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Changes in Secondary Outcomes Associated with Brief Interventions for Problem Gambling in Methadone Patients

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Abstract

Background: Patients in methadone maintenance treatment (MMT) with problem gambling (PG) experience worse psychosocial outcomes than their non-PG counterparts. Interventions targeting PG in MMT may enhance psychosocial functioning beyond gambling reduction and abstinence. The present study was a secondary data analysis that examined the trajectories of non-gambling outcomes of three brief PG interventions (i.e., brief psychoeducation, brief advice, motivational enhancement therapy plus cognitive-behavioral therapy [MET+CBT]) among MMT patients.

Methods: Participants (N=109) were engaged in substance use disorder treatment, met criteria for PG, and had a current or lifetime history of MMT. Latent growth curve models examined outcome trajectories of psychiatric, medical, legal, employment, and social problems, as well as psychological distress and quality of life. Follow-up analyses examined clinically significant change.

Results: MET+CBT patients reported lower medical problems at baseline and over time than the brief interventions. There was no evidence of differences between interventions on the other

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Contributors

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Author Agreement

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Conflict of Interest

The authors declare no conflicts of interest.

outcomes. Psychiatric problems and psychological distress decreased over time for the entire sample, regardless of the PG intervention. About 24% and 13% of the sample demonstrated clinically significant improvements in psychological distress from baseline to 5 months, and 5 months to 12 months, respectively. Nearly 21% of the sample showed clinically significant improvements in psychiatric problems from 5 months to 12 months. Among all patients, men and those with more severe opioid dependence symptoms demonstrated the greatest psychological improvements.

Conclusions: Many patients in MMT with PG experience improvements in psychological problems, including long-term improvement, regardless of the PG intervention offered.

Keywords

gambling disorder; opioid use disorder; motivational interviewing; cognitive behavioral therapy

1. Introduction

Gambling disorder and subthreshold symptoms, termed problem gambling (PG), are elevated among patients seeking substance use disorder (SUD) treatment, with particularly high rates observed among patients in methadone maintenance treatment (MMT; Cowlishaw et al., 2014; Himelhoch et al., 2016). In the general population, prevalence rates for gambling disorder are between 0.5% to 3.0%, but range 4.5% to 43.4% in SUD treatment patients and 7% to 52.7% in MMT patients (Calado & Griffiths, 2016; Cowlishaw et al., 2014; Williams et al., 2012). Given the deleterious and costly consequences linked to opioid use disorder (Florence et al., 2016; Rudd et al., 2016) and gambling disorder (Fong, 2005; Moghaddam et al., 2015), patients experiencing both conditions may represent a severe, at-risk population (Feigelman et al., 1995; Weinstock et al., 2006). For example, patients in MMT with PG experience greater psychosocial, substance use, and physical health problems than those MMT patients without PG (Feigelman et al., 1995; Ledgerwood & Downey, 2002; Weinstock et al., 2006). These MMT patients are also more likely to experience negative opioid treatment outcomes, including continued substance use and MMT dropout (Himelhoch et al., 2016; Ledgerwood & Downey, 2002). Therefore, interventions targeting PG while receiving MMT are needed.

Positive treatment outcomes go beyond just reduction or abstinence from the addictive behavior (Betty Ford Institute Consensus Panel, 2007; Laudet, 2011). Examination of secondary treatment outcomes in clinical trials for SUD (Donovan et al., 2012) and gambling disorder (Pickering et al., 2018) is recommended, and may be particularly meaningful for MMT patients with PG. Patients with PG during MMT display poorer psychosocial functioning than their non-PG counterparts (Feigelman et al., 1995; Ledgerwood & Downey, 2002; Weinstock et al., 2006). Therefore, the investigation of secondary, non-gambling treatment outcomes for MMT patients with PG may provide an enhanced understanding of the efficacy of treatments for this population.

To date, only limited work has examined the efficacy of PG interventions in the context of SUD treatment (Petry et al., 2016). Petry and colleagues (2016) conducted a randomized clinical trial (RCT) evaluating the efficacy of three brief gambling interventions on gambling

and substance use behavior among 217 patients engaged in outpatient SUD treatment. The first intervention was a brief psychoeducational (BP) intervention that provided broad information on gambling. The second was a brief advice (BA) intervention that delivered personalized feedback and recommendations for reducing risky gambling behavior. The third intervention included four sessions of motivational enhancement therapy and cognitive-behavioral therapy (MET+CBT) for gambling. All three interventions significantly reduced gambling behaviors and gambling problems over time. When the interventions were compared, BA led to greater reductions in the number of days gambled as compared to BP. Further, MET+CBT led to greater reductions in the amount wagered, gambling problems, alcohol use, and alcohol problems over time in comparison to BA. Brief interventions likely reduce PG over time, though MET+CBT likely demonstrates the greatest impact. However, individuals in MMT were less likely to demonstrate reductions in gambling behavior compared to individuals engaged in non-MMT SUD treatment.

The present study was a secondary data analysis of Petry and colleagues (2016) RCT examining the 12-month trajectories of the three brief PG interventions on secondary, non-gambling outcomes among a subsample of MMT patients with PG. These outcomes were of particular interest given that MMT patients with PG experience worse psychosocial and treatment outcomes than those without PG (Ledgerwood & Downey, 2002; Weinstock et al., 2006). It was hypothesized that participants in MET+CBT would experience greater improvements in secondary outcomes than those in BP and BA. In the context of poorer gambling treatment response, findings related to psychosocial improvements may guide selection of brief gambling interventions in MMT.

2. Method

2.1. Participants

The sample included 109 patients with PG and a history of MMT, taken from the larger (*N*=217) RCT of gambling interventions in the broad context of SUD treatment (Petry et al., 2016). Participants were recruited from SUD treatment clinics, including methadone and psychosocial clinics. To be eligible for the parent trial, individuals had to be 18 years or older, meet *Diagnostic and Statistical Manual for Mental Disorders* (4th ed.; DSM-IV; American Psychiatric Association, 1994) for a SUD (i.e., alcohol, cocaine, opioid, or cannabis use disorder), gamble >4 days and $100 in the previous two months, and earn a score of >3 on a two-month version of the South Oaks Gambling Screen (Lesieur & Blume, 1987; Petry et al., 2016). Individuals with uncontrolled psychiatric concerns, cognitive impairment, or inability to read were excluded, as well as those receiving gambling treatment or seeking more intensive treatment services (Petry et al., 2016). To be included in the present analysis, participants had to endorse current or previous engagement in MMT.

Assessments were scheduled at baseline and 2, 5, 8, and 12 months. The 8-month assessment was conducted via telephone, while other assessments were administered in-person. About 90.8% of the sample completed the assessment at 2 months, 90.8% at 5 months, 85.3% at 8 months, and 86.2% at 12 months. More information on the original study procedures, randomization, and research therapists can be found in Petry and colleagues (2016).

2.2. Measures

2.2.1. Gambling and Substance Use.—The National Opinion Research Center DSM-IV Screen for Gambling Problems (Gerstein et al., 1999; Hodgins, 2004) assessed past-year DSM-IV diagnoses of pathological gambling. To determine lifetime engagement in MMT, participants were asked, “Have you ever or are you currently receiving methadone treatment?” Participants who positively endorsed current or past MMT provided additional information on their current or usual dose, number of times they received methadone, and longest duration of MMT.

The Timeline Follow-Back (TLFB) was utilized to retrospectively assess self-reported past 30-day gambling and substance-related behaviors. The TLFB demonstrates good to excellent test-retest reliability, convergent validity, and discriminant validity among individuals with substance use (Sobell & Sobell, 1992) and gambling disorders (Weinstock et al., 2004).

2.2.2. Secondary Outcomes.—The Addiction Severity Index (ASI) assessed the severity of past-month medical status, legal status, psychiatric symptoms, employment, and family/social functioning (McLellan et al., 1980). Scores on the ASI range from 0–1, with higher scores indicating greater problems. The subscales of the ASI have good test-retest reliability, concurrent validity, and discriminant validity among patients with SUD and gambling disorders (McLellan et al., 1985; Petry, 2003). The ASI was the only measure collected during the 8-month assessment.

The Brief Symptom Inventory-18 (BSI-18; Derogatis, 2000) examined recent psychological distress. The 18-items were rated on a 5-point scale, with greater scores indicating greater distress. A global severity index reflects severity of psychological distress. The BSI-18 has good test-retest reliability, concurrent validity, and discriminant validity among individuals with SUDs (Derogatis, 2001; Wang et al., 2010).

The Quality of Life Inventory (QOLI; Frisch et al., 1992) is a psychometrically supported instrument that assessed overall life satisfaction (Frisch et al., 1992). The 17-items were rated for their importance and satisfaction, and a weighted score was calculated by averaging the items with a non-zero importance rating to represent an overall life satisfaction score.

2.3. Interventions

Participants were randomized to one of three brief gambling interventions. These gambling interventions were implemented as adjunctive treatments to the participant’s standard SUD treatment and were provided by the research team. Information about the participants was not shared with the providers in the SUD clinics.

2.3.1. Brief psychoeducation (BP).—An informational handout on gambling with basic information about gambling and how gambling is related to substance use, mood, and legal problems was reviewed with participants for about 10 minutes. It did not include strategies to reduce gambling. At the end of this one-time session, the participants were reminded of their follow-up interviews and instructed to call a telephone number if their gambling increased.

2.3.2. Brief advice (BA).—A one-page personalized handout on PG was reviewed with participants for about 10 minutes. It discussed how the participant's gambling behavior compared to the general population, risk factors for developing a gambling problem, and strategies to reduce the risk of further gambling problems (e.g., reducing time and money spent on gambling, increasing other recreational activities). Like the BP condition, the participants were given a telephone number to call if their gambling problems increased and were reminded of their follow-up interviews.

2.3.3. MET+CBT.—The MET+CBT intervention was comprised of one 50-minute MET session and three subsequent 50-minute CBT sessions for a total of four sessions. In the initial MET session, participants received a personalized feedback report of their gambling behavior, conducted a decisional balance exercise, explored how gambling related to their values and goals, its relationship to their substance use, and completed a change plan worksheet. The following CBT sessions were aimed at identifying gambling triggers and learning skills to cope with these triggers. Non-abstinence treatment goals were supported and encouraged as few participants identified gambling abstinence as their goal.

2.4. Data Analysis

ANOVA and chi-square tests examined differences in demographic and baseline characteristics by intervention. Data were also examined for violations of normality. The ASI subscales of legal and family/social problems were non-normally distributed and a square root transformation was utilized. After these transformations, the absolute values of the skew and kurtosis were <3 and <5, respectively, which is below Kline's (2005) suggested cutoff for testing models (Kline, 2005). The study hypotheses predicting that the 12-month trajectories of the secondary outcomes would differ by PG intervention were analyzed with latent growth curve models (LGCM) in Mplus, Version 7.4 (Muthén & Muthén, 1998–2017). LGCM provides information on intra- and inter-individual change over multiple time points while simultaneously modeling measurement error (Duncan et al., 2006). For the ASI subscales, the LGCM were conducted in a piecewise fashion (i.e., baseline to 5 months and follow-ups 5 months to 12 months) to assess the short and long-term impact of the interventions. Piecewise LGCM require five or more data points (Duncan et al., 2006); therefore, outcomes that were not collected during the 8-month follow-up (i.e., the BSI-18 and QOLI) are run as a single model with four data points (i.e., baseline, 2 months, 5 months, 12 months). Intervention, gender, and past-year opioid dependence criteria were included as covariates in the models based on theoretically related outcomes and the parent study. Notably, similar to contrasts in the main outcomes paper (Petry et al., 2016) and given the limited differences between the brief interventions on gambling and substance use outcomes, BP and BA were combined in the LGCM to examine the impact of very brief interventions versus brief MET+CBT on secondary outcomes over time. Statistical significance ($p<.05$) of the slope parameter for the interventions determined treatment effects. Participants that did not receive one or more sessions of MET+CBT were excluded from the LGCM ($n=8$); as these participants were not exposed to the intervention, their 12-month trajectories may reflect the natural course of MMT rather than the course of the intervention. Missing data were handled with maximum likelihood.

Power analyses conducted for the parent study indicated that the sample size in that study were insufficient to detect small treatment effects (Petry et al., 2016). To examine the degree to which power would also be an issue with the current analyses given the reduced sample size, we conducted power analyses using an alpha of $p<.05$, power level of .8, and degrees of freedom of our primary latent variable model (25). We first examined the ideal sample of the overall sample based on Hancock and Freeman's (2001) guidelines, and found that the optimal sample size for this study was 350–400 participants. We then conducted a Monte Carlo analysis specific to this model with this data using the simsem package in R (Pornprasertmanit et al., 2020) and found that although our sample was not grossly underpowered in the estimation of observed variable variances (ideal sample size generally within the range of 100–200), estimation of regression coefficients may have required a sample of upwards of 3,000. Due to less than optimal power to detect statistically significant findings in this study, we relied on effect size rather than statistical significance in interpreting results.

Follow-up analyses examined clinically significant change. Clinically significant change was defined by participant pre-to-post-treatment change scores of at least two standard deviations from the original mean, as normative sample means were unavailable for comparison among all the outcome measures (i.e., criterion A; Jacobson et al., 1984). Clinically significant change was calculated as A=initial M–2*SD due to a lack of available healthy norms for some outcome measures (Jacobson et al., 1984). This approach may be more conservative than other methods. Participants that earned scores at the follow-up period above or below this absolute value were determined to have demonstrated clinically significant change.

3. Results

3.1. Baseline Characteristics and Treatment Attendance

Baseline and demographic data for each intervention are presented in Table 1. Consistent with the findings from the parent trial, small effect sizes emerged between BP and BA. Only the participants in BA reported more days gambled in the past month than those in BP (medium-sized effect: d = .63).

All participants in BP and BA attended the single session at baseline. Of the participants in MET+CBT (n=41), nearly 80% (n=33) were exposed to one or more session of the intervention, with 59% (n=24) attending at least one CBT session (M=1.96, SD=0.91) and 22% (n=9) attending all three CBT sessions. The means and standard deviations for the secondary outcomes at each time point are presented in Table 2.

3.2. Latent Growth Curve Models

The LGCM for ASI psychiatric symptoms, medical status, and employment, and for BSI-18 psychological distress demonstrated good model fit as indicated by χ^2, RMSEA, CFI, SRMR, and TLI (see Table 3; for a review of model fit statistics and recommended values/cut scores see Stull [2008]). LGCM with good model fit are depicted in Table 4. As determined by small effect sizes, the interventions demonstrated minimal effects on all secondary outcomes from baseline to 5 months or from 5 months to 12 months. However,

individuals in MET+CBT displayed much lower medical problems (large effect size: $\mathcal{A}_{StdY}$ = 0.65, 95% CI [0.08, 1.23]) than BP and BA across all time points, including baseline.

Among all participants, men reported many fewer ASI psychiatric problems (large effect size: $\mathcal{A}_{StdY}$ = 0.60, 95% CI [0.01, 1.19]) and BSI-18 psychological distress (large effect size: $\mathcal{A}_{StdY}$ = 0.55, 95% CI [0.12, 0.99]) than women across time. Men also had a greater decline in ASI psychiatric problems than women (large effect size: $\mathcal{A}_{StdY}$ = 1.02, 95% CI [0.03, 2.02]) between 5 months and 12 months. Individuals with greater past-year opioid dependence symptomology experienced a greater decline in ASI psychiatric problems from baseline to 5 months, though these problems increased somewhat from 5 months to 12 months (small effect size: $\mathcal{A}_{StdY}$ = 0.10, 95% CI [0.00, 0.19]). On average, high levels of psychiatric symptoms predicted a much slower decline in symptoms between 5 and 12 months (large effect size: $\mathcal{A}_{StdY}$ = −0.89, 95% CI [−1.67, −0.11]) but had no effect on symptoms decline before that.

3.3. Clinically Significant Change

Regardless of intervention, trajectories indicated improvement over time. In particular, BSI-18 psychological distress decreased significantly from baseline to 5 months, with 23.7% (n=22/93) of participants showing clinically significant improvements, 2.1% (n=2/93) demonstrating no problems at any time point, and 57.0% (n=53/93) evidencing minimal to no change. A clinically significant increase in BSI-18 psychological distress was observed among the remaining participants (17.2%; n=16/93). From 5 months to 12 months, 12.9% (n=11/85) of the participants showed clinically significant improvements in BSI-18 psychological distress, 8.2% (n=7/85) displayed no problems at any time point, and 72.9% (n=62/85) showed minimal to no change from 5-month problem severity. The remaining participants (5.9%; n=5/85) demonstrated clinically significant increases in BSI-18 psychological distress. ASI psychiatric problems also declined significantly from 5 months to 12 months, with 21.4% (n=18/84) of the participants demonstrating clinically significant improvements, 35.7% (n=30/84) evidencing no problems at any time point (i.e., ASI score=0.00), and 34.5% (n=29/84) demonstrating minimal to no change. The remaining individuals' (8.3%; n=7/84) scores evidenced a clinically significant increase in ASI psychiatric problems.

4. Discussion

Three brief PG interventions were compared on secondary, non-gambling outcomes among patients with a history of MMT. Contrary to expectations, there was no evidence that these interventions differed on secondary outcomes. Reductions in psychological problems and distress were observed over time regardless of the intervention, which may reflect regression to the mean, natural change over time, or an assessment reactivity effect (Maisto et al., 2007). About 24% of patients experienced clinically significant reductions in psychological distress from baseline to 5 months and about 13% experienced reductions from 5 to 12 months. Psychological problems also decreased from 5 to 12 months in about 21% of patients. More work is needed to determine what, if any, impact brief PG interventions have on psychological outcomes in MMT.

Notable gender differences emerged across the entire sample, with men endorsing fewer psychiatric problems and lower psychological distress across time than women. Men also reported a greater decline in psychiatric problems between 5 and 12 months than women. This finding is consistent with literature suggesting women with opioid use disorder and women with gambling disorder experience more severe psychiatric difficulties than men, including greater rates of co-occurring mood and anxiety disorders, distress, and suicidal ideation (Brooner et al., 1997; Brown et al., 1993; Grant et al., 2012; Grella & Lovinger, 2012). While specific diagnostic information relating to psychiatric disorders was not collected in the original study to minimize participant burden, prior work suggests that rates were likely high (Dowling et al., 2015; Kessler et al., 2008; Lorains et al., 2011). Further, patients that endorsed a larger number of past-year diagnostic criteria for opioid dependence demonstrated a larger decrease in these psychiatric problems from baseline to 5 months, although an increase in psychiatric problems emerged between 5 and 12 months. It is possible that this decline in psychiatric problems for patients with more severe opioid dependence symptoms reflect the regression to the mean. In addition, the subsequent increase in psychiatric problems may reflect individuals who dropped out of MMT treatment as Petry et al. (2016) reported about 25% were no longer receiving MMT at month 5. Another explanation may be that engagement in gambling treatment and MMT yields benefits in mood and psychiatric symptoms (Maremmani et al., 2007; Pani et al., 2011). However, our study suggests that a booster session may be warranted around 5 months to support continued psychiatric improvement.

Regardless of the intervention, employment problems were high and remained relatively stable across time. Indeed, employment problems are common among patients with gambling disorder that have histories of SUD treatment (Ladd & Petry, 2003), suggesting that more targeted occupational interventions may be warranted to address these problems. While it was unfortunate that the interventions demonstrated small effects on other secondary outcomes, previous studies with gambling disorder patients found similar results on non-gambling (Carlbring et al., 2010; Smith et al., 2015) and gambling-related outcomes (Petry et al., 2017; Quilty et al., 2019). Possible explanations for these findings may be that any intervention that increases one’s awareness of gambling behavior improves psychological outcomes, though further investigation of the null-results using a larger sample size with greater power to detect effects is needed before drawing such conclusions (Harms & Lakens, 2018). It is also possible that longer duration in SUD treatment, or MMT in particular, has psychological benefits (Pani et al., 2011). Alternatively, it may be that none of the interventions reflect any change beyond the natural course of MMT. Replication is needed to determine the impact of the PG interventions, and future work should explore the components (i.e., “active ingredients”) of these brief interventions that are efficacious.

The results of the present study should be interpreted in light of a number of limitations. First, the durations of BP and BA were shorter than MET+CBT by design; thus, it is unknown whether therapist contact or other therapeutic processes impacted the findings. While all participants in the current study were recruited from SUD treatment clinics, participants could enroll in the study at any point during their SUD treatment. Thus, the analyses do not account for SUD treatment factors (i.e., early versus later recovery stage), which may have impacted the trajectories of the secondary outcomes. It was also beyond the

scope of the present study to examine whether changes in gambling behavior influenced these trajectories, though future studies should examine this relationship. Additionally, the LGCM for legal status, family/social problems, and quality of life demonstrated poor model fit. The legal status and family/social problem variables were not normally distributed even when the data were transformed, suggesting that future studies may need a larger sample size to explore these outcome variables. Indeed, the issue of non-normal data distribution notwithstanding, sample size in this study was not optimal for observing important effects in this study. In terms of quality of life, it may be that other factors influence this outcome; however, the covariates included in the present study analyses were based on the empirical literature. Further, limited data were collected during the 8-month assessment to minimize participant burden. Therefore, information relating to quality of life and psychological distress was unavailable at the 8-month time point. Finally, the PG interventions were co-located within the SUD treatment clinics rather than fully integrated into the treatment programs. Integration of co-occurring gambling and SUD treatment is recommended (Leavens et al., 2014; Rash et al., 2016), as integrated models are associated with improved treatment outcomes for patients with co-occurring disorders (McGovern et al., 2011).

The present study unexpectedly found no evidence of differences between three brief PG interventions on non-gambling outcomes. These findings are important to document, as the absence of reporting null results leads to publication bias in the literature (Franco, Malhotra, & Simonovits, 2014). Future meta-analyses investigating brief PG interventions should report the results of the present study to avoid forming erroneous conclusions.

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Highlights

- Reductions in psychological problems and distress were observed in the entire sample
- Men evidenced greater improvements in psychological problems than women
- Psychological problems improved in patients with greater opioid dependence severity
- There was no evidence that the brief gambling interventions differed on outcomes

Table 1

Demographic and Baseline Characteristics

Baseline Variables	BP	BA	MET+CBT	Statistic (*df*)
N	34	34	41	
Clinic, no. (%)				$\chi^2(10) = 8.01$
Clinic A	16 (47.1)	15 (44.1)	20 (48.8)	
Clinic B	1 (2.9)	4 (11.8)	5 (12.2)	
Clinic C	4 (11.8)	3 (8.8)	5 (12.2)	
Clinic D	5 (14.7)	4 (11.8)	3 (7.3)	
Clinic E	5 (14.7)	8 (23.5)	7 (17.1)	
Miscellaneous clinics	3 (8.8)	0 (0.0)	1 (2.4)	
Age, *M* (*SD*), years	43.0 (9.3)	41.7 (9.3)	44.7 (11.3)	$F(2, 106) = 0.84$
Female, no. (%)	15 (44.1)	17 (50.0)	11 (26.8)	$\chi^2(2) = 4.63$
Race/ethnicity, no. (%)				$\chi^2(2) = 5.41$
African American	15 (44.1)	14 (41.2)	14 (34.1)	
White, non-Hispanic	10 (29.4)	11 (32.4)	10 (24.4)	
Hispanic	9 (26.5)	8 (23.5)	17 (41.5)	
Other	0 (0.0)	1 (2.9)	0 (0.0)	
Marital status, no. (%)				$\chi^2(2) = 1.30$
Never married	19 (55.9)	19 (55.9)	20 (48.8)	
Divorced/widowed	10 (29.4)	8 (23.5)	14 (34.1)	
Married/living with partner	5 (14.7)	7 (20.6)	7 (17.1)	
Education, *M* (*SD*), years	11.3 (2.0)	11.2 (2.4)	11.6 (1.7)	$F(2, 106) = 0.40$
Employment status, no. (%)				$\chi^2(2) = 3.12$
Full or part time	5 (14.7)	5 (14.7)	7 (17.1)	
Unemployed	24 (70.6)	19 (55.9)	22 (53.7)	
Other, not in work force	5 (14.7)	10 (29.4)	12 (29.3)	
Annual income, *M* (*SD*), $	10,536.4 (12,225.2)	13,992.6 (13,167.4)	12,792.0 (10,432.1)	$F(2, 106) = 0.74$
Past-year substance dependence, no. (%)				
Alcohol	13 (38.2)	13 (38.2)	13 (31.7)	$\chi^2(2) = 0.47$
Cannabis	9 (26.5)	4 (11.8)	6 (14.6)	$\chi^2(2) = 2.91$
Cocaine	21 (61.8)	22 (64.7)	24 (58.5)	$\chi^2(2) = 0.30$
Opioids	23 (67.6)	19 (55.9)	22 (53.7)	$\chi^2(2) = 1.66$
Past-year opioid dependence criteria, *M* (*SD*)	4.5 (3.1)	3.8 (3.2)	3.6 (3.4)	$F(2, 98) = 0.78$
Past 30-day substance use, *M* (*SD*), days				
Benzodiazepines	1.0 (3.7)	0.7 (2.2)	0.8 (4.2)	$F(2, 105) = 0.07$
Cocaine	2.3 (6.8)	3.7 (7.1)	3.1 (6.9)	$F(2, 105) = 0.33$
Alcohol	2.4 (6.5)	4.2 (8.9)	2.8 (7.6)	$F(2, 105) = 0.5$
Cannabis	3.2 (8.6)	1.5 (5.2)	0.7 (2.2)	$F(2, 105) = 1.83$
Opiates	1.1 (3.0)	1.4 (4.3)	0.2 (0.7)	$F(2, 105) = 1.54$
Past-year GD no. (%)	28 (82.4)	32 (94.1)	38 (92.7)	$\chi^2(2) = 3.15$
Past 60-day SOGS score, *M* (*SD*)	8.9 (3.6)	10.8 (3.6)	10.3 (3.7)	$F(2, 106) = 2.39$

Baseline Variables	BP	BA	MET+CBT	Statistic (*df*)
Past 30-day gambling behavior				
Days	19.0 (8.4)	24.1 (7.8)	21.6 (8.4)	$F(2, 106) = 3.30^{*}$
Hours	27.9 (32.5)	43.4 (56.1)	33.4 (40.1)	$F(2, 106) = 1.10$
Amount risked, $	1,010.6 (1,834.4)	1,002.2 (1,560.5)	1,009.8 (1,515.63)	$F(2, 106) < .01$
Methadone treatment, *M* (*SD*)				
Current Prescription, *n*	32	29	36	
Current dose, mm	77.9 (34.7)	76.6 (29.1)	75.1 (37.7)	$F(2, 94) = 0.06$
Usual dose, mm	85.0 (32.8)	73.7 (28.2)	82.2 (37.3)	$F(2, 106) = 1.08$
Number of episodes	2.0 (1.7)	2.2 (1.6)	1.8 (1.3)	$F(2, 106) = 0.55$
Longest duration, months	30.8 (42.8)	31.1 (30.0)	20.9 (26.9)	$F(2, 106) = 1.14$

Note. BP = brief psychoeducation. BA = brief advice. GD = gambling disorder. SOGS = South Oaks Gambling Screen (scale range = 0–20). Past-year opioid dependence criteria scale range = 0–7.

$^{*}p < .05$.

Table 2

Means and standard deviations of secondary outcomes at each follow-up

	Baseline *M* (*SD*)	2 Months *M* (*SD*)	5 Months *M* (*SD*)	8 Months *M* (*SD*)	12 Months *M* (*SD*)
ASI Psychiatric Symptoms					
BP & BA	0.20 (0.22)	0.22 (0.22)	0.24 (0.24)	0.17 (0.19)	0.15 (0.21)
MET+CBT	0.19 (0.20)	0.22 (0.21)	0.17 (0.22)	0.15 (0.19)	0.12 (0.19)
ASI Medical Status					
BP & BA	0.35 (0.42)	0.30 (0.35)	0.26 (0.37)	0.26 (0.38)	0.34 (0.39)
MET+CBT	0.15 (0.32)	0.22 (0.37)	0.21 (0.35)	0.19 (0.32)	0.20 (0.34)
ASI Employment					
BP & BA	0.76 (0.28)	0.75 (0.29)	0.74 (0.32)	0.75 (0.30)	0.73 (0.31)
MET+CBT	0.77 (0.25)	0.76 (0.28)	0.74 (0.27)	0.73 (0.26)	0.77 (0.25)
ASI Legal Status[a]					
BP & BA	0.27 (0.29)	0.17 (0.24)	0.15 (0.26)	0.11 (0.21)	0.08 (0.21)
MET+CBT	0.18 (0.25)	0.13 (0.23)	0.10 (0.17)	0.08 (0.20)	0.11 (0.22)
ASI Family/Social Problems[a]					
BP & BA	0.19 (0.25)	0.18 (0.26)	0.23 (0.25)	0.26 (0.29)	0.24 (0.29)
MET+CBT	0.26 (0.26)	0.20 (0.23)	0.17 (0.25)	0.21 (0.23)	0.12 (0.23)
BSI Psychological Distress					
BP & BA	0.93 (0.75)	0.86 (0.72)	0.87 (0.78)		0.76 (0.65)
MET+CBT	0.95 (0.85)	0.71 (0.78)	0.70 (0.83)		0.60 (0.63)
Quality of Life					
BP & BA	1.35 (1.98)	0.74 (1.73)	1.42 (2.18)		1.34 (2.10)
MET+CBT	1.86 (1.70)	1.01 (1.69)	2.51 (1.85)		3.06 (1.54)

Note. BP = brief psychoeducation. BA = brief advice. MET+CBT = motivational enhancement therapy + cognitive-behavioral therapy. ASI = Addiction Severity Index (scale range = 0–1). BSI = Brief Symptom Inventory-18 scale range = 0–4. Quality of Life Inventory scale range = −6–6.

[a]Square root transformation.

Table 3

Goodness of Fit Indices for Latent Growth Curve Modeling

	χ^2	df	RMSEA (*CI*)	CFI	SRMR	TLI
ASI Psychiatric Symptoms	19.82	12	0.08 (0.00–0.14)	0.94	0.05	0.87
ASI Medical Status	5.31	12	0.00 (0.00–0.01)	1.00	0.03	1.12
ASI Employment	7.73	12	0.00 (0.00–0.07)	1.00	0.03	1.03
ASI Legal Status[a]	18.99	12	0.09 (0.00–0.16)	0.88	0.07	0.75
ASI Family/Social Problems[a]	23.40*	12	0.10 (0.03–0.16)	0.78	0.07	0.54
BSI Psychological Distress	14.13	11	0.05 (0.00–0.12)	0.98	0.04	0.97
Quality of Life	29.89**	11	0.13 (0.08–0.19)	0.81	0.07	0.69

Note. ASI = Addiction Severity Index. BSI = Brief Symptom Inventory.

[a]Square root transformation.

*$p < .05$

**$p < .01$.

Table 4

Unstandardized Results of Latent Growth Curve Models.

	Problem Gambling Intervention			Gender			Opioid Dependence			Intercept			Slope (5 Months − 12 Months)		
	ƙ	*SE*	95% CI	*ƙ*	*SE*	95% CI	*ƙ*	*SE*	95% CI	*ƙ*	*SE*	95% CI	*ƙ*	*SE*	95% CI
ASI Psychiatric Symptoms															
Slope 1	−0.02	0.01	(−0.04, 0.01)	0.02	0.01	(−0.00, 0.05)	< −0.01*	< 0.01	(−0.01, −0.00)	0.11	0.11	(−0.10, 0.32)	< 0.01	< 0.01	(−0.00, 0.00)
Slope 2	0.01	0.01	(−0.01, 0.03)	−0.02*	0.01	(−0.04, −0.00)	< 0.01*	< 0.01	(0.00, 0.00)	−0.15*	0.07	(−0.28, −0.02)			
Intercept	0.01	0.04	(−0.07, 0.10)	−0.08*	0.04	(−0.16, −0.00)	0.01	< 0.01	(−0.00, 0.02)						
ASI Medical Status															
Slope 1	0.03	0.02	(−0.01, 0.07)	−0.02	0.02	(−0.05, 0.01)	< −0.01	< 0.01	(−0.01, 0.00)	−0.03	0.07	(−0.17, 0.11)	< 0.01	< 0.01	(−0.00, 0.00)
Slope 2	−0.01	0.01	(−0.04, 0.01)	0.01	0.01	(−0.02, 0.03)	< 0.01	< 0.01	(−0.00, 0.00)	0.01	0.03	(−0.06, 0.08)			
Intercept	−0.17*	0.08	(−0.32, −0.02)	< −0.01	0.07	(−0.15, 0.14)	0.01	0.01	(−0.01, 0.02)						
ASI Employment															
Slope 1	< −0.01	0.01	(−0.02, 0.02)	−0.01	0.01	(−0.00, 0.00)	< 0.01	< 0.01	(−0.03, 0.01)	< 0.01	0.03	(−0.05, 0.06)	< 0.01	< 0.01	(−0.00, 0.00)
Slope 2	< 0.01	0.01	(−0.01, 0.02)	< −0.01	0.01	(−0.00, 0.00)	< 0.01	< 0.01	(−0.02, 0.01)	−0.03	0.02	(−0.07, 0.01)			
Intercept	0.04	0.06	(−0.07, 0.15)	−0.06	0.05	(−0.00, 0.02)	0.01	0.01	(−0.17, 0.05)						
BSI Psychological Distress															
Slope	−0.01	0.01	(−0.03, 0.01)	0.01	0.01	(−0.01, 0.03)	< 0.01	< 0.01	(−0.00, 0.00)	−0.03*	0.01	(−0.05, −0.01)			
Intercept	−0.02	0.15	(−0.30, 0.28)	−0.34*	0.14	(−0.61, −0.06)	0.01	0.02	(−0.02, 0.03)						

Note. ASI = Addiction Severity Index. BSI = Brief Symptom Inventory. Slope 1 refers to baseline to 5 months of intervention and Slope 2 refers to 5 to 12 months of intervention. The reference categories for problem gambling intervention and gender are the very brief interventions (i.e., brief psychoeducation and brief advice) and women, respectively.

*$p < .05$.