



The effects of a brief mindfulness exercise on state mindfulness and affective outcomes among adult daily smokers



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HIGHLIGHTS

- Brief mindfulness exercises reduce cravings and distress when nicotine deprived.
- This study explored effects when smokers were not nicotine-deprived.
- Results suggest increases in state mindfulness and decreases in distress levels.
- Brief mindfulness training did not affect the ability to tolerate distress.

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ABSTRACT

Brief, single session mindfulness training has been shown to reduce emotional distress, craving, and withdrawal symptoms among smokers when they are nicotine-deprived. However, no research has examined the efficacy of brief mindfulness training for non-nicotine-deprived smokers, or explored its effects on smokers' ability to tolerate emotional distress. Smokers progress differently through various stages as they attempt to change their smoking behavior and evidence-based strategies are needed for smokers at all levels of nicotine deprivation. Therefore, the purpose of the current study was to examine the effects of a brief mindfulness exercise on state mindfulness, distress, distress tolerance, and smoking urges following a distressing laboratory task among 86 non-nicotine-deprived adult daily smokers ($M_{\text{age}} = 46$ years, 55% male, 74% African-American) who completed behavioral tasks and self-report measures before and after randomization to a 10-min mindfulness or control exercise. As hypothesized, the mindfulness exercise significantly increased state mindfulness [$F = 14.24$, $p = 0.00$, $\eta^2_{\text{partial}} = 0.15$] and demonstrated a non-significant small to medium effect on decreased distress levels [$F = 3.22$, $p = 0.08$, $\eta^2_{\text{partial}} = 0.04$]. Contrary to prediction, it was not associated with improvements in self-reported [$F = 2.68$, $p = 0.11$, $\eta^2_{\text{partial}} = 0.03$] or behavioral distress tolerance [$F(1) = 0.75$, $p = 0.39$, $\eta^2_{\text{partial}} = 0.01$], or smoking urges following a stressor [$F = 0.22$, $p = 0.64$, $\eta^2_{\text{partial}} = 0.00$]. These findings suggest that brief mindfulness exercises successfully induce states of mindfulness in non-nicotine-deprived smokers. These exercises might also improve current moment levels of distress, but they do not appear to improve self-report or behavioral indices of distress tolerance.

1. Introduction

Smoking remains the leading preventable cause of death and disability in the United States (Center for Disease Control [CDC], 2008; U.S. Department of Health and Human Services [USDHHS], 2004). While nearly 70% of smokers report a desire to quit smoking in any given year, most smokers who attempt to quit smoking are not successful and quickly relapse (Bränström, Penilla, Perez-Stable, & Munoz, 2010; CDC, 2011; Hughes, Keely, & Naud, 2004; West, McEwen,

Bolling, & Owen, 2001). Mindfulness-based interventions, which teach present moment awareness and acceptance as a way of managing smoking triggers and cravings, have shown efficacy for promoting long-term smoking cessation (Brewer, Elwafi, & Davis, 2012; Davis et al., 2013; Davis et al., 2014; Davis, Fleming, Bonus, & Baker, 2007). Indeed, a recent systematic review of randomized controlled trials found that while quit rates were comparable between mindfulness-based interventions and standard care interventions (e.g., quit line, traditional cognitive-behavioral interventions) immediately post-intervention,

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significantly more individuals who received mindfulness training remained quit at four months post-intervention (25%) compared to individuals who received standard care (14%; Oikonomou, Arvanitis, & Sokolove, 2016).

Mindfulness interventions are thought to promote smoking cessation by targeting emotional factors that underlie smoking behavior. Smokers consistently report that one of the primary reasons they smoke is to reduce negative affect, and increased negative affect is one of the strongest predictors of smoking relapse (Brandon & Baker, 1991; Copeland, Brandon, & Quinn, 1995; Fiore, 2008; Kenford et al., 2002; Piper et al., 2004). Negative affect is also a common nicotine withdrawal symptom, highlighting how important it is that smokers be able to tolerate negative emotions without the use of cigarettes in order to successfully quit smoking (Abrantes et al., 2008; Brown et al., 2008; Brown, Lejuez, Kahler, Strong, & Zvolensky, 2005; Simons & Gaher, 2005). Mindfulness-based smoking cessation interventions have been shown to reduce negative affect and increase mindfulness in smokers (Davis et al., 2007; Davis, Manley, Goldberg, Smith, & Jorenby, 2014). Mindfulness training has also been shown to increase distress tolerance (i.e., the ability to withstand affective distress) in other populations (Lotan, Tanay, & Bernstein, 2013; Sauer & Baer, 2012), and greater levels of trait mindfulness have been associated with greater self-reported distress tolerance in smokers (Luberto et al., 2013). However, no research to date examined the effects of mindfulness training on distress tolerance among smokers specifically.

Recently, research has focused on examining the acute effects of brief, single-session mindfulness training. These training exercises are often 5–15 min in length and involve noticing internal and external events (e.g., body sensations, sounds in the room) with an attitude of openness and curiosity, while also noticing when the mind wanders off and gently redirecting attention back to the present moment. These exercises are taught in the context of larger mindfulness-based interventions as a skill smokers can use to ground themselves and choose adaptive behaviors in response to cravings, rather than reacting to cravings by automatically smoking (Bowen, Chawla, & Marlatt, 2011). Given that mindfulness-based interventions are often 8-weeks in duration with 2-h weekly sessions and up to 45 min of daily home practice, understanding the immediate effects of a single mindfulness exercise could help provide smokers with skills that are efficient, easily accessible, and more feasible to learn. Extant research has demonstrated significant reductions in distress, cravings, withdrawal symptoms, and smoking behavior following single, brief mindfulness practices (Bowen & Marlatt, 2009; Cropley, Ussher, & Charitou, 2007; Rogojanski, Vettese, & Antony, 2011).

There are, however, at least three notable gaps in the research on brief mindfulness exercises and smoking-related outcomes. First, although research has demonstrated effects on distress, no research has examined the effects of a brief mindfulness exercise on distress tolerance. There has been one study of a brief mindfulness exercise for smokers that addressed distress tolerance (Paz, Zvielli, Goldstein, & Bernstein, 2017). Here, brief mindfulness training was shown to decouple the relationship between self-reported distress tolerance and anxious responding to a laboratory stressor among nicotine-deprived smokers; that is, distress tolerance was less strongly predictive of anxious responding following a mindfulness exercise as compared to a neutral control exercise (Paz et al., 2017). Thus, distress tolerance is relevant to the effects of mindfulness training on emotional outcomes in smokers, but no research has tested whether brief mindfulness training actually impacts smokers' levels of distress tolerance. Given that distress tolerance is an important factor in substance use behavior above and beyond levels of distress (Buckner, Keough, & Schmidt, 2007), and because it theorized to be a key mechanism by which mindfulness training promotes smoking cessation (Abrantes et al., 2008; Bowen & Marlatt, 2009; Breslin, Zack, & McMain, 2002; Katz & Toner, 2013), this knowledge would advance theoretical models of mindfulness and smoking, and provide insight into the practical utility of these brief exercises for helping smokers withstand distress in the moment.

Second, research has focused exclusively on smokers who have been fully nicotine deprived for up to 12 h. However, smokers progress differently through various stages of change as they plan or prepare to quit, and smokers at all levels of nicotine deprivation need evidence-based strategies to cope with distress and cravings (i.e., DiClemente et al., 1991; Lindson, Aveyard, & Hughes, 2010). Strategies that are useful for nicotine-deprived smokers may not be as useful for smokers who are not nicotine-deprived given that smokers prefer different coping strategies at different levels of nicotine deprivation (Araujo, Oliveira, Pedroso, & Castro, 2009). Thus, it is important to identify evidence-based strategies that are acceptable and useful for non-nicotine-deprived smokers. Also, methodologically, nicotine deprivation impairs cognitive and attentional skills (Ernst, Heishman, Spurgeon, & London, 2001; Gross, Jarvik, & Rosenblatt, 1993), which could negatively impact smokers' abilities to participate in mindfulness exercises and distress tolerance tasks, and nicotine deprivation is considered a state of elevated distress (Paz et al., 2017), which could make the distress tolerance tasks more difficult than is relevant to the experience of smokers who are not attempting to quit (Bernstein, Trafton, Ilgen, & Zvolensky, 2008). Examining the effects of a brief mindfulness exercise in non-nicotine-deprived smokers is therefore also important for isolating the effects of mindfulness training and facilitating an accurate assessment of mindfulness for distress tolerance.

Lastly, only one study, conducted in nicotine-deprived smokers, has examined whether brief mindfulness exercises actually elicit a mindful state in smokers. A mindful state is a state of being openly, non-judgmentally aware of internal or external experiences that are occurring in a given moment (Bishop et al., 2004). Although mindfulness is often considered a trait or set of skills, consensus definitions emphasize that mindfulness may actually be best considered a state-like, context-dependent, and dynamic mental behavior (Bishop et al., 2004; Tanay & Bernstein, 2013). It is important to examine state mindfulness in smokers because it is the ability to be in a mindful state that is thought to help smokers reduce emotional and behavioral reactivity (e.g., non-smoking in response to smoking urges). Understanding whether mindfulness practices actually elicit a mindful state for smokers would inform the delivery of evidence-based strategies for coping with distress and smoking urges. In addition, this knowledge is necessary to understand whether mindfulness itself is responsible for effects on smoking and emotional outcomes at a conceptual level.

Therefore, the purpose of the present study was to examine the effects of a brief mindfulness exercise on state mindfulness and affective outcomes among non-nicotine-deprived adult daily smokers. To replicate previous work in nicotine-deprived smokers (e.g., Cropley et al., 2007; Westbrook et al., 2011), distress levels and cravings following an emotional stressor were assessed. To further replicate and extend previous work in smokers (e.g., Paz et al., 2017) and non-smokers (Lotan et al., 2013), state mindfulness and two additional indices of distress tolerance (i.e., self-reported and behavioral) were assessed. We used both self-report and behavioral measures to assess a range of distress tolerance outcomes, given that different measurement methods are correlated with different emotional and behavioral substance use outcomes (Magidson, Ali, Linstead, & Daughters, 2013). It was hypothesized that smokers who were randomized to participate in a brief mindfulness exercise, as compared to a neutral control exercise, would demonstrate a greater increase in self-reported distress tolerance, behavioral distress tolerance, and state mindfulness, and a greater decrease in distress and smoking urges following a stressful laboratory task.

2. Methods

2.1. Participants

See Table 1 for a summary of the demographic characteristics of the sample. Participants were 86 daily smokers recruited from the

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