

Mindfulness-Based Relapse Prevention: History, Mechanisms of Action, and Effects

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Published online: 14 August 2013
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Abstract Mindfulness-based relapse prevention (MBRP) is an intervention for persons recovering from addiction which integrates mindfulness practices and cognitive and behavioral-based relapse prevention techniques, with the goal of helping individuals avoid a return to substance use. MBRP has shown promise in reducing relapse rates among individuals recovering from substance use disorders, but literature examining the effectiveness and mechanisms of action of MBRP is still rather limited. The current paper is a theoretical review of the development of MBRP and research evidence supporting the effectiveness of this intervention. Proposed psychological and physiological mechanisms of action of MBRP and directions for future research are also examined with a specific focus on treating individuals recovering from alcohol use disorders.

Keywords Mindfulness-based relapse prevention · Craving · HRV · Drinking outcomes · Mechanisms of action

Introduction

Mindfulness-based relapse prevention (MBRP) is a contemplative intervention which integrates mindfulness practices

such as meditation with proven effective components of relapse prevention (RP) for persons in recovery from substance use disorders or other addictions, with the goal of helping them avoid a return to substance use. It is a unique combination of two related but distinct intervention approaches which are meant to work synergistically to maintain abstinence and promote well-being. The development and details regarding implementation of this intervention specifically for alcohol use disorders are reviewed below, followed by research findings to date. Potential mechanisms of action are discussed in addition to possible future directions for research.

The RP component of MBRP was conceived by Marlatt and Gordon (1985), and was created using a cognitive behavioral framework that conceptualized relapse as a process amenable to intervention. RP classifies factors contributing to relapse into two broad categories: immediate determinants (high-risk situations, coping skills, outcome expectancies, and the abstinence violation effect) and covert antecedents (lifestyle imbalances and urges and cravings). Using a cognitive-behavioral framework, RP seeks to help the patient recognize and prepare for high-risk situations in which a lapse in abstinence is likely. By training the patient in effective coping strategies, RP increases the self-efficacy of the patient and thereby decreases the probability of relapse (Larimer and Palmer 1999).

In an attempt to improve upon the intervention and provide “a compassionate approach, emphasizing acceptance and openness rather than guilt, blame, and shame about one's behavior” (Bowen et al. 2011, p. viii), Marlatt et al. 2004 combined the techniques and strategies used in RP with mindfulness-based techniques, and manualized the resultant intervention as MBRP (Witkiewitz et al. 2005). As a concept and a practice, mindfulness has roots in many of the contemplative traditions of the various world religions, most notably Buddhism. Mindfulness is “a way of paying attention: on purpose, in the present moment, and non-judgmentally” (Kabat-Zinn 1990, p. 4). Mindfulness training allows the practitioner to develop “skillful means,” specifically the practitioner

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learns to observe unpleasant sensations or emotions without judgment (Witkiewitz et al. 2005) and without succumbing to automatic reactionary behavior, such as substance abuse. In the context of MBRP, the key contribution of mindfulness practice is "...to develop awareness and acceptance of thoughts, feelings...and to utilize these mindfulness skills as an effective coping strategy in the face of high-risk situations" (Witkiewitz et al. 2005, p. 221). In combining mindfulness training techniques with the techniques of RP, Bowen et al. (2011) augment the power of the cognitive-behavioral approach of RP by using mindfulness training to enhance the patient's ability to observe his/her emotional and physiologic state without reacting to it out of habitual patterns of behavior. By learning to observe experiences consciously and without judgment, the patient becomes able to use his/her awareness of his/her emotional and physiological state of being to identify inner states that might trigger a relapse to addictive behaviors, and put into practice coping strategies learned from RP. Mindfulness becomes a powerful supportive tool that allows the patient to gain enough objective "space" within their own emotional and physiological experience, so that he/she may apply the coping strategies learned and make a conscious choice not to perpetuate habitual patterns of behavior.

An example of the utility of combining the two techniques is seen through examination of abstinence violation effect. According to RP, one of the primary determinants of whether a lapse in abstinence will proceed to true relapse is the abstinence violation effect, which is a negative emotional response to a lapse in abstinence that is common among recovering addicts. The abstinence violation effect occurs when the addicted patient responds to a lapse with the thought that the lapse proves they are a failure and will never be capable of permanent abstinence, and it increases the likelihood that the patient will proceed to relapse. In RP, the patient is encouraged to learn to see any lapse as an opportunity to "learn from one's mistakes" and develop skills and coping strategies to deal with similar situations in the future (Larimer and Palmer 1999). Mindfulness meditation techniques are particularly helpful in combating the abstinence violation effect by reinforcing a sense of non-judgment and encouraging patients to take in experiences simply as information about themselves and their environment (Witkiewitz et al. 2005).

According to Buddhist psychology, mindfulness training allows the practitioner to develop "skillful means," specifically the practitioner learns to observe unpleasant sensations or emotions without judgment (Witkiewitz et al. 2005) and without succumbing to automatic reactionary behavior, such as substance abuse. Through research studies and theoretical commentary, mindfulness-based interventions have received significant attention as an efficacious approach for the treatment of several psychological disorders including borderline personality disorder (Linehan 1993), depression (Kabat-Zinn 1990; Kabat-Zinn et al. 1992; Segal et al. 2002), stress (Kabat-

Zinn 1990), and anxiety disorders (Evans et al. 2008). With the promising potential clinical applications of mindfulness, the translation of mindfulness-based practices to existing RP interventions for the treatment of addiction has been proposed (Bowen et al. 2006; Hendershot et al. 2011; Marlatt et al. 1980; Murphy et al. 1986; Witkiewitz et al. 2005). RP has been shown to be an effective aftercare intervention in preventing and/or reducing the frequency of relapse among patients who have received treatment for alcohol dependence (Larimer and Palmer 1999).

Description of the Intervention

MBRP incorporates therapeutic techniques consistent with cognitive-behavioral relapse prevention while maintaining a primary focus on mindfulness mediation practices (Witkiewitz et al. 2013a). The MBRP protocol is carried out over a period of 8 weeks, with weekly 2-h group sessions (Bowen et al. 2011). Each session follows a structured intervention plan that incorporates cognitive skills training such as identifying high-risk situations and coping skills training, approximately 30–45 min of meditation practices, and discussion of the experience (Bowen and Vieten 2012; Witkiewitz and Bowen 2010; Witkiewitz et al. 2013a). As compared to predominantly cognitive-behavioral interventions, the course of MBRP is intended to be a primarily experiential process with a limited inclusion of psycho-education and theoretical instruction (Bowen and Vieten 2012). Please see Table 1 for a brief description of each session's therapeutic focus and group exercises.

Research Evidence for MBRP

Currently, experimental literature examining the direct effects of MBRP on relapse rates and alcohol consumption is sparse. Researchers have conducted pilot efficacy trials (Bowen et al. 2009; Zgierska et al. 2008). The feasibility pilot study conducted by Zgierska et al. (2008) analyzed the effect of MBRP on alcohol relapse with no comparison group and a relatively small sample ($N=19$). Participants were allowed to continue other treatments concurrently, including motivational enhancement therapy, RP, and 12-step facilitation. Significantly lower numbers of heavy drinking days (HDD) and total number of drinks were found at post-treatment when compared to baseline. However, only HDD remained significant at 4 weeks post-intervention, though the average number of drinks remained relatively lower than baseline rates. Percent days abstinent did not significantly change at any time point. A total of 15 participants completed the study; four dropped out of the study and were lost to follow-up. However, there were no significant differences at baseline on clinical or demographic variables between those who completed versus those who

Table 1 Therapeutic focus and exercise(s) unique to the eight sessions of mindfulness-based relapse prevention

Session	Focus	Therapeutic exercise(s)
1	Automatic pilot and relapse	Raisin exercise; body scan meditation
2	Awareness of triggers and craving	Walking down the street; urge surfing; mountain meditation
3	Mindfulness in daily life	Awareness of hearing; breath meditation; SOBER breathing space
4	Mindfulness in high-risk situations	Awareness of seeing; SM: sound, breath, sensation, thought; SOBER breathing space in a challenging situation; walking meditation
5	Acceptance and skillful action	SM: sound, breath, sensation, thought, emotion; SOBER breathing space (in pairs)
6	Seeing thoughts as thoughts	SM: thoughts; SOBER breathing space
7	Self-care and lifestyle balance	Loving-kindness meditation
8	Social support and continuing practice	Body scan; concluding meditation

SOBER stop, observe, breath, expand awareness, and respond; SM sitting meditation

dropped out of the study. Because of the small sample size and lack of a comparison group, these results should be interpreted with caution.

Focusing on alcohol and other drug use, Bowen et al. (2009) conducted the first randomized controlled trial to examine the feasibility and efficacy of an 8-week MBRP intervention on substance use relapse. This study compared MBRP ($n=93$) to a treatment as usual (TAU) aftercare group ($n=75$) that was designed with a 12-step, process-oriented format. Forty-five percent of participants in the trial were alcohol dependent and intended to remain abstinent from alcohol. MBRP was shown to be a feasible intervention as evidenced by a high proportion of participants (86 %) engaging in meditation practices following the intervention. Furthermore, over half of participants (54 %) continued these practices at 4 months post-treatment. Results showed reduced substance use as well as decreased cravings for the MBRP group compared to the TAU group over time. Findings also revealed that participants in the MBRP group showed increased acceptance and a higher likelihood of acting with awareness by the end of treatment than the TAU group. The authors note that attrition did not significantly differ between the two groups at any time point. Thus, completion rates for the entire sample ($N=168$) were reported at post-intervention (61 %), 2-month follow-up (57 %), and 4-month follow-up (73 %).

Witkiewitz and Bowen (2010) conducted secondary analyses on the Bowen et al. (2009) data to explore the relations between depressive symptoms, cravings, and substance use between participants in the MBRP intervention versus the TAU group. Their results indicated attenuation of depressive symptomatology and cravings following MBRP. In addition, craving scores significantly mediated the relation between post-MBRP depressive symptoms and days of use at the 4-month follow-up assessment. The authors suggested that MBRP led to decreased cravings, which in turn weakened the need to alleviate psychological distress with substances. The authors further assert that these results are indicative of

the ability of mindfulness training to allow the practitioner to decouple their habitual behavioral patterns from the emotional and physiological experiences that historically trigger such behavior.

Taken together, these studies demonstrate initial efficacy for the clinical application of an 8-week MBRP program for the prevention of relapse. However, due to the small sample sizes and the fact that control groups were TAU, these results are tentative. To the best of our knowledge, there are no randomized controlled studies examining the effect of MBRP on RP in a group of alcohol-dependent individuals only. Thus, more research is warranted to examine the efficacy of MBRP in preventing alcohol relapse.

Proposed Psychological Mechanisms of Action

Relapse Prevention

The positive change evidenced in RP techniques has been theorized to be influenced by several mechanisms of change or “active ingredients” (Longabaugh et al. 2005; Morgenstern and Longabaugh 2000). The core mechanisms of change that have received the most attention and are proposed as the putative mechanisms of action in the RP model have been self-efficacy (Kadden and Litt 2011), outcome expectancies, and coping skills (Morgenstern and Longabaugh 2000). However, as Hendershot et al. (2011) point out, few studies support these presumptions.

Originally conceptualized by Albert Bandura (1977), efficacy expectancy is thought of as the belief that one can successfully execute behaviors needed to produce a desired outcome, with an emphasis on specific behaviors rather than simply the outcome. It is easy to imagine that one can achieve a desired outcome, though success may not be possible without belief in those behaviors that are a prerequisite to the outcome. Coping skills are the behaviors that individuals learn

and successfully execute to produce a desired outcome. Specific coping skills developed in RP include identifying high-risk situations in a hierarchical structure and promoting effective response strategies. These response strategies can include environmental supports and behavioral, cognitive, or affective coping strategies, and are developed during the therapy sessions and targeted homework assignments (Annis and Davis 1991).

A study by Brown et al. (2002) exploring components of RP in substance-abusing individuals found that RP versus 12-step facilitation produced increased self-efficacy which accounted for unique variance in the outcome of the study. Additionally, Witkiewitz et al. (2011a, b) found improvements in outcomes for study participants who learned drink refusal skills, presumably increasing their feelings of self-efficacy, which in turn appears to be the primary mechanism of change in drinking behavior. Finally, in a study exploring the behavioral intervention arm of COMBINE (Witkiewitz et al. 2011a, b), those participants who received skills training regarding coping with cravings and urges demonstrated significantly improved drinking outcomes via decreases in negative mood and craving.

Mindfulness Meditation

Psychologists and researchers have suggested different ways of conceptualizing the mechanisms at work in mindfulness therapies, though these mechanisms have not been specifically analyzed in relation to alcohol dependence. Nevertheless, these proposed theoretical underpinnings are helpful in our efforts to better conceptualize the mechanisms of action of MM on alcohol dependence/alcohol relapse, and thus they are discussed here briefly.

Shapiro et al. (2006) have put forth three axioms of MM: intention, attention, and attitude. Of the three axioms, intention is the most relevant to alcohol dependence, and is referred to as one's purpose for engaging in MM (Shapiro 1992). Shapiro concluded that as experience with MM increases, intention shifts from self-regulation, to self-exploration, and finally, to self-liberation. Shifts in perspective involve de-identification from the contents of consciousness and observation of moment-by-moment experience with increased clarity and objectivity; that is, shifts in perspective involve cultivating an intimate knowledge of the self that is facilitated by greater emotional and behavioral distance from mental events. Such intentional shifts appear to be highly applicable to alcohol-dependent individuals, who must learn how to “detach” themselves from high-risk drinking situations in efforts to resist the urge to drink alcohol.

Baer (2003) and Bowen et al. (2007) proposed similar mechanisms of mindfulness including exposure, cognitive change, self-management, relaxation, and acceptance. Within this framework, nonjudgmental observation is viewed as an essential component that influences each mechanism.

For example, with regard to exposure, nonjudgmental observation of anxiety-related thoughts and sensations may lead to reduced emotional reactivity when no attempt is made at escape or avoidance, or with regard to cognitive change, nonjudgmental observation may lead to an understanding that anxious thoughts are “just thoughts,” and not static reflections of truth or reality (Baer 2003; Bowen et al. 2007). The latter example is especially relevant to alcohol-dependent individuals, and the importance of teaching them how “thoughts” about wanting to drink alcohol (e.g., “I need to have a drink”) are just thoughts. With time and/or practice, thoughts about wanting to drink alcohol will subside in both frequency and intensity.

Hölzel et al. (2011) proposed the most recent theoretical framework of mechanisms that elicit change in mindfulness-based therapies. This framework includes four steps—attention regulation, body awareness, emotion regulation, and change in perspective on the self—that interact with each other in chronological order. The authors theorize that when a stimulus triggers an emotional reaction, the executive system attempts to regulate attention to the goal of remaining in a mindful state. Body awareness detects physiological signs that signal the emotional response to the stimulus. Emotion regulation processes are engaged to prevent the occurrence of a habitual, overlearned reaction, and with subsequent trials, this facilitated response prevention leads to extinction and reconsolidation of the self. The authors note that sustained attention is crucial to this process, as any suppression or avoidance of the conditioned stimuli (e.g., anxiety, fear, or self-doubt) would prevent extinction of the conditioned response (e.g., alcohol consumption).

In a recent review article, Brown et al. (2013) summarize mindfulness-based interventions in counseling and remark that Martin (1997) proposed that mindfulness may be a core process that underlies multiple therapeutic approaches. Specifically, by providing clients with a means for exploring unpleasant thoughts, feelings, or behaviors, many of which may have previously been unnoticed or perceived as too overwhelming for them, mindfulness can help counselors from virtually any theoretical orientation facilitate change processes in their clients (Martin 1997). Brown et al. (2013) summarizes that the internal state of attentional focus achieved via mindfulness meditation can be considered a core process necessary to facilitate change.

Mindfulness meditation ultimately focuses on a goal not of changing thoughts or circumstances of the patient, but rather a goal to change the patient's relationship to these psychological phenomenon. Mindfulness training explicitly discourages judging thoughts, emotions, or sensations. Thus, some researchers (Teasdale 1999) have proposed that the changes in the patient's relationship to his or her thoughts and beliefs may be the core process responsible for therapeutic improvement with mindfulness meditation.

To date, limited research has explored the core mechanisms of change of MBRP specifically. More recently, two studies performed secondary data analyses on the randomized controlled trial of Bowen et al. (2009) to examine (1) the role of between-session practice and therapeutic alliance on changes in levels of mindfulness following an MBRP program (Bowen and Kurz 2012), and (2) the potential mechanisms of action by which MBRP reduces cravings (Witkiewitz et al. 2013a, b). Bowen and Kurz (2012) discussed the positive role of the therapist–client relationship on the client's level of mindfulness. They hypothesized that the stronger the therapeutic alliance, the more willing clients would be to mindfully explore their own experiences. In this study, therapeutic alliance was measured using the 12-item client version of the Working Alliance Inventory, Short Form (WAI-S; Tracey and Kokotovic 1989).

In addition, they predicted that the time spent (i.e., duration and frequency) between sessions actively engaged in mindfulness meditation practices would be related to higher levels of mindfulness. Results revealed a significant positive correlation between time spent in mindfulness meditation between sessions and increased levels of mindfulness at post-treatment, but these effects diminished at 2 and 4 months follow-up. Therapeutic working alliance was significantly associated with higher levels of mindfulness at post-treatment and 2 months follow-up, but no effect was present at 4 months follow-up. Their results support the importance of between-session practice and therapeutic bond as significant predictors of increased levels of mindfulness at post-treatment, yet further research is warranted to determine how to maintain these gains at long-term (e.g., 6 months) follow-up intervals. In the second study (Witkiewitz et al. 2013a, b), the authors found that the processes of awareness, acceptance, and non-judgment (assessed via self-report measures) mediated the relationship between receiving MBRP and levels of craving at post-treatment. This finding adds support to the primary objective of MBRP—that is, to develop an ability to respond to internal and external stimuli by increasing awareness and acceptance, while maintaining a non-judgmental stance.

Hsu et al. (2013) examined the moderating effect of affect regulation in MBRP reanalyzing data from the Bowen et al. (2009) study involving 168 participants with AOD use disorders patients. They found that the participant's level of distress tolerance was positively associated with mindfulness as assessed by mindfulness scales and that MBRP may be particularly helpful for those individuals entering treatment with low distress tolerance skills.

In conclusion, integrating mechanisms of change from RP and MM to form a comprehensive treatment model aids in our current theoretical understanding of how MBRP works. That is, coping skills used in traditional RP to prevent relapse are modified to include periods of nonjudgmental, objective observation, and non-reactivity. Homework assignments, such as 5-min (or longer, for those who have more experience with

MM) breathing exercises, are focused on practicing sustained attention and emotion regulation when experiencing an urge to drink. Thus, with continued practice in mindfulness and incorporating these techniques into one's arsenal of coping skills, an alcohol-dependent individual becomes more likely to resist the urge to drink alcohol in identified high-risk situations and, with repeated success, becomes more confident (i.e., increased self-efficacy) in his or her ability to control his or her drinking.

Proposed Physiological Mechanisms of Action

Acute and chronic alcohol consumption is associated with the dysregulation of a number of physiological systems (Romanowicz et al. 2011; Thayer et al. 2006). Examining the physiological pathways which are disrupted as a result of heavy drinking is essential because the central and autonomic nervous systems work together to regulate attention, cognition, and emotion when stressful cues are encountered, such as when an alcohol-dependent individual is exposed to stressful and/or substance-related stimuli (Thayer and Lane 2000, 2009). When individuals are not able to regulate their attentional, cognitive, and emotional responses, they are less able to interact with the environment in an adaptable and efficient manner (Thayer and Lane 2000). Thus, it is not surprising that impaired ability to self-regulate in response to stress is associated with the development of alcohol use disorders as well as relapse (Quirk 2001).

Heart rate variability (HRV) is generally seen as an index of emotion regulation (Thayer and Lane 2000). HRV is defined as fluctuations in the length of inter-beat intervals (Romanowicz et al. 2011). By assessing the amount of time between heartbeats, or by focusing on certain frequencies of the heart rate waves, we can better understand the roles of parasympathetic and sympathetic activity in self-regulation. Higher levels of HRV are associated with greater emotional and behavioral flexibility and impulse control, as well as with better mental and physical health outcomes (Allen et al. 2000; Berntson et al. 1997). In contrast, lower levels of HRV are associated with a wide range of medical and psychiatric disorders (Romanowicz et al. 2011) including acute and chronic alcohol ingestion (Ingjaldsson et al. 2003), anxiety, and depression (Friedman 2007; Friedman and Thayer 1998; Musselman et al. 1998).

It is known that mindful meditation affects central and autonomic nervous system functioning (Carlson et al. 2007; Davidson et al. 2003; Tang et al. 2009; Witek-Janusek et al. 2008) and facilitates self-regulation. Among alcohol-dependent in-patients, compared to those with low levels of mindfulness, those with high levels of mindfulness were better able to divert their attention from alcohol cues and had better HRV recovery from stress/alcohol cues (Garland et al. 2012). It is known that trait levels of mindfulness are plastic and can

be modifiable by training (Carmody et al. 2009). However, research has only begun to examine the potential of teaching mindfulness meditation to facilitate physiological regulation in response to stressors among substance users (Brewer et al. 2009; Garland et al. 2011).

In one study, 36 individuals with alcohol and/or cocaine use disorders were randomly assigned to receive either 9 weeks of 1-h mindfulness training (MT) or 12 weeks of 1-h cognitive behavior therapy (CBT) in an outpatient setting (Brewer et al. 2009). Drug use was assessed weekly, and mindfulness skills were assessed before and after treatment. Within 2 weeks of treatment completion, a personalized imagery stress task was completed during which physiological measures were recorded. The results indicated that throughout treatment, there were no group differences for participant retention or treatment satisfaction. As expected, both groups demonstrated increased skin conductance and heart rate reactivity in response to personalized stress imagery. However, those in the MT group showed attenuated physiological responses to stress compared to those who received CBT. These results suggest that mindfulness training has beneficial physiological effects among individuals with substance use disorders. However, it is important to recognize that due to the small sample size and the large dropout rate (only 14 completers), these findings may not generalize. Also, the study included a heterogeneous population with regard to substance use (individuals with alcohol and/or cocaine use disorders). These findings may not be applicable to individuals with only an alcohol use disorder.

A more recent study examined the effect of mindfulness training on physiological responding among alcohol-dependent individuals (Garland et al. 2010). In this study, 53 individuals with a lifetime history of alcohol dependence were recruited from a long-term therapeutic treatment community after 18 months of sobriety because this represents a time of increased relapse risk. Participants were randomly assigned to attend either ten sessions of Mindfulness-Oriented Recovery Enhancement (MORE) training or an Alcohol Dependence Support Group (ASG). MORE is a ten-session, manualized intervention which was adapted as a treatment for alcohol dependence from Mindfulness-Based Cognitive Therapy, a mindfulness intervention designed to prevent depression relapse (Segal et al. 2002). Participants completed self-report measures of psychological functioning and a stress reactivity task before and after the 10-week intervention. In the stress reactivity task, participants were shown aversive and alcohol cue photographs (i.e., photographs of beer or wine) while HRV was assessed. Individuals in the MORE group showed greater reductions in self-reported perceived stress than ASG participants. Also, among MORE participants, self-reported thought suppression decreased significantly from pre- to post-treatment. As expected, the groups showed differential physiological responding during the post-treatment stress reactivity task. Relative to ASG participants, MORE participants

showed higher HRV during alcohol cue exposure, which decreased as they practiced mindfulness meditation during the recovery period. In contrast, at post-treatment, the ASG group demonstrated decreased HRV during the stress and alcohol cue exposure and an increase in HRV during recovery. The finding that MORE participants were better able than ASG participants to engage in emotion regulation during the stress task and to disengage from the alcohol cues during the recovery period are consistent with previous findings which link greater HRV to greater inhibition of the sympathetic nervous system during stress (Thayer and Lane 2009). In sum, these findings suggest that MORE training lowers subjective levels of psychological distress in response to stressful cues and improves physiological and emotion regulation among recovering alcohol-dependent individuals in the short term. Unfortunately, no follow-up data was reported in the study, and thus the long-term effects of the intervention on relapse rates are unknown.

Summary and Directions for Future Research

There is a significant gap in the literature on the long-term outcomes (i.e., 6 months or greater) of individuals recovering from alcohol dependence who receive training in mindfulness-based treatment modalities, including MBRP. Follow-up data is critical to alcohol and other drug (AOD) use treatment outcome studies since previous research has reported that up to two thirds of substance users relapse within the first 3 months following treatment (Pickens et al. 1985). Of most concern to the present article is that only a handful of studies (Bowen et al. 2009; Vieten et al. 2010; Zgierska et al. 2008) report follow-up data on participants' alcohol use and rates of mindfulness practices, of which only two utilize MBRP. For a review of other mindfulness-based interventions that report follow-up data on substances other than alcohol, see Zgierska et al. (2009).

To the authors' knowledge, only one of the MBRP studies (Bowen et al. 2009) utilized a randomized controlled trial (RCT) to evaluate the effects of MBRP on participants' alcohol and other drug use and provided follow-up data. In this study, alcohol and drug use, as well as cravings, decreased post-intervention in participants who received MBRP in comparison to a treatment as usual group. However, at 4 months post-intervention, the findings had "decayed," and only 54 % of the MBRP participants reported continued mindfulness practices. In the second study utilizing MBRP, Zgierska et al. (2008) analyzed the effect of MBRP on alcohol relapse with no comparison group and found a decrease in HDD and total number of drinks after completing the 8-week intervention. However, only HDD remained significant at 4 weeks post-intervention, though the average number of drinks remained relatively lower than baseline rates.

Together, these studies suggest that MBRP shows positive outcomes compared to other standards of care at post-intervention. However, it is unclear whether MBRP can have long-term lasting effects for individuals recovering from alcohol use disorders specifically. Future research incorporating individuals with alcohol use disorders, larger sample sizes, improvements in study design, continued support of some kind (e.g., booster sessions) at follow-up, and intent-to-treat analyses are necessary to answer this question.

While research indicates that MBRP appears to be effective in reducing substance use relapse, there has been limited preliminary research examining the influence of MBRP on the physiological mechanisms involved in emotion regulation after exposure to stress (Brewer et al. 2009; Garland et al. 2011). More fully assessing both the psychological and physiological effects of MBRP will provide a more accurate and comprehensive understanding of the mechanisms through which mindfulness aids in promoting self-regulation and RP.

Finally, little is known about which types of individuals are most likely to benefit from MBRP. It is necessary to examine individual characteristics (i.e., baseline levels of HRV, trait mindfulness, substance use, anxiety, and depression) to determine which characteristics are associated with positive treatment outcomes in both the short and long term. This knowledge will enable more efficient and effective delivery of the MBRP treatment.

Overall, although there is a sound theoretical foundation for MBRP and its implementation with persons in recovery from addictions, including alcohol use disorders, and there is building evidence suggesting that MBRP is effective in reducing substance use relapse, knowledge regarding who responds to MBRP and why is still sparse, as is knowledge regarding longer term effects and impact. Thus, future research will need to entail large, longitudinal, well-controlled studies that examine the intentions, psychological, behavioral, and physiological characteristics of individuals participating in treatment in order to define mechanisms of action and help further the ability to tailor this treatment for most effective implementation.

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