Published in final edited form as:

Subst Use Misuse. 2019 ; 54(7): 1067–1074. doi:10.1080/10826084.2018.1528458.

Social functioning outcomes among individuals with substance use disorders receiving internet-delivered community reinforcement approach

LA Marino^a, ANC Campbell^a, M Pavlicova^b, M Hu^c, and EV Nunes^a

^aColumbia University Medical Center, Department of Psychiatry, New York State Psychiatric Institute, New York, NY 10032

^bColumbia University, Mailman School of Public Health, Department of Biostatistics, New York, NY 10032

^cColumbia University Medical Center, Department of Psychiatry, New York, NY 10032

Abstract

Background: The Community Reinforcement Approach (CRA) is an evidence-based practice for the treatment of substance use disorders and achieving and maintaining abstinence, but few studies have systematically explored the effect of CRA on secondary, yet also important outcomes, such as social functioning.

Objectives: The purpose of this study was to examine whether an internet-based version of the CRA plus contingency management is associated with improved social functioning of individuals seeking substance use disorder treatment in a multi-site clinical effectiveness trial.

Methods: Social functioning was measured using the 54-item Social Adjustment Scale (SAS) assessing role performance in six domains (work, social and leisure activities, extended family relationships, marital relationship, parenting, and immediate family). Generalized linear mixed models tested the effects of treatment, time, sex, baseline abstinence, baseline social functioning and baseline psychological distress on overall social functioning and across social functioning subscales at the end of the 12-week treatment phase and three and six months post treatment.

Results: Results showed no significant association between treatment and total social functioning score or any subscale scores. Being male was significantly associated with better social functioning overall at the end of treatment ($p=.024$). Higher levels of psychological distress at baseline predicted significantly worse social functioning at the end of treatment overall ($p=.037$).

Conclusions: The addition of an internet-based version of the CRA was not associated with greater improvements in social functioning compared to standard outpatient care after 12 weeks of treatment. Implications for internet-delivered CRA are discussed.

Corresponding Author: Leslie Marino, MD, MPH, New York State Psychiatric Institute, 1051 Riverside Drive, Room 6204A, New York, NY, 10032. (P) 646-774-6119. leslie.marino@nyspi.columbia.edu.

Declaration of Interest

Dr. Nunes has received medication for research studies from Alkermes/Cephalon, Duramed Pharmaceuticals, and Reckitt-Benckiser. The other authors report no financial relationships with commercial interest.

Keywords

Community reinforcement approach; contingency management; substance use disorders; social functioning; technology-assisted interventions

Background

Both contingency management (CM) and Community Reinforcement Approach (CRA) have substantial evidence supporting their use for the treatment of substance use disorders (Budney & Higgins, 1998; Smith et al., 2001; Stitzer, Petry, & Pierce, 2010). The combination of these two approaches has demonstrated synergistic effects, improving outcomes beyond each intervention individually (Christensen et al., 2010; Garcia-Fernandez et al., 2011; Higgins et al., 2003). CRA focuses on developing and reinforcing positive resources in an individual's social context that are ultimately incompatible with ongoing substance use (Roozen et al., 2004). By exploring and enhancing relationships with family, friends, significant others, and children and building positive employment and social experiences, the CRA intends to make the "sober lifestyle" more rewarding than the use of alcohol or drugs (Moos, 2007).

With this mechanistic underpinning of CRA, improvements in social functioning should be expected as a result of treatment with CRA, along with decreased substance use and improved quality of life. Despite this likely relationship, there is little data on social functioning in the substance use disorder population and few studies which look systematically at the effect of CRA on social functioning. A review of CRA found that the number of hours that participants engaged in CRA activities was associated with opioid and cocaine abstinence, suggesting a relationship between social functioning and substance use (Schottenfeld et al., 2000). Another study examining the CRA in an opioid use disorder population found improvement in social functioning over time, as measured by the Social Adjustment Scale, but no effect of treatment itself (Abbott, 2009). Other research has demonstrated improvements on Addiction Severity Index composite scores following CRA, but this is not a typical measure of social functioning.

Technology-assisted interventions for substance use disorders show great promise for providing access to high quality, evidence-based interventions while reducing barriers such as cost, geographic distance from specialty care, stigma, and maintaining treatment fidelity (Carroll & Rounsaville, 2010). Internet-delivered versions of CM and CRA are relatively new. A recent randomized controlled trial compared treatment-as-usual (TAU) to a computer-assisted Therapeutic Education system (TES), a combination of Internet-delivered CRA plus CM, and found that participants in TES were retained in treatment significantly longer and had greater abstinence than TAU participants (Campbell et al., 2014).

In the current study, we conducted a secondary analysis of data from this trial to examine whether TES was associated with improvement in social functioning. As CRA is designed to improve social functioning by focusing on social and interpersonal problems identified by the patient and therapist and creating a specific plan to address them, it is important to assess

whether improvement in social functioning can also be attained via a technology-based intervention.

Methods

Participants, setting and study design

Participants seeking treatment for substance use disorders were recruited from 10 outpatient substance abuse treatment programs affiliated with the National Drug Abuse Treatment Clinical Trials Network ($N=507$). Eligible participants were: (1) 18 or older, (2) using illicit substances in the 30 days prior to study entry (or 60 days if the patient was exiting a controlled environment), (3) within 30 days of entering the treatment episode, and (4) proficient in English. Participants were excluded if they were: (1) prescribed opioid replacement therapy (e.g., buprenorphine, methadone), or (2) unable to provide informed consent. The study was approved by the Institutional Review Boards of the New York State Psychiatric Institute and all participating clinical sites. The study was registered on clinicaltrials.gov under the identifier NCT01104805. Additional details of program selection, design, and methods (Campbell et al., 2012) and main study outcomes (Campbell et al., 2014) have been previously published.

After providing a complete description of the study, written informed consent was obtained and a baseline assessment conducted. Following the assessment, participants were randomized to 12 weeks of either: (1) treatment as usual (TAU); or (2) TAU + the computer-assisted, Internet-delivered TES, whereby TES was a substitute for approximately 2 hours per week of usual care (i.e., clinician-delivered psychosocial groups). Randomization was stratified by: treatment site; patient's primary substance of abuse (dichotomized as stimulant vs. non-stimulant); and whether or not the patient was abstinent at point of baseline assessment and study entry based on urine drug and breath alcohol tests. All participants were asked to provide self-reported substance use and urine drug and breath alcohol screens twice per week during the treatment phase; additional assessments were collected at treatment weeks 4, 8, and 12.

TAU in both intervention arms included site-specific recommended outpatient treatment at each of the 10 treatment program sites which was on average 4-6 sessions. Study participants completed an average of 1.5 sessions of TAU per week.

The TES (Bickel et al., 2008) consists of 62 Internet-delivered, interactive, multimedia modules, grounded in the CRA (Budney & Higgins, 1998) and includes CM in the form of intermittent, escalating vouchers. An initial training module instructs participants how to use the program, followed by modules (or topics) on cognitive behavioral relapse prevention skills, psychosocial functioning which covers topics such as improving communication skills, effective problem solving, giving constructive criticism and giving and receiving compliments, and HIV and other sexually transmitted infection prevention and treatment information. Video clips show actors modeling the skills being taught and short quizzes at the end of each module assess patient's grasp of material and maximize individual mastery of the skills being taught. The CM component, also managed within the TES program, is a prize-based incentive system (Petry et al., 2005; Stitzer et al., 2010). Participants earn draws

for submitting negative urine/breath alcohol screens and for completing TES modules (up to 4 per week). Draws are redeemed from a virtual “fish bowl” and yield congratulatory vouchers with messages (e.g., “good job”) or prizes of mostly modest value (usually around \$1, occasionally around \$20, rarely \$80-\$100).

Measures

Sex, age, race/ethnicity, education, employment, marital status, primary substance of abuse and abstinence at study entry were assessed at baseline. Primary substance of abuse was self-reported based on the substance with which the participant felt they had the largest problem or for which they were primarily seeking treatment. Abstinence at baseline/study entry was defined as negative results on both the urine drug and breath alcohol screens.

General mental health was assessed using the Brief Symptom Inventory-18 (BSI-18), a shortened version of the 53-item Brief Symptom Inventory (Derogatis and Spencer, 1983). The short version assesses psychological distress in three distinct domains: somatization, depression, and anxiety (Derogatis, 2001), each with six items rated on a 5-point Likert scale ranging from 0-not at all to 4-extremely. The total score was calculated by summing the responses for all items. These three dimensions are relevant to the most common psychiatric problems in the substance use disorder population, and the BSI-18 has been widely used in this population for research and clinical practice (Wang et al., 2010).

Social functioning was measured using the 54-item Social Adjustment Scale Self-report (SAS; Weissman, 1999) which assesses instrumental (i.e., what we do in the world) and expressive (i.e., how we relate to others) role performance over the prior two weeks. It is comprised of questions covering six social roles (work [paid worker, student, or homemaker], social and leisure activities, extended family relationships, marital relationship, role as a parent, and role within the family unit), relevant to both males and females, and provides an overall indicator of social functioning (Weissman et al., 2001). Items are rated on a 5-point scale (1 to 5) with higher scores indicating greater social impairment. Each subscale is scored by summing the score for each item and obtaining a mean. Subscales were not completed if the specific role area was not relevant to the respondent, e.g., individuals would not complete the parenting subscale if they did not have children. The overall score was obtained by summing all scores of all items, and dividing by the number of items scored (Weissman and Bothwell, 1976). Social functioning was measured at baseline, at the end of treatment (week 12) and at three and six months post treatment follow-up assessments.

Analytical and statistical approach

Demographic and clinical characteristics of the entire sample were described using means, standard deviations, and frequencies. To explore differences in social functioning (operationalized as overall SAS score or scores for each of the 6 subscales) as a function of randomized treatment assignment (TAU or TES), the following variables were included in generalized linear mixed effect models (with Proc GLIMMIX in SAS) a priori as determined by literature review and expert consensus: treatment assignment, time (1=the end of treatment, 2=3-month, 3=6-month follow-up, treated as a continuous variable), sex,

abstinence at study entry, baseline BSI score and baseline social functioning score. Site and subject were treated as random effects. Interactions were tested between treatment and time and included in the final model if significant at $p < .05$. Missing data was assumed missing at random. At the recommendation of reviewers, we explored the association between treatment engagement (number of TES modules completed and number of TAU sessions attended) and outcomes (overall social functioning and subscale scores and at end of treatment, 3- and 6- month follow up) using Spearman's rank correlation coefficients and corresponding p-values.

All hypothesis tests were tested as two-sided. SAS version 9.3 was utilized for all analyses.

Results

There were 507 subjects randomized to TES or TAU. The mean age of the sample was 35 years old and just over one-third (37.9%) were female. (Table 1) A majority of the sample was white (56.0%), 22.9% was Black or African American, and 10.9% identified as Hispanic or Latino. Sixty-one percent of the sample had never been married and 59.0% were unemployed at study entry. Roughly three-quarters (76.7%) had a high school diploma/GED or greater. Primary substance of abuse was distributed relatively equally across categories, including alcohol (20.5%), cocaine (20.1%), marijuana (22.5%) and opioids (21.3%) with fewer reporting stimulants (13.6%). Just over half the sample were abstinent at study entry (negative urine drug and breath alcohol screen). The mean BSI score for the sample was 13.5 (SD=12.6). There were no significant differences between TES or TAU in baseline characteristics as reported in the primary outcome paper (Campbell et al., 2012). Patients in the TES group completed a mean of 36.6 computer-delivered modules (SD=18.1) out of a recommended 48 (range=0–72). Patients in the treatment-as-usual and TES groups attended similar numbers of treatment-as-usual therapy sessions at their treatment programs (TES group: mean=21.2, SD=17.5; treatment-as-usual group: mean=20.4, SD=17.5). (data not shown)

The overall mean social functioning score for the entire sample was 2.17 (SD=0.50) at baseline (lower scores indicate better social functioning). (Table 1) The mean subscale scores ranged from 1.38 (SD=0.55) for the parenting subscale to 2.49 (SD=0.64) for the social and leisure subscale. (Table 1) The overall mean social functioning score significantly improved ($p=0.013$) over time, with no difference in the mean scores between treatment groups at the end of treatment (2.01, SD=0.47 in the TES group and 2.03, SD=0.48 for TAU) or at 6-month follow-up (1.99, SD=0.51 in the TES group and 1.96, SD=0.47 for TAU).

The models tested the effects of treatment, time, sex, baseline abstinence, baseline social functioning and baseline psychological distress on the social functioning outcomes across time. There was no significant effect of the interaction of treatment group and time on overall social functioning score or social functioning subscales and thus the interaction was omitted from all final models (see Table 2). There was also no main effect of treatment arm (TES vs TAU) on the total SAS score or any subscale scores. Time was significantly associated with overall social functioning ($p=.013$), work subscale ($p=.003$), extended family subscale ($p=.019$) and immediate family subscale ($p=.002$). In all cases, social functioning

significantly improved with time. Being male was significantly associated with better social functioning overall and across time ($p=.024$), as well as extended family ($p=.010$) and immediate family subscales ($p=.001$). Higher scores on the BSI at baseline was associated with significantly worse social functioning at the across time for the overall score ($p=.037$), work ($p=.031$), extended family ($p=.001$) and immediate family subscales ($p=.008$). Baseline abstinence was not significantly related to social functioning scores.

When we explored the association between proxy measures of treatment engagement and outcome, we found a significant correlation between number of TAU sessions attended (Mean=20.79, SD=17.47, Range=1-90, N=507) and overall social functioning ($r=-.10$, $p=.042$) and the social/leisure subgroup ($r=-.10$, $p=.026$) at end of treatment, but this significance disappeared at 3- and 6-months follow-up. In addition, we found a significant correlation between the number of modules completed (Mean=36.84, SD=16.82, Range=1-62, N=249, TES arm only) and overall social functioning ($r=-.23$, $p=.001$), social/leisure ($r=-.21$, $p=.002$), and extended family ($r=-.20$, $p=.003$) subgroups at end of treatment. There was also a significant correlation between the number of modules completed and overall social functioning ($r=-.21$, $p=.002$), work ($r=-.16$, $p=.038$), social/leisure ($r=-.15$, $p=.029$), and extended family ($r=-.19$, $p=.004$) at 3-months, but not at 6-months follow-up.

Discussion

This study explored the effect of an internet-delivered version of the Community Reinforcement Approach (plus contingency management) (Therapeutic Education System [TES]) on social functioning in a large and diverse sample of individuals with substance use disorders seeking treatment in the community. No difference was detected in social functioning based on randomized treatment arm (TES vs treatment-as-usual [TAU]), however overall improvement in social functioning was demonstrated across the three follow up time points.

There may be several reasons for these findings. First, the mean overall social functioning scores at baseline indicate relatively low impairment. The scores map closely to normative scores from community samples of individuals with alcohol use disorder and better than those with acute depression (Weissman et al., 1978). This is consistent with other findings of social functioning among individuals with substance use disorder and could be partly due to the population recruited from outpatient substance use treatment programs, as opposed to out of treatment samples (Abbott, 2009; Roozen et al., 2004). Thus, although there was some improvement in social functioning over time, large improvements were unlikely to be seen. Second, the Social Adjustment Scale may not capture social functioning as it relates to CRA skills or for individuals with active substance use disorders. Further, the analytic approach used (comparison of mean scores) may limit its application in this population. Many trials of CRA have used the Addiction Severity Index (ASI) to examine social and interpersonal functioning in the context of an individual's substance use (Roozen et al., 2004), but the length and effort required to administer this assessment may limit its use. Social functioning measures that better map onto the intervention context or social and interpersonal experiences of individuals with active substance use disorders may need to be

developed for use in CRA studies. Future research may also explore different analytic approaches for the Social Adjustment Scale in this population.

Prior research has demonstrated that the amount of time individuals participate in nondrug-related activities is higher for those receiving CRA who achieved abstinence, compared to those that did not (Schottenfeld et al., 2000). In this particular study, we did not hypothesize the effect of the dose of TES (i.e., number of modules completed) on social functioning outcomes, but future analyses could explore this, as well as the association between specific modules (or skills) completed and specific types of social functioning. How frequently and to what extent participants practiced activities from the online modules was not assessed as part of the study and may also explain the lack of effect seen for TES on social functioning outcomes. Given the short course of treatment, there may not have been enough time for skills learned in TES to produce measurable effects.

In addition, patients were instructed to complete a core set of modules first before being able to select modules on their own. Thus, the core modules may not necessarily reflect individual areas needing improvement and may not target areas of social functioning that may be more deficient and have more room for improvement. Helping clients choose modules that would be most helpful to them as well as asking counselors to follow-up on home practice (as is the case in clinician-delivered CRA) may be essential ingredients for TES to more directly improve social functioning and should be considered when integrating TES into treatment programs.

In post-hoc analyses, we found that the number of TES modules completed and number of TAU sessions attended were significantly correlated with overall social functioning at 12 weeks (TES and TAU) and 3 months (TES only), but these significant findings dissipated by 6 months suggesting that the effects of dose were not sustained and likely not sufficient to explain either improvement, or lack thereof. It appears in this exploratory analysis that more general areas of social functioning might be impacted, while more personal, immediate familial relationships, those areas which often bear the brunt of addiction-related behaviors, are less impacted. This finding could provide preliminary guidance for social functioning assessment of people with Substance Use Disorders.

The link between gender (i.e., being male) and improved social functioning was not surprising. Gender differences in substance use disorder treatment are well-known, particularly differences related to psychological and social functioning (Greenfield et al., 2007; Griffin et al., 1989; Kingree, 1995) and may be the result of different coping responses, social resources, and societal expectations (Billings & Moos, 1981). The finding that women had less improvement in social functioning over time may suggest that treatment approaches should incorporate training in social and interpersonal skills that are tailored to the experience of women with substance use disorders. Furthermore, the finding that individuals with more psychological distress had worse social functioning scores in the overall, work, extended family and immediate family domains was expected. The interplay between psychological distress and social support has been well documented (Kawachi & Berkman, 2001; Kessler, 1979). Individuals with poor social supports/functioning have higher psychological distress and poorer health outcomes, while the opposite is also true:

individuals with higher psychological distress, particularly those with depression have worse social functioning (Hirschfeld, 2000). This relationship has not been thoroughly studied in the substance use disorder population, but extrapolating from other areas of health and mental health, suggests that interventions to improve social functioning in substance use disorders should take into account co-occurring mental health issues which may significantly affect outcomes.

This study has several strengths. The sample is large and relatively diverse with respect to demographics and primary substance. Further, social functioning is measured by a validated, frequently used and comprehensive measure. Taken together, these strengths increase the generalizability to the broader population of individuals with substance use disorders receiving treatment in community-based addiction treatment settings. It also contributes to the literature on the overall social functioning of individuals with substance use disorders. One of the limitations of the study, however, is that the Social Adjustment Scale may not be the best measure of changes associated to CRA. Further, there is limited use of this scale with addiction populations and it may be less reflective of their experiences. This study did not collect data documenting participants' home practice of TES and so it is unknown whether participants practiced skills, which may have a significant effect on whether or not social functioning improves.

Conclusions

While TES was not associated with improvement in social functioning outcomes among participants when compared to TAU, male participants and those with less psychological distress at baseline experienced greater improvements in social functioning at the end of treatment. When integrating TES into community treatment programs, it may be important to have counselors involved to guide clients when choosing modules; completing home practice is also a critical factor in improving outcomes and should be monitored. In addition, improved measures of social functioning may be needed for studies involving patients with substance use disorders as more traditional secondary outcomes, such as social functioning and quality of life, should be more systematically studied in research involving treatment for substance use disorders.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

Funding

This work was supported by grants from the National Drug Abuse Treatment Clinical Trials Network (CTN), NIDA: U10 DA013035 (Edward V. Nunes and John Rotrosen), U10 DA015831 (Kathleen M. Carroll and Roger D. Weiss), U10 DA013034 (Maxine L. Stitzer and Robert P. Schwartz), U10 DA013720 (José Szapocznik and Lisa R. Metsch), U10 DA013732 (Theresa Winhusen), U10 DA020024 (Madhukar H. Trivedi), U10 DA013714 (Dennis M. Donovan and John Roll), U10 DA015815 (James L. Sorensen and Dennis McCarty), U10 DA013045 (Walter Ling), and K24 DA022412 (Edward V. Nunes).

References

1. Abbott PJ (2009). A review of the community reinforcement approach in the treatment of opioid dependence. *J of Psychoactive Drugs*, 41, 379–85. doi: 10.1080/02791072.2009.10399776 [PubMed: 20235445]
2. Bickel WK, Marsch LA, Buchhalter AR, & Badger GJ (2008). Computerized behavior therapy for opioid-dependent outpatients: a randomized controlled trial. *Exp Clin Psychopharm*, 16, 132–43. doi: 10.1037/1064-1297.16.2.132
3. Billings AG, & Moos RH (1981). The Role of Coping Responses and Social Resources in Attenuating the Stress of Life Events. *J Behav Med*, 4, 139–157. [PubMed: 7321033]
4. Budney AJ, Higgins ST (1998). Therapy manuals for drug addiction, a community reinforcement plus vouchers approach: treating cocaine addiction. Rockville, MD: National Institute on Drug Abuse.
5. Campbell ANC, Nunes EV, Matthews AG, Stitzer M, Miele GM, Polsky D, ... Ghitza UE (2014). Internet-delivered treatment for substance abuse: a multisite randomized controlled trial. *Am J Psych*, 171, 683–90. doi: 10.1176/appi.ajp.2014.13081055
6. Campbell ANC, Nunes EV, Miele GM, Matthews A, Polsky D, Ghitza UE, ... Crowell AR (2012). Design and methodological considerations of an effectiveness trial of a computer-assisted intervention: An example from the NIDA Clinical Trials Network. *Contemp Clin Trials*, 33, 386–395. doi: 10.1016/j.cct.2011.11.001 [PubMed: 22085803]
7. Can G, & Tanriverdi D (2015). Social Functioning and Internalized Stigma in Individuals Diagnosed with Substance Use Disorder. *Arch Psychiat Nurs*, 29, 441–446. doi: 10.1016/j.apnu.2015.07.008
8. Carroll KM, & Rounsaville BJ (2010). Computer-assisted therapy in psychiatry: be brave-it's a new world. *Curr Psychiatry Rep*, 12, 426–32. doi: 10.1007/s11920-010-0146-2 [PubMed: 20683681]
9. Christensen DR, Landes RD, Jackson L, Marsch LA, Mancino MJ, Chopra MP, & Bickel WK (2014). Adding an Internet-delivered treatment to an efficacious treatment package for opioid dependence. *J Consult Clin Psych* 82, 964–72. doi: 10.1037/a0037496
10. Derogatis LR, & Spencer MS (1983). The Brief Symptoms Inventory (BSI): Administration, scoring, and procedures manual. Baltimore: Johns Hopkins University School of Medicine, Clinical Psychometrics Unit.
11. Derogatis LR (2001). The Brief Symptom Inventory–18 (BSI-18): Administration, Scoring and Procedures Manual. Minneapolis, MN: National Computer Systems.
12. García-Fernández G, Secades-Villa R, García-Rodríguez O, Sánchez-Hervás E, Fernández-Hermida JR, & Higgins ST (2011). Adding Voucher-Based Incentives to Community Reinforcement Approach Improves Outcomes during Treatment for Cocaine Dependence. *Am J Addiction*, 20, 456–461. doi: 10.1111/j.1521-0391.2011.00154
13. Greenfield SF, Brooks AJ, Gordon SM, Green CA, Kropp F, McHugh RK, ... Miele GM (2007). Substance abuse treatment entry, retention, and outcome in women: A review of the literature. *Drug Alcohol Depen*, 86, 1–21. doi: 10.1016/j.drugalcdep.2006.05.012
14. Griffin ML, Weiss RD, Mirin SM, & Lange U (1989). A comparison of male and female cocaine abusers. *Arch Gen Psychiat*, 46, 122–126. [PubMed: 2913971]
15. Higgins ST, Sigmon SC, Wong CJ, Heil SH, Badger GJ, Donham R, ... Anthony S (2003). Community reinforcement therapy for cocaine-dependent outpatients. *Arch Gen Psychiat*, 60, 1043–52. doi: 10.1001/archpsyc.60.9.1043 [PubMed: 14557150]
16. Hirschfeld RMA, Montgomery SA, Keller MB, Kasper S, Schatzberg AF, ... Bourgeois M (2000). Social Functioning in Depression: A Review. *J Clin Psychiat*, 61, 268–275.
17. Kawachi I, & Berkman LF (2001). Social ties and mental health. *J Urban Health*, 78, 458–67. doi: 10.1093/jurban/78.3.458 [PubMed: 11564849]
18. Kessler RC (1979). Stress, Social Status, and Psychological Distress. *J Health Soc Behav*, 20, 259–272. [PubMed: 479536]
19. Kingree JB (1995). Understanding Gender Differences in Psychosocial Functioning and Treatment Retention. *Am J Drug Alcohol Ab*, 21, 267–281. doi: 10.3109/00952999509002694
20. Moos RH (2007). Theory-based active ingredients of effective treatments for substance use disorders. *Drug Alcohol Depen*, 88, 109–21. doi: 10.1016/j.drugalcdep.2006.10.010

21. Petry NM, Pierce JM, Stitzer ML, Blaine J, Roll JM, Cohen A, ... Li R (2005). 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 Psychiat*, 62, 1148–1156. doi: 10.1001/archpsyc.62.10.1148 [PubMed: 16203960]
22. Roozen HG, Boulogne JJ, van Tulder MW, van den Brink W, De Jong CA ., & Kerkhof AJF . (2004). A systematic review of the effectiveness of the community reinforcement approach in alcohol, cocaine and opioid addiction. *Drug Alcohol Depen*, 74, 1–13.
23. Schottenfeld RS, Pantalon MV, Chawarski MC, & Pakes J (2000). Community reinforcement approach for combined opioid and cocaine dependence. Patterns of engagement in alternate activities. *J Subst Abuse Treat*, 18(3), 255–261. [PubMed: 10742639]
24. Smith JE, Meyers RJ, Miller WR (2001). The community reinforcement approach to the treatment of substance use disorders. *Am J Addiction*, 10, S51–9.
25. Stitzer ML, Petry NM, & Peirce J (2010). Motivational incentives research in the National Drug Abuse Treatment Clinical Trials Network. *J Subst Abuse Treat*, 38, S61–S69. doi: 10.1016/j.jsat.2009.12.010 [PubMed: 20307797]
26. Wang J, Kelly BC, Booth BM, Falck RS, Leukefeld C, & Carlson RG (2010). Examining factorial structure and measurement invariance of the Brief Symptom Inventory (BSI)-18 among drug users. *Addict Behav*, 35, 23–9. doi: 10.1016/j.addbeh.2009.08.003 [PubMed: 19733442]
27. Weissman MM & Bothwell S (1976) Assessment of social adjustment by patient self-report. *Arch Gen Psychiat*, 33, 1111–1115. [PubMed: 962494]
28. Weissman MM, Prusoff BA, Thompson WD, Harding PS, & Myers JK (1978). Social adjustment by self-report in a community sample and in psychiatric outpatients. *J Nervous Ment Dis*, 166, 317–326.
29. Weissman MM (1999). *Social Adjustment Scale – Self Report*. North Tonawanda, NY: Multi Health Systems.
30. Weissman MM, Olfson M, Gameroff MJ, Feder A, & Fuentes M (2001). A comparison of three scales for assessing social functioning in primary care. *Am J Psychiat*, 158, 460–466. doi: 10.1176/appi.ajp.158.3.460 [PubMed: 11229989]

Table 1.

Baseline demographic and clinical characteristics of participants

Overall Sample N=507		
	N	% or Mean (SD)
Age	507	34.5 (10.9)
Female	312	37.94
Race		
White	284	56.02
Black or African American	116	22.88
American Indian or Alaska Native	3	0.59
Asian	13	2.56
Native Hawaiian or Pacific Islander	12	2.37
Multiracial	54	10.65
Other or missing (n=2)	25	4.93
Hispanic or Latino	55	10.85
Education		
<High school diploma	118	23.27
High school diploma or GED	310	61.14
>High school diploma	79	15.58
Marital status		
Never married	308	60.75
Married or remarried	72	14.2
Separated, divorced, or widowed	127	25.05
Employed at time of study entry	209	41.22
Primary substance		
Alcohol	104	20.51
Cocaine	102	20.12
Stimulants	69	13.61
Marijuana	114	22.49
Opiates	108	21.3
Other	10	1.97
Abstinent at baseline and study entry	275	54.24
Baseline Brief Symptom Inventory (BSI)	506	13.5 (12.6)
Baseline overall Social Adjustment Scale score	507	2.17 (0.50)
Work subscale score	376	1.68 (0.58)
Social/leisure subscale score	507	2.49 (0.64)
Extended family subscale score	507	1.99 (0.71)
Intimate partner subscale score	152	2.08 (0.62)
Parenting subscale score	115	1.38 (0.55)
Immediate family subscale score	507	2.43 (1.06)

Generalized linear mixed effect final models of overall social functioning and social functioning subscales as measured by the Social Adjustment Scale (SAS) self-report

Table 2.

	Overall SAS score		Work subscale score ^a		Social/Leisure subscale score		Extended Family subscale score ^a		Intimate Partner subscale score ^a		Parenting subscale score ^a		Immediate Family subscale score ^a	
	Beta (SE)	p-value	Beta (SE)	p-value	Beta (SE)	p-value	Beta (SE)	p-value	Beta (SE)	p-value	Beta (SE)	p-value	Beta (SE)	p-value
Treatment *	0.0154 (0.0315)	0.624	-0.0071 (0.0171)	0.679	0.0163 (0.0385)	0.672	-0.0117 (0.0219)	0.595	0.0649 (0.0411)	0.116	0.0007 (0.0455)	0.989	0.0384 (0.0319)	0.229
Time *	-0.0275 (0.0110)	0.013	-0.0168 (0.0056)	0.003	-0.0195 (0.0149)	0.191	-0.0197 (0.0084)	0.019	-0.0082 (0.0157)	0.602	0.0067 (0.0159)	0.673	-0.0387 (0.0122)	0.002
Baseline SAS score	0.4005 (0.0401)	<0.001	0.1936 (0.0237)	<0.001	0.4278 (0.0357)	<0.001	0.1363 (0.0171)	<0.001	0.2588 (0.0373)	<0.001	0.1212 (0.0473)	0.012	0.1253 (0.0161)	<0.001
Baseline abstinence	0.0193 (0.0319)	0.546	0.0240 (0.0173)	0.165	0.0105 (0.0392)	0.789	0.0216 (0.0223)	0.331	0.0303 (0.0411)	0.461	0.0442 (0.0454)	0.333	-0.0167 (0.0324)	0.607
Males (vs. Females)	-0.0751 (0.0331)	0.024	-0.0294 (0.0180)	0.102	-0.0735 (0.0405)	0.070	-0.0591 (0.0230)	0.010	-0.0315 (0.0436)	0.471	-0.0396 (0.0469)	0.400	-0.1092 (0.0335)	0.001
Baseline BSI	0.0034 (0.0016)	0.037	0.0019 (0.0009)	0.031	0.0026 (0.0019)	0.158	0.0036 (0.0010)	<.001	-0.0015 (0.0018)	0.406	0.0014 (0.0020)	0.472	0.0038 (0.0014)	0.008

^aOutcomes were analyzed using lognormal distribution

*Treatment-by-time interaction term was tested in each of the models and it was not significant, so it was omitted from the final models.