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## Race/ethnicity and racial group composition moderate the effectiveness of mindfulness-based relapse prevention for substance use disorder

Brenna L. Greenfield<sup>1</sup>, Corey Roos<sup>2</sup>, Kylee J. Hagler<sup>2</sup>, Elena Stein<sup>2</sup>, Sarah Bowen<sup>3</sup>, and Katie A. Witkiewitz<sup>2</sup>

<sup>1</sup>University of Minnesota Medical School, Duluth campus, Duluth, Minnesota

<sup>2</sup>University of New Mexico, Center on Alcoholism, Substance Abuse, and Addictions, Albuquerque, New Mexico

<sup>3</sup>School of Professional Psychology, Pacific University, Hillsboro, Oregon

### Abstract

**Introduction**—Mindfulness-based relapse prevention has shown promise as a treatment for substance use disorder but its efficacy according to racial/ethnic minority status and group composition is unknown.

**Method**—This is a secondary analysis of existing data (insert citation after blind review) testing individual race/ethnicity and racial/ethnic group composition as moderators of mindfulness-based relapse prevention (MBRP). Participants ( $N=191$ ; 29% female; 47% racial/ethnic minority; mean age=39) with substance use disorder were randomized to MBRP or relapse prevention (RP). Outcomes were heavy drinking days (HDD) and drug use days (DUD) 12 months after treatment completion. Negative binominal regression models were conducted.

**Results**—Analyses accounted for drug of choice. Individual race/ethnicity was a significant moderator of substance use outcomes. White participants had lower HDD in MBRP than RP (IRR=0, 95% CI: 0,0), whereas for minority participants, there was no treatment difference in HDD. Conversely, minorities had lower DUD in MBRP than RP (IRR=0.03, 95% CI: 0.01, 0.10), whereas for whites there was no treatment difference in DUD. Group racial/ethnic composition was a significant moderator. Participants in groups with more than half whites had lower HDD in

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### Contributors

Authors Bowen and Witkiewitz designed the original study that this secondary analysis draws upon. They obtained funding, collected data, and prepared the data for that study. For the current secondary analysis, Greenfield, Hagler, Roos, and Witkiewitz conceived the study design. Roos conducted the statistical analyses, with consultation from Witkiewitz. Greenfield, Hagler, and Stein conducted the background literature review and drafted the introduction. Roos drafted the methods and results section. Greenfield and Hagler drafted the discussion section. All authors critically reviewed the full manuscript draft for important intellectual content and approved the final version.

### Conflict of Interest

Drs. Bowen and Witkiewitz conduct MBRP trainings for which they sometimes receive monetary incentives, although the findings presented in this article have not yet been presented as part of these trainings. No other disclosures were reported.

MBRP than RP (IRR=0.01, 95% CI: 0, 0.09), whereas for participants in groups with more than half minorities there was no treatment difference in HDD. Exploratory analyses suggested MBRP resulted in better outcomes than RP when individual race/ethnic status was reflected in the group race/ethnicity (i.e., whites in groups with more than half whites or minorities in groups with more than half minorities).

**Conclusions**—Among whites, MBRP appears to be more effective than RP in preventing heavy drinking relapse. However, among racial/ethnic minorities, MBRP appears to be more effective than RP in preventing drug use relapse. This suggests that the interaction between individual race/ethnicity and group composition may influence primary outcomes.

### Keywords

mindfulness-based relapse prevention; race; minority; group psychotherapy; substance use disorder; treatment moderators

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Multiple large-scale surveys highlight racial and ethnic disparities in rates of alcohol and drug use and related negative consequences (e.g., Chartier & Caetano, 2010; Grant et al., 2016). These studies suggest that Native Americans have the highest rates of substance use disorder (SUD), Asians and Pacific Islanders have the lowest, and rates for blacks, whites, and Hispanics fall in between (Grant et al., 2015, 2016). However, experiencing adverse outcomes related to substance use, such as negative health and social consequences, is more common among racial and ethnic minorities than whites<sup>1</sup> (Substance Abuse and Mental Health Services Administration, 2014). Specifically, in the National Alcohol Survey, black and Hispanic men had higher rates of substance-related injuries, accidents, and health, social, work, and legal consequences than white men (Witbrodt, Mulia, Zemore, & Kerr, 2014). Native Americans have the highest rates of alcohol-related deaths, among other substance-related disparities (Chartier & Caetano, 2010). There is a clear need to address these health inequities.

### Treatment Need and Access

There are also significant racial/ethnic disparities in access to SUD treatment, though these findings are not always consistent and this is an underrepresented area of research. Many studies indicate that Hispanics are less likely than whites to receive SUD treatment (e.g., Mulia, Tam, & Schmidt, 2014; Wells, Klap, Koike, & Sherbourne, 2001). In some samples, Blacks have evidenced a higher unmet treatment need than whites (Acevedo et al., 2015; Wells et al., 2001); although, in other studies, blacks have a lower unmet treatment need (e.g., Mulvaney-Day, DeAngelo, Chen, Cook, & Alegría, 2012; Perron et al., 2009).

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<sup>1</sup>We acknowledge the inherent limitations of the terms “white” and “racial/ethnic minority”; Race/ethnicity is a social construct and not biologically determined (Ford & Kelly, 2005). However, inasmuch as societally assigned and self-identified “race” is associated with differential treatment experiences, response, and outcomes, we believe it merits investigation and so compare the experiences between self-identifying “whites” and “racial/ethnic minorities” in this article. Racial and ethnic minorities may not be in the minority in all contexts. Rather, this term includes individuals who tend to have a common set of experiences different from whites, such as experiencing racial discrimination.

## Treatment Retention and Outcomes

Alongside these disparities in treatment access is evidence of inequalities in retention and outcomes. Hispanics and blacks are significantly less likely to complete publicly-funded SUD treatment than whites (e.g., Bluthenthal et al., 2007; Guerrero et al., 2013; Saloner & LeCook, 2013). Despite lower rates of treatment completion, some studies suggest racial and ethnic minority individuals experience similar benefit from SUD treatment (see Schmidt, Greenfield, & Mulia, 2006 for a review). One meta-analysis found that cognitive-behavioral therapy for SUD was highly effective in reducing substance use across racial and ethnic groups, although results from these studies suggested that blacks and Hispanics benefited less than whites (Windsor, Jemal, & Alessi, 2015). Less is known about whether similarities between racial and ethnic groups in SUD treatment outcomes extend to newer mindfulness-based interventions. A primary goal of this paper is to provide data on racial and ethnic differences in SUD treatment response to such interventions.

## Group SUD Treatment

Group-based treatment is the most common type of SUD treatment (National Survey on Drug Use and Health, 2013) and creating a coherent group that offers mutual support is paramount (Yalom, 2005). Cohesion between group members has been positively associated with use of cognitive restructuring and self-efficacy in SMART addiction recovery groups (Kelly, Deane, & Baker, 2015; Pooler, Qualls, Rogers, & Johnston, 2014). Racial and ethnic group composition may impact cohesion; ability to select a single-race therapy group was associated with a 43% increase in the odds of receiving mental health care in a nationwide study (Campbell & Alexander, 2002). Only ten percent of groups in an outpatient substance abuse treatment (OSAT) survey of 618 agencies nationwide were single-race groups (Campbell & Alexander, 2002), yet research on racial and ethnic group composition and outcomes is limited. One study of group treatment for anxiety disorder found that increased racial/ethnic heterogeneity predicted lower rates of recovery at the group level (Paulus, Hayes-Skelton, & Norton, 2015). However, follow-up analyses yielded complex results; poor outcomes were limited to seven of the 43 total groups having the most racial/ethnic diversity and in each of these seven groups, no two individuals shared the same race/ethnicity. Different racial/ethnic group make-up warrants further and perhaps more nuanced study.

## Mindfulness-Based Treatment

Mindfulness-based relapse prevention (MBRP) is a group SUD treatment that combines mindfulness principles and practices with cognitive-behavioral relapse prevention. It has shown superior outcomes to standard cognitive-behavioral relapse prevention (RP) in alcohol and drug use outcomes at a one-year follow-up (removed for blind review), and was more effective than RP for racial/ethnic minority women in a residential sample, but not more effective than RP for white women in the same residential treatment program (removed for blind review). It has been proposed that mindfulness-based treatments are congruent with the worldviews of some racial and ethnic minorities (Hall, Hong, Zane, & Meyer, 2011;

Mohatt et al., 2008) and many mindfulness-based treatments have been adapted for racial/ethnic minorities (e.g., Dutton, Bermudez, Matas, Majid, & Myers, 2013).

## Study Aims

Given racial/ethnic disparities in SUD rates and treatment engagement and outcomes, as well as the potential acceptability of MBRP for racial/ethnic minorities, we conducted a secondary analysis of a randomized clinical trial of mindfulness-based relapse prevention (MBRP) versus cognitive-behavioral relapse prevention (RP) to determine how individual race/ethnicity and racial/ethnic group composition moderate MBRP outcomes. We investigated: (1) individual race/ethnicity (whites compared to racial/ethnic minorities) and racial/ethnic group composition (whether group was more than half racial/ethnic minorities) as predictors of treatment outcomes, (2) treatment by individual race/ethnicity interaction effects, and (3) treatment by group racial/ethnic composition interaction effects. Finally, we evaluated whether the relationship between individual racial/ethnic minority status and group racial/ethnic composition moderated treatment effects. This was largely an exploratory study. We did hypothesize based on previous research (insert after blind review) that racial/ethnic minority participants would have better outcomes than whites in MBRP as compared to RP. Whether group composition predicted outcomes, however, was an exploratory analysis.

## Method

### Participants and Procedures

Participants were 286 individuals recruited from two sites within a community SUD treatment agency. Inclusion criteria for this study included: age 18 or older, fluency in English, medical clearance, ability to attend treatment sessions, agreement to random assignment, and prior completion of either intensive outpatient or inpatient care for SUD. Exclusion criteria were: current psychotic disorder, dementia, suicidality, imminent danger to others, or participation in prior MBRP trials. Written informed consent was obtained from participants and all procedures were approved by the [removed for blind review] Institutional Review Board.

Participants were recruited following an inpatient or intensive outpatient treatment at the treatment agency and then randomly assigned to one of three treatment conditions: MBRP, RP, or treatment as usual. The current analyses only included participants assigned to MBRP or RP ( $n=191$ ) because no data were available on racial/ethnic group composition for the treatment as usual groups. The current study included baseline (before randomization to MBRP or RP) and 12-month (12-months following completion of MBRP or RP) assessment data.

The 191 participants were dispersed across 22 different therapy groups. In the sample, 83 (43.5%) participants were in the 10 groups comprised of more than half whites, and 108 (56.5%) were in the 12 groups comprised of more than half racial/ethnic minorities. The average size of each therapy group was nine individuals ( $SD = 2$ ), with no significant difference in group size between the two treatment conditions.

## Measures

**Demographic**—Participants were asked to identify ethnicity (Hispanic/Latino or Not Hispanic/Latino), and race (African American, Caucasian, Asian American, Pacific Islander, Native American, Alaska Native, or “Other”). Participants could check more than one category; if they did so they were categorized as mixed race. Gender, age, educational level, and employment status were assessed in the same self-report questionnaire.

**Substance use disorder severity**—SUD severity was assessed at baseline with the Severity of Dependence Scale, a 5-item self-report measure (SDS; Gossop et al., 1995). In the current sample, the SDS demonstrated good internal consistency reliability (Cronbach’s  $\alpha = 0.85$ ).

**Substance use**—The Timeline Followback interview (Sobell & Sobell, 1992) was used to assess alcohol and other drug use. The Timeline Followback is a reliable and well-validated calendar-based method for quantifying recent substance use. Primary substance use outcomes were number of drug use days and number of heavy drinking days (defined as 4+/5+ standard drinks for women/men) over the 90-day period prior to the 12-month post-treatment follow-up assessment.

## Interventions

The MBRP intervention was based on the MBRP Clinician’s Guide (Bowen, Chawla, & Marlatt, 2011). The intervention was delivered in group format, with 2-hour groups offered once a week over the course of eight weeks. Each therapy session was led by two therapists. MBRP fidelity was assessed via review of sessions by a trained rater; mean competence was between adequate and good (insert citation after blind review). Four MBRP therapists were clinical psychologists, one was in a doctoral training program, and five had Master’s degrees. Every intervention session included formal guided mindfulness practices followed by discussion of personal experiences during meditation practices. Additionally, sessions involved discussion about core themes (e.g., the role of automatic pilot in addiction), as well as the applications of mindfulness to daily living and the prevention and reduction of substance use. Audio-recordings of mindfulness meditations were provided for home practice.

The RP intervention was based on an established cognitive-behavioral relapse prevention program (Monti et al., 2002). The RP intervention in the study was adapted to match MBRP in time, format, size, location, and amount of assigned homework. The RP intervention was primarily skills-based and focused on topics such as self-efficacy, coping skills training, goal setting, problem solving, and social support. Six RP therapists were clinical psychologists, one was in a doctoral training program, and two had Master’s degrees.

## Statistical Analyses

Chi-square and t-tests conducted in SPSS Version 23 were used to examine differences in study variables by race/ethnicity in this secondary data analysis. Using Mplus Version 7.4 (Muthén & Muthén, 2012), negative binomial regression analyses were conducted to examine the main effects of treatment, individual race/ethnicity, and group racial/ethnic

composition on substance use outcomes. The moderating effects of individual race/ethnicity and group racial/ethnic composition on the relationships between treatment and substance use outcomes were also examined. Negative binomial regression was used to account for a high frequency of zero values for substance use outcomes. To account for dependency in the data due to clustering by therapy group, standard errors were adjusted using the sandwich estimator in Mplus (White, 1980).

The primary outcomes examined were drug use days and heavy drinking days (coded as 4+/5+ standard drinks for women/men) during the 90-days prior to the 12-month post-treatment assessment. Treatment and individual race/ethnicity were dummy-coded as 0 = RP and 1 = MBRP and 0 = racial/ethnic minority and 1 = non-Hispanic white, respectively. While collapsing across racial/ethnic categories is not ideal and certainly reduces the ability to detect differences between ethnically and racially diverse groups (e.g., African American versus Hispanic clients), we chose to collapse the racial/ethnic minority clients into a single group due to the small numbers of individuals in each racial and ethnic group, a particularly problematic issue in moderation analyses. Further, members of racial/ethnic minority groups may have common experiences of levels of racism (e.g., institutionalized racism; Jones, 2000) and doubts about the availability of culturally competent treatment, suggesting some similar characteristics within the general racial/ethnic minority group (Hayes, McAleavey, Castonguay, & Locke, 2016). Group racial/ethnic composition was coded as 0 = group comprised of more than 50% whites and 1 = group comprised of more than 50% racial/ethnic minorities. We chose a cut-off of 50% or more racial/ethnic minorities to represent the total percentage (48%) of racial/ethnic minorities in the sample.

For all models, we controlled for age, baseline dependence severity, number of prior treatment episodes, treatment hours completed, and treatment site, consistent with the main outcomes paper (removed for blind review). For models testing the main effects of individual race/ethnicity and group racial/ethnic composition, we controlled for treatment condition. For each interaction model, we included the following predictors: the moderator variable (i.e., individual race/ethnicity or group racial/ethnic composition), the treatment variable, and an interaction term (treatment  $\times$  moderator variable). We controlled for the set of covariates noted above and for the other moderator variable not being tested (e.g., group racial/ethnic composition for the model testing individual race/ethnicity as a moderator). To probe significant two-way interactions, we examined the effect of treatment at each level of the moderator using separate negative binomial regression models with treatment as a predictor.

As exploratory analyses, we examined whether the efficacy of MBRP was moderated by match between each participant's own racial/ethnic minority status and the group racial/ethnic composition. We created a "race/ethnicity match" dummy variable, coded as 0 = different race/ethnicity (e.g., racial/ethnic minority participant in a group comprised of more than 50% whites), and 1 = race/ethnicity match (e.g., racial/ethnic minority participant in a group comprised of more than 50% minorities). Subsequently, we examined the two-way interaction between treatment and the race/ethnicity match dummy variable, controlling for the same set of demographic and treatment-related covariates noted above. To probe significant interactions, we examined the effect of treatment for those with race/ethnicity

match and then for those without. To further probe the nature of the race match by treatment interaction, we examined descriptive statistics for the following subgroups: 1) racial minorities in groups comprised of more than half racial/ethnic minorities (match), 2) racial minorities in groups comprised of more than half whites (difference), 3) whites in groups comprised of more than half whites (match), and 4) whites in groups comprised of more than half racial/ethnic minorities (difference).

We reported the effect size of treatment in terms of incidence rate ratios (IRRs). IRRs can be interpreted as the rate of increase (when the IRR is above 1.0) or the rate of decrease (when the IRR below 1.0) in heavy drinking or drug use days for a 1-unit increase in the predictor (with other predictors in the model held constant). An IRR of approximately 1.44 (for IRRs above 1) or 0.69 (for IRRs below 1) corresponds with a Cohen's *d* effect size of 0.2 (small effect); an IRR of approximately 2.48 or 0.40 corresponds with a Cohen's *d* effect size of 0.5 (medium effect); and an IRR of approximately 4.27 or 0.23 corresponds with a Cohen's *d* effect size of 0.8 (large effect; Borenstein, Hedges, Higgins, & Rothstein, 2009).

## Results

### Descriptive Results and Comparison of Study Variables Between Racial/Ethnic Groups

Descriptive statistics for demographics and other treatment-relevant variables in the full available sample ( $N = 191$ ) and separated by self-reported race/ethnicity are listed in Table 1. There were no significant differences on demographic variables presented in Table 1 between whites and racial/ethnic minorities, with the exception of age ( $t(183) = 2.52, p = 0.013$ ), such that racial/ethnic minorities ( $M = 41.19, SD = 10.38$ ) were significantly older than whites ( $M = 37.21, SD = 11.03$ ). Thus, we controlled for age in all models that included race/ethnicity as a predictor. Of note, there were no significant differences in completion rates between whites and racial/ethnic minorities at the 12-month follow-up assessment ( $\chi^2(1) = 1.27, p = 0.26$ ).

### Main Effects of Individual Race/Ethnicity and Group Race/Ethnic Composition

Across treatment conditions, there was a significant main effect of individual race/ethnicity on 12-month HDD ( $B (SE) = -4.09 (1.21), p = 0.001$ ), such that whites had a lower rate of 12-month HDD compared to racial/ethnic minorities. There was not a significant main effect of individual race/ethnicity on 12-month DUD ( $B (SE) = -7.02 (3.69), p = 0.06$ ).

There was not a significant main effect of group racial/ethnic composition on 12-month HDD ( $B (SE) = -1.27 (1.05), p = 0.23$ ). There was a significant main effect, however, of group racial/ethnic composition on 12-month DUD ( $B (SE) = -5.13 (1.15), p < .001$ ), such that individuals in groups comprised of more than half whites had lower DUD than individuals in groups comprised of more than half racial/ethnic minorities.

### Interaction Effects

Table 2 provides a summary of interaction effects across models. Table 3 provides a summary of the effects of treatment condition within race/ethnicity subgroups and the effect size of treatment in terms of IRRs. These simple slope analyses were conducted to probe the

nature of interaction effects. Additionally, to provide clarity about the treatment outcomes in terms of absolute values, Table 3 provides descriptive results of the outcomes by treatment condition among the full available sample and within each subgroup.

Given the differences in interaction model results by type of substance, we conducted sensitivity analyses in which we added the following baseline covariates to each interaction model: “alcohol use only” (1 = reported alcohol only as substance of choice, 0 = reported at least one other drug besides alcohol as substance of choice) and “polysubstance use” (1 = reported 2 or more substances of choice [one of these could be alcohol], 0 = reported only one substance of choice). The pattern of results did not change with the inclusion of these additional covariates. Of note, as reported in Table 1, there were also no significant differences in the “alcohol use only” and “polysubstance use” variables between whites and racial/ethnic minorities.

**Moderation of Treatment by Individual Race/Ethnicity**—There was a significant interaction between individual race/ethnicity and treatment in the prediction of 12-month HDD (Table 2). Among racial/ethnic minorities, there was not a significant difference in 12-month HDD between MBRP and RP participants. Among whites, however, there was a significant main effect of treatment on 12-month HDD, such that MBRP participants reported 100% fewer heavy drinking days than RP participants (Table 3).

There was also a significant interaction between individual race/ethnicity and treatment in the prediction of 12-month DUD (Table 2). Among racial/ethnic minorities, there was a significant main effect of treatment on 12-month DUD, such that MBRP participants reported 97% fewer drug use days than RP participants (Table 3). However, among whites, there was not a significant difference in 12-month DUD between MBRP and RP participants.

**Moderation of Treatment by Group Race Composition**—There was a significant interaction between group racial/ethnic composition and treatment in the prediction of 12-month HDD (Table 2). Among individuals in groups comprised of more than half racial/ethnic minorities, there was not a significant difference in 12-month HDD between MBRP and RP participants. However, among individuals in groups comprised of more than half whites, there was a significant main effect of treatment on 12-month HDD, such that MBRP participants reported 99% fewer days of heavy drinking than RP participants. There was not a significant interaction between group racial/ethnic composition and treatment in the prediction of 12-month DUD.

**Moderation of Treatment by Race/Ethnicity of Individual versus Group**—Among racial/ethnic minorities, there was a significant interaction between individual vs. group race/ethnicity composition and treatment in the prediction of 12-month HDD, but not DUD (Table 3). Among racial/ethnic minority individuals in groups comprised of more than half racial/ethnic minorities, there was a significant main effect of treatment on 12-month HDD, such that MBRP participants had 91% fewer 12-month HDD than RP participants. However, among racial/ethnic minority individuals in groups with more than half whites, there were no significant differences in 12-month HDD between MBRP and RP participants.



Among whites, there was a significant interaction between racial/ethnic group composition and treatment in the prediction of 12-month HDD and DUD (Table 3). Among white individuals in groups comprised of more than half whites, there was a significant main effect of treatment on 12-month HDD and DUD, such that MBRP participants had 100% fewer 12-month HDD and 93% fewer DUD than RP participants. However, among white individuals in groups comprised of more than half racial/ethnicity minorities, there were no significant differences in 12-month HDD and DUD between MBRP and RP participants.

## Discussion

This study adds to the growing body of literature on mindfulness-based interventions for substance use disorder (SUD) by considering individual race/ethnicity and racial/ethnic group composition as predictors and moderators of treatment outcomes following mindfulness-based relapse prevention (MBRP). In this diverse sample of 191 individuals who had completed group SUD treatment (either relapse prevention [RP] or MBRP), MBRP was superior to RP for *both* whites and racial/ethnic minorities in substance use outcomes (add citation after blind review). However, the substance use outcome (i.e., heavy drinking days [HDD] vs. drug use days [DUD]) that showed improvement differed between whites and racial/ethnic minorities. Whites had significantly lower HDD at 12-months in MBRP than RP (large effect size), whereas for minorities there was no treatment difference in HDD at 12-months. Conversely, minorities had significantly lower DUD at 12-months in MBRP than RP (large effect size), whereas for whites there was no treatment difference in DUD.

Group racial/ethnic composition was also a significant treatment moderator. Participants in groups with more than half whites had significantly lower HDD in MBRP than RP (large effect size), whereas for participants in groups with more than half minorities there was no treatment difference in HDD. Given the significant interaction effects found for both individual race/ethnicity and group racial/ethnic composition, we performed exploratory analyses to examine the interaction effects between treatment and participants' own race/ethnicity compared to the racial/ethnic composition of the therapy group. Exploratory analyses demonstrated that MBRP resulted in better outcomes than RP (large effect sizes) when individual race/ethnicity minority status matched that of the majority of the group. Specifically, whites in groups with more than half whites had lower HDD and DUD at 12 months. Similarly, minorities in groups with more than half minorities had lower HDD at 12 months.

Our collective findings suggest that both whites and racial/ethnic minorities can benefit from receiving MBRP. Hence, our findings generally align with those in the review by Schmidt and colleagues (2006) in which racial/ethnic minorities had similar outcomes to whites in SUD treatment. However, we did find differences in results between whites and minorities by type of substance use, even when covarying substance of choice. Specifically, our findings indicate that for whites, but not minorities, MBRP may be a particularly effective treatment option for preventing heavy drinking relapse. On the other hand, for minorities, but not whites, MBRP may be a particularly effective treatment option for preventing drug use relapse. The reason for this finding is unclear; qualitative interviews with participants could help to clarify.

Importantly, the current study findings build upon previous findings that racial/ethnic minorities, but not whites, did better in MBRP than RP with respect to drug use outcomes (removed for blind review). There are a few potential explanations for why MBRP, as compared to RP, may be a particularly good option for minorities. As a present-centered treatment, MBRP may be more aligned with the worldviews of racial/ethnic minorities. Hall and colleagues (2011) argue that the more therapies incorporate worldviews of particular cultural groups, the more effective they will be. Woods-Giscombe and Gaylord (2014) interviewed African Americans about their experiences with mindfulness mediation. Views of mindfulness were generally positive, though cultural adaptations were recommended. The authors highlighted that mindfulness may be beneficial for African Americans because of their disproportionate exposure to race-related and institutional stressors; this likely applies to other racial/ethnic minorities as well, although discrimination experiences vary within racial and ethnic groups.

Given that group treatment is the most commonly available treatment for SUD (NSDUH, 2013), understanding group processes and their association with outcomes is important to impact care as provided in community settings. The present study was the first, to our knowledge, to examine the effects of participant's own race/ethnicity compared to the group race/ethnic composition. These results certainly do not suggest therapy groups should be homogenous in race or ethnic composition, but rather that outcomes might benefit from a therapeutic emphasis on common experiences, and enhancement of group safety and cohesion.

One potential explanation for these findings is that individuals participating in groups with other participants who reflect their own race/ethnicity may perceive a greater sense of trust in other group members, particularly for racial and ethnic minority individuals (Campbell & Alexander, 2002). Perceived trust in other group members or overall group cohesion may play a significant role in MBRP outcomes, given that MBRP emphasizes sharing of ongoing emotional, sensory and cognitive experiences. A key task of the MBRP facilitator is to actively draw upon participants' direct affective, cognitive and sensory experiences to highlight treatment themes (e.g., the role of thoughts in the relapse process). In fact, one study has linked therapist fidelity in delivering MBRP to greater increases in dispositional mindfulness and enhanced therapeutic alliance (Chawla et al., 2010). The degree to which participants are comfortable sharing these experiences, whether due to a sense of identification with and trust in other group members or to the facilitator's ability to foster participants' sharing to highlight treatment themes, may therefore affect treatment outcomes.

### **Limitations and Future Directions**

Given that this was a secondary analysis, a key limitation was the use of race/ethnicity as a self-report item and the inability to explore differences between racial and ethnic minority groups (e.g., conducting analyses by Hispanic, black, Native American groups). Collapsing across groups limits our ability to draw conclusions about whether MBRP may be more or less effective for particular racial and ethnic groups. The study would also have benefited from a measure of acculturation or racial identity, and measures of group cohesion. Self-reported race/ethnicity does not always correspond to socially assigned race or ethnicity

(i.e., the race or ethnicity that others perceive someone to be) and there are often differences in ethnic/racial minority groups with respect to prevalence of SUD (Grant et al., 2015, 2016) as well as in-group identification. Another limitation was the primary outcomes of heavy drinking days and drug use days addressed the frequency of substance use in the sample, but did not provide a complete assessment of the intensity of substance use (such as drinks per drinking day, or quantity of a particular drug used per day), related negative consequences, or quality of life. Future analyses could examine these metrics to provide a more complete assessment of factors that relate to a fuller richer outcome picture.

Future studies would also benefit from examination of the relationship of race/ethnicity to treatment outcomes for different types of SUD treatment, and different regions and settings in the United States. In addition to outcomes, future research is warranted on how race/ethnicity influences MBRP initiation and retention. Future studies could also examine group climate, alliance, and cohesion in MBRP, as well as levels of acculturation and racial identity.

### **Clinical Implications**

MBRP may be a preferred option over RP, particularly because it shows efficacy for both racial/ethnic minority and white participants. Given that racial/ethnic minorities are more likely to access non-specialty care (Perron et al., 2009), availability of MBRP in primary care settings may reduce substance-related health inequities. This coincides with a push for the integration of primary care and mental health services (Baird et al., 2014), and is similar to existing offerings of other mindfulness-based programming (e.g., mindfulness-based stress reduction) in primary care settings.

The current findings on racial/ethnic group composition highlight the need for clinicians to consider the interaction of race and ethnicity within a treatment group and how this may impact group cohesion and outcomes. Regardless of racial/ethnic group composition, therapists should focus on enhancing group cohesion and on ensuring generalizability of materials to diverse groups of clients. Research and clinical endeavors need to further explore how to identify and address the ethnicity/race-related factors (e.g., racial identity, discrimination) that impede or enhance participant experiences and outcomes in mindfulness-based interventions for substance use, as well as in all treatment approaches and modalities.

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### Highlights

- Mindfulness-based relapse prevention (MBRP) outperformed relapse prevention (RP).
- Racial/ethnic group composition moderated the effectiveness of MBRP.
- Clinicians should focus on group cohesion to improve MBRP outcomes.

**Table 1**

Descriptive Statistics for Study Variables, n (%) or Mean (standard deviation)

	Whites (n= 100)	Racial/Ethnic Minorities (n= 89)	Full Available Sample (MBRP and RP conditions only; n = 191)
Gender			
Male	71 (72.4%)	59 (69.4%)	132 (71.0%)
Female	27 (27.6%)	26 (30.6%)	54 (29.0%)
Self-reported Race/Ethnicity			
Non-Hispanic white	100 (100%)	–	100 (52.9%)
Black/African-American	–	39 (43.8%)	39 (20.6%)
Native American	–	14 (15.7%)	14 (7.4%)
Asian	–	1 (1.1%)	1 (0.5%)
Native Hawaiian/Pacific Islander	–	1 (1.1%)	1 (0.5%)
Mixed (selected multiple categories)	–	18 (20.2%)	18 (9.5%)
Not specified	–	3 (3.4%)	3 (1.6%)
Hispanic or Latina/Latino	–	17 (19.1%)	19 (10.1%)
Age	37.30 (10.93)	41.16 (10.60)*	39.04 (10.93)
Educational Level			
High School Degree/GED or Less	47 (48.0%)	49 (56.3%)	99 (52.4%)
Completed at Least some College	51 (52.0%)	38 (43.7%)	90 (47.6%)
Unemployed	66 (67.3%)	52 (59.1%)	120 (63.2%)
Income			
\$4999 or below	65 (71.4%)	46 (70.8%)	111 (70.7%)
\$5000 or above	26 (28.6%)	19 (29.2%)	46 (29.3%)
Abstinence from Drug Use at Baseline	86 (92.5%)	83 (96.5%)	174 (94.6%)
Abstinence from Drinking at Baseline	88 (94.6%)	81 (94.2%)	174 (94.6%)
Substance Dependence Severity	9.97 (4.05)	9.75 (3.93)	9.87 (3.99)
Prior Treatment Episodes	1.53 (1.70)	1.79 (1.49)	1.64 (1.60)
Treatment Hours Completed During the Study	12.53 (7.46)	11.92 (6.09)	12.19 (6.81)
Alcohol Use Only	17 (17.3%)	8 (9.1%)	25 (13.2%)
Polysubstance Use	77 (78.6%)	76 (86.4)	156 (82.1%)
12-Month Drug Use Days	2.61 (14.60)	6.57 (19.58)*	4.46 (17.04)
12-Month Heavy Drinking Days	1.27 (5.74)	4.10 (13.24)*	2.59 (10.07)

Note. MBRP = Mindfulness-Based Relapse Prevention. RP = Relapse Prevention.

\* significant difference ( $p < .05$ ) between whites and minorities based on t-tests or chi-square tests

**Table 2**

## Summary of Results Across Interaction Models

Predictors	12-Month Heavy Drinking Days	12-month Drug Use Days
	B (SE)	B (SE)
<b>Among Full Available Sample</b>		
Treatment × Race/Ethnicity	-14.73 (1.25) **	2.92 (1.14) *
Treatment × Group Racial/Ethnic Composition	6.07 (1.79) **	-1.89 (1.35)
<b>Among whites only</b>		
Treatment × Race/Ethnicity Match	-5.75 (1.29) **	-4.71 (1.97) **
<b>Among Racial/Ethnic Minorities Only</b>		
Treatment × Race/Ethnicity Match	-5.90 (2.70) *	-0.42 (2.49)

Note.

\*  
p < .05;

\*\*  
p < .01.

B = unstandardized regression coefficient; SE = standard error. Race was coded 1 = white, 0 = racial/ethnic minority. Group Race Composition was coded 1 = diverse race group, i.e., 50% or more ethnic/racial minorities in group, 0 = non-diverse race/ethnicity group, i.e., less than 50% ethnic/racial minorities. Race/Ethnicity Match coded 1 = race/ethnicity match: race composition of group was match to participant's own race, i.e., white participant in a group with more than 50% whites, or racial minority participant in a group with 50% or more racial minorities, 0 = race/ethnicity different: race composition of group was different from participant's own race, i.e., white participant in group with 50% or more racial minorities, or racial minority participant in group with more than 50% whites. A total of 8 separate interaction models were conducted: 2 Treatment × Race/Ethnicity models (one for each of the two outcomes), 2 Treatment × Group Race/Ethnicity Composition models, and 2 Treatment × Race/Ethnicity Match models for whites, and 2 Treatment × Race/Ethnicity Match models for racial/ethnic minorities. Treatment was coded 1 = received MBRP, 0 = received RP. For all interaction models, we controlled for: age, site, treatment hours completed, prior treatment episodes, and baseline substance dependence severity. For interaction models with the treatment × race interaction term, we also controlled for group race/ethnicity composition. For interaction models with the treatment × group race/ethnicity composition interaction term, we also controlled for individual race/ethnicity.



Table 3

Effects of Treatment among Full Sample and within Race/Ethnicity Subgroups

12-Month Number of Heavy Drinking Days (HDD) as Outcome				
	Effect of Treatment in Negative Binomial Regression B (SE)	n (%) with zero HDD	n (%) with 10 or more HDD	Mean HDD (SD)
Full Available Sample	-0.62 (0.85) IRR = 0.54 (95% CI for IRR:0.10, 2.89)	MBRP: 71 (89.90) RP: 53 (75.7)	MBRP: 8 (10.50) RP: 6 (8.60)	MBRP: 1.44 (7.66) RP: 3.88 (12.17)
Whites	-19.38 ** (1.51) IRR = 0.00 (95% CI for IRR:0, 0)	MBRP: 43 (100.00) RP: 24 (72.70)	MBRP: 0 (0.00) RP: 3 (9.00)	MBRP: 0.00 (0.00) RP: 2.97 (8.57)
Racial/Ethnic Minorities	-0.06 (0.83) IRR = 0.94 (95% CI for IRR:0.18, 4.76)	MBRP: 28 (77.80) RP: 27 (77.10)	MBRP: 3 (8.33) RP: 4 (11.43)	MBRP: 3.17 (11.18) RP: 5.06 (15.18)
50% or More Racial/Ethnic Minority Groups	-1.76 (1.57) IRR = 0.17 (95% CI for IRR:0.01, 3.74)	MBRP: 37 (88.10) RP: 36 (80.00)	MBRP: 1 (2.40) RP: 3 (6.67)	MBRP: 1.64 (9.42) RP: 3.80 (13.62)
50% or More white Groups	-5.67 (1.66) ** IRR = 0.01 (95% CI for IRR:0, 0.09)	MBRP: 34 (91.90) RP: 18 (69.20)	MBRP: 2 (5.41) RP: 4 (15.38)	MBRP: 1.22 (5.09) RP: 4.04 (9.48)
Whites in 50% or more white Groups (Race Match)	-16.75 (0.81) ** IRR = 0.00 (95% CI for IRR:0, 0)	MBRP: 29 (100.00) RP: 12 (70.60)	MBRP: 0 (0.00) RP: 3 (17.65)	MBRP: 0.00 (0.00) RP: 5.24 (11.40)
Whites in 50% or More Racial/Ethnic Minority Groups (Race Different)	-0.38 (0.21) IRR = 0.68 (95% CI for IRR:0.45, 1.034)	MBRP: 14 (100.00) RP: 12 (75.00)	MBRP: 0 (0.00) RP: 0 (0.00)	MBRP: 0.00 (0.00) RP: 0.40 (0.83)
Racial/Ethnic Minorities in 50% or more Racial/Ethnic Minority Groups (Race Match)	-2.37 (1.06) * IRR = 0.09 (95% CI for IRR:0.01, 0.72)	MBRP: 23 (82.10) RP: 21 (80.80)	MBRP: 1 (3.60) RP: 3 (11.54)	MBRP: 2.46 (11.51) RP: 6.19 (17.44)
Racial/Ethnic Minorities in 50% or more white Groups (Race Different)	1.15 (0.66) IRR = 3.15 (95% CI for IRR:0.23, 12.20)	MBRP: 5 (62.50) RP: 6 (66.70)	MBRP: 2 (25.00) RP: 1 (11.10)	MBRP: 5.63 (10.24) RP: 1.78 (3.49)
12-Month Number of Drug Use Days (DUD) as Outcome				
	Effect of Treatment in Negative Binomial Regression B (SE)	n (%) with zero DUD	n (%) with 10 or more DUD	Mean (SD)
Full Available Sample	-1.85 ** (0.57) IRR = 0.16 (95% CI for IRR:0.05, 0.48)	MBRP: 74 (89.90) RP: 56 (78.90)	MBRP: 2 (2.50) RP: 7 (9.90)	MBRP: 3.06 (15.08) RP: 6.10 (19.05)
Whites	-0.98 (0.88) IRR = 0.38 (95% CI for IRR:0.06, 2.11)	MBRP: 38 (88.40) RP: 30 (90.90)	MBRP: 1 (2.30) RP: 1 (3.00)	MBRP: 2.37(13.74) RP: 2.94 (15.89)
Racial/Ethnic Minorities	-3.45 ** (0.60) IRR = 0.03 (95% CI for IRR:0.01, 0.10)	MBRP: 34 (89.50) RP: 25 (69.40)	MBRP: 2 (5.26) RP: 7 (19.44)	MBRP: 4.00 (16.97) RP: 9.28 (21.92)
50% or More Racial/Ethnic Minority Groups	-2.86 (0.65) ** IRR = 0.06 (95% CI for IRR:0.01, 0.20)	MBRP: 43 (93.50) RP: 35 (76.10)	MBRP: 1 (2.20) RP: 4 (8.70)	MBRP: 2.11 (13.27) RP: 4.51 (14.71)
50% or More white Groups	-1.11 (0.96) IRR = 0.33 (95% CI for IRR:0.05, 2.14)	MBRP: 31 (83.80) RP: 22 (84.60)	MBRP: 2 (5.41) RP: 4 (15.38)	MBRP: 4.24 (17.19) RP: 8.85 (24.96)
Whites in 50% or more white Groups (Race Match)	-2.73 (1.25) * IRR = 0.07	MBRP: 26 (89.70) RP: 16 (94.10)	MBRP: 0 (0.00) RP: 1 (5.90)	MBRP: 0.34 (1.50) RP: 5.29 (21.83)

<b>12-Month Number of Heavy Drinking Days (HDD) as Outcome</b>				
	<b>Effect of Treatment in Negative Binomial Regression B (SE)</b>	<b>n (%) with zero HDD</b>	<b>n (%) with 10 or more HDD</b>	<b>Mean HDD (SD)</b>
	(95% CI for IRR:0., 0.76)			
Whites in 50% or more Racial/Ethnic Minority Groups (Race Different)	1.31 (1.26) IRR = 3.71 (95% CI for IRR:0.91, 33.11)	MBRP: 12 (85.70) RP: 14 (87.5)	MBRP: 1 (7.10) RP: 0 (0.00)	MBRP: 6.57 (24.02) RP: 0.27 (0.70)
Racial/Ethnic Minorities in 50% or more Minority Groups (Race Match)	-3.82 (1.12)** IRR = 0.02 (95% CI for IRR:0.002, 0.19)	MBRP: 29 (96.70) RP: 19 (70.40)	MBRP: 0 (0.00) RP: 4 (14.81)	MBRP: 0.17 (0.91) RP: 7.19 (18.61)
Racial/Ethnic Minorities in 50% or more white Groups (Race Different)	0.167 (0.87) IRR = 1.18 (95% CI for IRR:0.21,6.5)	MBRP: 5 (62.50) RP: 6 (66.70)	MBRP: 2 (25.00) RP: 3 (33.33)	MBRP: 18.38 (34.92) RP: 15.56 (30.28)

Note.

\*  
p < .05;

\*\*  
p < .01.

B = unstandardized regression coefficient; SE = standard error. IRR = Incidence Rate Ratio. MBRP = Mindfulness-Based Relapse Prevention; RP = Relapse Prevention. Treatment was coded 1 = received MBRP, 0 = received RP. Diverse race group = 50% or more ethnic/racial minorities in group. Non-diverse race group = less than 50% ethnic/racial minorities. Race/Ethnicity Match coded 1 = race/ethnicity match: race/ethnicity composition of group matched participant's own race, i.e., white participant in a group with more than 50% whites, or racial/ethnic minority participant in a group with 50% or more racial minorities), 0 = race/ethnicity different: race/ethnicity composition of group was different from participant's own race/ethnicity, i.e., white participant in group with 50% or more racial/ethnic minorities, or racial/ethnic minority participant in group with more than 50% whites.