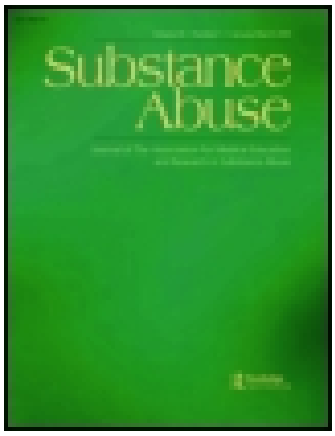

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Mindfulness-Based Relapse Prevention for Substance Use Disorders: A Pilot Efficacy Trial

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ABSTRACT. The current study is the first randomized-controlled trial evaluating the feasibility and initial efficacy of an 8-week outpatient Mindfulness-Based Relapse Prevention (MBRP) program as compared to treatment as usual (TAU). Participants were 168 adults with substance use disorders who had recently completed intensive inpatient or outpatient treatment. Assessments were administered pre-intervention, post-intervention, and 2 and 4 months post-intervention. Feasibility of MBRP was demonstrated by consistent homework compliance, attendance, and participant satisfaction. Initial efficacy was supported by significantly lower rates of substance use in those who received MBRP as compared to those in TAU over the 4-month post-intervention period. Additionally, MBRP participants demonstrated greater decreases in craving, and increases in acceptance and acting with awareness as compared to TAU. Results from this initial trial support the feasibility and initial efficacy of MBRP as an aftercare approach for individuals who have recently completed an intensive treatment for substance use disorders.

KEYWORDS. Mindfulness, meditation, relapse prevention, substance use disorders, treatment

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INTRODUCTION

With rates of relapse following substance abuse treatment estimated at over 60% (1), substance use disorders are often described as "chronic relapsing conditions" (2,3). The most commonly available treatments in many developed countries are 12-step or mutual support groups (4). Participation in12-step programs is associated with greater abstinence (5); however, these approaches may not be clinically indicated for individuals adverse to the disease model of addiction (6) or whose spiritual beliefs and/or lifestyle are in conflict with the 12-step philosophy. As an alternative to 12-step programs, Relapse Prevention (RP) (7), a cognitive-behavioral treatment, focuses on responses to high-risk situations, combining skills-training with cognitive interventions to prevent or limit relapse. RP has been disseminated for treatment of several types of substance abuse (8–12) with considerable empirical support (13–20). Although RP suggests promising advancement in treatment, relapse remains a significant problem for 44% to 70% of clients (21). Integration of further efficacious treatment components may enhance RP treatment effects (18).

Mindfulness has been described as "paying attention in a particular way: on purpose, in the present moment, and non-judgmentally" (22). Many therapeutic orientations, such as Mindfulness-Based Stress Reduction (MBSR) (23) and Mindfulness-Based Cognitive Therapy for depression (MBCT) (24), use mindfulness techniques and practices, leading to growing evidence of its benefits (24–30). Research on mindfulness in the treatment of substance use disorders is beginning to receive attention in scientific literature (31–33). Theoretical foundations for integration of mindfulness with traditional cognitive-behavioral relapse prevention (34) suggest that mindfulness may help develop a detached and de-centered relationship to thoughts and feelings, preventing escalation of thought patterns that may lead to relapse (35,36). Via increased awareness, regulation, and tolerance of potential precipitants of relapse, mindfulness may enhance ability to cope with relapse triggers, interrupting the previous cycle of automatic substance use behavior. In the event of a lapse, awareness and acceptance fostered by mindfulness may aid in recognition and minimization of the blame, guilt, and negative thinking that increase risk of relapse (37).

Mindfulness-Based Relapse Prevention (MBRP), a novel mindfulness-based aftercare approach, integrates core aspects of RP with practices adapted from MBSR (23) and MBCT (24). Identification of high-risk situations remains central to the treatment. Participants are trained to recognize early warning signs for relapse, increase awareness of internal (i.e., emotional and cognitive) and external (i.e., situational) cues previously associated with substance use, develop effective coping skills, and enhance self-efficacy. Mindfulness practices included in MBRP are intended to raise awareness of triggers, monitor internal reactions, and foster more skillful behavioral choices. The practices focus on increasing acceptance and tolerance of positive and negative physical, emotional, and cognitive states, such as craving, thereby decreasing the need to alleviate associated discomfort by engaging in substance use.

The current pilot randomized controlled trial (RCT) evaluated the feasibility and initial efficacy of MBRP in comparison to treatment as usual (TAU) among individuals with substance use disorders. The study assessed treatment effects on substance use outcomes as well as key secondary processes including craving, mindfulness, and acceptance. It was hypothesized that participation in MBRP would be associated with greater reductions in substance use, and greater increases in mindfulness and acceptance in MBRP versus TAU participants.

METHODS

Participants

Participants ($N = 168$) were recruited from a private, nonprofit agency providing a continuum of care for alcohol and drug use disorders, serving approximately 126 clients per month in both inpatient and outpatient settings. Approximately 57% of the agency's outpatient and 2% of inpatient clients are legally mandated to substance

abuse treatment, and 19% of outpatient and 75% of inpatient clients are homeless. Roughly 55% of clients complete treatment as recommended.

Eligible participants were between the ages of 18 and 70, fluent in English, had completed intensive outpatient or inpatient treatment in the previous 2 weeks, and were medically cleared for participation. Exclusion criteria included psychosis, dementia, imminent suicide risk, significant withdrawal risk, or need for more intensive treatment.

Measures

With the exception of demographics questions, administered at baseline, the same battery of measures was administered at baseline, immediately following the 8-week intervention period, and 2 and 4 months post-intervention. All assessments were completed onsite via an Internet-based assessment program, with study staff available to guide participants through assessment procedures.

Eligibility Screening

Eligibility was determined via telephone assessment. The "Psychotic and Associated Symptoms" sections of the Structured Clinical Interview for DSM-IV, Axis I (SCID-I) (38) assessed lifetime experience of a psychotic disorder. The SCID-I has demonstrated reliability and validity in such settings. Suicidality was assessed using the suicide section of the Hamilton Depression Inventory (39), and a single item from the Brief Symptom Inventory (40) ("How much were you distressed by thoughts of ending your life?").

Substance Use

The Timeline Followback (TLFB) (41) assessed daily use of alcohol (using a standard drink conversion chart) and drugs. At baseline, participants were asked to report for the 60 days prior to initial inpatient or outpatient treatment admission. For all other assessments, participants reported on the 60 days immediately prior to assessment. The TLFB has demonstrated good reliability and validity with both online and in-person administration (42).

Alcohol and Drug Craving

The Penn Alcohol Craving Scale (PACS) (43) was adapted to include both alcohol and drug craving. The PACS is a 5-item, self-report measure assessing frequency, intensity, and duration of craving, and overall rating of craving for the previous week. It has shown excellent internal consistency and predictive validity for alcohol relapse. Its internal consistency in the current sample was .87.

Alcohol and Drug Use Consequences

The 15-item Short Inventory of Problems (SIP-AD) (44), adapted from the Inventory of Drug Use Consequences-2R (InDUC-2R) (45), assessed impulse control, social responsibility, and physical, interpersonal, and intrapersonal consequences. The correlation between InDUC and SIP-AD has been shown to be strong ($r =$ .96) (44), and internal consistency in the current study was .96.

Mindfulness

The Five Factor Mindfulness Questionnaire (FFMQ) consisting of 39 items rated on a 5-point Likert scale, assessed 5 factors of mindfulness (46). The FFMQ has demonstrated good internal consistency (46). Internal consistency in the current study was .91, with subscale alphas ranging from .80 to .87.

Acceptance

The Acceptance and Action Questionnaire (AAQ) (47) is a 9-item instrument assessing acceptance versus avoidance and control of negative private experiences. Items are rated on a 7-point Likert-type scale, with higher scores indicating greater acceptance. Lower scores have been associated with increased levels of psychopathology and decreased quality of life (48). Its internal consistency in the current study was .68.

Meditation Practice

MBRP participants recorded the type and number of minutes of mindfulness practice using a worksheet submitted weekly throughout

the intervention. In addition, average days per week and minutes per meditation session were assessed at all time points.

Participant Feedback

Participants attending the final MBRP session completed a questionnaire assessing course satisfaction on a 10-point Likert scale ranging from "Not at all"' to "Very." Questions included "How important has this program been to you?" and "How likely are you to continue engaging in formal mindfulness practice after this course?"

Treatment

MBRP

The treatment was delivered in 8 weekly, 2-hour group sessions, following the protocol outlined in the MBRP treatment manual (Bowen, Chawla, and Marlatt, 48a). Each group (6 to 10 participants) was facilitated by 2 therapists. Each session had a central theme, with meditation practices and related RP discussions and exercises. Themes included "automatic-pilot" and its relationship to relapse, recognizing thoughts and emotions in relation to triggers, integrating mindfulness practices into daily life, practicing the skills in high-risk situations, and the role of thoughts in relapse.

Sessions began with a 20- to 30-minute guided meditation and involved a variety of experiential exercises, interspersed with discussions of the role of mindfulness in relapse prevention and review of homework assignments. Participants were assigned daily exercises to practice between sessions, and were provided with meditation CDs (49) for practice outside group sessions.

TAU

Participants in the TAU condition remained in standard outpatient aftercare provided by the treatment agency, designed to maintain abstinence through a 12-step, process-oriented format. Several groups were offered as part of TAU, with a weekly aftercare groups serving as the primary and regularly attended component. Topics included rational thinking skills (50), grief and loss, assertiveness, self-esteem, goal setting, effects of alcohol and other drugs on interpersonal relations and experience, and related themes. RP skills, based upon the disease model of addiction (51), were included in some of the groups. TAU groups lasted approximately 1.5 hours, and met 1 to 2 times weekly depending on client need, as compared to the 2-hour weekly MBRP group sessions. TAU groups were not regularly assigned homework.

Therapists

Therapists facilitating MBRP groups held master's degrees in psychology or social work, and were experienced in delivery of cognitive-behavioral interventions. Several had extensive backgrounds in mindfulness meditation. Therapists participated in several weeks of intensive training, engaged in daily meditation practice, and received weekly supervision throughout the trial from therapists experienced in mindfulness-based treatments. Therapists facilitating the TAU groups were licensed Chemical Dependency Counselors, with varying levels of experience in the delivery of outpatient aftercare services.

Design and Procedure

All study procedures were approved by the University of Washington Institutional Review Board. Participants were recruited near the end of their inpatient or outpatient substance abuse treatment through flyers and referrals from agency or research staff. Potential participants contacted research staff by telephone, were verbally consented for screening, and completed a 30- to 45-minute telephone eligibility screen.

Following informed consent procedures, eligible participants completed an on-site baseline assessment, with research staff available to assist or answer questions. Following completion of the assessment, participants were randomly assigned, using a computerized random number generator, to either 8 weeks of MBRP or continuation of their existing TAU. Those refusing randomization were given community treatment resource information. Participants randomized to MBRP agreed to discontinue TAU for the 8 weeks of the MBRP course duration, and to resume TAU following completion of MBRP. TAU

participants were given the opportunity to attend the MBRP course free of charge upon completion of their 4-month post-intervention assessment.

Participants who did not complete their scheduled follow-up assessments were contacted via telephone to document their substance use. All participants received $45 gift cards for completion of both baseline and post-intervention assessments, and $50 gift cards for each post-intervention assessment. All participants were encouraged to continue attending 12-step or other self-help groups as recommended by the treatment agency.

Statistical Analysis

Variables were examined for univariate outliers and deviation from expected distributions. The substance-use variables were positively skewed count variables. The AAQ and the FFMQ were continuous, normally distributed variables. The PACS was a positively skewed, continuous variable that fit the gamma distribution. Examination of postestimation residual plots indicated no extreme outliers. Chi-square and *t* tests were used to examine baseline treatment group differences at baseline.

Population-averaged generalized estimating equations (52) were conducted to test treatment effects on substance-use and process outcomes using STATA-10 statistical program (53). Poisson distributions were specified for the positively skewed substance-use outcomes (54). To enhance interpretability, the log link was used for these models, and coefficients were exponentiated to yield incident rate ratios (IRRs). For analyses involving alcohol or drug (AOD) days, the natural log of the days of valid self-report data was entered as an offset variable. Normal or gamma distributions were used for analyses involving the process variables. To accommodate the longitudinal and incomplete data, an exchangeable correlation structure was used, and bootstrapping was applied to correct standard errors (55). The count, integer, or continuous nature of the outcome variables precluded the use of intent-to-treat analyses; however, recent simulation studies have shown that the estimation method employed in this study (i.e., maximum likelihood estimation) is less biased and more precise in dealing with missing data than traditional data imputation methods, such as assuming use for missing observations (intent-to-treat methods) or carrying the last observation forward (56).

Models included 6 predictors: a linear time (t) variable that modeled linear change in the variables from baseline, post-intervention, and 2- and 4-month post-intervention (coded as 0, 1, 2 and 3, respectively); a quadratic time (t^2) variable; dummy-coded treatment effects (1 = MBRP, 0 = TAU); and t and t^2 × treatment interactions. The 2-tailed alpha level was $P = .05$ for all analyses. Results are presented as mean (standard deviation [SD]) unless otherwise specified.

RESULTS

Of screened participants ($N = 260$), 187 met eligibility criteria. Nine declined participation, 9 failed to complete the baseline assessment, and 1 refused randomization, reducing the overall sample to 168.

The majority of the final sample (63.7%) was male, with an average age of 40. 5 (10.3) years. Approximately half identified as Caucasian (51.8%), followed by African American (28.6%), Multiracial (15.3%), and Native American (7.7%). The majority had at least a high-school diploma (71.6%). Approximately 41.3% was unemployed and 32.9% reported receiving some form of public assistance. The majority (62.3%) earned less than $4999 per year. Primary substances of abuse were alcohol (45.2%), cocaine/crack (36.2%), methamphetamines (13.7%), opiates/heroin (7.1%), marijuana (5.4%), and other (1.9%). Approximately 19.1% reported polysubstance use.

Treatment Group Differences at Baseline

Racial distribution differed between groups at baseline (χ^2 (1, $N = 168$) = 5.51, $P = .02$); the MBRP group consisted of a higher proportion of White participants (63%) than TAU (45%). This difference was a nonsystematic effect of randomization, and there were no differences in

attrition between White and non-White participants in the MBRP group (χ^2 (1, $N = 93$) = .631, $P = .43$). To control for this baseline difference, race was used as a covariate in all analyses. There were no other baseline treatment differences on demographic or main outcome variables (all $P > .14$). Other sociodemographic variables, including gender, ethnicity, and severity of initial substance use, were examined in primary analyses as potential covariates and moderators of the treatment effects. None were significant (all $P > .05$), and they were not included in final models.

Treatment Compliance, Attrition, and Satisfaction

Approximately 61%, 57%, and 73% of the sample ($N = 168$) completed post-intervention and 2-month and 4-month follow-up assessments, respectively. Attrition did not significantly differ between groups at any time point and the predictors in each model were not significantly associated with missing data on dependent variables.

MBRP participants reported attending 5.2 (2.4) or 65% of treatment sessions. Attendance rates in TAU groups were not available; however, a significant difference was noted between the MBRP (12.8 ± 4.9) and TAU (9.8 ± 8.2) groups in number of treatment hours received during the 8-week intervention period (Mann-Whitney U test, $U = 2113.5$, $P < .001$). Total number of treatment hours was therefore used as a covariate in all primary analyses.

Most MBRP participants (86%) reported practicing meditation post-intervention, and 54% reported continued practice at 4 months post-intervention for an average of 4.7 ± 4.0 days/week and 29.9 ± 19.5 minutes per session. On a 10-point Likert scale, participants rated the MBRP course as highly important (8.3 ± 1.4) and reported a high likelihood of continuing formal (8.9 ± 1.2) and informal (8.9 ± 1.7) meditation practices.

Primary Outcomes

The AOD use model was statistically significant (Wald χ^2 (7, N =163) = 97.72, P <.001). (See Table 1 for means.) As shown in Table 2,

TABLE 1. Means (Standard Deviations) for Alcohol and Other Drug Use and Process Variables During the Study

	Baseline		Posttest		2 months post-intervention		4 months post-intervention	
Variables	MBRP	TAU	MBRP	TAU	MBRP	TAU	MBRP	TAU
AOD days	27.0 (24.0) ($n = 93$)	28.9 (24.8) (n = 70)	.1 (.3) (n = 77)	2.6 (9.1) (n = 56)	2.1 (7.2) (n = 74)	5.4 (14.7) (n = 56)	5.1 (14.9) (n = 69)	5.1 (15.3) (n = 49)
SIP	11.1 (5.4) (n = 93)	11.7 (4.7) (n = 75)	2.3 (4.5) (n = 62)	3.4 (5.6) (n = 42)	2.9 (5.3) (n = 53)	3.8 (5.8) (n = 42)	3.1 (5.4) (n = 71)	3.9 (5.8) (n = 52)
PACS	1.6 (1.1) (n = 91)	1.7 (1.4) (n = 75)	1.1 (1.1) (n = 62)	1.7 (1.4) (n = 41)	1.0 (1.0) (n = 53)	1.4 (1.5) (n = 42)	1.1 (1.3) (n = 70)	1.3 (1.5) (n = 52)
AAQ	47.1 (7.5) (n = 76)	47.2 (9.6) (n = 72)	51.2 (7.8) (n = 56)	47.6 (10.0) (n = 40)	49.6 (9.1) (n = 51)	48.8 (9.6) (n = 39)	50.2 (7.5) (n = 63)	50.3 (10.3) (n = 50)
FFMQ-ACT	26.2 (6.2) (n = 84)	27.7 (6.9) (n = 72)	27.1 (7.0) (n = 55)	26.5 (7.2) (n = 40)	27.9 (6.3) (n = 52)	25.3 (7.2) (n = 37)	26.2 (5.8) (n = 61)	28.8 (7.9) (n = 48)

Note. MBRP = Mindfulness-Based Relapse Prevention; TAU = treatment as usual; AOD = alcohol and other drug use; SIP = Short Inventory of Problems; PACS = Penn Alcohol Craving Scale; AAQ = Acceptance and Action Questionnaire; FFMQ-ACT = Five-Factor Mindfulness Questionnaire–Act With Awareness Scale.

TABLE 2. Generalized Estimating Equations Models Evaluating Treatment Effects on Main and Process Outcomes

	AOD use ($N = 163$)			
Predictors	IRR	CI (95%)	*z*	*P*
t	.10	.05–.24	−5.31	<.001
t^2	1.80	1.42–2.27	4.86	<.001
Total treatment hrs	1.00	.97–1.03	−.04	.97
Race	1.02	.76–1.36	.10	.92
Treatment	.92	.67–1.25	−.54	.59
t × treatment	.14	.03–.70	−2.40	.02
t^2 × treatment	1.91	1.16–3.15	2.55	.01
	Craving ($N = 166$)			
Predictors	Exp(B)	CI (95%)	*z*	*P*
t	1.06	.76–1.47	.35	.73
t^2	.95	.86–1.07	−.83	.41
Total treatment hours	.99	.97–1.01	−1.34	.18
Race	1.55	1.24–1.94	3.84	<.001
Treatment	.84	.66–1.06	−1.46	.14
t × treatment	.68	.49–.95	−2.27	.02
t^2 × treatment	1.13	1.01–1.26	2.21	.03
	Acceptance ($N = 163$)			
Predictors	β	CI (95%)	*z*	*P*
t	.03	−.26, .32	0.21	.84
t^2	.06	−.25, .36	0.36	.72
Total treatment hours	−.05	−.18, .08	−.71	.48
Race	−.05	−.21, .10	−0.68	.50
Treatment	.03	−.14, .20	0.35	.73
t × treatment	.44	.01, .87	2.00	.045
t^2 × treatment	−.40	−.80, −.01	−1.98	.047
	Acting with awareness (N =165)			
Predictors	β	CI (95%)	*z*	*P*
t	−.48	−.85, −.11	−2.53	.01
t^2	.52	.10, .93	2.44	.02
Total treatment hours	−.03	−.20, .13	−0.40	.69
Race	−.09	−.23, .06	−1.18	.24
Treatment	−.09	−.27, .09	−1.03	.30
t × treatment	.67	.15, 1.18	2.54	.01
t^2 × treatment	−.61	−1.11, −.11	−2.43	.02

Note. For all models: t = linear time predictor (0 = baseline; 1 = posttest; 2 = 2-month follow-up; 3 = 4-month follow-up); t^2 = quadratic time predictor. IRR = incident rate ratio or the rate of increase/decrease outcome variable based on a one-unit change in the predictor, where IRR values greater than 1 indicate rate increases, and values less than 1 indicate rate decreases. Exp(B) = exponentiated gamma-log coefficient (values less than 1 represent inverse associations; values greater than 1 represent positive associations). β = standardized regression coefficient (negative values represent inverse associations; positive values represent positive associations). SE = bootstrapped standard error. CI (95%) = 95% confidence intervals. The treatment variable was dummy coded with MBRP treatment group = 1, TAU = 0. Self-reported race was dummy coded with 1 = White, 0 = non-White.

For alcohol and other drug use (AOD) model: An additional series of post hoc, cross-sectional, Poisson regressions tested treatment differences at each time point. The MBRP group reported significantly lower AOD use at both post-intervention (IRR = .02, $P <$ .001) and 2 months post-intervention (IRR = .39, $P <$ .001); however, this difference was reduced to nonsignificant at 4 months post-intervention (IRR = 1.11, $P = .21$).

t and t^2 were significant predictors of AOD use days following the intervention. The significant main effects for t were qualified by a significant t × Treatment interaction, which indicated that AOD use decreased to a greater extent among MBRP versus TAU participants. Specifically, the MBRP group showed an average 86% decrease in AOD use for each 2-month increase in linear time. Two months post-intervention, MBRP participants reported an average of 2.1 days of use, and TAU participants reported an average of 5.4 days (see Table 2). The significant t^2 × Treatment interaction also indicated a curvilinear effect of treatment on AOD use, which suggested that the treatment gains made by MBRP participants, compared to TAU participants, decayed by 4 months post-intervention.

The omnibus model for substance-use problems (Wald χ^2 (7, $N = 163$) = 135.14, $P <$.001) was significant. Significant main effects for t (IRR = .25, $P < .001$) and t^2 (IRR = 1.44, $P = .001$) indicated that, overall, participants showed a curvilinear decrease in experience of substance-use problems over time. There were no significant treatment interactions or main effects of treatment on substance use problems ($P > .68$).

Process Outcomes

The craving (PACS) model was statistically significant (Wald χ^2 (7, $N = 166$) = 37.60, $P < .001$). As shown in Table 2, race was a significant covariate: overall White participants showed higher craving than non-White participants. Secondary analyses, however, showed that race did not interact with time or treatment to have an effect on craving ($P > .05$). The significant t × Treatment interaction shown in Table 2 indicated that, over time, craving decreased to a greater extent among MBRP versus TAU participants. The significant t^2 × Treatment interaction suggests the magnitude of decreases in craving among MBRP participants plateaued over the 4-month post-intervention period.

The acceptance (AAQ) model was statistically significant (Wald χ^2 (7, $N = 163$) = 16.25, $P = .02$). There was a significant t × Treatment interaction such that, over time, acceptance increased more among MBRP participants

than among TAU participants (see Table 2). The significant $t^2 \times$ treatment interaction showed that increases in acceptance among MBRP participants plateaued over 4 months post-intervention.

The acting with awareness (FFMQ-ACT) model was marginally significant (Wald χ^2 (7, $N = 165) = 13.03$, $P = .07$). As shown in Table 2, t and t^2 were significant predictors of acting with awareness. The significant main effects for t were qualified by a significant t × Treatment interaction, suggesting that acting with awareness increased to a greater extent among MBRP versus TAU participants, for whom it decreased. At 4 months post-intervention, however, the significant $t^2 \times$ treatment interaction showed that increases in acting with awareness among MBRP participants plateaued. Models for the other subscales of the FFMQ evinced nonsignificant treatment effects or omnibus model tests ($P > .05$).

No side effects of treatment or adverse events during the course of the study were detected or reported.

DISCUSSION

Results of the current study provide evidence for the feasibility and initial efficacy of MBRP, offering empirical support for MBRP as an alternative to standard-of-care 12-step-based or related aftercare programs. Outcomes suggest significant improvement in MBRP versus TAU participants in days of substance use, craving, awareness, and acceptance. Differences were not evident on other aspects of mindfulness (observing, describing, nonjudgment of inner experience, and nonreactivity to inner experience). Additionally, although participants in both groups reported a decrease in substance-related problems, decreases were not significantly different between groups. Finally, analyses of sociodemographic variables (gender, ethnicity, and severity of initial substance use) did not show evidence of their moderating effects on treatment outcomes.

Good participant compliance, reflected in attendance and continued meditation practice, supports feasibility of MBRP. Over half of the sample continued formal meditation practice for at least 4 months post-intervention, supporting acceptability of MBRP in this population. Positive course ratings and the absence of significant differences in attrition rates between the MBRP and TAU arms indicate tolerability of and interest in MBRP among participants with substance use disorders. The MBRP intervention appears safe as indicated by lack of reported side effects or adverse events.

Significant decreases were found in overall days of substance use post-intervention among participants in MBRP versus those in TAU group. These gains appeared to diminish at 4 months post-intervention, however, with those in MBRP returning to levels similar to those in TAU. This reduction in treatment effects over time may be attributed to the study design, which entailed MBRP participants returning to TAU groups following their 8-week MBRP course. The TAU groups did not necessarily foster continuation of practices and perspectives learned in MBRP. It is therefore not surprising that MBRP treatment gains were not fully maintained. These findings suggest need for continued support and maintenance following MBRP treatment. Future studies may benefit from inclusion of continuing, intervention-consistent support, which has been found to improve treatment efficacy in substance use disorders (57,58).

In view of MBRP's focus on increasing awareness, decreasing judgment, and shifting from "reacting" to "skillful responding" (all key "descriptors" of mindfulness) absence of significant differences in FFMQ factors representing observing, describing, nonjudgment, and nonreactivity is surprising. However, evidence of processes targeted by MBRP is reflected in differential increases in acceptance and acting with awareness, and decreases in craving. A substantial body of literature documents harmful effects of suppression or avoidance of cognitive and affective responses on a variety of psychological and health outcomes (59–63). A central focus of MBRP is thus to increase awareness and acceptance of physical, emotional, and cognitive states. Increases in acceptance and acting with awareness, reflected in the current study, may indicate a decreased need to alleviate discomfort with substance use, and an increase in intentional versus reactive behavior.

Reductions in severity of craving in the current study may be explained by increases in awareness of sensations, thoughts, and emotions that accompany craving, coupled with encouraging acceptance of and nonreactivity to the craving response. Repeated exposure to triggering stimuli during which participants practice nonreactivity may, over time, result in habituation, thereby decreasing the intensity of the initial craving reaction (64).

Taken together, results from the current study are consistent with the underlying rationale for mindfulness-based treatments, designed to interrupt reactive behaviors and encourage skillful responses to challenging situations (23,26). Further, results are consistent with neurobiological research indicating associations between mindfulness practice and changes in brain regions involved in modulation of arousal and emotion regulation (65,66).

The current study has several strengths. To our knowledge, this is the first RCT evaluating the efficacy of a mindfulness-based intervention for substance use disorders and the prevention of relapse. The study provides preliminary support for feasibility, acceptability, and efficacy of mindfulness-based therapies for substance use disorders in an ethnically diverse and challenging population, with high rates of homelessness and involvement with the legal system. Although other acceptance- and mindfulness-based treatments or protocols with related components have been applied to substance abuse samples, MBRP is uniquely designed to address the specific needs of this population.

The current study also has several limitations. The brevity of the follow-up period restricted the ability to examine effects of MBRP on long-term outcomes. Although research indicates up to two thirds of individuals relapse within the first 3 months following treatment (21), rates of substance use remained low in both groups throughout the study, limiting variability and thus power to find significant between-group differences. Although retrospective self-report of substance use using may present another potential limitation, the TLFB method is considered a gold standard of substance use assessment. However, additional methods, such as urine toxicology testing, would strengthen the validity of these reports. Finally, due to attrition, complete data were not available for all participants during the follow-up period. Although attrition in the current study is comparable to studies in similar populations (67), conclusions that can be drawn about treatment effects for the complete sample are limited.

In conclusion, this RCT demonstrates empirical promise for feasibility and initial efficacy of MBRP as an aftercare treatment for substance use disorders, and provides preliminary support for the theoretical framework behind mindfulness meditation as a therapy for addictive behaviors. In the tradition of well-established MBSR (28) and MBCT (26) programs, MBRP extends the populations for which mindfulness meditation therapies can be used to alleviate distress and foster fundamental change in maladaptive patterns of behavior.

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