



Full length article

## Mindfulness practice moderates the relationship between craving and substance use in a clinical sample

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## ABSTRACT

Relapse following treatment for substance use disorders is highly prevalent, and craving has been shown to be a primary predictor of relapse. Mindfulness-Based Relapse Prevention (MBRP) is a psychosocial aftercare program integrating mindfulness and cognitive-behavioral approaches, aimed at reducing the risk and severity of relapse. Results from a recent randomized clinical trial demonstrate enhanced remission resilience for MBRP participants versus both cognitive-behavioral and treatment-as-usual controls. The current study investigated between-session formal and informal mindfulness practice, a hypothesized primary mechanism of action in this treatment, as an attenuating factor in the relationship between craving and substance use. Participants in this secondary analysis were 57 eligible adults who completed either inpatient treatment or intensive outpatient treatment for substance use disorders, were randomized in the parent study to receive MBRP, and completed relevant follow-up assessments. For formal mindfulness practice at post-intervention, both number of days per week and number of minutes per day significantly moderated the relationship between craving at post-intervention and number of substance use days at 6-month follow up. Informal practice did not significantly influence the craving-use relationship in this analysis. These results indicate that increasing formal mindfulness practice may reduce the link between craving and substance use for MBRP participants and enhance remission resiliency.

### 1. Introduction

Substance use disorders (SUD) have been described as a chronic relapsing condition (McLellan, 2002; McLellan et al., 2005), in which roughly 50% of individuals participating in treatment relapse to problematic substance use within 6 months of completing treatment (McKay and Weiss, 2001), and up to 80% of those who relapse experience an ongoing cycle of treatment, relapse, and problematic use (Scott et al., 2005). Over the past several decades, SUD treatment providers and researchers have begun to shift from an abstinence only focus to decreasing frequency and severity of relapse (Hendershot et al., 2011; Larimer et al., 1998; Collins et al., 1985). Relapse Prevention (RP) is an example of the shift from a traditional view of any substance use following treatment as a failure, to acknowledging and planning for the possibility of a lapse, and learning skills to reduce severity if a lapse does occur (Hendershot et al., 2011; Marlatt and Witkiewitz, 2005).

The RP treatment protocol, based on biopsychosocial theory, is designed to improve treatment outcomes by increasing likelihood of remission maintenance and reducing negative consequences when relapse occurs (Larimer et al., 1999). The dynamic model consists of an

interconnected system of specific traits (such as family history and cue-reactivity) and states (such as craving and negative affect) that influence relapse risk (Witkiewitz and Marlatt, 2007). Although the dynamic model is in many ways still young (Witkiewitz, 2011), the relationship between craving and subsequent substance use behavior has been identified across multiple levels of analysis, ranging from neuroscientific to psychosocial (Moore et al., 2014; Witkiewitz et al., 2013b; Donovan and Witkiewitz, 2012). This relationship has been identified as a particularly useful target for interventions that aim to reduce the likelihood and severity of relapse (Moore et al., 2014; Marhe et al., 2013; Witkiewitz and Bowen, 2010).

The current study briefly reviews literature on craving as a predictor of treatment outcomes, and mindfulness as an intervention for SUD. We also report new evidence supporting mindfulness practice as an active ingredient in MBRP, moderating the relationship between craving and substance-related treatment outcomes.

#### 1.1. Craving and substance use

Several factors predict substance use following treatment; however,

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craving has been hypothesized to be one of the strongest and most consistent across diverse contexts and substances (Kavanagh and Connor, 2013). Craving can be defined as, “a cognitive event in which an object or activity that is associated with pleasure or relief of discomfort is in focal attention” (Kavanagh et al., 2013, p. 447). Although no meta-analysis of craving predicting use following treatment for SUD is currently available, craving as a cognitive construct has been shown to positively predict post-treatment substance use (Kavanagh et al., 2013). For example, in a trial assessing the predictive validity of a retrospective self-report measure, craving was demonstrated to predict subsequent alcohol use for participants in treatment for alcohol use disorder (Flannery et al., 2003). In another trial with opioid dependent participants, post-intervention opioid craving predicted opioid relapse (Tsui et al., 2014). However, it is important to acknowledge the limitations of craving as a distal predictor of treatment outcomes, particularly due to the biases of retrospective reporting (Serre et al., 2015). For example, the effect of retrospective reports of craving on relapse may be influenced by level of behavioral training and coping resources such that it becomes difficult to detect (Miller et al., 1996; Rohsenow and Monti, 1999).

Indeed, for people in SUD remission, craving may be the most difficult challenge to successful remission maintenance (Brewer et al., 2014). Many SUD treatments focus on identifying and avoiding high-risk situations that may trigger relapse (Larimer et al., 1999). While this strategy has been successful, avoidance of craving cues may not always be feasible (Moore et al., 2014). Thus, enhancing skillfulness in coping with craving through mindfulness practice may further improve long-term outcomes (Witkiewitz et al., 2014a; Brewer et al., 2014).

### 1.2. Mindfulness-based treatment for substance use disorders

Mindfulness practices have been incorporated into treatment for SUD to improve remission maintenance (Bowen et al., 2014; Brewer et al., 2014; Garland et al., 2014; Witkiewitz et al., 2013a; Zgierska et al., 2009). As a psychological construct, mindfulness can be described as a gentle, kind, and curious awareness of experience (Grossman, 2010). Mindfulness practices have played a central role in religious and spiritual traditions for at least several millennia (Hanh, 1998; Hart, 1987). In the Buddhist tradition, practice is intended to increase access to mindfulness, and help people experience freedom from craving, and develop insight into the relationship between thoughts, emotions, and behaviors (Brewer et al., 2014, 2012; Hanh, 1998; Hart, 1987). Although attempts to operationalize mindfulness as a construct within modern Western psychology are ongoing (Brown et al., 2011; Grossman and Van Dam, 2011; Grossman, 2010; Bishop et al., 2006; Brown, 2004; Baer, 2003), mindfulness practices to enhance non-judgment and acceptance of experience have been effectively incorporated into various forms of mental health treatment with notable success (Hayes, 2003; Kabat-Zinn, 2003; Linehan et al., 1999; Teasdale et al., 2000), including SUD treatment (Bowen et al., 2014; Elwafi et al., 2013; Garland et al., 2014). Indeed, a non-judgmental and accepting response to the experience of craving has been linked to fewer problematic alcohol use behaviors (Reynolds et al., 2015).

In a recent study with poly-substance users, participants who received mindfulness training, compared to those in RP or a 12-step treatment-as-usual condition, were less likely to relapse one year post-intervention (Bowen et al., 2014). Further, those who had relapsed reported significantly fewer days of substance use or heavy drinking. In a subsequent randomized trial (Witkiewitz et al., 2014b) in a women's residential criminal justice addictions treatment program, participants in MBRP reported significantly fewer drug use days and fewer legal and medical problems compared to participants in RP. Another study with cigarette smokers found that participants who received mindfulness training, versus treatment as usual, were more likely to maintain abstinence during the four-month follow-up period (36% compared to 15%), and maintained a greater reduction in use over all (Brewer et al.,

2011).

Current theory suggests that including mindfulness practice in treatment may improve outcomes by altering the craving-use relationship (Brewer et al., 2014; Elwafi et al., 2013; Witkiewitz et al., 2013a). MBRP, integrating RP and traditional mindfulness practices, focuses on developing skillful responses to craving (Bowen et al., 2011; Witkiewitz et al., 2013a, 2005). Mindfulness practices may increase the ability of individuals in SUD treatment to accept the unpleasant physical, affective and cognitive experiences of craving, and resist engaging in substance-seeking behavior to alleviate the discomfort (Witkiewitz et al., 2005). Indeed, recent behavioral and neurobiological models of addiction identify an associative learning loop reinforced by the relieving and enhancing effects of substance use to be at the core of the chronicity of relapse (Brewer et al., 2014; Field et al., 2009; Robinson and Berridge, 2008; Franken, 2003). Mindfulness practice may disrupt the relapse cycle by weakening these associative links between craving and use (Bowen et al., 2014; Elwafi et al., 2013; Ostafin et al., 2012; Rogojanski et al., 2011).

The reduction of substance use observed in trials of mindfulness-based interventions might be partially explained by alteration in the relationship between craving and substance use, whereby mindfulness training and ongoing practice supports exposure and response prevention processes (Bowen et al., 2014; Brewer et al., 2014; Garland et al., 2010; Witkiewitz et al., 2014a, 2013a), weakening the conditioned response of substance use to alleviate craving. Although SUD treatments often identify craving as dangerous, and to be avoided, reduced, or tolerated through will power, in mindfulness-based interventions the experience of craving is investigated through experiential practices. People are encouraged to observe their experience within treatment sessions as an introduction to the practice of formal and informal skills and behavioral repertoires that increase mindfulness and acceptance outside of group meetings (Bowen et al., 2011). Mindfulness practice may develop skillful coping via awareness and acceptance of craving without self-distraction or behavioral disengagement, as hypothesized by behavioral and neurobiological models (Brewer et al., 2014; Witkiewitz et al., 2013b), and demonstrated in recent experimental findings (Grow et al., 2015; Moore et al., 2014; Elwafi et al., 2013; Ostafin et al., 2012),

### 1.3. Current study

The current study was designed to test mechanisms of action underlying mindfulness-based approaches to treatment for substance use disorders, using data from a randomized controlled trial (Bowen et al., 2014). While there has been a widespread incorporation of mindfulness into SUD treatment, and growing evidence that mindfulness-based interventions may provide additional protection from relapse, evaluations of hypothesized mechanisms of action are still lacking. This study tested a simple moderation hypothesis based on recent research (Grow et al., 2015; Garland et al., 2014; Moore et al., 2014; Elwafi et al., 2013; Witkiewitz and Bowen, 2010), whereby mindfulness practice moderates the relationship between craving and substance use following mindfulness training. We predicted that the association between craving and use would be weakest for people who reported higher levels (i.e., frequency and length) of mindfulness practice.

## 2. Material and methods

### 2.1. Participants

Participants in this secondary analysis were between ages 21 and 60, drawn from the larger parent MBRP efficacy trial (Bowen et al., 2014), in which participants had previously completed either inpatient or intensive outpatient treatment, and were expected to attend after-care. To be eligible for the study, participants had to have completed treatment during the previous two weeks, been fluent English speakers,

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