schedules of reinforcement of drug abstinence using cigarette smoking as an exemplar. *Drug Alcohol Depend* 58:103–109
- Roll JM, Higgins ST, Badger GJ (1996) An experimental comparison of three different schedules of reinforcement of drug abstinence using cigarette smoking as an exemplar. *J Appl Behav Anal* 29:495–504; quiz 504–505. doi: [10.1901/jaba.1996.29-495](https://doi.org/10.1901/jaba.1996.29-495)
- Roll JM, Reilly MP, Johanson C-E (2000) The influence of exchange delays on cigarette versus money choice: a laboratory analog of voucher-based reinforcement therapy. *Exp Clin Psychopharmacol* 8:366–370. doi:[10.1037/1064-1297.8.3.366](https://doi.org/10.1037/1064-1297.8.3.366)
- Rowan-Szal G, Joe GW, Chatham LR, Simpson DD (1994) A simple reinforcement system for methadone clients in a community-based treatment program. *J Subst Abuse Treat* 11:217–223
- Ryan RM, Deci EL (2000) Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *Am Psychol* 55:68–78. doi:[10.1037/0003-066X.55.1.68](https://doi.org/10.1037/0003-066X.55.1.68)
- Siegal HA, Li L, Rapp RC, Saha P (2001) Measuring readiness for change among crack cocaine users: a descriptive analysis. *Subst Use Misuse* 36:687–700
- Sigmon SC, Higgins ST (2006) Voucher-based contingent reinforcement of marijuana abstinence among individuals with serious mental illness. *J Subst Abuse Treat* 30:291–295. doi:[10.1016/j.jsat.2006.02.001](https://doi.org/10.1016/j.jsat.2006.02.001)
- Silverman K, Wong CJ, Higgins ST et al (1996) Increasing opiate abstinence through voucher-based reinforcement therapy. *Drug Alcohol Depend* 41:157–165
- Simpson DD, Sells SB (1982) Effectiveness of treatment for drug abuse. *Adv Alcohol Subst Abuse* 2:7–29. doi:[10.1300/J251v02n01\\_02](https://doi.org/10.1300/J251v02n01_02)
- Stitzer ML, Iguchi MY, Felch LJ (1992) Contingent take-home incentive: effects on drug use of methadone maintenance patients. *J Consult Clin Psychol* 60:927–934
- Volpp KG, John LK, Troxel AB et al (2008) Financial incentive-based approaches for weight loss: a randomized trial. *J Am Med Assoc (JAMA)* 300:2631–2637. doi:[10.1001/jama.2008.804](https://doi.org/10.1001/jama.2008.804)
- Volpp KG, Troxel AB, Pauly MV et al (2009) A randomized, controlled trial of financial incentives for smoking cessation. *N Engl J Med* 360:699–709. doi:[10.1056/NEJMsa0806819](https://doi.org/10.1056/NEJMsa0806819)
- Willoughby FW, Edens JF (1996) Construct validity and predictive utility of the stages of change scale for alcoholics. *J Subst Abuse* 8:275–291