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David “Ikela” I.K. Moniz-Lewis

Candidate

Psychology

Department

This thesis is approved, and it is acceptable in quality and form for publication:

Approved by the Thesis Committee:

Katie Witkiewitz, Ph.D., Chairperson

Steven P. Verney, Ph.D.

Matthew “Mateo” R. Pearson, Ph.D.

**NON-ABSTINENT RECOVERY IN MINDFULNESS-BASED RELAPSE PREVENTION:
EXPLORING MECHANISMS OF CHANGE AND SOCIAL MODERATORS**

BY

DAVID “IKELA” I.K. MONIZ-LEWIS

**BACHELOR OF ARTS, PSYCHOLOGY
SIERRA NEVADA COLLEGE, 2019**

THESIS

Submitted in Partial Fulfillment of the
Requirements for the Degree of

**Master of Science
Psychology**

The University of New Mexico
Albuquerque, New Mexico

May, 2023

DEDICATION

In loving memory of PFC Daniel Israel Kalikiano Lewis (2002 – 2023). One of my greatest joys in life will always be having been your big brother.

**NON-ABSTINENT RECOVERY IN MINDFULNESS-BASED RELAPSE PREVENTION:
EXPLORING MECHANISMS OF CHANGE AND SOCIAL MODERATORS****by****David “Ikela” I.K. Moniz-Lewis****B.A., Psychology, Sierra Nevada College, 2019
M.S., Psychology, University of New Mexico, 2023****ABSTRACT**

Recovery from substance use disorder (SUD) is heterogeneous by nature. Yet, over the last 50 years, substance use treatment providers and researchers have often defined success as sustained abstinence from substances. An often overlooked but equally valid pathway to recovery for persons with SUD is non-abstinent recovery. However, the majority of the literature on non-abstinent recovery exists for individuals with alcohol use disorder (AUD) with little empirical inquiry into non-abstinent recovery for other types of SUD. Additionally, there is also no known literature, to date, that explores the mechanisms that lead to non-abstinent recovery for individuals who have engaged in treatment for SUD. As such, the current study aimed to address these gaps by examining non-abstinent recovery profiles for individuals (N =453) who were recruited into two randomized clinical trials examining Mindfulness-Based Relapse Prevention (MBRP), as compared to Cognitive Behavioral Relapse Prevention (RP) and Treatment as Usual (TAU). Using a combined sample, we used latent profile analysis to empirically derive four profiles of recovery following outpatient aftercare SUD treatment (1) high-functioning frequent substance using, (2) low-functioning frequent substance using (3) high-functioning infrequent substance using, (4) low-functioning infrequent substance using. Multinomial logistic regression failed to an association between treatment assignment and recovery profile. Likewise, we found no evidence for interaction effects of race/ethnicity by treatment, and socioeconomic status by

treatment, in the prediction of recovery profiles. Trait mindfulness, craving, and psychological flexibility failed to partially mediate the association between treatment assignment and recovery profile; however, there were statistically significant differences in trait mindfulness such that individuals in the low-functioning infrequent substance using profile reported significantly lower levels of trait mindfulness compared to individuals in the two high-functioning profiles. The results from this study suggest that recovery from SUD is heterogeneous, and common forms of recovery based on dimensions of substance use and functioning can be identified across a variety of SUD, including those with co-occurring SUD. Additionally, mindfulness appears to be an important factor in the recovery process, though further research is needed to explore how psychological and social factors may influence both abstinent and non-abstinent forms of recovery.

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Introduction

Background

In 1971, Richard Nixon used the power of his office as President of the United States to declare “drug abuse” as “public enemy number one” (Niesen, 2011). In doing so, his administration catalyzed what has become known as the “War on Drugs” and has resulted in the mass incarceration of hundreds of thousands of people – overwhelmingly from marginalized backgrounds – for non-violent drug offenses (Earp et al., 2020; Mauer & King, 2007; Omori, 2019). Looking back over the last 50 years, it is now clear that this “war” has not been a war on drugs but rather an unjust attack on *the people* who use drugs (Dineen & Pendo, 2021; Yearby & Mohapatra, 2020). Not only has insurmountable harm been done to generations of people from communities of color and low socioeconomic backgrounds in the name of this false war (Chiappori & Orfali, 2021), but it has fueled the belief that abstinence is the only true way for people with problematic substance use to achieve recovery (Magura, 2007). The sickly synergistic combination of the stigmatization of the use of substances, and the perpetuation of the myth of abstinence as the only viable treatment outcome for individuals with problematic substance use, has created a society that up until very recently has entirely overlooked an equally valid pathway to recovery – one that places the quality of one’s life, and the meaning and fulfillment one finds therein, over and above their use of substances – that being non-abstinent recovery.

Non-Abstinent Recovery

Despite abstinence from substances being the primary target for addiction treatment programs across the world for many decades (Mayock & Butler, 2021), a growing body of literature continues to elucidate the multidimensional and heterogenous pathways to recovery

that exist for persons with substance use disorders (Eddie et al., 2022; Hasin et al., 2017; Subbaraman & Witbrodt, 2014; Witkiewitz, Wilson, et al., 2021). Not all individuals seeking treatment for SUD accept abstinence as a goal (Probst et al., 2015), and many do not consider abstinence as necessary for success following treatment (Ann Kaskutas et al., 2014; Costello et al., 2020; Laudet, 2007). Likewise, several empirical studies indicate that abstinence need not always be the primary treatment goal, as moderation and reduction in substance use are associated with improvements in health and wellbeing (Cheong et al., 2020; Fan et al., 2019; Henssler et al., 2021; Witkiewitz, Kranzler, et al., 2021). As such, it is essential for SUD treatment providers to meet those seeking their services where they are at in their recovery journey with whatever goals they deem to be personally meaningful – whether abstinent or otherwise (Körkel, 2021). Doing so requires an embrace of a broader definition of recovery that does not so much concern itself with the quantity or frequency of one's substance use, but instead holds an individual's overall quality of life as of the utmost importance.

One such definition is that offered by Witkiewitz et al., (2020) in their review of the validity of various conceptualizations of recovery. In that review, the authors examined quantitative, qualitative, and mixed-method sources to synthesize the heterogeneous definitions of recovery into an empirically based conceptualization of what it means for one to be in recovery from a SUD. After examining a body of literature from various scholars and stakeholders, including from those with lived experiences of SUD, they conclude by defining recovery as “a process of behavior change characterized by improvements in biopsychosocial functioning and purpose in life” (p. 9, Witkiewitz, Montes, et al., 2020). Such a definition, when fully embraced, presents the field of addiction treatment with the opportunity to collectively move away from a pathology-based model of recovery toward a strengths-based model (Tucker

& Witkiewitz, 2022). Via a strengths-based model a variety of recovery pathways become viable, of which abstinence is optional if one so chooses, but not required. Although the pathways to recovery that include continued substance use are idiographic in nature, it is possible to generally label these pathways through their shared value of placing improved quality of life at the center of what it means to be in recovery, despite non-abstinence. As such, this set of pathways will hereafter be referred to as non-abstinent recovery.

As has previously been alluded to, numerous empirical studies have validated non-abstinent recovery as a legitimate outcome following treatment for SUD – particularly within the alcohol use disorder (AUD) literature. One such series of studies has been conducted by Witkiewitz and colleagues using data from Project MATCH (Witkiewitz et al., 2019; Witkiewitz, Wilson, et al., 2021) and COMBINE (Witkiewitz, Pearson, et al., 2020) to examine recovery profiles over time for individuals diagnosed with AUD.

In their 2019 paper, Witkiewitz and colleagues utilized latent profile analysis using data from Project MATCH, a randomized clinical trial that examined the efficacy of three psychosocial treatments for AUD (Project MATCH Research Group, 1997) to quantitatively define four profiles of recovery from AUD at a three-year follow-up. These profiles were (1) low-functioning frequent heavy drinking, (2) low-functioning infrequent heavy drinking, (3) high-functioning occasional heavy drinking, and (4) high-functioning infrequent non-heavy drinking. They found relatively few differences among high-functioning infrequent non-heavy drinkers and high-functioning occasional heavy drinkers in outcomes such as social functioning, employment, and life satisfaction.

In a later secondary analysis conducted using three-year follow-up data from COMBINE, a randomized clinical trial that examined the efficacy of behavioral and pharmacological

treatments for AUD (Anton et al., 2003), Witkiewitz, Pearson, and colleagues (2020) replicated these four recovery profiles. In doing so, they again established that recovery from AUD does not require abstinence and can include some heavy drinking. Importantly, while they found that the majority of those who were identified as high functioning engaged in infrequent heavy drinking, high functioning did not necessitate abstinence. Further, they found that those who engaged in infrequent heavy drinking and those who were abstinent had better functional outcomes than those who were low-functioning infrequent heavy drinkers at a 7-9 year follow-up. Similarly, those in the high-functioning occasional heavy drinking profile had above-average physical health, low unemployment, and average to above-average quality of life compared to the other three profiles.

In 2021, Witkiewitz, Wilson, and colleagues (2021) examined AUD recovery profiles within the Project MATCH data set to examine whether non-abstinent recovery at three years following treatment was associated with better functioning at 10 years following treatment. Once again, they found that three-year abstinence was not predictive of functioning at the 10-year follow-up, but rather three-year functioning was the best predictor of functioning at the 10-year follow-up. Taken together, these results offer strong evidence for the notion that functionality is not fully explained by one's use of alcohol, and that recovery, as defined by improved biopsychosocial outcomes, need not depend on one's use of alcohol.

Despite the strong body of evidence supporting the validity of non-abstinent recovery for individuals with AUD, there is a paucity of empirical literature on the validity of non-abstinent recovery for individuals with other SUD (Xin et al., 2022). There have been a handful of studies examining functional outcomes associated with non-abstinent reductions in substance use, including cannabis (Borodovsky et al., 2022; Sherman et al., 2021) and stimulants (Amin-

Esmaeili et al., 2021; Roos, Nich, et al., 2019). Results from these studies also support the notion that non-abstinent reductions in substance use are associated with similar functional outcomes, as compared to those who abstain completely. However, little literature exists beyond this small collection of studies.

The lack of further inquiry into the subject is not due to failed or disconfirmed hypotheses that sought to establish non-abstinent recovery as a valid treatment outcome for other SUD. Rather, this absence of empirical literature exists due to a lack of inquiry into the subject altogether. Despite the growing embrace of the harm reduction treatment paradigm – an approach to SUD treatment that acknowledges that humans will always use substances and thus seeks to reduce the potential harms associated with doing so (Dea, 2020) – there is a significant gap in the substance use literature on quantitative examinations of non-abstinent recovery for substances other than alcohol. As such, the current study seeks to address this gap by examining non-abstinent recovery across various SUD for individuals who have engaged in randomized controlled trials testing the efficacy Mindfulness-Based Relapse Prevention.

Mindfulness-Based Relapse Prevention

Originating from thousand-year-old Eastern Buddhist spiritual traditions and brought to the West by teachers such as Joseph Goldstein and Jack Kornfield in the 1980s, mindfulness is both a state of being and a trait developed over time in which one is attentive to the present moment in a non-judgmental way (Kabat-Zinn, 2003). Over the last few decades, the literature on the effects of mindfulness on various domains of health has exploded in quantity and popularity (Baminiwatta & Solangaarachchi, 2021). Despite the difficulty of empirically operationalizing mindfulness as a construct (Grossman, 2008), it has been found to be an important treatment mechanism across contemporary evidence-based psychotherapies (Brown &

Ryan, 2003; Goldberg et al., 2022). In recent years, several meta-analyses have established strong support for mindfulness-based interventions as effective in the treatment of SUD – one of the best-supported interventions being Mindfulness-Based Relapse Prevention (Korecki et al., 2020).

Mindfulness-Based Relapse Prevention (MBRP) is an evidence-based treatment for individuals with addictive behaviors. It was initially designed as an 8-week manualized group aftercare treatment intervention for individuals who have recently completed inpatient or outpatient treatment for SUD (Bowen et al., 2021). MBRP draws on components of Cognitive-Behavioral Relapse Prevention and Relapse-Prevention Theory and incorporates these with mindfulness practices aimed at enhancing one's ability to engage with the present moment in a flexible, accepting, and non-judgmental way (Bowen et al., 2021; Witkiewitz & Marlatt, 2004). To date, there have been nearly a dozen randomized controlled trials comprising over 1,000 participants that have examined the efficacy of MBRP in the treatment of SUD (Grant et al., 2017). Across this literature, MBRP has been found to be an efficacious treatment intervention for SUD across various populations and types of SUD, with one of the most recent trials establishing MBRP as an effective individual treatment intervention for Spanish-speaking persons (Massaro et al., 2022). Three of the most cited MBRP trials were conducted by Bowen et al., (2009), Bowen et al. (2014), and Witkiewitz et al. (2014). Taken together, these studies establish MBRP as a robust treatment for various SUD, even when compared to other known efficacious treatments for SUD such as Cognitive Behavioral Relapse Prevention (see Methods: Data Sources for additional information on these three parent trials).

Despite a firm establishment of efficacy in the treatment of SUD, further research on MBRP will promote the adaptation of MBRP to diverse populations, the dissemination of MBRP

to a wider range of SUD treatment providers, and the implementation of MBRP across various treatment settings (Wilson et al., 2017; Witkiewitz, Bowen, et al., 2014). One such way that future research can support this advancement is through the examination of the mechanisms by which MBRP influences behavior change and thus evokes the positive outcomes found across the MBRP literature. To date, there is evidence that MBRP, and mindfulness-based treatment more generally, may influence SUD treatment outcomes via increases in self-efficacy, acceptance, and psychological flexibility, and reductions in craving and reactivity (Brewer et al., 2013; Garland et al., 2010; Korecki et al., 2020; Moniz-Lewis et al., 2022; Witkiewitz, Lustyk, et al., 2013), though further research is warranted. As such, the current study aimed to further investigate the mechanism that promotes behavior change in individuals who have achieved non-abstinent recovery following engagement in MBRP.

Mechanisms of Behavior Change in SUD Treatment

Despite having different philosophical foundations and pragmatic orientations, there are several evidence-based treatments for SUD with relatively equivalent efficacy (Miller & Wilbourne, 2002). As such, there is a growing effort toward improving SUD treatment by identifying the mechanisms of behavior change (MOBC), and the components of specific treatment protocols that evoke these mechanisms (Hayes et al., 2020; Magill et al., 2015, 2020). The hope is that identifying and understanding MOBC will aid in the further implementation of evidence-based care for SUD. Likewise, it is an important step in moving beyond diagnosis-specific protocols that treat persons with SUD as homogenous and instead will better position providers to tailor treatment based on the idiographic processes that underline one's unique psychopathology (Boness et al., 2021; Hayes et al., 2022; Hayes & Hofmann, 2017).

Researchers commonly seek to discern MOBC through mediation analyses. The aim is to identify specific variables that explain the effects of treatment (or components of treatment) on substance use outcomes. There are several nuanced techniques for conducting mediation analyses in ways that are most clinically relevant (Hallgren et al., 2018); however, a thorough discussion of these techniques is beyond the scope of this study. The important point to note is that although mediation is the dominant form of identifying potential MOBC, mediation alone is not sufficient to establish causation (MacKinnon, 2008; Tofighi et al., 2019). Thus, potential evidence for MOBC gained through meditation is simply just that – potential evidence – and further research is always necessary to move beyond correlation. With that in mind, there are several potential MOBC that have been continually supported in the literature. Some of the most commonly cited MOBC across SUD treatments are increased coping skills, self-efficacy, readiness to change, and reductions in craving (Magill et al., 2015, 2020). Within mindfulness-based interventions specifically, there are additional potential MOBC – namely mindfulness (including the sub-facets of mindfulness of observing, describing, acting with awareness, non-judgment, and non-reactivity), acceptance, self-compassion, and psychological flexibility (Cavicchioli et al., 2018; Korecki et al., 2020; Mallik et al., 2021; Witkiewitz, Lustyk, et al., 2013). For the purposes of the current study, we will explore craving, mindfulness, and psychological flexibility/acceptance as potential MOBC of MBRP in predicting recovery.

Craving

Craving, defined as the experience of an urge/desire to engage in substance use, is an important predictor of treatment outcomes across the SUD literature (Cavicchioli et al., 2020). Despite differences in the conceptualization of craving across models of addiction (Skinner & Aubin, 2010), craving remains an essential component of the addiction topography and recovery

trajectory (Stohs et al., 2019). As previously mentioned, craving is an important predictor of treatment outcomes across evidence-based treatment for SUD (Subbaraman & Witbrodt, 2014). Using data from COMBINE, McHugh et al. (2016) investigated whether self-reported craving was associated with alcohol use one week later. They found that across treatment conditions, a one-unit increase on a self-report craving scale was associated with a 31% higher likelihood of engaging in alcohol use the following week. In a similar study, Stohs et al., (2019) examined if craving reported after residential treatment predicted the use of any amount of alcohol at follow-up. They found that post-treatment craving was significantly associated with participant alcohol use 3-months following discharge from the residential treatment program. Within the MBRP literature, a similar pattern of results has been found (Witkiewitz, Bowen, et al., 2013; Witkiewitz & Bowen, 2010). Though there is some uncertainty about what specific facets of treatment drive reductions in craving (Hsiao et al., 2019), reductions in craving in MBRP trials are associated with reduced substance use at follow-up (Abed & Ansari Shahidi, 2019). As such, the current study examined if reductions in craving predict the likelihood of achieving non-abstinent recovery across treatment conditions.

Psychological Flexibility

Credited as being originally introduced and coined within Acceptance and Commitment Therapy (ACT), psychological flexibility is defined as a transdiagnostic process of change in which through contact with the present moment, one can meet thoughts, sensations, and emotions with acceptance, and in doing so orient one's behavior in the direction of intrinsic values (Cherry et al., 2021). Since its conceptualization, psychological flexibility has been found to be an essential aspect of psychological health (Pakenham et al., 2020; Ramaci et al., 2019). So much so that some have argued that psychological flexibility *is* psychological health (Kashdan &

Rottenberg, 2010). Within the substance use literature, there is evidence for psychological flexibility as an important characteristic contributing to recovery (Rosen et al., 2020). In a recent study by Albal & Buzlu, (2021), psychological flexibility was found to significantly mediate the association between maladaptive schemes and addiction severity. There is some evidence that psychological flexibility is an important MOBC within MBRP. Mallik et al., (2021) conducted a secondary analysis of a randomized controlled trial for MBRP. They found a similar mediating effect of psychological flexibility on explaining the relationship between MBRP and craving. Given that craving is an important predictor of treatment outcomes for individuals who have received MBRP, and that psychological flexibility appears to explain partial variance of craving within those who have received MBRP, the current study seeks to examine psychological flexibility as a potential MOBC contributing to non-abstinent recovery for individuals who have engaged in MBRP.

Mindfulness

There is some evidence for mindfulness as a MOBC within mindfulness-based interventions for SUD. In a trial testing the efficacy of 8-week rolling MBRP groups, Roos, Kirouac, et al. (2019) investigated mechanisms that lead to positive treatment outcomes. They found a significant mediating effect of the amount of mindfulness practice one engaged in and the overall mental health and general mindfulness of participants after participating in the MBRP rolling group. Additionally, Witkiewitz, Bowen, et al. (2013) found evidence that a latent factor describing one's level of mindfulness significantly mediated the effect of MBRP on craving. However, this failed to replicate in a more recent paper by Hsiao et al., (2019), bringing into question the function of trait mindfulness in promoting the outcomes found across MBRP trials.

As such, the current study seeks to add to this literature by examining the mediating effects of participant trait mindfulness on non-abstinent recovery outcomes.

Racial and Socioeconomic Disparities in Addiction Treatment Outcomes

When looking across the literature on non-abstinent recovery, and SUD treatment more broadly, a clear pattern continues to arise – treatment outcomes are not equivalent across racial and socioeconomic groups (Pouille et al., 2021; Subbaraman & Witbrodt, 2014; Swan et al., 2021; Williams, 2016). More specifically, there is evidence that race and socioeconomic status significantly moderate the association between treatment and SUD outcomes (Parlier-Ahmad et al., 2021; Stahler et al., 2021; Ullrich et al., 2021). In a review by (Alegría et al., 2011), it was found that Black and Latino/a/x adolescents reported decreased quality of care when seeking treatment for SUD. Sahker et al. (2020) found that Black individuals improved less than their White counterparts following outpatient treatment for SUD and that socioeconomic status moderated the effect of race on treatment outcomes. In a large meta-analysis on the efficacy of Cognitive Behavioral-Therapy (CBT) across racial groups, Windsor et al. (2015) found that CBT was significantly more effective in reducing substance use in non-Hispanic White individuals compared to Black individuals.

Within the MBRP literature, there is evidence to suggest that individuals from racial and ethnic minority backgrounds responded better to MBRP compared to non-Hispanic White individuals. In a secondary analysis of a randomized controlled trial that tested the efficacy of MBRP versus standard relapse prevention for legal-system involved women, Witkiewitz, Greenfield, et al. (2013) found that racial and ethnic minority women had better outcomes when engaged in MBRP versus standard Cognitive Behavioral Relapse Prevention. Specifically, they found a significant interaction between race/ethnicity and treatment type in the prediction of drug

use days at follow-up, such that none of the women in the MBRP condition reported any drug use at 15-weeks post-treatment compared to 14% of women reporting drug use in the standard Relapse Prevention condition. Additionally, they found significantly better follow-up rates for racial/ethnic minority women in the MBRP condition versus the Relapse Prevention condition. Likewise, in a secondary analysis of a randomized controlled trial that tested MBRP versus standard Relapse Prevention, Greenfield et al., (2018) found differences in substance use outcomes depending on the racial and ethnic background of an individual. Their analyses revealed that individuals from racial/ethnic minority backgrounds had significantly lower days of drug use at 12-months post-treatment when in the MBRP condition versus the standard Relapse Prevention, with no difference between treatment type for non-Hispanic White individuals. Additionally, they found that when group composition was majority non-White, the minority individuals had lower heavy drinking days at the 12-month follow-up.

Though we are aware not of any literature that explicitly investigates disparities between racial and socioeconomic groups in non-abstinent recovery outcomes, some literature exists that suggests that differences in SUD treatment outcomes between racial groups are not exclusive to abstinent recovery. In the previously cited studies by Witkiewitz et al., (2019) and Witkiewitz, Pearson, et al. (2020), racial differences were found between recovery profiles. Specifically, non-White individuals were more likely to belong to the low-functioning infrequent heavy drinking profile than White individuals (Witkiewitz, Pearson, et al., 2020), and White individuals were more likely to belong to the high-functioning occasional heavy drinking profile versus the high-functioning infrequent heavy drinking profile (Witkiewitz et al., 2019). Perhaps most telling is a recent paper by Swan et al., (2021) that followed up on this series of studies by examining the social determinants of health that were associated with the four AUD recovery profiles

determined in Witkiewitz et al. (2019), Witkiewitz, Pearson, et al. (2020), and Witkiewitz, Wilson, et al. (2021). In this study, they found that various socioeconomic factors were significantly associated with the probability of recovery profile following treatment for AUD and that being Black was significantly associated with membership in the high-functioning infrequent drinking profile versus the high-functioning heavy drinking profile. Additionally, they found that low-functioning profiles were differentiated from high-functioning profiles based on significant differences in education, poverty, income, and health insurance. Their findings indicate that individuals from higher-resourced communities were more likely to achieve non-abstinent recovery as compared to individuals from less-resourced communities.

Given that race and socioeconomic factors are significantly associated with recovery outcomes, the current study seeks to identify if race and annual household income are associated with non-abstinent recovery outcomes.

Aims and Hypotheses of the Current Study

Given that the literature on non-abstinent recovery is limited, further quantitative examinations are warranted. In an attempt to address the specific need for further research on non-abstinent recovery for individuals with SUD other than AUD, and to further examine the role of race and socioeconomic status in non-abstinent recovery, the current study held the following aims and exploratory hypotheses:

Aim 1: Identify Non-Abstinent Recovery Profiles via Latent Profile Analysis

Using data from three randomized controlled trials of MBRP, we used latent profile analysis to quantitatively ascertain recovery profiles of functioning and substance use among individuals in MBRP and comparison conditions. Consistent with prior work we hypothesized four profiles: (1) high-functioning frequent substance using, (2) low-functioning frequent

substance using (3) high-functioning infrequent substance using, (4) low-functioning infrequent substance using.

Hypothesis 1: Consistent with prior work demonstrating the efficacy of MBRP in improving SUD outcomes, we hypothesized individuals who received MBRP would be significantly more likely than comparison conditions to be in the high-functioning profiles, regardless of the frequency of substance use.

Aim 2: Identify Racial and Socioeconomic Moderators of Non-Abstinent Recovery Outcomes

Once recovery profiles were determined, we explored the extent to which race and ethnicity (specifically, non-Hispanic White individuals versus people of color and/or of Hispanic ethnicity) and socioeconomic status (as defined by annual household income) were significantly associated with belonging to any of the four profiles (Aim 2a), and whether race/ethnicity and/or socioeconomic status moderated the association between treatment type and recovery profiles (Aim 2b).

Hypothesis 2a: Consistent with previous literature on race within recovery profiles, we hypothesized that individuals of color and/or of Hispanic ethnicity would be significantly more likely to belong to the low-functioning recovery profiles (namely profiles 2 & 4) than White individuals and that treatment would moderate the association between race/ethnicity and recovery profile, such that MBRP would increase the likelihood that individuals who are from non-dominant racial and ethnic groups would be in the high-functioning recovery profiles.

Hypothesis 2b: We hypothesize that individuals with lower-socioeconomic status as measured by annual household income would be significantly more likely to belong to the low-functioning recovery profiles (Profiles 2 & 4), than individuals with higher socioeconomic status, and that treatment would moderate the association between socioeconomic status and recovery

profile, such that MBRP would increase the likelihood that individuals who are from lower socioeconomic status would be in the high-functioning recovery profiles.

Aim 3: Identify Potential Mediators of Non-Abstinent Recovery Outcomes

Using multinomial logistic regression, we examined the mediating effects of craving, trait mindfulness, and psychological flexibility on the association of treatment and latent profiles at follow-up. Specifically, we tested whether treatment predicted the hypothesized mediating variables, which then predicted latent profile membership at follow-up.

Hypothesis 3: We hypothesized that craving, trait mindfulness, and psychological flexibility would mediate the association between treatment and latent profile membership at follow-up, such that individuals in MBRP would be more likely to be in high-functioning recovery profiles via lower levels of craving, and higher levels of trait mindfulness and psychological flexibility at post-treatment.

Method

Data Sources

The current study utilized samples from three randomized controlled trials of Mindfulness-Based Relapse Prevention (see Table 1): Bowen et al., (2009), Bowen et al. (2014), and Witkiewitz, Warner, et al., (2014). We sought to combine all three data sets to test the above hypotheses to increase sample size and power to detect differences between treatment types and racial groups and increase the generalizability of our findings.

Psychosocial functioning and substance use variables assessed at follow-up were used to determine recovery profiles. However, given the differences in follow-up time points between the trials, we used the 2-month follow-up data from Bowen et al. (2009), 3-month follow-up data from Bowen et al. (2014), and 15-week follow-up data from Witkiewitz, Warner, et al. (2014) to

chronologically align the follow-up measures as closely as possible. The mediating variables assessed at post-treatment were used to test mediation hypotheses, and all three studies assessed these mediators at post-treatment (8 weeks following baseline assessment).

Bowen et al. (2009)

This study was the first randomized controlled trial of MBRP in which the feasibility of MBRP was assessed via comparison to a treatment as usual (TAU) control. One hundred sixty-eight individuals from a non-profit treatment center were recruited to participate in the trial. Inclusion criteria were medical clearance, being between the ages of 18 and 70, fluency in English, and completion of intensive inpatient or intensive outpatient treatment for a SUD within the last two weeks. Exclusion criteria included a need for more intensive treatment, significant withdrawal risk, imminent suicide risk, diagnosis of dementia, or psychosis. Individuals were assigned to receive either eight weeks of MBRP delivered via weekly two-hour sessions or to a treatment as usual condition that included psychoeducation and 12-step facilitation. Assessments were conducted at baseline, post-treatment, 2-, and 4-months post-treatment. Substance use was measured via the Timeline Follow Back (TLFB; Sobell & Sobell, 1992). Additional measures relevant to the current study included: the Short Inventory of Problems (SIP; Bennett et al., 2009) which assessed drug use consequences, the Five Facet Mindfulness Questionnaire (FFMQ; Baer et al., 2006) which assessed participant trait mindfulness, the Acceptance and Action Questionnaire (AAQ; Hayes et al., 2004) which assessed participant acceptance versus avoidance of negative private experiences, the Penn-Alcohol Craving Scale (PACS; Flannery et al., 1999) assessed participant craving, the Addiction Severity Index (ASI; McLellan et al., 1980) which assess the severity of one's addiction on various life domains, the Severity of Dependence Scale (SDS; Gossop et al., 1995) which assess participant psychological dependence to substance

use, Beck Depression Inventory (BDI; Beck et al., 1961) which assess participant depression symptoms, Beck Anxiety Inventory (BAI; Beck et al., 1988) and Distress Tolerance Scale (DTS; Simons & Gaher, 2005) which assess participant ability to withstand distress. Results of the trial found that individuals in the MBRP condition had significantly greater reductions in substance use at the 2-month follow-up compared to those in the control condition.

For the analyses of the current study, we used demographic (race/ethnicity and annual household income at baseline), post-treatment, and 2-month follow-up assessment data. TLFB was used to establish domains of frequent substance use and infrequent substance use via the number of drinking days (DD) and drug use days (DUD) measured at follow-up. We sought to establish psychosocial functioning domains via follow-up SIP, ASI, SDS, BDI, BAI, and DTS measures. Additionally, post-treatment AAQ, PACS, and FFMQ were used to examine the potential mechanisms that lead to non-abstinent recovery.

Bowen et al. (2014)

This study was a randomized clinical trial that assessed the efficacy of MBRP compared to Cognitive-Behavioral Relapse Prevention (RP) and TAU. Two hundred eighty-six individuals were recruited from two community substance use treatment facilities that provided inpatient treatment, intensive outpatient treatment, detoxification, and standard aftercare services for individuals with SUD. Inclusion criteria included being over the age of 18, English fluency, medical clearance, agreement to random assignment of condition, and completion of initial intensive outpatient or inpatient treatment. Exclusion criteria included a diagnosis of a psychotic disorder, dementia, suicidality, being a danger to others, or previous participation in MBRP trials. Individuals were assigned to one of the three treatment conditions via random assignment. All interventions were in a group format. The MBRP condition consisted of weekly two-hour

groups for eight weeks centered on teaching the skills of mindfulness. The RP condition mirrored the MBRP condition in time and length but covered topics such as managing high-risk situations, coping skills, etc. The TAU condition included psychoeducation and 12-step facilitation and was the same TAU condition tested in the Bowen et al (2009) trial. Assessments were conducted at baseline, post-treatment, 3-, 6-, and 12-months post-treatment. Substance use was measured via TLFB. Additional measures relevant to the current study included the SIP, FFMQ, PACS, AAQ, ASI, SDS, BDI, BAI, DTS, and the PTSD Checklist (PCL; Blevins et al., 2015) which was used to assess for participant PTSD symptoms. Results found that individuals in the MBRP and RP conditions had significantly lower substance use at all time points compared to TAU and that those in the RP condition had the longest period of abstinence before their first drug use compared to MBRP and TAU. Additionally, participants in the MBRP condition had significantly fewer days of heavy drinking and drug use days compared to those in RP and TAU.

For the analyses of the current study, we used demographic data (race/ethnicity and annual household income at baseline), post-treatment, and 3-month follow-up assessment data. TLFB was used to establish domains of frequent substance use and infrequent substance use, once again via DD and DUD measured at follow-up. We again sought to establish psychosocial functionality domains via follow-up SIP, ASI, SDS, BDI, BAI, DTS, and PCL scores. Additionally, the post-treatment AAQ, PACS, and FFMQ were used to examine the mechanisms of change that lead to non-abstinent recovery.

Witkiewitz, Warner, et al. (2014)

This study was a randomized controlled trial that examined the efficacy of MBRP compared to RP for legal system-involved women. One hundred-five women were recruited

from a residential addiction treatment program. These women were referred by the criminal legal system to complete residential treatment for SUD. Inclusion criteria included English proficiency, agreement to random assignment of condition, and residency at the treatment program. Women were recruited to the study near the end of the detoxification stage of the treatment program. All participants were randomly assigned to one of the two treatment conditions. The MBRP condition was conducted as an 8-week rolling group for two hours per week. The content of the MBRP group mirrored those in previous MBRP trials (see Bowen et al., 2009 and Bowen et al., 2014). RP groups were also conducted via group format. The content of the groups centered on teaching participants coping skills, managing craving, high-risk situations, etc. Assessments were administered at baseline, 4 weeks following the start of treatment, post-treatment, and 15 weeks following post-treatment. Substance use was measured via the TLFB. Additional relevant measures for the current study included the AAQ, PACS, SIP, ASI, SDS, and PCL. Results found a statistically significant difference between those assigned to RP versus MBRP in both drug use days and drug use consequences with individuals in the MBRP condition reporting the least amount of substance use and consequences. Importantly, however, there was a low rate of substance use overall in the sample with only six individuals reporting substance use at the 15-week follow-up.

For the analyses of the current study, we intend to use demographic data (race/ethnicity), post-treatment, and the 15-week follow-up assessment data. TLFB was used to establish domains of frequent substance use and infrequent substance use, once again via DD and DUD measured at follow-up. Psychosocial functioning domains were established via follow-up SIP, ASI, SDS, and PCL measures. Additionally, the AAQ and PACS measured at post-treatment (2-month follow-up) were used to test potential mechanisms of change that lead to non-abstinent recovery.

Participants

Demographics

Demographic information relevant to the current analyses includes gender, age, race, ethnicity, and annual household income collected at baseline. The demographic makeup of the current study when including data from all three clinical trials was 58% Non-Hispanic/White and 45% Female, with a mean age of 38.5 (SD = 10.23). Only Bowen et al. (2009) and Bowen et al. (2014) reported annual household income. Across those two trials, 76.5% of the sample reported less than \$15,000 annual household income. The most common primary drug of choice across the three samples was alcohol (42.2%), followed by methamphetamine (20.51 %) and cocaine (19.22%), respectively. Only two studies reported whether participants had problematic polysubstance use (Bowen et al., 2009 and Bowen et al., 2014) with 51.32% of participants reporting problematic poly-substance use within those two trials. Table 1 displays additional demographic information by clinical trial.

Measures

Substance Use

For the current study, substance use was measured by the TLFB. The TLFB is a time-based tool that allows clinicians and researchers to attain self-reported quantitative estimates of the quantity and frequency of use for various substances over the previous 90-day period. Previous literature has indicated support for the TLFB as a robust indicator of recent engagement in substance use (Hjorthøj et al., 2012). All three randomized trials included TLFB measures. Follow-up TLFB scores across all three studies were used in the current analyses. Specifically, TLFB was used to quantify the number of drinking days and drug use days at follow-up. However, due to differences in follow-up across the three trials, the 2-month, 3-month, and 15-

week follow-up TLFB outcomes were included in the analyses from Bowen et al. (2009), Bowen et al. (2014), and Witkiewitz, Warner, et al. (2014), respectively, as indicators of substance use near 2-3 months following the end of treatment.

Psychosocial Functionality

We sought to quantify psychosocial functioning via the SIP, ASI, SDS, BDI, BAI, DTS, and PCL. All three parent trials administered the SIP, ASI, and SDS. Only Bowen et al. (2009) and Bowen et al. (2014) administered the BDI, BAI, and DTS. Likewise, only Bowen et al. (2014) and Witkiewitz, Warner, et al. (2014) administered the PCL.

Short Inventory of Problems. The SIP is a self-report assessment tool that measures the consequences of substance use across various domains of life (e.g., interpersonal consequences, intrapersonal consequences, physical health consequences, financial consequences, etc.). A strong body of literature supports SIP as a robust measure of substance use consequences across various populations and SUD (Kiluk et al., 2013). For the purposes of the current study, we sought to use the 2–3-month follow-up SIP scores (2-month, 3-month, and 15-week follow-up for Bowen et al. [2009], Bowen et al. [2014], and Witkiewitz, Warner, et al. [2014], respectively). The SIP indicates strong reliability within the parent trials (MacDonald's $\omega = 0.983$).

Addiction Severity Index. The ASI is a self-report assessment tool that measures the severity and impact of one's addiction on various life domains. The ASI is broken down into seven subdomains: medical status, employment, and support, drug use, alcohol use, legal status, family/social status, and psychiatric status (McLellan et al., 1980). For the purposes of the current study, we sought to use follow-up ASI scores as an indicator of psychosocial functioning. The ASI indicates moderate reliability within the parent trials (MacDonald's $\omega = 0.731$).

Severity of Dependence Scale. The SDS is 5-item self-report assessment tool used to assess aspects of psychological dependence within individuals with SUD (Gossop et al., 1995). In the current study, we sought to use follow-up SDS scores as an indicator of psychosocial functioning. The SDS indicates strong reliability within the parent trials (MacDonald's $\omega = 0.911$).

Beck Depression Inventory. The BDI is a self-report assessment tool used to assess the severity of one's depressive disorder symptoms (Beck et al., 1961). For the purposes of the current study, we sought to use the 2- and 3-month follow-up BDI scores from Bowen et al. (2009) and Bowen et al. (2014), respectively. The BDI indicates strong reliability across the parent trials (MacDonald's $\omega = 0.939$).

Beck Anxiety Inventory. The BAI is a self-report assessment tool used to assess the severity of one's anxiety disorder symptoms (Beck et al., 1988). For the purposes of the current study, we sought to use the 2- and 3-month follow-up BAI scores from Bowen et al. (2009) and Bowen et al. (2014), respectively. The BAI indicates strong reliability across the parent trials (MacDonald's $\omega = 0.967$).

Distress Tolerance Scale. The DTS is a 15-item self-report assessment tool used to assess one's current level of distress and ability to cope with distress (Simons & Gaher, 2005). For the purposes of the current study, we sought to use the 3-month follow-up DTS scores from Bowen et al. (2014). The DTS indicates strong reliability within the parent trial (MacDonald's $\omega = 0.937$).

PTSD Checklist. The PCL is a self-report assessment tool used to assess the severity of one's post-traumatic stress disorder symptoms (Blevins et al., 2015). For the purposes of the current study, we sought to use the 15-week and 3-month follow-up PCL scores from

Witkiewitz, Warner, et al. (2014) and Bowen et al. (2014), respectively. The PCL indicates strong reliability within the parent trials (MacDonald's $\omega = 0.941$).

Mechanisms of Behavior Change Measures

The current study sought to examine three potential MOBCs: mindfulness, acceptance/psychological flexibility, and craving.

Mindfulness. Various assessment tools for participant trait mindfulness (sometimes referred to as dispositional mindfulness) were used across the three parent studies. Bowen et al. (2009) and Bowen et al. (2014) used the Five-Facet Mindfulness Questionnaire (FFMQ; Baer et al., 2008) to assess trait mindfulness while Witkiewitz, Warner, et al. (2014) used the Freiburg Mindfulness Inventory (FMI; Walach et al., 2006). Both the FFMQ and FMI are self-report measures of trait mindfulness and have been found to be reliable and valid measures of trait mindfulness across various populations (Baer et al., 2008; de Bruin et al., 2012; Karatepe & Yavuz, 2019; Sauer et al., 2013). The FFMQ consists of 39 self-reported items with Likert responses formats ranging from 1 (totally disagree) to 5 (totally agree). The FFMQ further assesses five sub-facets of mindfulness: observing, describing, acting with awareness, non-judgment, and non-reactivity. Mindfulness was measured at baseline, post-treatment, and follow-up across all three parent studies. For the purposes of the current analyses, we only used FFMQ scores from Bowen et al. (2009) and Bowen et al. (2014) to ascertain measures of mindfulness at post-treatment. Specifically, post-treatment FFMQ total scores were used to examine if trait mindfulness at post-treatment mediates the association between treatment and recovery profile at follow-up. The FFMQ indicates strong reliability within the parent trials (MacDonald's $\omega = 0.911$).

Acceptance. The Acceptance and Action Questionnaire (AAQ) was used across each parent study. The AAQ is a seven-item self-report questionnaire that assesses participant psychological flexibility. Since its development in 2004, the AAQ has been one of the most commonly used measures of psychological flexibility across the psychological literature (Bond et al., 2011; Fledderus et al., 2012). For the purposes of the current study, we sought to use psychological flexibility measured at post-treatment from each parent trial. Specifically, post-treatment AAQ scores were used to examine if psychological flexibility at post-treatment mediates the association between treatment and recovery profile at follow-up. The AAQ indicates moderate reliability within the parent trials (MacDonald's $\omega = 0.777$).

Craving. The Penn-Alcohol Craving Scale (PACS; Flannery et al., 1999) was used across each parent study to measure participants' craving to use substances. The PACS is a 5-item self-report questionnaire that is widely used across the alcohol and substance use literature (Hartwell et al., 2019). It has been found to be a robust measure of one's craving for substances. For the current study, we used participants' reports of craving via the PACS measured at post-treatment for all three parent trials. Specifically, post-treatment PACS scores were used to examine if craving at post-treatment mediates the association between treatment and recovery profile at follow-up. The PACS indicates strong reliability within the parent trials (MacDonald's $\omega = 0.911$).

Statistical Analyses

Latent Profile Analysis

The first aim of the current study was to quantitatively determine recovery profiles for individuals with SUD following engagement in MBRP, RP, and a TAU condition, and in doing so define non-abstinent recovery within these data. To this end, we used latent profile analysis

(LPA) to empirically derive distinct profiles of recovery from SUD following engagement in outpatient aftercare treatment.

LPA is an exploratory mixture modeling approach that is used to examine heterogeneous phenotypes/subgroups within observed continuous data (Goodman, 1974). It is commonly used across disciplines to quantitatively define latent subpopulations (Berlin et al., 2014). Latent profiles are determined based on the relationship between continuous indicator variables (e.g., variables that operationally define substance use and variables that operationally define functionality – as in the case of the current study). LPA assumes that unobserved subgroups within the observed data generate patterns of responses to the indicator variables that define the latent profiles. In LPA, two sets of parameters are estimated: (1) the probability of endorsing specific indicators given membership to a latent profile (i.e., item-response probabilities), and (2) the item-response means given the latent profile categorization (Peugh & Fan, 2013). These item-response means are then used to define the latent profiles/subgroups based on the patterns of item responses.

The current study sought to replicate the 4-profile solution of recovery profiles found in Witkiewitz et al., (2019), Witkiewitz, Pearson, et al., (2020), Witkiewitz, Wilson, et al., (2021), and Swan et al. (2021) across the three parent trials. Specifically, we sought to delineate these profiles via the frequency of substance use outcomes, specifically the number of drinking days and the number of drug use days at follow-up, and psychosocial functioning as defined via the SIP, ASI, SDS, BDI, BAI, DTS, and PCL. Based on prior work we hypothesized four profiles would provide a reasonable fit, characterized by (1) high-functioning frequent substance using, (2) low-functioning frequent substance using (3) high-functioning infrequent substance using, (4) low-functioning infrequent substance using. Frequent and infrequent substance use was

operationalized as the number of drinking days (DD) and the number of drug use days (DUD) reported over the last 90-day period as measured via the TLFB at follow-up. Likewise, high and low functionality was operationalized via scores across the SIP, ASI, SDS, BDI, BAI, DTS, and PCL measured at follow-up. Being in non-abstinent recovery was operationally defined as belonging to Profile 1 or Profile 3 in which recovery is strictly determined based on one's functioning and non-abstinence refers to one's continued (though potentially reduced/moderated) use of substances.

Model fit was assessed via the Bayesian Information Criteria (BIC) where a lower BIC score indicates a better fitting model and via the likelihood ratio test (LRT). The LRT will measure how much more likely the data would be under an alternative model with one fewer profile, with a significant LRT indicating a rejection of the model with one fewer profile (Vuong, 1989). Specifically, we hypothesized that the LRT would reject the 2- and 3-profile solutions, in favor of the four-profile model, and that the LRT would fail to reject the 4-profile solution, in comparison to a 5- and 6-profile solution. Additionally, we evaluated latent profile classification precision using model entropy. We examined how well individual cases fit within latent profiles based on case probability of belonging to each latent profile. A model entropy value of 0.80 or greater was considered good classification (Nylund et al., 2007). The current LPA utilized robust maximum likelihood estimation to include all available data across the three data sets under the assumption that any missing data are missing at random. Covariates include gender (male, female, other) and age.

Multinomial Logistical Regression

Multinomial logistical regression is a statistical technique that uses maximum likelihood estimation to test the probability of two dichotomous or continuous independent factors (e.g.,

RP/TAU vs. MBRP, non-Hispanic White vs. person of color and/or of Hispanic ethnicity) belonging to more than two categorical dependent variables (e.g., latent profiles; Kwak & Clayton-Matthews, [2002]). Multinomial logistic regression does not assume normality, linearity, or homoscedasticity of data but does assume independence among dependent variables – leaving it well suited for the current study aims.

The current study utilized multinomial logistic regression to examine whether MBRP vs other treatments (Aim 1) and race/ethnicity (Aim 2a) were significantly associated with the latent profile classification. Additionally, multinomial logistic regression was used to examine whether there was a treatment by income and treatment by race/ethnicity interaction on latent profiles (Aim 2b).

Due to the low number of racial minorities per racial category (see Table 1), the current study defined race/ethnicity across two levels: (1) White and non-Hispanic; (2) person of color and/or of Hispanic ethnicity. Likewise, socioeconomic status (operationalized via annual household income) was defined across two levels: (1) individuals reporting an annual household income between \$0 - \$5000; (2) individuals reporting an annual household income of \$5000 or more.

Mediation via Multinomial Logistic Regression. The third aim of the current study was to examine potential mechanisms of change that promote non-abstinent recovery for individuals with SUD following engagement in MBRP and RP. To this end, we again utilized multinomial logistic regression to test whether there was a significant association between treatment condition (i.e., MBRP versus RP or TAU) and mediating variables (a-path), which in turn was associated with latent recovery profile membership (b-path). The products of coefficients approach, which multiplies the $a*b$ paths, was used to test the significance of the mediated (i.e., indirect) effect,

with bootstrapping to assess 95% confidence intervals of the mediated effect (MacKinnon, 2008).

For the current study, three potential mediating variables were examined to assess the relationship between treatment and follow-up latent profile: (1) craving, as measured by PACS, (2) dispositional/trait mindfulness, as measured by the FFMQ, and (3) psychological flexibility, as measured by the AAQ. Specifically, we examined whether higher trait mindfulness and psychological flexibility, and lower craving, independently predicted latent profile membership, and whether these mediating variables explained the association between treatment type and latent profiles. We hypothesized that individuals with lower craving and higher mindfulness and psychological flexibility at posttreatment would have a higher likelihood of being assigned to the higher functioning profiles.

All data sets were cleaned and aggregated in IBM SPSS Statistics version 28.0.0.0 (190; Field, 2013) and all analyses were conducted in *Mplus* version 8.8 (1; Muthén & Muthén, 2017).

Results

Initial Model Testing

Initial latent profile analyses that included data from all three datasets resulted in model non-identification and/or poor entropy with all attempted 2- through 6-profile solutions. Model diagnostics indicated problems with the indicators from the Witkiewitz, Warner, et al. (2014) data. As such, we opted to remove these data and instead conducted analyses with a single aggregated dataset comprised of data from Bowen et al., (2009) and Bowen et al., (2014).

Descriptive Statistics of Final Analyzed Sample

Table 2 displays descriptive statistics for the final analyzed sample (N = 453). Of the final sample of participants, 30% were female, 50.1% identified as non-Hispanic White, and had

an average age of 39.24 years ($SD = 10.73$). At baseline, 60% of the sample reported an annual income between \$0 - \$4,999 with 3.8% of the sample reporting an annual income of greater than \$20,000. Regarding treatment assignment, 196 received MBRP, 163 received RP, and 94 were randomized to TAU. Of the total sample, only 180 participants had no missing data on any included measures at baseline and follow-up.

Latent Profile Analysis

Profile Enumeration

Poor model fit and continued model non-identification for the 2-, 3-, 4-, 5-, and 6-profile solutions when comprised of all psychosocial functioning outcomes led us to systematically remove various psychosocial functioning variables until an identifiable model with appropriate model fit was derived. Though we intended to include the ASI, PCL, and DTS as indicators of psychosocial functioning, including these measures as indicators in our models resulted in model non-identification and/or poor model entropy (entropy $< .80$). Once these indicators were removed, we arrived at a 4-profile solution by which we retained drinking and drug use days as indicators of substance use frequency, and psychosocial functioning was defined via the SDS, SIP, BDI, and BAI. When retaining these indicators, we were able to produce models that were identifiable, with some models retaining acceptable model entropy (entropy $\geq .80$), Superior model fit as defined by the LRT, BIC, and model entropy, as well as parsimony, and overall interpretability of the 4-profile solution led us to select this solution over the 2-, 3-, 5-, and 6-profile solutions comprised of the same profile indicators. LRT supported the 4-profile solution (LRT = -3947.89, $p = 0.004$), over the 5- and 6-profile solutions, and BIC supported the 4-profile solution (BIC = 7937.519) over the 2- and 3-profile solutions. BIC, LRT, and entropy for all tested models are presented in Table 3.

Profile Interpretation

Table 4 presents the standardized scores for the psychosocial and substance use indicators across each of the four profiles. The classification precision of the 4-profile solution was acceptable (entropy = 0.848). Individuals with expected classification in Profile 1 (6.79% of the total sample), which we named the “high-functioning frequent substance using” profile, reported comparatively more frequent days of drug and alcohol use and comparatively lower levels of depression and anxiety, substance use consequences, and dependence severity as measured via the BAI, BDI, SIP, and SDS respectively. Individuals with expected classification in Profile 2 (9.56% of the total sample), which we named the “low-functioning frequent substance using” profile, reported comparatively more frequent days of drug and alcohol use and comparatively higher levels of depression and anxiety, substance use consequences, and dependence severity. Individuals with expected classification in Profile 3 (75.66% of the total sample), named the “high-functioning infrequent substance using” profile, reported comparatively less frequent days of drug and alcohol use and comparatively lower levels of depression and anxiety, substance use consequences, and dependence severity, while those with expected classification in Profile 4 (7.99% of the total sample), which we named the “low-functioning infrequent substance using” profile, reported less frequent days of drug and alcohol use, and higher levels of depression and anxiety, substance use consequences, and dependence severity. Figure 1 depicts the four latent profiles by indicator type.

Multinomial Logistic Regression

Multinomial logistic regression was used to test the association of each latent profile (Profiles 1 – 4 described above) with treatment assignment (Hypothesis 1), race and ethnicity (Hypothesis 2A), and socioeconomic status (Hypothesis 2B). Further, we examined whether

treatment assignment moderated the effect of race and ethnicity (Hypothesis 2A) and socioeconomic status (Hypothesis 2B) on profile membership. Finally, we sought to test whether craving, trait mindfulness, and psychological flexibility mediated the association between treatment assignment and profile membership (Hypothesis 3). We included age and gender as covariates in all models.

Hypothesis 1. To test hypothesis 1, we examined the association of treatment (MBRP, RP, or TAU) on profile membership using the four-profile solution described above. Given our hypothesis that individuals assigned to MBRP would be more likely to belong to the high-functioning profiles (Profiles 1 and 3), we coded treatment assignment such that MBRP was the reference treatment. In doing so, we found no significant association between treatment assignment and profile when controlling for age and gender, as shown in Table 5, thus disconfirming hypothesis 1.

Hypothesis 2A. Based on our hypothesis that persons of color (i.e., belonging to non-White racial groups and/or of Hispanic ethnicity) would be more likely to belong to the low-functioning profiles (Profiles 2 and 4), we coded race and ethnicity as a binary predictor of profile membership in which we compared non-Hispanic white individuals to individuals of color and/or Hispanic ethnicity. We then tested the association of race and ethnicity on recovery profile. Results indicated no significant association between race/ethnicity and recovery profile when controlling for age and gender, as shown in Table 5. We further examined whether treatment assignment partially moderated the effect of race/ethnicity and profile membership. As shown in Table 5, there was no significant partial moderating effect of treatment assignment on race/ethnicity and profile membership when controlling for age and gender. These results thus disconfirm Hypothesis 2A.

Hypothesis 2B. Given our hypothesis that individuals with lower-socioeconomic status (operationalized as self-reported baseline annual income) would be more likely to belong to the low-functioning profiles (Profiles 2 and 4), we coded income as a binary predictor of latent class membership by which individuals who reported a baseline annual income between \$0 - \$4999 were compared to individuals who reported annual income of \$5000 or more per year. We then examined socioeconomic status as a covariate predictor of profile membership. Results indicate no significant association between socioeconomic status, as defined by income, and latent profile membership when controlling for age and gender, as shown in Table 5. We then examined if treatment assignment partially moderated the effect of socioeconomic status and profile membership. As shown in Table 5, there was no significant partial moderating effect of treatment assignment on socioeconomic status and profile membership when controlling for age and gender, thus disconfirming Hypothesis 2B.

Hypothesis 3. We further examined the partial mediating indirect effects of craving, trait mindfulness, and psychological flexibility on the direct effect between treatment assignment and profile membership in three separate models controlling for age and gender. As shown in Table 6, we found no evidence of partial mediation for either craving, trait mindfulness, or psychological flexibility on the association of treatment assignment and profile membership. Failure to identify partial mediation disconfirmed Hypothesis 3. However, we did find a significant direct effect of trait mindfulness on latent profile membership for Profile 2 compared to Profile 1 and Profile 3, such that individuals in the “low-functioning frequent substance using” profile (Profile 2), had significantly lower trait mindfulness than individuals in the “high-functioning frequent substance using” (Profile 1) and “high-functioning infrequent substance using” profiles (Profile 3).

Discussion

Despite decades of perpetuating the myth that abstinence is the only viable treatment outcome for individuals with SUD (Mayock & Butler, 2021), there is growing recognition of a more holistic definition of recovery, where improvements in quality of life, meaning, and fulfillment are seen as the key indicators of success following SUD treatment (Hagman et al., 2022; Tucker & Witkiewitz, 2022). The adoption of such a definition respects the dignity and autonomy of people who use substances (Ashford et al., 2019), actively works against the harms of stigma caused by racist drug policies (Ahern et al., 2007; Young et al., 2005), acknowledges the reality that there are many pathways to recovery (Tucker & Witkiewitz, 2022; Witkiewitz, Montes, et al., 2020), and empowers individuals to co-create their own path to wellbeing whether or not they choose to be abstinent (Körkel, 2021). To this end, the purpose of the current study was to quantitatively examine non-abstinent recovery in a sample of individuals with various types of substance use disorders. We sought to replicate profiles of recovery identified in the AUD literature that differed on the bases of substance use frequency and psychosocial functioning (Swan et al., 2021; Witkiewitz et al., 2019; Witkiewitz, Pearson, et al., 2020; Witkiewitz, Wilson, et al., 2021). We also aimed to explore the potential influence of treatment type on these recovery profiles, as well as evaluate the moderating effects of race/ethnicity and socioeconomic status on this association. Additionally, we sought to investigate whether previously identified mechanisms of change, specifically craving, psychological flexibility, and trait mindfulness, mediate the association between treatment type and recovery profile.

We replicated the four recovery profiles previously identified in the AUD literature, though notably, we did so in an outpatient sample of individuals with various, and sometimes co-occurring, SUD (see Table 4 and Figure 1). To our knowledge, this is the first time these profiles

have been enumerated in a sample that did not primarily consist of individuals with AUD. Of note, when operationalizing psychosocial functioning, rather than abstinence, as the key indicator of recovery, a majority of the sample (82.45%) achieved comparative recovery (Profiles 1 & 3), with a subset of these individuals (6.79%) continuing to engage in frequent substance use (Profile 1). We also found evidence for a profile of individuals that abstained or used substances infrequently but did not experience comparatively high psychosocial functioning (Profile 4; 7.99%). These findings offer two key takeaways that align with existing literature: (1) recovery is possible whether or not one abstains (Hasin et al., 2017; Tucker & Witkiewitz, 2022; Witkiewitz, Wilson, et al., 2021), and (2) abstinence does not necessarily result in recovery (Eddie et al., 2022; Swan et al., 2021; Witkiewitz, Pearson, et al., 2020). This suggests that SUD treatment programs that are based on an abstinence-only approach may not be beneficial for individuals who do not require or desire abstinence (Probst et al., 2015), and for those who do not experience better mental health outcomes even after abstaining, these programs are limited and ineffective (Tucker & Simpson, 2011; Wilson et al., 2016). Taken together, by replicating these four profiles in a sample of individuals with various SUD, we add to the growing literature which recognizes non-abstinent recovery as a viable SUD treatment outcome and reiterates that abstinence-only frameworks are not the only answer (Witkiewitz & Tucker, 2020).

Despite evidence that MBRP is more effective than RP in targeting co-occurring mood disorders (Roos et al., 2017), we did not find any evidence that treatment type was a predictor of recovery profile. Failure to support this hypothesis garners that these treatments are equivalent regardless of the type of recovery an individual attains (i.e., whether abstinent or non-abstinent). This finding aligns with previous literature which presents recovery as an individual process informed by one's goals, values, and greater life context (Witkiewitz, Montes, et al., 2020).

Likewise, this finding suggests that the processes by which recovery is achieved are applicable regardless of whether one desires abstinence, and may be shared across differing treatments. In other words, it is not the treatment that determines the form of recovery one attains, and rather that individuals can achieve recovery regardless of treatment type.

This is particularly interesting when viewed in light of the literature on treatment equivalency (Mechanisms of Behavior Change Satellite Committee, 2018). It was discoveries like this that initially sparked our field's interest in the mechanisms of behavior change more broadly (Kazdin, 2007). Based on the evidence that treatments for SUD are just as effective regardless of the philosophical and practical approaches used (Magill et al., 2015, 2020), the field has shifted its focus away from evidence-based manuals and toward the evidence-based process of change (Hayes et al., 2022). The failure of the present study to support one form of treatment over another in predicting recovery profile fits well within the larger context of this literature. The definition of recovery that we are arguing for, one that centers wellbeing and quality of life, does not seem to resolve the phenomena of treatment equivalency. This is but another reason why continued research on the mechanisms of change is essential for the amelioration of suffering resulting from addiction. While we should learn what best facilitates recovery, for whom, and in what context (i.e., contextually-sensitive processes of change), it matters most where one is going (i.e., towards a life of greater meaning and fulfillment) than how exactly one gets there (i.e., whether through MBRP, RP, or TAU).

The current study did however seek to identify mechanisms of behavior change that may facilitate recovery regardless of substance use frequency. However, we failed to find evidence for partial mediation of craving, trait mindfulness, or psychological flexibility in predicting the association between treatment type and recovery profile. This finding, which was contrary to our

hypotheses, may be explained by the failure of treatment type to predict recovery profile in the first place (as explained above). But it is also possible that these mechanisms of change may not be the most salient processes for this population, or for these specific treatments (Magill et al., 2020; Witkiewitz, Lustyk, et al., 2013). For example, there may be confounding variables of which we did account that may better explain any association between treatment type and recovery profile (e.g., self-efficacy; Moniz-Lewis et al., [2022]). Further, we are limited in our ability to examine the extent to which these potential processes of change may be relevant or irrelevant depending on the context of the individual. Without appropriate methods to test interactions among multi-level factors (e.g., individual, community, etc.), such questions remain beyond the scope of precision medicine approaches to SUD treatment (Chang et al., 2021; Lamont et al., 2018).

However, we did find that individuals with expected classification in the low-functioning frequent substance using profile (Profile 2) reported significantly lower levels of trait mindfulness than individuals with expected classification in the high-functioning profiles (Profiles 1 & 3). This finding aligns with existing research that has found mindfulness to be inversely correlated with symptoms of anxiety and depression (two key features of our psychosocial functioning indicator; Hofmann et al., [2010]), and to improve psychosocial functioning overall (Bowlin & Baer, 2012; Goyal et al., 2014). Mindfulness may also be a protective factor against the development of severe consequences resulting from substance use, meaning that individuals with higher levels of mindfulness are less likely to use substances in ways that cause harm (Chiesa & Serretti, 2014; Vinci et al., 2020). For example, a recent study of young adults found that certain facets of mindfulness such as acting with awareness and non-judgment, were linked to lower levels of alcohol-related consequences, but not the amount of

alcohol consumed (Single & Keough, 2021). Similar evidence for mindfulness as a protective factor has been found in both clinical and community samples who engage in substance use (Brett et al., 2018; Fernandez et al., 2010; Frohe et al., 2020; Wisener & Khoury, 2019), so much so that entire treatments for SUD are based upon teaching individuals to practice mindful substance use to decrease the risk of adverse effects (Brewer et al., 2011). However, due to our inability to establish causation in this study, future research is needed to verify whether this correlational finding can be causally explained (MacKinnon et al., 2002; Tofighi et al., 2019).

Despite our research not finding a link between race, ethnicity, or socioeconomic status (as measured by annual household income) and a person's expected profile classification, studies on non-abstinent recovery from AUD have found otherwise (e.g., Swan et al., 2021). This difference may be due to our selection of variables which poorly capture the constructs most associated with SUD treatment disparities (Guerrero et al., 2017; Jackson et al., 2022; Reskin, 2012). For example, to measure socioeconomic status, we divided the sample into two groups: those who reported an income of \$0 - \$5000 and those who reported an income of \$5000 or more. This was because of a small sample size (less than 12%) who reported an annual household income of \$15000 or more, and a comparatively larger sample (60%) reported an annual income of less than \$5000, thus causing a lack of statistical power. More research with larger samples and more detailed measures of socioeconomic status is needed to further understand potential SUD treatment disparities. We also had to compare non-Hispanic white individuals to individuals of color and/or Hispanic ethnicity due to the same lack of statistical power. This binary comparison of racial and ethnic minorities may obscure potential differences that would otherwise be revealed by superordinate constructs, such as economic inequality, generational trauma, and systematic racism, which may be most associated with disparities in

SUD treatment outcomes (Farahmand et al., 2020; Marsh et al., 2015; Probst et al., 2020).

Therefore, future research that can better capture these superordinate constructs and account for unique differences across and between minoritized groups is needed to advance our understanding of the contextual features of recovery for individuals from non-dominant groups.

Notwithstanding those already mentioned, the present study is not without further limitations. Importantly, this study utilized exploratory secondary data analysis to test our hypotheses regarding recovery profiles and associated mediators and moderators. Future research that makes use of rigorous methodological designs that directly test each of these hypotheses with sufficient statistical power is warranted. For example, longitudinal designs that follow the trajectory of individuals who identify non-abstinent recovery as their desired outcome a priori would better inform the viability of and processes associated with this form of recovery. Further, such a design would allow the comparison of pre- and post-treatment substance use and psychosocial functioning among individuals in each profile to better delineate how individuals may change across these dimensions over time – another limitation of the present study.

The current study is further limited by the measures used to define the indicators of the recovery profiles. We relied on self-report measures to define our profile indicators, which may not have accurately captured the constructs of psychosocial functioning and substance use frequency as intended. Further, it is necessary to examine the extent to which the experiences of individuals in recovery converge with quantitative measures of recovery used here (Ashford et al., 2019). To this end, future research should utilize mixed methods, incorporating objective measures, collateral verification, and input from the recovery community, to provide a more comprehensive and accurate assessment of recovery.

Additionally, the measures used to define psychosocial functioning (specifically the BAI, BDI, SIP, and SDS) differed from those in previous literature (Swan et al., 2021; Witkiewitz et al., 2019; Witkiewitz, Pearson, et al., 2020; Witkiewitz, Wilson, et al., 2021). Nonetheless, we still replicated the same four recovery profiles. This replication suggests that a superordinate construct of psychosocial functioning may adequately approximate, or at least correlate with, the measures used in this study and those prior. However, without future research that tests the factor structure of psychosocial functioning via the variables included in this study, and others, this possibility remains unknown. Moreover, previous studies that examined four profiles of recovery did so at a 3-year follow-up, whereas the current study utilized the 2- and 3-month follow-up data to replicate these same profiles. Future research would benefit from examining these profiles at various time points to further explore the relationship between both short- and long-term psychosocial functioning, substance use frequency, and associated recovery profiles.

While the literature on non-abstinent recovery is in its infancy, the lived experiences and stories of resilience from individuals who have achieved recovery despite non-abstinence are not (Tucker & Witkiewitz, 2022; Witkiewitz, Montes, et al., 2020). Against the unjust backdrop of the war on (people who use) drugs, it is time that our field disabuses itself from the myth of abstinence and empowers individuals healing through addiction to define, co-create, and walk their path to greater wellbeing. Doing so not only allows treatments for SUD to be more inclusive (Probst et al., 2015), but most importantly, it allows individuals to find for themselves what makes recovery worth it. The present study, which has yet again quantitatively verified the existence of non-abstinent recovery, this time for individuals with various SUD, is an invitation to those both walking the path to recovery, and those with the privilege to walk alongside, to destigmatize the use of substances and embrace human wellbeing as the central target of

treatment. By uplifting this new paradigm, we prize the autonomy and dignity of all people – whether abstinent or non-abstinent.

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Appendix

Table 1.
Demographic Makeup of All Three MBRP Parent Trials

Trial	N	Sex (% Male)	Race/Ethnicity (% Non-Hispanic White)	Income (% <\$15k)	Primary SUD	Measures
Bowen et al. (2009)	168	64%	55%	78.4%	Alcohol: 46.3% Cocaine: 26.3% Methamphetamine: 12.0%	TLFB; SIP; AAQ; PACS; ASI; SDS; FFMQ; BDI; BAI; DTS
Bowen et al. (2014)	286	71%	58%	74.6%	Alcohol: 49.3% Cocaine: 12.3% Methamphetamine: 12.0%	TLFB; SIP; AAQ; PACS; ASI; FFMQ; SDS; BDI; BAI; DTS; PCL
Witkiewitz et al. (2014)	105	0%	62%	N/A	Methamphetamine: 35.5% Heroin/Opiates: 22.6% Cocaine: 19.5%	TLFB; SIP; AAQ; PACS; ASI; SDS; PCL
Total	559	55%	58%	76.5%	Alcohol: 42.20% Methamphetamine: 20.51% Cocaine: 19.22%	

Note. N = Sample Size; Income = percent below \$15,000 baseline annual household income; Primary SUD = top three most common primary drugs of choice by percent type; Measures = measures that were intended to be included in proposed analyses; TLFB = Timeline Follow-Back; SIP = Short Inventory of Problems; AAQ = Acceptance and Action Questionnaire; PACS = Penn Alcohol and Craving Scale; ASI = Addiction Severity Index; SDS = Severity of Dependence Scale; FFMQ = Five-Facet Mindfulness Questionnaire; BDI = Beck Depression Inventory; BAI = Beck Anxiety Inventory, DTS = Distress Tolerance Scale; PCL = PTSD Checklist; **Bold font** indicates measure is shared across all three parent trials.

Table 2.*Descriptive Statistics of Final Analyzed Sample*

	% of Overall Sample	Mean (S.E.)	SD	Median
MBRP	43.3	—	—	—
RP	36.0	—	—	—
TAU	20.7	—	—	—
Male	67.8	—	—	—
Female	30.9	—	—	—
Non-Binary	0.2	—	—	—
Hispanic	8.8	—	—	—
Non-Hispanic	90.9	—	—	—
Black	24.7	—	—	—
American Indian/Alaskan Native	7.5	—	—	—
Asian	0.4	—	—	—
Hawaiian/Pacific Islander	0.7	—	—	—
Other/Mixed Race	14.3	—	—	—
^a \$0 - \$4999	60.0	—	—	—
^a \$5000 - \$9999	9.7	—	—	—
^a \$10000 - \$14999	5.1	—	—	—
^a \$15000 - \$19999	4.0	—	—	—
^a \$20000 - \$34999	4.6	—	—	—
^a \$35000 - \$49999	2.4	—	—	—
^a \$50000+	0.9	—	—	—
Age	—	39.24 (0.51)	10.73	40.00
^b Drinking Days	—	1.25 (0.29)	5.56	0.00
^b Drug Use Days	—	1.68 (0.37)	7.19	0.00
^c SIP	—	2.41 (0.27)	4.58	0.00
^c SDS	—	3.61 (0.29)	4.46	2.00
^c BAI	—	10.27 (0.77)	12.83	5.00
^c BDI	—	11.70 (0.70)	11.56	8.10
^c AAQ	—	4.56 (0.37)	6.45	4.00
^c FFMQ	—	3.30 (0.11)	1.94	3.13
^c PACS	—	1.94 (0.65)	11.41	1.00

Note. Descriptive statistics for the final analyzed sample (N = 453; Bowen et al., [2009] and

[2014]). S.E. = Standard Error; SD = Standard Deviation; MBRP = Mindfulness-Based Relapse

Prevention; RP = Cognitive-Behavioral Relapse Prevention; TAU = Treatment As Usual; SIP = Short Inventory of Problems; SDS = Severity of Dependence Scale; BDI = Beck Depression Inventory; BAI = Beck Anxiety Inventory; AAQ = Acceptance and Action Questionnaire; FFMQ = Five Facet Mindfulness Questionnaire; PACS = Penn Alcohol Craving Scale.

^a Annual household income reported at baseline.

^b Number of substance use days reported over the last 2-3 months at follow-up.

^c Reported at follow-up.

Table 3.*Model Fit Statistics by Number of Profiles*

Number of Profiles	BIC	LRT (p-value)	Entropy
2	8169.63	-4261.95 (p < 0.00)	0.825
3	8062.34	-4022.36 (p < 0.00)	0.848
4 ^a	7937.52	-3947.89 (p < 0.01)	0.848
5	7870.10	-3864.67 (p = 0.71)	0.796
6	7790.54	-3806.68 (p = 0.70)	0.806

Note. This table presents all statistics used to assess latent profile solutions for models by which substance use frequency was derived via the number of drug use and drinking days, and by which psychosocial functioning was defined via the total scores of the Beck Anxiety Inventory, Beck Depression Inventory, Severity of Dependence Scale, and the Shorty Inventory of Problems; BIC = Bayesian Information Criteria; LRT = Likelihood Ratio Test.

^a Profile solution selected based on model fit, parsimony, and interpretability of profiles.

Table 4.*Means and Standard Errors for Indicators of the 4-Profile Solution*

	Profile 1	Profile 2	Profile 3	Profile 4
	High	Low	High	Low
	Functioning, Frequent Substance Using	Functioning, Frequent Substance Using	Functioning, Infrequent Substance Using	Functioning, Infrequent Substance Using
	Mean (S.E.)	Mean (S.E.)	Mean (S.E.)	Mean (S.E.)
^a Substance Use Frequency				
^b Drinking Days	2.04 (0.60)	2.51 (0.64)	1.35 (0.68)	-0.93 (1.11)
^c Drug Use Days	2.76 (0.29)	3.06 (0.33)	2.26 (0.44)	2.37 (0.30)
Psychosocial Functioning				
SIP	6.10 (0.52)	21.17 (1.63)	0.16 (0.03)	13.61 (1.02)
SDS	1.34 (0.20)	2.77 (0.31)	0.60 (0.05)	2.01 (0.29)
BDI	1.39 (0.22)	1.81 (0.26)	0.88 (0.05)	1.77 (0.25)
BAI	0.78 (0.21)	1.32 (0.25)	0.72 (0.05)	1.19 (0.20)

Note. This table presents the standardized means and standard errors for each indicator of the 4-profile solution. S.E. = Standard Error; SIP = Short Inventory of Problems; SDS = Severity of Dependence Scale; BDI = Beck Depression Inventory; BAI = Beck Anxiety Inventory.

^a Means and standard errors of drinking and drug use days are unstandardized. Drinking and drug use days are modeled as count indicators via a negative binomial hurdle model.

^b Unstandardized threshold mean = 1.95; threshold standard error = 0.16.

^c Unstandardized threshold mean = 2.19; threshold standard error = 0.17.

^d Standardized means and standard errors of all psychosocial functioning variables are reported here.

Table 5.*Results of Multinomial Logistic Regression*

	Profile 1 vs. Profile 4 (reference)	Profile 2 vs. Profile 4 (reference)	Profile 3 vs. Profile 4 (reference)	Profile 1 vs. Profile 3 (reference)	Profile 2 vs. Profile 3 (reference)	Profile 1 vs. Profile 2 (reference)
	B (SE)	B (SE)	B (SE)	B (SE)	B (SE)	B (SE)
Hypothesis 1; ^a (MBRP = 0)						
Treatment as Usual	0.39 (0.86) p=0.65	0.22 (0.80) p=0.78	-0.08 (0.60) p=0.90	0.47 (0.69) p=0.50	0.30 (0.60) p=0.62	0.17 (0.86) p=0.85
Relapse Prevention	0.39 (0.77) p=0.61	0.68 (0.66) p=0.30	0.08 (0.52) p=0.16	0.31 (0.63) p=0.62	0.59 (0.48) p=0.22	-0.28 (0.75) p=0.70
Hypothesis 2A; ^b (Non-Hispanic White = 1)						
Race/Ethnicity	-1.14 (0.71) p=0.11	-0.08 (0.62) p=0.90	-0.63 (0.49) p=0.20	-0.51 (0.55) p=0.36	0.55 (0.44) p=0.21	-1.06 (0.66) p=0.11
Race/Ethnicity Moderation	-0.55 (0.79) p=0.49	0.47 (0.77) p=0.54	0.21(0.59) p=0.72	-0.76 (0.62) p=0.22	0.26 (0.57) p=0.65	-1.02 (0.78) p=0.19
Hypothesis 2B; ^c (Baseline Income of \$0 - \$4999 = 1)						
Income	-1.02 (0.87) p=0.24	-1.23 (0.78) p=0.11	-0.98 (0.66) p=0.14	-0.04 (0.61) p=0.95	-0.25 (0.45) p=0.58	0.21 (0.71) p=0.77
Income Moderation	1.00 (1.30) p=0.44	0.16 (1.21) p=0.90	-0.10 (1.08) p=0.93	1.10 (0.82) p=0.18	0.26 (0.62) p=0.68	0.84 (0.98) p=0.39

Note. This table presents all results for each multinomial logistic regression model assessed. Age

and gender are included as covariates for all models. Hypothesis 1 tests the association of treatment assignment with latent profile. Hypothesis 2A tests the association of race and ethnicity with latent profile, and further tests the moderating effect of race/ethnicity on latent profile and treatment assignment. Hypothesis 2B tests the association of income with latent profile, and further tests the moderating effect of income on latent profile and treatment assignment. Profile 1: “high-functioning frequent substance using” profile (6.79% of the total sample). Profile 2: “low-functioning frequent substance using” profile (9.56% of the total sample). Profile 3: “high-functioning infrequent substance using” profile (75.66% of the total sample). Profile 4: “low-functioning infrequent substance using” profile (7.99% of the total sample). B = unstandardized beta coefficient; S.E. = standard error; p = p-value.

^a Treatment assignment was dummy-coded such that MBRP is the reference group.

^b Race and ethnicity were modeled as a binary categorical predictor such that persons of color are compared to non-Hispanic White individuals.

^c Income was coded as a binary categorical predictor such that individuals who reported a baseline annual income of \$0 - \$4999 were compared to individuals who reported an annual income of \$5000 or greater.

Table 6.*Mediating Effects of Trait Mindfulness, Psychological Flexibility, and Craving*

	Profile 1 vs. Profile 4 (reference)	Profile 2 vs. Profile 4 (reference)	Profile 3 vs. Profile 4 (reference)	Profile 1 vs. Profile 3 (reference)	Profile 2 vs. Profile 3 (reference)	Profile 1 vs. Profile 2 (reference)
	(B) (S.E.)	(B) (S.E.)	(B) (S.E.)	(B) (S.E.)	(B) (S.E.)	(B) (S.E.)
Direct Effects						
AAQ	0.30 (0.11) p=0.79	0.11 (0.58) p=0.85	0.14 (0.12) p=0.23	-0.11 (0.08) p=0.16	-0.04 (0.64) p=0.96	0.08 (0.61) p=0.90
PACS	>-0.01 (0.01) p=0.84	<0.01(<0.01) p=0.46	<0.01 (0.01) p=0.82	>-0.01 (0.01) p=0.76	<0.01 (0.01) p=0.88	<0.01 (0.05) p=0.42
FFMQ	0.60 (0.45) p=0.19	-0.37 (0.49) p=0.44	0.63 (0.46) p=0.17	-0.03 (0.06) p=0.63	-0.99 (0.36) p=0.01*	0.97 (0.39) p=0.01*
Indirect Effects						
AAQ	<0.01 (<0.01) p=0.80	<0.01 (0.01) p=0.90	<0.01 (0.01) p=0.65	—	—	—
PACS	0.00 (<0.01) p=0.85	0.00 (0.00) p=0.47	0.00 (<0.01) p=0.86	—	—	—
FFMQ	>-0.01 (<0.01) p=0.499	<0.01 (<0.01) p=0.59	>-0.01 (<0.01) p=0.50	—	—	—

Note. This table presents all direct and indirect effects of trait mindfulness, craving, and

psychological flexibility on treatment and latent profile. Age and gender are included as

covariates for all models. Profile 1: “high-functioning frequent substance using” profile (6.79%

of the total sample). Profile 2: “low-functioning frequent substance using” profile (9.56% of the

total sample). Profile 3: “high-functioning infrequent substance using” profile (75.66% of the

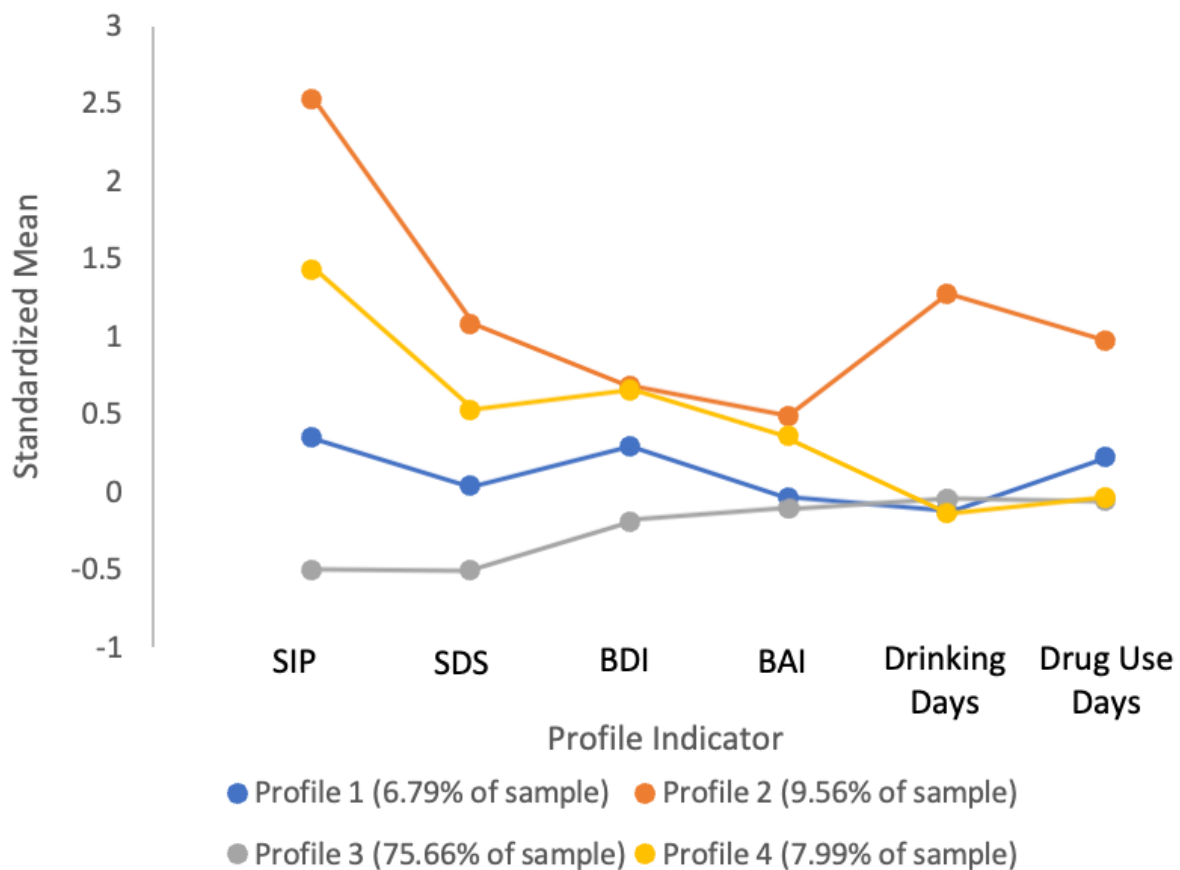
total sample). Profile 4: “low-functioning infrequent substance using” profile (7.99% of the total

sample). B = unstandardized beta coefficient; S.E. = standard error; p = p-value. AAQ =

Acceptance and Action Questionnaire; PACS = Penn Alcohol Craving Scale; FFMQ = Five

Facet Mindfulness Questionnaire.

* Indicates a significant p-value at alpha = 0.05 significance level.

Figure 1.*Plot of Standardized Means of 4-Profile Solution by Indicator*

Note. This figure presents the standardized means of each of the latent profile indicators of the 4-profile solution. Profile 1: “high-functioning frequent substance using” profile (6.79% of the total sample). Profile 2: “low-functioning frequent substance using” profile (9.56% of the total sample). Profile 3: “high-functioning infrequent substance using” profile (75.66% of the total sample). Profile 4: “low-functioning infrequent substance using” profile (7.99% of the total sample). SIP = Short Inventory of Problems; SDS = Severity of Dependence Scale; BDI = Beck Depression Inventory; BAI = Beck Anxiety Inventory.