



## Substance use outcomes for mindfulness based relapse prevention are partially mediated by reductions in stress: Results from a randomized trial

Jordan P. Davis<sup>a,\*</sup>, Daniel Berry<sup>b</sup>, Tara M. Dumas<sup>c</sup>, Ellen Ritter<sup>d</sup>, Douglas C. Smith<sup>e</sup>, Christopher Menard<sup>f</sup>, Brent W. Roberts<sup>g</sup>

<sup>a</sup> Suzanne Dworak-Peck School of Social Work, Department of Children, Youth, and Families, University of Southern California, United States

<sup>b</sup> University of Minnesota, Institute For Child Development, United States

<sup>c</sup> Department of Psychology, Huron University College at Western University, London, Ontario, Canada

<sup>d</sup> Department of Kinesiology and Community Health, University of Illinois at Urbana Champaign, United States

<sup>e</sup> School of Social Work, University of Illinois at Urbana Champaign, United States

<sup>f</sup> Psychological Services Center, University of Illinois at Urbana-Champaign, United States

<sup>g</sup> Department of Psychology, University of Illinois at Urbana Champaign and the University of Tübingen, United States

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### ABSTRACT

**Objective:** Mindfulness based relapse prevention (MBRP) has demonstrated efficacy in alleviating substance use, stress, and craving but how MBRP works for marginalized young adults has not been investigated. The current study used a novel rolling group format for MBRP as an additional intervention for young adults in residential treatment. We tested the hypothesis that MBRP (plus Treatment as usual (TAU)) would reduce stress, craving, and substance use among young adults in residential treatment relative to treatment-as-usual plus 12-step/self-help meetings (TAU only). Further, we examined whether reduced stress during treatment was a potential mechanism of change operating in MBRP.

**Method:** Seventy-nine young adults ( $M_{age} = 25.3, SD = 2.7; 35\%$  female) were randomly assigned to MBRP ( $n = 44$ ) or TAU ( $n = 35$ ). Follow-up assessments were conducted bi-monthly for self-reported measures of stress, craving, and substance use.

**Results:** At treatment completion young adults receiving MBRP had lower substance use ( $d = -0.58, [-0.91, -0.26]$ ), craving ( $d = -0.58, [-1.0, -0.14]$ ), and stress ( $d = -0.77 [-1.2, -0.30]$ ) relative to TAU condition. Reduced stress during treatment partially mediated observed outcome differences between MBRP and TAU for substance use ( $\beta_{indirect} = -0.45 [-0.79, -0.11]$ ).

**Conclusions:** Results suggest that MBRP is a useful and appropriate intervention for marginalized young adults. Further, our results suggest that the effects of MBRP on long-term substance use outcomes may be partially explained by reduced stress.

## 1. Introduction

Substance use and stress are among the most detrimental contributors to psychological, behavioral and health-related problems (Andersen & Teicher, 2009). The risk for substance use is particularly pronounced in young adulthood (age 18–29; Sussman & Arnett, 2014), and compared to both adolescents (age 12–17) and adults (age 30 and above), young adults exhibit the highest rates of cannabis use (19%), alcohol use (59.6%), binge drinking (37.9%), and illicit drug use (21.5%) (SAMHSA, 2014). One explanation for why young adults are so susceptible to substance use is stress (Shonkoff & Garner, 2012; Shonkoff et al., 2009). From the psychological tradition, stress, in

general, is defined as an individual's subjective appraisal of an event as threatening, or otherwise harmful, yet their ability to cope with the stressful event is inadequate or unavailable (Cohen, Gianaros, & Manuck, 2016). With stress being posited as one of the most consistent predictors of continued use of alcohol or drugs and relapse (Shonkoff & Garner, 2012; Sinha, 2001), young adults who have experienced abnormal amounts of stressful life events (e.g., childhood trauma, criminal justice involvement, foster care) are at a higher risk of developing substance use disorders and experiencing more substance related problems later in life (Ford, Grasso, Hawke, & Chapman, 2013). This may be particularly true for *marginalized* young adults, or individuals who have been (or are) involved in the child welfare system, criminal justice

\* Corresponding author at: 669 W 34th Street, Los Angeles, CA 90089, United States.  
E-mail address: [jordanpd@usc.edu](mailto:jordanpd@usc.edu) (J.P. Davis).

system, or have not attended some form of higher education (IOM, 2014). In particular, marginalized young adults, compared to their peers, are less likely to graduate from high school, have low rates of college attendance, more involvement in the criminal justice system, are more likely to be unemployed, and experience high levels of housing instability and homelessness (IOM, 2014). With marginalized young adults having a heightened risk for mental health, physical health, substance use problems (Scott & White, 2005; Traube, James, Zhang, & Landsverk, 2012) and worse substance use treatment outcomes (Davis, Smith, & Briley, 2017), research on effective interventions for marginalized young adults that address substance use and the factors that prompt relapse, such as stress, are urgently needed.

Studies of clinical populations have shown that clients entering substance use treatment report heightened levels of stress and an inability to adaptively cope with acute stressors (see Sinha, 2008 for a review). Several early studies show that stress is positively associated with abuse and relapse of opiates and psychostimulant drugs (Gawin, 1991; O'Doherty, 1991). Sinha (2001) found that cocaine users exposed to stress imagery had significantly higher cocaine cravings and increased physiological stress response. One treatment modality that has shown strong evidence in reducing both stress and substance use are mindfulness based interventions (Li, Howard, Garland, McGovern, & Lazar, 2017). For example, several studies have assessed mindfulness based interventions, namely mindfulness based substance abuse treatment for adolescents (MBSAT), with at-risk youth (Barnert, Himelstein, Herbert, Garcia-Romeu, & Chamberlain, 2014; Himelstein, Hastings, Shapiro, & Heery, 2012; Himelstein, Saul, & Garcia-Romeu, 2015). For example, Himelstein et al. (2015) found support for reductions in problem behaviors and improvements in decision making and self-esteem among justice involved youth following a 12 week MBSAT program. Other studies of MBSAT have found reductions in perceived stress and increases in self-regulation (Himelstein et al., 2012) as well as decreases in impulsivity and increased perceived risk or drug use (Himelstein, 2011) among incarcerated adolescents following an 8–10 week MBSAT program. Other mindfulness based interventions such as mindfulness based relapse prevention (MBRP), a particular form of mindfulness training designed for drug and alcohol use patients (Bowen et al., 2009; Witkiewitz, Marlatt, & Walker, 2005), has been shown to reduce perceived stress (Brewer, Bowen, Smith, Marlatt, & Potenza, 2010) and days of substance use (Bowen et al., 2009; Brewer, Elwafi, & Davis, 2013) among adults. MBRP was developed to target negative thought processes, such as rumination and craving, which play significant roles in relapse (Witkiewitz, Bowen, Douglas, & Hsu, 2013). Keeping in line with general practices of mindfulness interventions, MBRP aims to increase a patient's ability to tolerate problematic cognitive and physiological experiences by helping remain present focused through meditative practice (Bowen et al., 2009). Participants are taught to “respond” (versus react) to situations that may trigger use through present-moment focus rather than reacting in a habitual manner (Witkiewitz & Bowen, 2010). MBRP aids in identifying high risk situations while creating alternative responses and coping strategies to respond to triggers (Witkiewitz et al., 2013). Emerging evidence indicates that mindfulness based interventions (no specificity) may have powerful effects on overall substance use ( $d = -0.33$ ), opiate use ( $d = -0.51$ ), craving ( $d = -0.65$ ), and stress ( $d = -1.21$ ) (Li et al., 2017). However, prior research investigating the effects of MBRP have been mixed, with individual studies showing strong effects but a recent meta-analysis showing no differences between MBRP and comparison groups (Grant et al., 2017). An example of a study showing strong MBRP effects is that of Witkiewitz et al. (2014), who found at 15-week follow-up, adult women offenders assigned to MBRP showed significantly fewer days of drug and alcohol use ( $d = 0.36-0.45$ ), and significantly fewer legal problems ( $d = 1.18$ ) compared to individuals assigned to relapse prevention only. Further, Bowen et al. (2014) found that, compared to treatment as usual (TAU), adults in a step down residential treatment program assigned to MBRP showed a 54%

decreased risk of relapse for drug use and a 59% decrease risk of relapse for heavy drinking.

Although these studies find mixed results for MBRP with adults, there remain two significant gaps in the literature. First, little is known regarding how MBRP works for young adults. In two recent meta-analyses on mindfulness interventions for substance misuse, only two studies focused on young adults, and these studies employed convenience samples of college students (Grant et al., 2017; Li et al., 2017). While these studies provide needed information on the effects of mindfulness on substance use, young adults in residential settings are a more severe population relative to the general college population and more studies are needed to evaluate the effectiveness of MBRP with this severe population. Further, the most stress prone young adults in substance use treatment tend to receive residential services (Sinha, 2008), and yet not a single randomized study on MBRP exists with this population (Grant et al., 2017). Second, of the studies investigating MBRP, few have assessed the role reductions in stress may play (e.g., mechanism) in long-term substance use and craving outcomes. One study found that those assigned to mindfulness training had significantly lower physiological and psychological stress reactivity following a stress provocation lab task (Brewer et al., 2009), but no differences existed between groups on substance use outcomes. Recently, Goldberg et al. (2014) showed hair cortisol concentration (chronic stress indicator) was associated with decreases in cigarette smoking behavior after mindfulness training, indicating that changes in stress may be a key player in understanding changes in other substance use behaviors. However, many of the reviewed studies did not utilize a high stress sample, and a lack of stress or failure to screen participants for high stress is a shortcoming of prior research. Nonetheless, to date, no study has investigated the relationship between receipt of MBRP, changes in perceived stress levels, and substance use outcomes (e.g., days of use and craving) among a sample of marginalized young adults. The current study will address these gaps and assess the effectiveness of MBRP with a high risk, high stress sample of young adults.

### 1.1. Study objectives and hypotheses

The primary objective of the study was to examine the effect of our experimental condition (treatment as usual + MBRP) compared a control condition (treatment-as-usual plus additional 12-step meetings (TAU)) on perceived stress, craving and substance use. We hypothesized participants who received MBRP would have lower craving during the *treatment phase* (e.g., from study entry to treatment discharge) and *post-treatment phase* (e.g., from discharge to 6-month follow-up) (H1), fewer substance using days during the post-treatment phase (H2), and lower perceived stress during the treatment phase and post-treatment phase (H3). Further, among those who received MBRP, reductions in treatment-phase stress would mediate the association between treatment assignment and post-treatment craving (H4) and substance using days (H5). Pre-registered hypotheses can be found in our open science framework portal here: <https://osf.io/83x3t/> (Davis & Roberts, OSF, 28 June 2017).

## 2. Method

### 2.1. Procedures and participants

The study was approved by the University Institutional Review Board. Participants were recruited between September 2015 and November 2016, with follow-up assessments continuing until June 2016. Treatment status was concealed from research assistants conducting assessments, and the trial adhered to established procedures to maintain separation between research staff who conducted assessments and delivered the intervention. Treatment took place at a residential public not-for profit substance use treatment center that provided care to low income clients (18 years and older) with substance use disorders.

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