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Behavioral Interventions for Individuals Dually-Diagnosed with a Severe Mental Illness and a Substance Use Disorder

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Abstract

The prevalence of substance abuse among severely mentally ill individuals (SMI) with a schizophrenia-spectrum or bipolar disorder is about three times the rate of the general population. However, few effective interventions exist to address the problem. In this paper, we evaluate recent studies of behavioral interventions for substance abuse among SMI individuals. These include cognitive-behavioral, motivational interviewing, and contingency management interventions, as well as combinations thereof. Consistent with prior systematic reviews, ours indicates that no behavioral intervention has clearly demonstrated efficacy beyond that of usual care. Unfortunately, most of the reviewed studies suffer from methodological problems that hamper detection of treatment effects. Also, it can be argued that interventions tested thus far may not be well-suited for this cognitively-impaired population. A programmatic series of studies is needed to further develop and test behavioral interventions for treating substance abuse in this population.

Keywords

behavioral interventions; motivational interviewing; dual diagnosis; contingency management; cognitive-behavioral therapy; schizophrenia

Introduction

Abuse of alcohol and drugs is pervasive among persons diagnosed with a severe mental illness (SMI; i.e., schizophrenia-spectrum or bipolar disorder) with approximately 50% of those diagnosed meeting criteria for a substance use disorder (SUD; Kessler et al., 1997;

Compliance with Ethics Guidelines

Conflict of Interest

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Mueser et al., 1990). Epidemiological studies indicate that this rate is approximately three times higher than in the general population (Kessler et al., 1997) underscoring the magnitude of the problem faced by both the severely mentally ill and the treatment community. Individuals dually diagnosed with a SMI and a SUD incur greater negative consequences compared with SMI individuals who do not abuse substances including more psychiatric symptoms (Carey, Carey, & Meisler, 1991) and re-hospitalizations (Drake, Osher, & Wallach, 1989), less stable living conditions (Drake & Wallach, 1989) and higher rates of violent behavior (Steadman et al., 1998; Swanson, Holzer, Ganju, & Jono, 1990). In addition to elevated rates of substance use, rates of relapse to alcohol and drug use in this population are high following psychiatric and/or substance use treatment, with 60-90% returning to substance use within the first year (Graeber, Moyers, Griffith, Guajardo, & Tonigan, 2003; Xie, Drake, McHugo, Xie, & Mohandas, 2010; Xie, McHugo, Drake, & Sengupta, 2003). Thus, there is much room for improvement in the treatment of substance use for these individuals.

Robert Drake and colleagues (2000) have been at the forefront of championing integrated treatment for dually-diagnosed individuals. Integrated treatments involve the same clinicians (or at times, clinical teams) providing both mental health and substance abuse interventions at the same facility. The benefits of an integrated treatment model include having providers who are familiar with both the patient's mental health and substance use histories, have the ability to prioritize treatment goals most relevant to the individual, and can coordinate interventions that are likely to concurrently improve both psychiatric symptoms and substance use (Drake, Mueser, Brunette, & McHugo, 2004). However, work toward such integration has been hampered by the repeated failure of studies to yield clear empirical support for any behavioral treatment or set of treatments for treating substance use in SMI individuals.

Several behavioral interventions have been found to be efficacious for the treatment of substance abuse in non-SMI populations (W. R. Miller, Zweben, & Johnson, 2005). Over time, the best-supported of these treatments have been adapted and tested for use with dually-diagnosed individuals. The most frequently studied of these behavioral interventions have been motivational interviewing (MI; W.R. Miller & Rollnick, 2013), cognitive-behavioral therapy (CBT; Marlatt & Gordon, 1985), contingency management (CM; Higgins, Silverman, & Heil, 2008) and combinations of these interventions (e.g., MI + CBT). Motivational interventions with SMI individuals focus on engaging patients in a dialogue that is intended to increase their motivation and commitment to changing substance use (Martino, 2007; Westra, Aviram, & Doell, 2011). Cognitive-behavioral treatments emphasize teaching of skills to overcome deficits in interpersonal and intrapersonal life areas that are seen as functionally related to substance abuse, thus improving individuals' ability to cope with high-risk situations and relapse precipitants (e.g., Kadden et al., 1994). Contingency management utilizes a reinforcement-based system where target behaviors (e.g., drug-negative urines, session attendance, homework completion) are reinforced by valued, tangible rewards in order to induce periods of abstinence (Higgins & Petry, 1999). Patients who achieve behavioral targets earn vouchers that can be accumulated and exchanged for desirable goods (e.g., electronics, self-care items, movie tickets).

Individual studies utilizing these interventions and narrative reviews have found evidence for their effectiveness (Baker, Hiles, Thornton, Hides, & Lubman, 2012; De Witte, Crunelle, Sabbe, Moggi, & Dom, 2014); however, systematic reviews that more carefully account for the number and quality of clinical trials have not found strong support for the efficacy of any behavioral interventions. Two recent Cochrane reviews examining nearly two decades of behavioral interventions for substance abuse treatment for dually-diagnosed individuals (Cleary, Hunt, Matheson, Siegfried, & Walter, 2008; Hunt, Siegfried, Morley, Sitharthan, & Cleary, 2013) concluded that there is insufficient evidence to support the efficacy of any one behavioral intervention over any other or even treatment as usual. In addition, these reviews noted a number of methodological problems (Hunt et al., 2013).

Our review is intended both to provide an update regarding the current state of research on behavioral interventions for treating substance abuse among SMI individuals and to suggest directions for future research in this area. We have focused on empirical studies published during the period from January 2011 to May 2014 that involved individuals diagnosed with a schizophrenia-spectrum or bipolar disorder and a substance use disorder involving alcohol, drugs or nicotine. We have included both controlled and uncontrolled studies and those with and without post-treatment follow-up data. Table 1 provides a summary of the studies included in this review categorized by type of intervention.

Cognitive-Behavioral, Relapse Prevention, and Motivational Enhancement Interventions

Five clinical treatment studies utilizing CBT, or a popular derivative, relapse prevention (RP), were published within the period covered by our review (Barrowclough et al., 2014; Cather et al., 2013; Goldie, Masuhara, Heah, Okoli, & Johnson, 2012; Hjorthoj et al., 2013; Madigan et al., 2013; Morrens et al., 2011). Common elements across these studies include recruitment of participants with a DSM-IV diagnosis of psychosis or a schizophrenia-spectrum disorder, testing of an integrated psychiatric and substance use disorder treatment, testing of combined behavioral interventions (e.g., MI + CBT), and the collection of post-intervention follow-up data, for periods ranging from 4 to 12 months.

Most of these studies were conducted in outpatient settings (Barrowclough et al., 2014; Cather et al., 2013; Goldie et al., 2012; Hjorthoj et al., 2013; Madigan et al., 2013) although one (Morrens et al., 2011) took place in a residential setting. Three studies (Barrowclough et al., 2014; Hjorthoj et al., 2013; Madigan et al., 2013) met criteria for a randomized clinical trial. Finally, studies investigated different substances of abuse (nicotine, cannabis, alcohol and other drugs).

Cognitive-Behavioral Therapy and Pharmacotherapy

Behavioral smoking cessation was addressed by two studies, both of which were open trials that combined behavioral and pharmacological interventions (i.e., bupropion and/or varenicline) (Cather et al., 2013; Goldie et al., 2012). However, these studies differed with respect to phase of treatment. Goldie and colleagues (2012) conducted a smoking cessation study in which individuals were provided with up to 24 weeks of pharmacotherapy and

group behavioral counseling by on-site community staff. At post-treatment, only 8.6% had achieved bio-verified smoking abstinence; however, 21.9% reduced their smoking from baseline by at least 50%. In contrast, Cather et al. (2013) examined the impact of RP for newly-abstinent smokers. Pharmacotherapy was combined with group CBT (Phase 1) during a 12-week treatment period to induce smoking abstinence. Those who attained biochemically-verified 7-day point prevalence (PPA) abstinence (41.5% of the original sample) subsequently entered a 12-month RP phase consisting of continued pharmacotherapy and RP (Phase 2). At the end of Phase 2, 64.7% of participants had 7-day PPA and 23.5% self-reported continuous abstinence for the entire 12-month post-treatment period. Despite some promising findings, both studies are limited by a single group design, small sample sizes, and no treatment or outcomes reported for psychiatric symptoms.

Motivational Interviewing and Cognitive-Behavioral Therapy

Three studies targeting individuals with psychosis and comorbid cannabis dependence (Barrowclough et al., 2014; Hjorthoj et al., 2013; Madigan et al., 2013) utilized a combination of MI and CBT and compared outcomes to those of treatment as usual (TAU). The results of all three studies were consistent in demonstrating no significant benefit for MI + CBT on cannabis outcomes. Barrowclough et al. (2014) randomized participants to either brief (up to 12 sessions) or longer-term (up to 24 sessions) MI + CBT and compared these two conditions to a group that received standard case management. Follow-up assessments conducted at 4.5-, 9-, and 18-months following randomization found no significant differences between the groups on any measure of cannabis use or psychiatric symptoms. In the Hjorthoj et al (2013) study, participants were randomized to 6 months of MI + CBT or to TAU (the latter focused primarily on reduction of psychiatric symptoms). Follow-up assessments conducted at end-of-treatment and 4 months post-treatment found no significant differences between the two groups with respect to number of cannabis-using days. However, MI + CBT participants who were younger, began smoking cannabis at younger ages, and who smoked more frequently prior to starting treatment reported significantly less cannabis consumption at post-treatment but not a 4-month follow-up as compared with the TAU condition. Lastly, the Madigan et al. (2013) study was a multi-site, randomized clinical trial that, in addition to cannabis use, assessed psychosocial and psychiatric outcomes (i.e., Quality of Life [QOL], Global Assessment of Functioning). At 3- and 12-months post-randomization, there were no between-group differences on cannabis use frequency or psychiatric symptoms. However, QOL was significantly greater for MI + CBT participants at both follow-up points. Considered together, these studies provide little support for the use of MI + CBT for the treatment of cannabis dependence among SMI individuals. However, there is some indication that this intervention may be more effective for younger, heavier users during and immediately following treatment. In addition, MI + CBT may improve quality of life for some patients, although this is probably not due to a reduction in cannabis use.

Morrens et al. (2011) provided a fully integrated MI + CBT + RP intervention for the treatment of both mental health and alcohol and other drug use and compared this intervention to TAU, which focused primarily on the treatment of psychotic symptoms. Patients were followed for 3- 6- and 12-months post-randomization and were assessed for

substance use, psychiatric symptoms, and QOL. At 3-months post-randomization, participants in the MI + CBT + RP group showed significant reductions in substance use and psychiatric symptoms and greater increases in QOL compared to TAU participants. However, by the 12-month assessment, no significant differences were found on any of the main outcomes. It should be noted that a high dropout rate in both conditions (58% for MI + CBT + RP vs. 80% for TAU at 12 months) raises concerns regarding the acceptability of the interventions, particularly given the absence of a clearly defined treatment period.

Motivational Interviewing

Only one study published in the past three years has employed MI alone, not in combination with another substance use intervention (Bonsack et al., 2011). In this study, individuals in treatment for a psychotic disorder who smoked at least 3 cannabis joints per week were assigned to receive either TAU alone (n = 30) or TAU plus an initial MI session followed by a feedback session and two to four “booster sessions” over the following six months (n = 32). Participants in the MI + TAU group evidenced a greater reduction in number of joints smoked per week than did TAU participants at the 3- and 6-month follow-up assessments, but there was no significant difference between groups at 12-month follow-up. However, despite improvements in cannabis use, the two groups did not differ on psychiatric or social functioning at any of the assessments.

Transtheoretical Model-based Counseling and Exercise

A unique pilot study examined the feasibility of an eight-week smoking reduction intervention that combined five sessions of group counseling based on Prochaska's Transtheoretical Model (Prochaska, Johnson, & Lee, 2009) with three sessions of moderate exercise. Participants were 12 patients in treatment for a schizophrenia-spectrum disorder who smoked at least 15 cigarettes per day (Bernard et al., 2013). Counseling sessions included content designed to improve motivation and self-efficacy for smoking reduction; exercise sessions were designed to help patients cope with withdrawal symptoms. At the end of treatment, motivation was found to have increased, while self-report of tobacco use and expired breath carbon monoxide (CO) were significantly reduced from baseline levels. However, a follow-up assessment of tobacco use conducted at 6 weeks after treatment found that changes in self-report tobacco use and expired CO were no longer statistically significant.

Summary and Critique of MI and CBT Studies

Although the number of studies reviewed is limited, none provide clear support for the use of MI, CBT, or their combination to address the use of tobacco, cannabis, alcohol, or other drugs in SMI-diagnosed individuals. A prior review of combined MI and CBT interventions concluded that neither CBT alone nor MI + CBT have been shown to improve drug use or quality of life outcomes among SMI individuals when compared with other interventions (Hunt et al., 2013). This review also highlighted methodological issues, including small sample sizes and poor trial methods that make it difficult to draw conclusions regarding the impact of these interventions on substance use. Conducting rigorous clinical trials that include control conditions equated for time and patient expectation for improvement, use of

manualized treatments that can be replicated, and monitoring of treatment adherence and therapist competence would serve to advance our knowledge of whether CBT/RP-based interventions are effective in reducing substance use among SMI individuals. In addition, measurement of secondary outcomes that have particular relevance for this population, including psychiatric symptoms, quality of life, and social functioning, could provide important information to support the wider dissemination of effective interventions.

With regard to research that addresses the efficacy of MI for improving substance use outcomes in this population, several additional serious limitations make it difficult to evaluate the literature. First, studies in this area generally have not included procedures to document the fidelity of MI delivery, a critical step in insuring its integrity. Given that effective use of MI with dually diagnosed individuals likely requires an especially high level of therapeutic skill (Martino & Moyers, 2008), it is essential that future research remedy this omission. Second, when MI is combined with CBT, it is unclear whether the integration is being implemented in a manner that preserves MI's efficacy for increasing motivation to change (Westra et al., 2011). For instance, relying on a protocol that calls for the initiation of CBT after one or two introductory sessions of MI, regardless of the individual's response to MI, risks a premature focus on *how* to change when some patients are still deciding *whether* to change (Moyers & Houck, 2011). Such a mismatch between the agendas of patient and therapist may reduce, rather than increase, the patient's motivation for change. For many patients, addressing substance use with MI as a stand-alone intervention, similar to that used in motivational enhancement therapy (MET; Graeber et al., 2003; W.R. Miller, Zweben, DiClemente, & Rychtarik, 1994) may yield better outcomes than uniformly transitioning into a skills-focused approach after a set number of MI sessions. Studies that independently vary whether patients receive MI alone or in combination with other behavioral interventions such as CBT or contingency management (CM), and that clearly address potential conflicts between treatment approaches with the study protocol, would help to address the relative value and specific utility of MI in these combination interventions.

Third, recent research has identified therapeutic processes associated with effective MI (e.g., Apodaca & Longabaugh, 2009; Martin, Christopher, Houck, & Moyers, 2011; Vader, Walters, Prabhu, Houck, & Field, 2010) and it is unknown whether these can be replicated in dually diagnosed populations (Martino, 2007; Westra et al., 2011). For instance, does skillfully delivered MI lead to increased change talk with dual diagnosis patients, and does such an increase lead them to reduce their substance use? Finally, it will be important for future research to establish the boundaries of efficacy for MI with respect to patient psychiatric and substance use diagnoses (e.g., schizophrenia versus bipolar disorder; alcohol versus marijuana), symptoms severity, age and treatment setting, and to establish whether MI for dually-diagnosed individuals can be effectively delivered in cost-effective group formats (De Witte et al., 2014; Handmaker, Packard, & Conforti, 2002; Martino & Moyers, 2008; Westra et al., 2011).

Contingency Management Interventions

Three studies have utilized contingency management (CM) approaches to address substance use (McDonnell et al., 2013; Petry, Alessi, & Rash, 2013; Tidey, Rohsenow, Kaplan, Swift, & Reid, 2011). One study (Tidey et al., 2011) examined the feasibility and initial efficacy of three weeks of sustained-release bupropion combined with two weeks of CM for smoking reduction and/or abstinence among individuals with schizophrenia who smoked at least 20 cigarettes per day and expressed an interest in quitting smoking. At the end of the 3-week treatment period, cotinine levels in participants randomized to a condition where receipt of incentives was contingent on smoking reduction (verified through expired CO and urine cotinine) were lower than those randomized to non-contingent reinforcement; however, bupropion had no significant impact on smoking cessation or reduction compared with placebo.

Two studies involved randomized clinical trials to examine the efficacy of CM for cocaine (Petry et al., 2013) and stimulant (McDonnell et al., 2013) dependence among SMI patients. In the Petry et al. (2013) study, participants were randomized to standard care plus reinforcement for cocaine-negative urines utilizing a lower-cost procedure that allows participants to draw tickets to earn prizes for cocaine-negative urines (Peirce et al., 2006) or to standard care with non-contingent reinforcement (NCR) for submitting urines. Over the 8-week treatment period, the CM condition submitted a significantly greater proportion of cocaine-negative urines and had longer durations of abstinence as compared with the non-contingent condition. In addition, psychiatric symptoms decreased in the CM group but not in the NCR group. However, interpretation of study findings is hampered by a low rate of submission of urine samples by both the CM (50%) and the NCR (34%) groups and thus, study conclusions differed depending on how missing samples were treated in analyses.

McDonnell and colleagues (2013) randomized SMI individuals diagnosed with stimulant dependence to either 12 weeks of CM with prize draws plus TAU (consisting of integrated mental health and substance abuse treatment) or TAU plus non-contingent reinforcement. Participants were followed for 12 weeks post-treatment. Contingency management resulted in fewer days of stimulant use during treatment and follow-up, as well as fewer days of alcohol and illicit injection drug use and improved psychiatric symptoms during treatment but not the follow-up. Surprisingly, the CM group had a significantly greater rate of treatment drop-out, possibly due to the added requirement of stimulant-negative urines in order to receive reinforcers, compared to the NCR group. Although the McDonnell study yielded promising results, these recent studies do not provide clear support for the efficacy of CM for treating substance abuse among SMI. However, both clinical trials (McDonnell et al., 2013; Petry et al., 2013) utilized lower-cost incentive procedures (i.e., “fishbowl”) in which only a proportion of target behaviors (i.e., drug negative urines) receive reinforcement, in contrast to studies in which each target behavior earns rewards (such as those successfully employed in the Tidey et al study) that escalate in value with each consecutive success. This partial reinforcement of drug-negative urines in the Petry and McDonnell studies may have negatively impacted both treatment retention and the submission of urine samples. At this juncture, it would be helpful to demonstrate the efficacy of “higher value” CM prior to testing lower-cost alternatives, as there is evidence

for greater effectiveness of these larger reward CM procedures, particularly with patients evidencing more severe substance use (Petry & Roll, 2011; Petry et al., 2004). In addition, extending the duration of CM procedures has shown promise for improving substance use outcomes among non-SMI populations (Roll, Chudzynski, Cameron, Howell, & McPherson, 2013) and could be of value in improving outcomes among SMI individuals.

Conclusions

Our review of the recent literature examining behavioral interventions for dually-diagnosed individuals indicates that no particular treatment appears to be clearly efficacious for addressing substance abuse when compared to either another behavioral intervention or to usual care. Although a few studies evidenced better outcomes for the behavioral intervention condition at the end of treatment, these improvement were not sustained post-treatment (Bonsack et al., 2011; Morrens et al., 2011). Studies that we reviewed utilized cognitive-behavioral, motivational enhancement and contingency management interventions alone or in combination, with the goal of reduction or cessation of nicotine, alcohol, marijuana, cocaine and/or stimulant use. Despite some promising preliminary findings particularly for combined pharmacological and CBT interventions (Cather et al., 2013; Goldie et al., 2012) and higher value reward CM for smoking cessation (Tidey et al., 2011), and CM for stimulant dependence (McDonell et al., 2013), the substance use outcomes for these studies have generally been disappointing.

A number of factors have likely contributed to the failure of studies to demonstrate efficacy of behavioral interventions for addressing substance use among SMI individuals. These factors include small sample sizes, inconsistent monitoring of treatment fidelity and therapist competence, alteration of treatment components in ways that make them less effective for SMI, and providing combinations of behavioral treatments or sequencing them in ways that may not be optimal for patient change. Alternatively, it is possible that these behavioral interventions, even if provided in optimal ways, would not be effective for SMI individuals, given their unique deficits and challenges. Schizophrenia is known to be associated with a wide range of deficits across most higher-order cognitive domains, with relatively worse performance on tests of episodic memory and processing speed (Schaefer, Giangrande, Weinberger, & Dickinson, 2013). The generalized nature of these cognitive deficits may impact the extent to which patients can benefit from behavioral interventions, particularly motivational interviewing and cognitive-behavioral interventions that are cognitively complex. Interestingly, our review found some promise for CM interventions, which may be less cognitively taxing than the other behavioral interventions (Tidey & Ries, 2008). Greater attention should be allocated to designing intervention programs that work in concert with these generalized cognitive deficits. Finally, the current approach to selecting and testing behavioral interventions for SMI individuals seems somewhat “scattershot” rather than representing a planned series of studies that follow a logical and sequential trajectory. The planning and execution of such a programmatic series of studies will require a significant investment from funding agencies but ultimately may be necessary in order to achieve success in reducing the high prevalence of substance use disorders in SMI populations.

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Table 1

Summary of Studies Providing Behavioral Interventions for Substance Abuse to Severely Mentally Ill Individuals

Studies by Intervention	Primary Substance	Psychiatric Diagnosis	Total Sample	Conditions	Treatment	Follow-up
Cognitive-Behavioral + Pharmacotherapy						
Goldie et al. (2012)	Nicotine	Psychotic, Mood or Anxiety	N = 35	Single group	Up to 24 weeks of TX* including NRT* + bupropion (300 mg) or varenicline (2 mg) + behavioral and supportive counseling	Variable – 1 month after TX completion
Cather et al. (2013)	Nicotine	Schizophrenia-spectrum	N = 41 (CBT) N = 17 (RP)	Single group	12 weeks of NRT + bupropion (300 mg) + group CBT* for smoking cessation followed by 12 months of group NRT* + bupropion + RP*	End of cessation phase (Month 3) and end of RP phase (Month 15)
Motivational Interviewing + Cognitive-Behavioral						
Barrowclough et al. (2014)	Cannabis	Non-affective Psychotic	N = 110	MI + CBT + TAU (12 sessions; n = 38) MI + CBT + TAU (24 sessions; n = 37) TAU only (24 sessions; n = 35)	MI* + CBT focused on motivation building + developing a plan for change* TAU* consisted of case management & crisis response	4.5, 9 and 18 months post-randomization
Hjorthoj et al. (2013)	Cannabis	Schizophrenia-spectrum	N = 103	MI + CBT + TAU (n = 52) TAU only (n = 51)	6 months of MI to enhance alliance and motivation + CBT focused on skills to manage high-risk situations Variable duration of TAU consisting of psychiatric usual care	6 and 10 months post-randomization
Madigan et al. (2013)	Cannabis	Psychotic	N = 88	MI + CBT (n = 59)	3 months of group-based MI + CBT	3 and 6 months post-randomization

Studies by Intervention	Primary Substance	Psychiatric Diagnosis	Total Sample	Conditions	Treatment	Follow-up
Motivational Interviewing + Cognitive-Behavioral + Relapse Prevention	Alcohol & drugs	Psychotic	N = 120	TAU only (n = 29)	focused on increasing motivation and commitment to change and enhancing coping skills + 1 booster session Variable duration of TAU consisting of psychiatric usual care	3, 6 and 12 months post-randomization
				Integrated TX (n = 85) TAU only (n = 35)	Variable duration of integrated substance abuse and psychiatric TX utilizing MI + CBT + RP + psycho-education in inpatient setting plus case management following discharge to outpatient care Variable duration of TAU consisting of standard inpatient psychiatric care. No outreach following discharge to outpatient care.	
Motivational Interviewing	Cannabis	Psychotic	N = 62	MI + TAU (n = 30) TAU only (n = 32)	Four to six individual MI sessions + 3 optional group MI sessions over 6 months Variable duration of TAU consisting of usual psychiatric care	3, 6, and 12 months post-randomization
TTM-Based Counseling + Exercise						
Bernard et al. (2013)	Nicotine	Schizophrenia-spectrum	N = 12	Single group	2-month intervention consisting of 5 group-	End of treatment and 6 weeks post-TX

Studies by Intervention	Primary Substance	Psychiatric Diagnosis	Total Sample	Conditions	Treatment	Follow-up	
Contingency Management					based TTM [*] - influenced smoking reduction sessions + 3 exercise sessions		
	Tidey et al. (2011)	Nicotine	Schizophrenia-spectrum	N = 57 randomized to meds (1 wk) N = 52 to both meds and CM (2 wks)	Bupropion + CM [*] (n = 12) Placebo + CM (n = 16) Bupropion + NCR [*] (n = 11) Placebo + NCR (n = 13)	22 days of bupropion (300mg) or placebo 14 days of higher-value contingent reinforcement of smoking reduction + reinforcement for session attendance (CM) or reinforcement for providing urine sample and session attendance (NCR)	No follow-up
	Petry et al. (2013)	Cocaine	Schizophrenia-spectrum, Bipolar or Recurrent Major Depression	N = 19	Standard care + CM (n = 10) Standard care (n = 9)	8 weeks of usual care psychiatric/substance abuse TX + \$1 for each urine sample submitted + lower-cost contingent reinforcement of cocaine-negative urines (SC [*] + CM) 8 weeks of usual care psychiatric/substance abuse TX + \$1 per urine sample submitted (SC)	No follow-up
McDonnell et al. (2013)	Stimulants	Schizophrenia-spectrum, Bipolar or Recurrent Major Depression	N = 176	TAU + CM (n = 91) TAU + NCR (n = 85)	3 months TAU consisting of mental health, substance abuse, housing and vocational services + lower-cost CM (TAU + CM) or TAU + quasi-yoked control that receives same number of lower-cost	End of treatment and 3-month post-TX	

Studies by Intervention	Primary Substance	Psychiatric Diagnosis	Total Sample	Conditions	Treatment	Follow-up
					reinforcers as CM condition but not contingent on stimulant- free urines (TAU + NCR)	

* TX = treatment, NRT = nicotine replacement therapy, CBT = cognitive-behavioral treatment, RP = relapse prevention, MI = motivational interviewing, TAU = treatment as usual, TTM = Transtheoretical Model, CM = contingency management, NCR = non-contingent reinforcement, SC = standard care