Summer 2016

Buffering the Associations Between Negative Mood States and the Incentive Salience of Alcohol: A Brief Mindfulness Induction

Adrian J. Bravo
Old Dominion University, ajbravo9@gmail.com

Buffering the Associations between Negative Mood States and the Incentive Salience of Alcohol: A Brief Mindfulness Induction

by

Adrian J. Bravo
B.A., 2012, College of William & Mary
M.S. 2014, Old Dominion University

A Dissertation Submitted to the Faculty of
Old Dominion University in Partial Fulfillment of the
Requirements for the Degree of

DOCTOR OF PHILOSOPHY

PSYCHOLOGY

OLD DOMINION UNIVERSITY
AUGUST 2016

Approved by:

James M. Henson (Director)

Michelle L. Kelley (Member)

Christopher A. Sink (Member)

ABSTRACT

Buffering the Associations between Negative Mood States and the Incentive Salience of Alcohol: A Brief Mindfulness Induction

Adrian J. Bravo
Old Dominion University, 2016
Director: Dr. James M. Henson

The present study examined drinking to cope (DTC) motives and state mindfulness (via a brief mindfulness induction) as two distinct factors that may enhance (DTC) and reduce (state mindfulness) the association between negative mood states (i.e., sadness and anxiety) and the incentive salience of alcohol (i.e., subjective alcohol craving and attentional bias for alcohol-related cues) among college student drinkers. Participants were 207 undergraduate students from a large, southeastern university in the United States that consumed at least one drink per typical week in the previous month. The majority of participants identified as being either White, non-Hispanic (n = 81; 39.1%), or African-American (n = 86; 41.6%), were female (n = 170; 82.1%), and reported a mean age of 20.94 (SD = 5.48) years. Results indicated that at both pre and post-mindfulness induction assessments, higher levels of both DTC-depression and DTC-anxiety motives were related to higher subjective alcohol craving. Further, collapsing across mood groups (i.e., sadness vs mood control) and at average levels of both DTC-depression and DTC-anxiety motives, individuals in the mindfulness condition reported a significant change score (i.e., reduction) in subjective alcohol craving scores at post-mindfulness induction compared to individuals in the no-mindfulness condition. Albeit preliminary, the present study offers support for mindfulness as a beneficial alternative coping strategy to drinking to cope among college student drinkers. Future work is needed to replicate these findings and examine how DTC motives, emotional mood states, and state mindfulness interrelate among college student drinkers within an ecological momentary framework.

Esta tesis doctoral está dedicada a mi familia y para los que me han ayudado a lo largo de mi carrera académica.

ACKNOWLEDGMENTS

I would like to acknowledge James M. Henson, Matthew R. Pearson, and Michelle L. Kelley for their guidance.

TABLE OF CONTENTS

Page

LIST OF TABLES

Table Page

LIST OF FIGURES

Figure Page

CHAPTER 1

INTRODUCTION

Heavy drinking among college students has been recognized as a major public health concern that has remained a consistent problem over the past two decades (Hingson, Zha, & Weitzman, 2009; National Institute on Alcohol Abuse and Alcoholism, 2015). According to some addiction theories, such as the Motivational Theory of Current Concerns (Klinger & Cox, 2004) and Incentive Sensitization Theory (Robinson & Berridge, 1993), implicit attentional bias to alcohol-related cues (i.e., alcohol-related stimuli or triggers) is indicative of susceptibility to greater alcohol consumption and alcohol-related problems, possibly due to an increasing alcohol craving (Field & Cox, 2008; Robinson & Berridge, 2000). Among college students who consume alcohol, experimental studies have confirmed that there is an increase in alcohol craving (Field & Quigley, 2009; Willner, Field, Pitts, & Reeve, 1998) and attentional bias for alcohol-related cues (Field & Powell, 2007; Grant, Stewart, & Birch, 2007) after negative mood inductions. Because attentional bias to alcohol-related cues and subjective alcohol craving play a role in the development of alcohol dependence (Robinson & Berridge, 1993), it is important to examine factors that may exacerbate or decouple the associations between negative mood states and the incentive salience of alcohol among college students. Thus, the present study examined drinking to cope (DTC) motives and mindfulness as two distinct factors that may enhance (i.e., DTC) and buffer (i.e., mindfulness) the association between negative mood emotional states (i.e., sadness and anxiety) and the incentive salience of alcohol (i.e., subjective alcohol craving and attentional bias for alcohol-related cues) among college student drinkers.

Negative Mood and the Incentive Salience of Alcohol

In support of self-medication models of alcohol use (Conger, 1951, 1956; Khantzian, 1997) and tension-reduction models of alcohol use (Greeley & Oei, 1999), daily dairy and ecological momentary assessment studies have found that negative mood states are related to increased alcohol-related outcomes (e.g., consumption and consequences) in the college student population (Armeli, Conner, Cullum, & Tennen, 2010; Dvorak, Pearson, & Day, 2014; O'Hara, Armeli, & Tennen, 2014; Todd, Armeli, & Tennen, 2009). One mechanism that may explain these relationships is the impact that negative mood states have on the incentive salience of alcohol, specifically subjective alcohol craving and attentional bias for alcohol-related cues (Field & Cox, 2008; Klinger & Cox, 2004; Robinson & Berridge, 1993). In support of the Motivational Theory of Current Concerns and the Incentive Sensitization Theory, attentional bias to alcohol-related cues has been shown to increase alcohol consumption as well as increase the motivation to drink alcohol among college students (Field & Eastwood, 2005).

Experimental research among college students has shown mixed findings when examining global negative affect mood inductions and attentional bias towards alcohol-related cues. For example, across two experiments Birch and colleagues (2008) found no evidence that negative mood activates or maintains implicit alcohol attention to alcohol cues. In contrast, Ostafin and Brooks (2011) found that negative affect increases automatic alcohol motivation (among coping-motivated drinkers). However, given that specific negative affect mood states (e.g., sadness and anxiety) differentially relate to alcohol outcomes (Birch et al., 2008; Grant et al., 2007), examining a global negative mood state variable could obfuscate the true relationships between negative mood states and alcohol outcomes. Experimental research among college students have shown that specific negative mood inductions (i.e., stress, sadness, and anxiety) uniquely lead to increased alcohol craving and greater attentional bias towards alcohol-related

cues (Field & Powell, 2007; Field & Quigley, 2009; Grant et al., 2007; Willner et al., 1998). Thus, because researchers have advocated for the examination of different negative affect states on alcohol outcomes (Birch et al., 2008; Grant et al., 2007) and based on previous research (e.g., Field & Quigley, 2009):

> Hypothesis 1a: I expected that individuals in the sadness induction group would exhibit higher subjective alcohol craving and attentional bias toward alcohol-related cues than individuals in the control group (i.e., no mood induction).
>
> Hypothesis 1b: I expected that individuals in the anxiety induction group would exhibit higher subjective alcohol craving and attentional bias toward alcohol-related cues than individuals in the control group (i.e., no mood induction).

Drinking to Cope Motives and Negative Mood States (DTC X Mood)

Motivation models of alcohol use (Cooper, 1994; Cox & Klinger, 1988, 1990) posit that drinking motives are the most proximal antecedent to alcohol use involvement and that different drinking motives (or reasons for drinking) are associated with different patterns of alcohol consumption and consequences. According to these motivational models, drinking motives are defined by two primary dimensions: source of motivation (internal vs. external) and type of reinforcement (positive vs. negative). Internally motivated, negatively reinforcing motives are referred to as coping motives. Based off Social Learning Theory (Abrams & Niaura, 1987; Bandura, 1977), researchers posit that individuals engage in drinking to cope (DTC) because they expect that drinking alcohol provides immediate coping benefits by alleviating their negative affect (Cooper, Russell, & George, 1988; Maisto, Carey, & Bradizza, 1999). Consistent with Social Learning Theory and motivational models of alcohol use, DTC motives explain and exacerbate (at high levels) the relationships between poor mental health (i.e., negative affect,

depression, anxiety, stress) and alcohol outcomes (i.e., alcohol consumption and alcohol-related consequences) among college students (see Bravo, Henson, & Pearson, 2016 for a review). However, there have been mixed findings in the examination of the role of DTC motives as a moderator to the relationship between daily negative mood states and alcohol outcomes.

Based off behavioral models of addiction, individuals high in DTC motives (compared to low) should theoretically show stronger relations between negative mood states and problematic alcohol consumption (Littlefield, Talley, & Jackson, 2012). Specifically, behavioral models of addiction (e.g., cognitive-behavioral model of relapse; Larimer, Palmer, & Marlatt, 1999; Marlatt & George, 1985) posit that engaging in a maladaptive coping response (i.e., DTC) when dealing with stressors (i.e., sadness and anxiety) leads to an increased probability of consuming a desired substance (Witkiewitz, Marlatt, & Walker, 2005). These models have been partially supported such that higher levels of DTC exacerbate certain alcohol-related relationships: anxiety-alcohol consumption (Armeli, Todd, Conner, & Tennen, 2008), anxiety-alcohol consequences (Armeli et al., 2014), and sadness-alcohol consumption (Hussong, 2007). In contrast, however, multiple studies have found non-existent moderating effects (Littlefield et al., 2012; O'Hara et al., 2014; Ralston, Palfai, & Rinck, 2013). One explanation for these inconsistent findings may be that specific types of affect may relate differentially to using alcohol as a coping mechanism (e.g., DTC for depression), and looking at specific types of negative affect can better explain the relationships between different daily moods and alcohol consumption.

According to Grant, Stewart, O'Connor, Blackwell, and Conrod (2007), defining drinking to cope based on a subtype of negative affect (e.g., DTC-depression) may be more advantageous because depression and anxiety are linked to different patterns of alcohol consumption and alcohol-related problems. This assertion has been supported by research that

reports differential findings on the relationships between DTC motives, negative affect, and alcohol outcomes when examining specific negative affect as opposed to general negative affect (Bravo et al., 2016). In further support of this argument, Grant, Stewart, and Mohr (2009) found that DTC-depression motives moderated the daily depressed mood-alcohol consumption model, such that the relationship between daily depressed mood and alcohol consumption was stronger among individuals with higher DTC-depression motives (compared to low). Similarly, DTC-anxiety motives moderated the daily anxiety mood-alcohol consumption model, such that relationship between daily anxious mood and alcohol consumption was stronger among individuals with higher DTC-anxiety motives (compared to low). One way to extend these findings would be to test whether these findings are upheld in an experimental paradigm.

Although there have been inconsistent findings examining the negative mood-DTC motives-alcohol outcomes relationship, more consistent findings have been shown in experimental studies among college student drinkers examining the associations between negative mood states, DTC motives, and the incentive salience of alcohol (i.e., subjective alcohol craving and attentional bias for alcohol-related cues). A three-pathway psychobiological model of craving for alcohol suggests that individuals who consume alcohol to gain relief from stressors are at an increased risk for alcohol consumption via increasing "relief" craving (i.e., craving alcohol to alleviate stress; Verheul, Van Den Brink, & Geerlings, 1999). Studies have found that the relationship between negative mood states and alcohol craving (Field & Quigley, 2009; Willner et al., 1998) as well as negative mood and attentional bias towards alcohol-related cues (Field & Powell, 2007; Grant et al., 2007) are stronger among individuals with high DTC motives as compared to low. However, a majority of these studies measure DTC motives globally as compared to isolating specific negative affect. In a replication and extension of these

previous findings, the present study examined DTC motives for a specific subtype of negative affect (i.e., DTC-depression and DTC-anxiety) as conditional variables (i.e., moderators) between specific negative emotional states (i.e., sadness and anxiety) and the incentive salience of alcohol (i.e., subjective alcohol craving and attentional bias for alcohol-related cues) among college student drinkers. Thus, based on previous research (Grant et al., 2009) and behavioral models of addiction:

> Hypothesis 2a: I expected that higher DTC-depression motives would be related to increased subjective alcohol craving and attentional bias toward alcohol-related cues, but only among individuals in the sadness mood induction condition.
>
> Hypothesis 2b: I expected that higher DTC-anxiety motives would be related to increased subjective alcohol craving and attentional bias toward alcohol-related cues, but only among individuals in the anxious mood induction condition.

Mindfulness and Negative Mood States (Mood X Mindfulness)

Given that the relationships among negative mood, DTC motives, alcohol craving, and attentional bias for alcohol-related cues have been established, an important next step is to determine what factors might reduce these associations among college student drinkers. Several converging lines of research suggest that mindfulness can buffer the effects of risk factors associated with increased substance use. Mindfulness has been conceptualized as the awareness that comes from paying attention to present moment experience in a purposeful and non-judgmental manner (Bishop et al., 2004; Kabat-Zinn, 1994). Among clinical populations, mindfulness based interventions (e.g., Mindfulness Based Relapse Prevention, MBRP; Witkiewitz et al., 2005) have been have been shown to be efficacious at reducing attentional bias for alcohol-related cues, alcohol craving, and alcohol misuse (Bowen et al., 2009; Witkiewitz &

Bowen, 2010). Similar findings have been found among non-clinical populations (Mermelstein & Garske, 2015; Ostafin, Bauer, & Myxter, 2012; Vinci et al., 2014).

Among college students, trait mindfulness has been shown to be related to decreased drinking motives (Roos, Pearson, & Brown, 2015), alcohol consumption (Bramm, Cohn, & Hagman, 2013), alcohol-related problems (Bondelos, Noonan, & Wells, 2013; Christopher, Ramsey, & Antick, 2013; Fernandez, Wood, Stein, & Rossi, 2010; Murphy & MacKillop, 2012; Pearson, Brown, Bravo, & Witkiewitz, 2015), and alcohol cravings (Karyadi & Cyders, 2015). Further, brief mindfulness based interventions and training have been shown to be efficacious at reducing binge episodes (Mermelstein & Garske, 2015), attentional bias for alcohol-related cues (Ostafin et al., 2012), negative affect (post mood induction; Arch & Craske, 2006; Vinci et al., 2014), and alcohol-related consequences (Mermelstein & Garske, 2015) among college students.

Recently, researchers have advocated for more research to determine why mindfulness (globally) and mindfulness based interventions are effective in reducing substance use (Witkiewitz & Black, 2014). Although mindfulness based training has been shown to be effective over time for reducing substance use (see Chiesa & Serretti, 2014 for a review), we still do not understand the mechanisms that occur in the moment when individuals are engaging in mindfulness meditation (i.e., context dependent). This lack of understanding has been a prominent critique among researchers because mindfulness has been generally defined as being aware and nonjudging to present moment experiences; yet, a majority of studies and measurement tools examine mindfulness retrospectively and as a trait (Chiesa, 2013; Sauer et al., 2013; Tanay & Bernstein, 2013). Further, there have been inconsistent findings in the relationship between trait mindfulness and state mindfulness, with one study finding little to no relationship between the two (Thompson & Waltz, 2007). One way to understand the health-

promoting effects of mindfulness is to examine psychological and health outcomes after a brief mindfulness induction (i.e., inducing state mindfulness).

Previous research has explored the effects of a brief mindfulness induction on emotion regulation (Arch & Craske, 2006), emotional responding (Erisman & Roemer, 2010), aggression (Yusainy & Lawrence, 2015), and disgust (Reynolds, Lin, Zhou, & Consedine, 2015). However, few studies have explored the effects of a brief mindfulness induction (i.e., one-time meditation session) on alcohol outcomes. Behavioral models of addiction posit that engaging in an adaptive coping mechanism (i.e., mindfulness) might reduce the association between stressors and the probability of consuming a desired substance (e.g., alcohol; Witkiewitz et al., 2005). In an extension of brief mindfulness training studies, the present study examined state mindfulness (via a brief mindfulness induction) as a conditional variable (i.e., buffer) between specific negative emotional states (i.e., sadness and anxiety) and the incentive salience of alcohol (i.e., subjective alcohol craving and attentional bias for alcohol-related cues) among college student drinkers. Thus, based on previous research (Arch & Craske, 2006; Mermelstein & Garske, 2015; Vinci et al., 2014) and behavioral models of addiction:

> Hypothesis 3a: I expected that mindfulness induction would buffer the associations between a sadness mood state and the incentive salience of alcohol (i.e., subjective alcohol craving and attentional bias for alcohol-related cues). Specifically, compared to individuals without a mindfulness induction, participants who received a mindfulness induction while in a sadness mood state would exhibit a greater reduction (i.e., negative change score) in subjective alcohol craving and attentional bias toward alcohol-related cues from pre-mindfulness induction to post-mindfulness induction.

Hypothesis 3b: I expected that mindfulness induction would buffer the associations between an anxious mood state and the incentive salience of alcohol (i.e., subjective alcohol craving and attentional bias for alcohol-related cues). Specifically, compared to individuals without a mindfulness induction, participants who received a mindfulness induction while in an anxious mood state would exhibit a greater reduction (i.e., negative change score) in subjective alcohol craving and attentional bias toward alcohol-related cues from pre-mindfulness induction to post-mindfulness induction.

Drinking to Cope and Mindfulness (DTC X Mindfulness)

According to the Attention-Allocation Model (Steele & Josephs, 1988, 1990), alcohol-induced impairment facilitates individuals to allocate their attention on the most salient internal or external cues (e.g., focusing on their negative mood or thoughts) in the absence of distractors, which may exacerbate their negative affect and lead to more problematic alcohol consumption. Thus, individuals who engage in high levels of DTC may be more prone to problematic drinking as a result of refocusing their attention on their reasons (i.e., stressors) for using alcohol as a coping mechanism. Decentering (Fresco et al., 2007), defined as a shift in perspective associated with decreased attachment to one's thoughts and emotions, has been shown to be a primary mechanism that explains the health-promoting effects of mindfulness (Brown, Bravo, Roos, & Pearson, 2015; Feldman, Greeson, & Senville, 2010; Pearson et al., 2015; Shapiro, Carlson, Astin, & Freedman, 2006; Shapiro, 2009). Thus, state mindfulness may buffer the association between DTC motives and problematic alcohol consumption by eliciting individuals to decenter from their present thoughts and emotions (i.e., stressors), which may reduce their craving or implicit associations to alcohol in the moment.

In an extension of the Attention-Allocation Model, the present study examined state mindfulness (via a brief mindfulness induction) as a conditional variable (i.e., buffer) between specific DTC motives and the incentive salience of alcohol (i.e., subjective alcohol craving and attentional bias for alcohol-related cues). Specifically, the present study examined whether being induced into a mindfulness state is associated with less alcohol craving and attentional bias towards alcohol cues even among individuals with higher DTC motives. Precisely:

> Hypothesis 4a: I expected that mindfulness induction would buffer the associations between DTC-depression motives and the incentive salience of alcohol (i.e., subjective alcohol craving and attentional bias for alcohol-related cues). Specifically, the association between DTC-depression motives and both subjective alcohol craving and attentional bias toward alcohol-related cues would be weaker among participants who receive mindfulness induction (compared to individuals without mindfulness induction).
>
> Hypothesis 4b: I expected that mindfulness induction would buffer the associations between DTC-anxiety motives and the incentive salience of alcohol (i.e., subjective alcohol craving and attentional bias for alcohol-related cues). Specifically, the association between DTC-anxiety motives and both subjective alcohol craving and attentional bias toward alcohol-related cues would be weaker among participants who receive mindfulness induction (compared to individuals without mindfulness induction).

Negative Mood, Mindfulness, and Drinking to Cope (Mood x Mindfulness x DTC)

Research suggests that craving for alcohol is closely associated with the anticipation of reinforcement from drinking (Verheul et al., 1999), and individuals engage in drinking to cope (DTC) because they expect that drinking alcohol provides immediate coping benefits by alleviating their negative affect (Cooper et al., 1988; Maisto et al., 1999). Further, research

suggest that mindfulness training can reduce the association between negative states (e.g., depression) and alcohol-related craving (Witkiewitz & Bowen, 2010). According to the Maladaptive Coping Hypothesis (Leventhal et al., 2010), engaging in an adaptive coping strategy may buffer the relationship between emotional functioning and poor health outcomes because it may provide an alternative strategy to a maladaptive coping strategy. Thus based off this theory, engaging in an effective coping response (i.e., mindfulness) compared to an ineffective coping response (i.e., DTC) may reduce the association between negative emotional states (i.e., sadness and anxiety) and the incentive salience of alcohol (i.e., subjective alcohol craving and attentional bias for alcohol-related cues) among college student drinkers. However, few studies have examined whether decoupling the associations between negative emotional states and motivations to drink to cope may be a broader mechanism through which mindfulness based interventions can reduce alcohol use.

Briefly, given their cross-sectional findings, trait mindfulness has been shown to be a protective factor against alcohol use and misuse via decreased levels of DTC motives (Reynolds, Keough, & O'Connor, 2015; Roos et al., 2015). In one of the few studies to examine trait mindfulness as a moderator, Bravo, Pearson, Stevens, and Henson (in press) found that mindfulness buffered the relationship between depressive symptoms and DTC-depression motives. Moreover, the researchers found that the indirect effect of depressive symptoms on alcohol-related problems via DTC-depression motivation was weakest among individuals with high trait mindfulness and strongest among individuals with low trait mindfulness (i.e., moderated-mediation). These findings suggest that mindfulness based interventions may be effective for college student drinkers by reducing the conditioned response of using alcohol as a coping mechanism when experiencing negative emotions (e.g., depressive symptoms).

In an extension of preliminary findings from cross-sectional studies (Bravo et al., in press; Reynolds et al., 2015; Roos et al., 2015), the present study examined state mindfulness (via a brief mindfulness induction) as a conditional variable (i.e., buffer) between specific negative mood states (i.e., sadness and anxiety) and the incentive salience of alcohol (i.e., subjective alcohol craving and attentional bias for alcohol-related cues) across levels of DTC motives for a specific negative affect. Specifically, to further validate the protective mechanisms of mindfulness, the present study examined whether being induced into a mindfulness state decouples the associations between negative mood states and alcohol outcomes even among individuals with higher DTC motives. Thus, based on previous research and the Maladaptive Coping Hypothesis:

Hypothesis 5a: I expected that mindfulness induction would buffer the associations between a sadness mood state and the incentive salience of alcohol (i.e., subjective alcohol craving and attentional bias for alcohol-related cues) across levels of DTC-depression motives. Specifically, compared to individuals in the non-mindfulness condition, non-mood condition (i.e., control condition), and who possess low DTC-depression motives, participants who receive mindfulness induction while in a sadness mood state and who report higher levels of DTC-depression motives would exhibit the greatest reduction (i.e., change score) in subjective alcohol craving and attentional bias toward alcohol-related cues from pre-mindfulness induction to post-mindfulness induction.

Hypothesis 5b: I expected that mindfulness induction would buffer the associations between an anxious mood state and the incentive salience of alcohol (i.e., subjective alcohol craving and attentional bias for alcohol-related cues) across levels of DTC-

anxiety motives. Specifically, compared to individuals in the non-mindfulness condition, non-mood condition (i.e., control group), and who possess low DTC-anxiety motives, participants who receive mindfulness induction while in an anxious mood state and who report higher levels of DTC-anxiety motives would exhibit the greatest reduction (i.e., change score) in subjective alcohol craving and attentional bias toward alcohol-related cues from pre-mindfulness induction to post-mindfulness induction.

Purpose of Study

The purpose of the present study is to extend research on drinking to cope (DTC) motives and mindfulness as two distinct factors that may enhance (DTC) and reduce (mindfulness) the association between negative mood states (i.e., sadness and anxiety) and the incentive salience of alcohol (i.e., subjective alcohol craving and attentional bias for alcohol-related cues) among college student drinkers. This examination would provide a better understanding of the potential impact mindfulness has as an alternative coping strategy to drinking to cope and illuminate one mechanism through which mindfulness can reduce problematic alcohol use among college students. Based on the Maladaptive Coping Hypothesis (Leventhal et al., 2010), I expected that being induced into a mindfulness state would decouple the associations between negative mood states, DTC motives, and the incentive salience of alcohol (i.e., subjective alcohol craving and attentional bias for alcohol-related cues) among college student drinkers.

CHAPTER 2

METHOD

Participants

Participants were undergraduate students recruited from a Psychology Department participant pool at a large, southeastern university in the United States to participate in lab study. To be eligible, participants must have been currently enrolled in any psychology course and been at least 18 years old. Although 309 students were recruited, for the present study, 102 non-drinkers were excluded from analyses (i.e., defined as drinking 0 drinks per typical week in the previous month), leaving an analytic sample of 207 college student drinkers. Among college student drinkers, the majority of participants identified as being either White, non-Hispanic (*n* = 81; 39.1%), or African-American (*n* = 86; 41.6%), were female (*n* = 170; 82.1%), and reported a mean age of 20.94 years (*SD* = 5.48). See Table 1 for a full description. Participants received research credit for completing the study which was applied as course extra credit at the participating university. The study was approved by the institutional review board at the participating institution.

Table 1
Demographics.

Gender	n (%)
Male	35 (16.9)
Female	170 (82.1)
Missing	2 (1.0)
Age	n (%)
M	20.94 (5.48)
18	62 (30.0)
19	49 (23.7)
20	27 (13.0)
21	20 (9.7)
22	12 (5.8)
23+	34 (16.4)
Missing	3 (1.4)
Race/Ethnicity	n (%)
American Indian/Alaska Native	1 (0.5)
Asian	10 (4.8)
Black/African American	86 (41.6)
Native Hawaiian/Pacific Islander	0 (0.0)
White, non-Hispanic | White	81 (39.1)
Hispanic/Latino	16 (7.7)
Other	12 (5.8)
Missing	1 (0.5)
Class Standing	n (%)
Freshman	99 (47.8)
Sophomore	36 (17.4)
Junior	36 (17.4)
Senior	35 (16.9)
Grad Student	1 (0.5)
Marital Status	n (%)
Never Married	149 (72.0)
Married	13 (6.3)
In a Committed Relationship	43 (20.8)
Separated	0 (0)
Divorced	2 (1.0)
Widowed	0 (0.0)
Mindfulness Experience	n (%)
Yes	63 (30.4)
No	144 (69.6)
Greek Life	n (%)
Yes	24 (11.6)
No	182 (87.9)
Missing	1 (0.5)

Procedure

Figure 1 shows an overview of the experimental procedure. Upon arrival to the laboratory, participants received information about the study before providing informed consent. All participants were instructed that they would watch a video clip that may elicit certain emotions and that they were free to leave any question blank or stop the video if they felt any major discomfort. After giving consent, all participants completed a battery of measures assessing current mood state, alcohol consumption, and drinking motives. Next, participants were randomly assigned (prior to start of the experiment) to 1 of 3 mood conditions in which they watched a 2-3 minute video clip to elicit that specific emotion: sadness (n = 73), anxious (n = 75), and a mood control condition (n = 59). Following the video clips, all participants completed measures on mood state, current subjective alcohol craving, and completed a visual dot probe task assessing attentional bias for alcohol-related cues. Next, participants in each mood induction paradigm were assigned to either a mindfulness condition (n = 102) or no-mindfulness control condition (n = 105). Individuals in the mindfulness condition completed a mindfulness meditation exercise via an 8-minute guided mindfulness audio clip. Participants in the no-mindfulness control condition listened to an 8-minute educational information audio clip. Following the audio clips, all participants completed measures of state mindfulness, current subjective alcohol craving, current mood state, and performed another visual dot probe task. Finally, the participants completed demographic information.

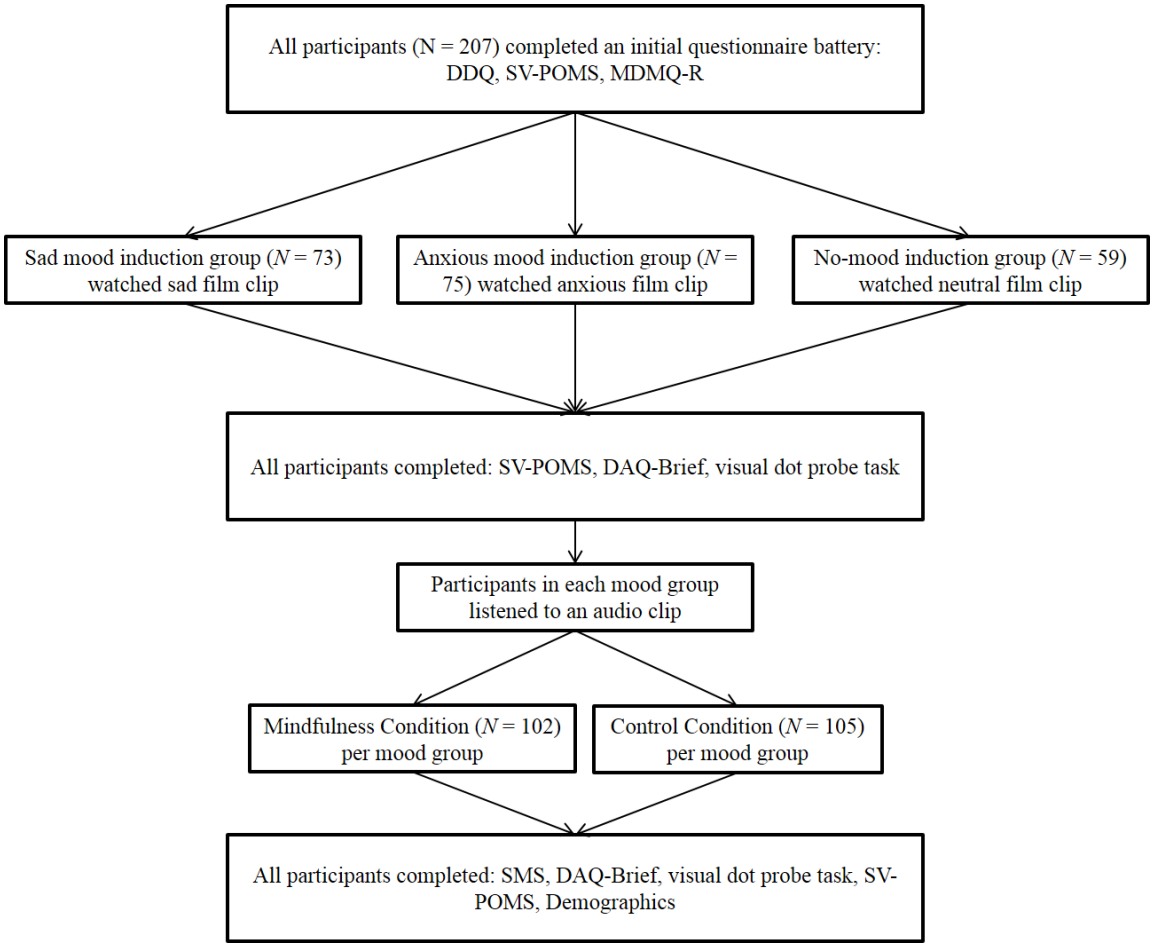

Figure 1. Depicts an overview of the experimental procedure.

Materials and Apparatus

All measures and tasks (i.e., mood inductions and dot probe task) were presented in a research lab to participants on computers using *Qualtrics* and *E-prime 2.0* software. The participants gave information about their age, race, ethnicity, gender, mindfulness meditation experience, class standing, and marital status. Demographics were collected at the end of the session to reduce bias (see Appendix A). For all measures (unless specified), composite scores were created by averaging items and reverse-coding items when appropriate such that higher scores indicate higher levels of the construct.

Alcohol consumption. Alcohol consumption was measured using a modified version of the Daily Drinking Questionnaire (DDQ; Collins, Parks, & Marlatt, 1985). The DDQ assesses alcohol consumption using a Monday through Sunday grid that assesses daily alcohol consumption during a typical drinking week in the past 30 days (see Appendix B). The instructions for the DDQ state, "We ask you to fill in the following grid with the typical number of standard drinks you consume each day of the week. Enter a '0' to indicate days on which you did not drink" (Collins et al., 1985). For the present study, the number of standard drinks consumed on each day of the typical drinking week was summed and alcohol consumption was entered as a covariate.

Mood states. Mood states were measured with the shortened version of the Profile of Mood States (SV-POMS; Shacham, 1983). The SV-POMS is a self-report measure that assesses 6 discrete mood states: tension-anxiety, depression-dejection, anger-hostility, vigor-activity, fatigue-inertia, and confusion-bewilderment. For purposes of this study, only the depression-dejection (e.g., "Sad"; 8 items) and tension-anxiety (e.g., "Tense"; 6 items) subscales were analyzed (see Appendix C). To assess mood states prior to mood induction, the participants

were provided with instructions stating, "Below is a list of words that describe feelings people have. Using the five-point scale below (0 = *not at all*, 4 = *extremely*), select which best describes how you have been feeling during the past week including today" (Shacham, 1983). To assess mood states post mood induction, the participants were provided with instructions stating, "Below is a list of words that describe feelings people have. Using the five-point scale below (0 = *not at all*, 4 = *extremely*), indicate to what extent you feel this way right now, that is, at the present moment". For the present study, the SV-POMS subscales were summed and used as a manipulation check of mood states after the mood induction paradigms. Across various psychometric studies (Curran, Andrykowski, & Studts, 1995; Dilorenzo, Bovbjerg, Montgomery, Valdimarsdottir, & Jacobsen, 1999), the SV-POMS has shown good to excellent reliability across various clinical and healthy adult samples: for depression-dejection subscale (α's ranging from .87 to .95) and for tension-anxiety subscale (α's ranging from .84 to .91). Convergent validity has been demonstrated by correlations with the original Profile of Mood States (McNair, Lorr, & Droppelman, 1971), r =.97 for depression-dejection and r = .96 for tension-anxiety subscale (Dilorenzo et al., 1999).

Drinking to cope motives. Drinking motives were measured using the Modified Drinking Motives Questionnaire-Revised (MDMQ-R; Grant et al., 2007). The MDMQ-R is a self-report measure that consist of 28 items (see Appendix D) and uses a 5-point response scale (1 = *never/almost never*, 5 = *almost always/always*). The measure assesses reasons for drinking within five domains: social, conformity, enhancement, coping with anxiety, and coping with depression. However, for the purpose of the present study, only the DTC-depression (e.g., "I drink alcohol to numb my pain"; 9 items) and DTC-anxiety (e.g., "To reduce my anxiety"; 4

items) subscales were analyzed. The MDMQ-R has exhibited good to excellent psychometric properties and is an accurate and valid measure of alcohol drinking motives (Grant et al., 2007).

Mood induction. Participants were assigned to 1 of 3 different mood induction paradigms: sadness, anxious, and no-mood (i.e., mood control condition). These paradigms consisted of three distinct short clips (2-3) minutes from three films (see Appendix E) that have been shown in previous research (Gross & Levenson, 1995; Hewig et al., 2005; Rottenberg, Ray, & Gross, 2007) to elicit these distinct moods of interest. The film clip for the sadness condition was selected from T*he Champ* (Zeffirelli, 1979), which shows a little boy facing the sudden death of his father after a boxing match (duration = 2:44 min). The film clip for the anxious condition was selected from *Silence of the Lambs* (Demme, 1991), which shows a basement chase scene where a young FBI agent is following and chasing a serial killer (duration = 2:11 min). The film clip for the mood control condition was selected from *Alaska's Wild Denali* (Hardesty, 1997), which is a narration about Alaskan landscapes and wildlife (duration = 2:16 min).

Mindfulness induction. Participants in each mood induction paradigm were evenly assigned to either a mindfulness condition or no-mindfulness control condition (see Appendix F). Individuals in the mindfulness condition completed a mindfulness meditation exercise via an 8-minute guided mindfulness audio clip: "Mindfulness Meditation of the Body and Breath" (Williams & Penman, 2011). The mindfulness exercise instructed participants to direct their attention towards their breathing and bodily sensations while noticing in an accepting manner when their minds wandered. This task has been shown in previous research (Kramer, Weger, & Sharma, 2013; Yusainy & Lawrence, 2015) to induce a mindfulness state among participants. Participants in the no-mindfulness control condition listened to an 8-minute educational excerpt

from a public radio station on recent discoveries about fruit flies and their nomenclature (All Things Considered, 2010). A similar procedure has been used elsewhere (Kramer et al., 2013; Reynolds et al., 2015; Yusainy & Lawrence, 2015) as a control condition for mindfulness induction.

States mindfulness. State mindfulness was measured using the State Mindfulness Scale (SMS; Tanay & Bernstein, 2013). The SMS is a self-report measure that consist of 21 items (see Appendix G) and uses a 5-point response scale (1 = *not at all*, 5 = *very well*). The measure assesses state mindfulness of mind (e.g., "I was aware of what was going on in my mind"; 15 items) and state mindfulness of body (e.g., "I noticed physical sensations come and go"; 6 items) immediately following a mindfulness experience (i.e., mindfulness induction). The participants were provided with instructions stating, "Please indicate the degree to which each of the 21 statements below described what you just experienced" (Tanay & Bernstein, 2013). The SMS has exhibited good to excellent psychometric properties and is an accurate and valid measure of state mindfulness (Tanay & Bernstein, 2013). For the present study, the SMS were summed and used as a manipulation check of state mindfulness after the mindfulness induction paradigms.

Alcohol attentional bias task. To assess alcohol attentional biases participants completed two visual dot-probe tasks (see Appendix H) after the mood induction and the mindfulness induction paradigms. Participants began by reading a brief summary of the task and then asked to press the spacebar when they were ready to begin. They were first instructed to fixate their vision on a computer screen (fixation cross). Next, two pictures (one alcohol-related and one neutral) appeared with a dot probe appearing on the right or left side of the screen 500 ms after the pictures were presented. This duration was selected as it reflects delayed disengagement of attention (Field & Cox, 2008) and researchers have demonstrated alcohol

attentional biases in high DTC motive drinkers compared to low DTC drinkers at 500 ms (Field & Quigley, 2009). Participants identified which probe was displayed (i.e., ← or →) using button press ("E" and "I" key). Prior to beginning the critical trials, the participants started with 20 practice trials in which neutral picture pairs were presented. Next, participants completed 144 critical trials in which alcohol–control picture pairs were presented. Probes replaced alcohol-related and control pictures with equal frequency, and there was an equal number of probes of each type (i.e., alcohol vs non-alcohol stimuli). A similar procedure has been used in previous alcohol studies examining attentional bias towards alcohol-related cues among college students (Field & Powell, 2007; Field & Quigley, 2009; Forestell, Dickter, & Young, 2012). In line with a previous study (Forestell et al., 2012), to examine the relative attention to alcohol-related compared to non-alcohol-related cues, a difference score was calculated in which reaction times to trials in which the dot-probe appeared on the side of the alcohol picture were subtracted from the reaction times to trials in which the dot-probe appeared on the side of the non-alcohol pictures. Positive difference scores indicate greater attention to the alcohol-related pictures relative to the non-alcohol-related pictures.

Subjective alcohol craving. Subjective alcohol craving was measured using the 14-item Desires for Alcohol Questionnaire-Brief (DAQ; Love, James, & Willner, 1998). The DAQ-Brief assess three facets of alcohol craving (see Appendix I): strong desires/intentions to drink (e.g., "I want a drink so much I can almost taste it"), negative reinforcement (e.g., "Even major problems in my life would not bother me if I drank now"), and positive reinforcement (e.g., "Drinking would be pleasant now"). To assess subjective alcohol craving post mood induction and mindfulness induction, the participants were provided with instructions stating, "Using the seven-point scale (1 = *strongly disagree*, 7 = *strongly agree*), please indicate to what extent you

feel this way right now". Consistent with previous research examining alcohol craving among college students (Dickter, Forestell, Hammett, & Young, 2014; Field & Quigley, 2009), scores from all subscales were summed to create a total subjective craving score. The DAQ-Brief has exhibited good to excellent psychometric properties and is an accurate and valid measure of alcohol craving (Kramer et al., 2010).

Statistical Analyses

All analyses were conducted in SPSS Version 21.0 and most hypothesis (unless specified) were assessed using an analysis of covariance (ANCOVA) model, which compared to an analysis of variance (ANOVA) model of change is a more powerful test for treatment effects (Van Breukelen, 2006). Although there were two separate groups of negative mood inductions (i.e., sadness and anxious), analyses were only conducted comparing each particular negative mood induction to the no-mood induction group (e.g., sadness mood condition vs. mood control condition). For all models, the effects of each predictor variable on the incentive salience of alcohol (i.e., subjective alcohol craving and attentional bias for alcohol-related cues) were examined using bias-corrected accelerated bootstrapped estimates (Efron & Tibshirani, 1993) based on 1,000 bootstrapped samples, which provides a powerful test of linear contrast of means within an analysis of variance (ANOVA) framework (Chen & Peng, 2013) and is robust to small departures from normality (Erceg-Hurn & Mirosevich, 2008). For significant interactions, simple slope analyses were conducted using PROCESS, a SPSS Macro that tests for mediation, moderation, and conditional process modeling (Hayes, 2012). Within all models, DTC-motives were mean-centered and both gender and alcohol consumption were entered as control variables.

Before analyses were conducted, data were cleaned and statistical assumptions were tested. With regards the attentional bias task (i.e., visual probe task) and consistent with

previous research (Field & Powell, 2007; Field & Quigley, 2009) reaction time data from trials with errors (i.e. incorrect responses) were excluded (3.82% of data). Further and consistent with previous research (Forestell et al., 2012), response latencies that were greater than three standard deviations above the mean were excluded (1.24% of data). With regards to assumptions, tests for linearity analyses between the covariates (i.e., DTC-anxiety and DTC-depression) and dependent variables indicated positive linear relationships. Specifically, controlling for gender and alcohol consumption, DTC-depression was significantly associated with higher subjective alcohol craving at pre-mindfulness induction, $\beta = .27$, 95% CI [0.10, 0.54], but was marginally significantly associated ($p = .049$) with attentional bias positive difference scores (i.e., greater attention to the alcohol-related cues relative to the non-alcohol-related cues) at pre-mindfulness induction, $\beta = .14$, 95% CI [-0.20, 8.14]. Controlling for gender and alcohol consumption, DTC-anxiety was significantly associated with higher subjective alcohol craving at pre-mindfulness induction, $\beta = .29$, 95% CI [.14, .51], but was marginally significantly associated ($p = .063$) with attentional bias positive difference scores at pre-mindfulness induction, $\beta = .15$, 95% CI [-0.64, 8.23]. Further, tests for independence between mood states and DTC motives was met; specifically, there were no significant differences between mood conditions (i.e., sadness, anxious, mood control) on both DTC-depression, $F(2,201) = 0.06$, $p = .94$, partial $\eta^2 = .00$, and DTC-anxiety, $F(2,201) = 0.01$, $p = .99$, partial $\eta^2 = .00$.

CHAPTER 3

RESULTS

Descriptive Statistics and Bivariate Correlations

The bivariate correlations, descriptive statistics, and internal consistency of primary variables included in all analyses among the entire sample are reported in Table 2. Sadness mood at post-mood induction had a weak positive relationship with both DTC-depression (r = .18) and DTC-anxiety (r = .20), a weak positive relationship with subjective alcohol craving at Time 1 (i.e., pre-mindfulness induction; r = .23) and Time 2 (i.e., post-mindfulness induction; r = .19), and a weak positive relationship with attentional bias positive difference scores (i.e., greater attention to the alcohol-related cues relative to the non-alcohol-related cues) at Time 1 (r = .20). Anxious mood at post-mood induction had a weak positive relationship with only DTC-anxiety (r = .17), a weak positive relationship with subjective alcohol craving at Time 1 (r = .22) and Time 2 (r = .14), and a weak positive relationship with attentional bias positive difference scores at Time 1 (r = .16) and Time 2 (r = .23). DTC-depression had strong positive relationship with DTC-anxiety (r = .69) and a moderate positive relationship with subjective alcohol craving at time 1 (r = .31) and Time 2 (r = .30). Further, DTC-anxiety had a moderate positive relationship with subjective alcohol craving at Time 1 (r = .33), a weak positive relationship with subjective alcohol craving at Time 2 (r = .24), and a weak positive relationship with attentional bias positive difference scores at Time 1 (r = .14). Correlations with covariates (i.e., gender and alcohol consumption) are noted in Table 2.

Table 2.

Descriptive statistics and bivariate correlations among primary variables within the entire sample

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	M	*SD*
1. Gender	---														0.83	0.38
2. Alcohol Consumption	-.12	---													6.47	5.82
3. Sad pre-mood induction	.04	.11	.94												12.93	6.87
4. Sad post-mood induction	**-.15**	.09	**.33**	.92											10.99	5.67
5. Anxious pre-mood induction	.05	.00	**.56**	**.17**	.88										13.01	5.54
6. Anxious post-mood induction	-.05	.08	**.23**	**.43**	**.43**	.88									10.27	4.86
7. DTC-Depression	-.06	**.19**	**.54**	**.18**	**.34**	.12	.94								1.75	0.96
8. DTC-Anxiety	-.02	**.15**	**.37**	**.20**	**.39**	**.17**	**.69**	.73							2.33	0.96
9. State Mindfulness-Mind	-.06	-.07	.05	.08	.05	.02	.01	.01	.93						46.55	12.42
10. State Mindfulness-Body	-.04	-.06	-.04	.06	.15	.02	-.06	-.01	**.73**	.87					17.39	5.63
11. Alcohol Craving Time 1	.08	**.33**	**.17**	**.23**	**.24**	**.22**	**.31**	**.33**	-.04	.05	.90				2.58	1.06
12. Alcohol Craving Time 2	.12	**.33**	**.22**	**.19**	**.24**	**.14**	**.30**	**.24**	-.03	-.01	**.78**	.91			2.59	1.20
13. Attentional Bias Time 1	.01	.05	.02	**.20**	.00	**.16**	.13	**.14**	.03	.14	.03	.06	---		0.82	27.97
14. Attentional Bias Time 2	-.08	-.03	-.01	.04	.05	**.23**	.02	.08	.03	.10	.01	-.01	**.19**	---	4.37	33.53

Note. Significant correlations ($p < .05$) are bolded for emphasis. Cronbach's alphas are underlined and shown on the diagonal. DTC = Drinking to Cope; Sad = depression-dejection; Anxious = tension-anxiety. Time 1 = Pre-mindfulness induction; Time 2 = Post-mindfulness induction; Attentional Bias = Positive difference scores indicate greater attention to the alcohol-related stimuli relative to the non-alcohol-related stimuli. Gender was coded 0 = men, 1 = women.

Manipulation Checks

Prior to conducting the ANCOVA models, manipulation checks were conducted to confirm equivalence of groups at baseline and to evaluate the effectiveness of each film clip to elicit the anticipated emotional response and the effectiveness of the mindfulness induction.

Mood manipulation check. To compare the two negative mood induction groups to the mood control group pre-mood induction (T1), a series of ANCOVA models (controlling for gender) were conducted. At pre-mood induction, there was a significant difference between the sadness mood group and the mood control group on depression-dejection, $F(1,128) = 6.40$, $p = .01$, partial $\eta^2 = .05$, such that the sadness group ($M = 13.32$) reported higher depression-dejection than the mood control group ($M = 10.81$). Comparably, there was not a significant difference between the anxious mood group ($M = 13.80$) and the mood control group ($M = 12.52$) on tension-anxiety, $F(1,130) = 1.46$, $p = .23$, partial $\eta^2 = .01$, at pre-mood induction. To test the effectiveness of the film clips, a series of ANCOVA models (controlling for gender and T1 mood) were conducted at post-mood induction (T2). At post-mood induction, there was a significant difference between the sadness mood group and the mood control group on depression-dejection, $F(1,127) = 33.65$, $p < .001$, partial $\eta^2 = .21$, such that the sadness group ($M = 14.28$) reported higher depression-dejection than the mood control group ($M = 9.00$). Similarly, there was a significant difference between the anxious mood group and the mood control group on tension-anxiety, $F(1,129) = 11.99$, $p < .01$, partial $\eta^2 = .09$, such that the anxious group ($M = 10.95$) reported higher tension-anxiety than the mood control group ($M = 8.38$).

Although there was not equivalence between the sadness mood group and the mood control group on depression-dejection pre-mood induction, the film clips did significantly

produce different emotion responses at post-mood induction, such that the sadness group elicited higher depression-dejection after the mood induction compared to the mood control group. With regards to anxiety, there was equivalence between the anxious mood group and the mood control group on tension-anxiety pre-mood induction and the film clips did significantly produce different emotion responses at post-mood induction, such that the anxious group elicited higher tension-anxiety after the mood induction compared to the mood control group.

State mindfulness manipulation check. To compare the mindfulness induction group to the no-mindfulness induction group, a series of ANCOVA models (controlling for gender and mood groups) were conducted on SMS mind and body subscales. At post-mindfulness induction, there was not a significant difference between the mindfulness induction group (M = 47.61) and the no-mindfulness induction group (M = 45.63) on SMS mindfulness of mind subscale, $F(1, 201) = 1.36$, $p = .24$, partial $\eta^2 = .01$. In contrast, there was a significant difference between the mindfulness induction group and the no-mindfulness induction group on SMS mindfulness of body subscale, $F(1, 201) = 16.05$, $p < .001$, partial $\eta^2 = .07$, such that the mindfulness induction group (M = 18.97) reported higher mindfulness body awareness than the no-mindfulness induction group (M = 15.89). Thus, the mindfulness intervention worked with regards to eliciting higher mindfulness of the body for those in the mindfulness induction group. Although the groups were not statistically different on the mindfulness of the mind subscale, this was expected given that the mindfulness exercise instructed participants to direct their attention towards their breathing and bodily sensations as opposed to mindful thoughts.

Mood Induction on Alcohol Outcomes (Hypothesis 1)

Sadness mood induction and incentive salience of alcohol. Hypothesis 1a suggested that individuals in the sadness induction group would exhibit higher subjective alcohol craving

and attentional bias toward alcohol-related cues than individuals in the control group (i.e., no mood induction) at pre-mindfulness induction. Across two ANCOVA models controlling for gender and alcohol consumption (see Table 3), the present hypothesis was not supported. Specifically, there was not a significant difference between the sadness mood group (M = 2.62) and the mood control group (M = 2.51) on subjective alcohol craving, $F(1, 127) = 0.11$, $p = .74$, partial $\eta^2 = .00$. Similarly, there was not a significant difference between the sadness mood group (M = 3.90) and the mood control group (M =1.17) on attentional bias toward alcohol-related cues, $F(1, 127) = 0.31$, $p = .58$, partial $\eta^2 = .00$. Thus, the sadness mood group did not differentiate from the mood control group on both incentive salience of alcohol outcomes.

Anxious mood induction and incentive salience of alcohol. Hypothesis 1b suggested that individuals in the anxious induction group would exhibit higher subjective alcohol craving and attentional bias toward alcohol-related cues than individuals in the control group (i.e., no mood induction) at pre-mindfulness induction. Across two ANCOVA models controlling for gender and alcohol consumption (see Table 3), the present hypothesis was not supported. Specifically, there was not a significant difference between the anxious mood group (M = 2.55) and the mood control group (M = 2.51) on subjective alcohol craving, $F(1, 129) = 0.08$, $p = .78$, partial $\eta^2 = .00$. Similarly, there was not a significant difference between the anxious mood group (M = -4.00) and the mood control group (M = 1.17) on attentional bias toward alcohol-related cues, $F(1, 129) = 1.97$, $p = .16$, partial $\eta^2 = .02$. Thus, the anxious mood group did not differentiate from the mood control group on both incentive salience of alcohol outcomes.

Table 3.
ANCOVA results for subjective alcohol craving and attentional bias by mood induction at pre-mindfulness induction

	Sadness Mood Group vs Mood Control Group					Anxious Mood Group vs Mood Control Group				
Outcome Variable	Sadness (*n* =73)	Control (*n* = 59)	*F*	*p*	η^2	Anxious (*n* = 75)	Control (*n* = 59)	*F*	*p*	η^2
Subjective Alcohol Craving	2.62	2.51	0.11	.742	.001	2.55	2.51	0.08	.776	.001
Attentional Bias	3.90	1.17	0.31	.582	.002	-4.00	1.17	1.97	.163	.015

Note. **p* < .05; ***p* < .01. Attentional Bias = Positive difference scores indicate greater attention to the alcohol-related stimuli relative to the non-alcohol-related stimuli. Means are reported for subjective alcohol craving and attentional bias. Gender and alcohol consumption were entered as covariates.

DTC Motives x Mood (Hypothesis 2)

Sadness mood induction and DTC-depression motives. Hypothesis 2a suggested that higher DTC-depression motives would be related to increased subjective alcohol craving and attentional bias toward alcohol-related cues, but only among individuals in the sadness mood induction condition. To test the present hypothesis, two custom ANCOVA models were constructed in which mood induction groups (i.e., sadness vs. control) and DTC-depression motives (covariate) and their interaction (i.e., mood group x DTC-depression) were entered as predictors of the both total craving scores and positive difference scores on the dot probe task at pre-mindfulness induction while controlling for gender and alcohol consumption. Across two custom ANCOVA models, the present hypothesis was not supported (see Table 4).

Subjective alcohol craving. At mean levels of DTC-depression, there was a non-significant main effect for mood induction on subjective alcohol craving. Further, there was also a non-significant interaction (i.e., mood group x DTC-depression) on subjective alcohol craving $F(1,125) = 2.36$, $p = .13$, partial $\eta^2 = .02$. There was a significant main effect for DTC-depression, such that collapsing across mood groups (i.e., sadness vs mood control) there was a significant relationship between DTC-depression and subjective alcohol craving, $F(1,125) = 12.79$, $p < .001$, partial $\eta^2 = .09$; however, caution must be taken given a non-significant parameter estimate, B = 0.19, 95% CI [-0.07, 0.67].

Attentional bias towards alcohol-related cues. At mean levels of DTC-depression, there was a non-significant main effect for mood induction on attentional bias. Further, there was also a non-significant interaction (i.e., mood group x DTC-depression) on attentional bias, $F(1,125) = 0.00$, $p = .96$, partial $\eta^2 = .00$. There was a significant main effect for DTC-depression, such that collapsing across mood groups (i.e., sadness vs mood control) there was a significant relationship

between DTC-depression and attentional bias, $F(1,125) = 5.19$, $p = .02$, partial $\eta^2 = .04$; however, caution must be taken given a non-significant parameter estimate, B = 6.13, 95% CI [-1.21, 11.52].

Table 4.

Custom ANCOVA results for subjective alcohol craving and attentional bias at pre-mindfulness induction by sadness vs control X DTC-depression

	Subjective Alcohol Craving						Attentional Bias					
Source	SS	df	MS	*F*	*p*	η^2	SS	df	MS	*F*	*p*	η^2
Sadness vs Control	0.21	1	0.21	0.21	.651	.002	320.79	1	320.79	0.37	.545	.003
DTC-Depression	13.03	1	13.03	12.79***	<.001	.093	4517.76	1	4517.76	5.19*	.024	.040
Interaction	2.34	1	2.34	2.36	.127	.018	2.77	1	2.77	0.00	.955	.000
Gender	4.04	1	4.04	3.97*	.049	.031	1247.55	1	1247.55	1.43	.234	.011
Alcohol Consumption	8.79	1	8.79	8.63**	.004	.065	142.82	1	142.82	0.16	.686	.001
Error	127.32	125	1.02				108897.85	125	871.18			

Note. *$p < .05$; **$p < .01$; ***$p < .001$. Attentional Bias = Positive difference scores indicate greater attention to the alcohol-related stimuli relative to the non-alcohol-related stimuli. Interaction = Sadness vs Control X DTC-Depression. Gender and alcohol consumption were entered as covariates.

DTC-anxiety as a moderator. In an attempt to distinguish between DTC-anxiety and DTC-depression motives, additional analyses were conducted (for every hypothesis) testing whether the relationships between mood groups are moderated by a different tive affect subtype of DTC (i.e., sadness X DTC-anxiety). Thus, two additional custom ANCOVA models were constructed in which mood induction groups (i.e., sad vs. control) and DTC-anxiety motives (covariate) and their interaction (i.e., mood group x DTC-anxiety) were entered as predictors of the both total craving scores and positive difference scores on the dot probe task at pre-mindfulness induction while controlling for gender and alcohol consumption. Across two custom ANCOVA models, there were no significant interaction between mood groups and DTC-anxiety (see Table 5). However, there was a main effect for DTC-anxiety on subjective alcohol craving, such that collapsing across mood groups (i.e., sadness vs mood control) there was a significant relationship between DTC-anxiety and subjective alcohol craving, $F(1,125) = 6.95$, $p < .01$, partial $\eta^2 = .05$; however, caution must be taken given a non-significant parameter estimate, B = 0.23, 95% CI [-0.05, 0.60]. There was also a significant main effect for DTC-anxiety on attentional bias, such that collapsing across mood groups (i.e., sadness vs mood control) there was a significant relationship between DTC-anxiety and attentional bias, $F(1,125) = 3.99$, $p < .05$, partial $\eta^2 = .03$, such that higher DTC-anxiety was associated with higher attentional bias for alcohol-related cues, B = 8.27, 95% CI [1.95, 13.80].

Table 5.

Custom ANCOVA results for subjective alcohol craving and attentional bias at pre-mindfulness induction by sadness vs control X DTC-anxiety

	Subjective Alcohol Craving						Attentional Bias					
Source	SS	df	MS	*F*	*p*	η^2	SS	df	MS	*F*	*p*	η^2
Sadness vs Control	0.16	1	0.16	0.15	.700	.001	301.07	1	301.07	0.35	.557	.003
DTC-Anxiety	7.41	1	7.41	6.95**	.009	.053	3458.60	1	3458.60	3.99*	.048	.031
Interaction	0.05	1	0.05	0.04	.836	.000	912.64	1	912.64	1.05	.307	.008
Gender	4.35	1	4.35	4.07*	.046	.032	1130.61	1	1130.61	1.30	.256	.010
Alcohol Consumption	10.51	1	10.51	9.85**	.002	.073	58.52	1	58.52	0.07	.796	.001
Error	133.36	125	1.07				108470.35	125	867.76			

Note. *$p < .05$; **$p < .01$. Attentional Bias = Positive difference scores indicate greater attention to the alcohol-related stimuli relative to the non-alcohol-related stimuli. Interaction = Sadness vs Control X DTC-Anxiety. Gender and alcohol consumption were entered as covariates.

Anxiety mood induction and DTC-anxiety motives. Hypothesis 2b suggested that higher DTC-anxiety motives would be related to increased subjective alcohol craving and attentional bias toward alcohol-related cues, but only among individuals in the anxious mood induction condition. To test the present hypothesis, two custom ANCOVA models were constructed in which mood induction groups (i.e., anxious vs. control) and DTC-anxiety motives (covariate) and their interaction (i.e., mood group x DTC-anxiety) were entered as predictors of the both total craving scores and positive difference scores on the dot probe task at pre-mindfulness induction while controlling for gender and alcohol consumption. Across two custom ANCOVA models the present hypothesis was not supported (see Table 6). For attentional bias as an outcome, no significant main effects were found (see Table 6). Further, there was also a non-significant interaction (i.e., mood group x DTC-anxiety) on attentional bias, $F(1,127) = 0.20$, $p = .66$, partial $\eta^2 = .00$.

Subjective alcohol craving. At mean levels of DTC-anxiety, there was a non-significant main effect for mood induction on subjective alcohol craving. Further, there was also a non-significant interaction (i.e., mood group x DTC-anxiety) on subjective alcohol craving, $F(1,127) = 1.26$, $p = .26$, partial $\eta^2 = .01$. There was a significant main effect for DTC-anxiety, such that collapsing across mood groups (i.e., anxious vs mood control) there was a significant relationship between DTC-anxiety and subjective alcohol craving, $F(1,127) = 18.11$, $p < .001$, partial $\eta^2 = .13$, such that higher DTC-anxiety was associated with higher subjective alcohol craving, B = 0.47, 95% CI [0.25, 0.68].

Table 6.

Custom ANCOVA results for subjective alcohol craving and attentional bias at pre-mindfulness induction by anxious vs control X DTC-anxiety

	Subjective Alcohol Craving						Attentional Bias					
Source	SS	df	MS	*F*	*p*	η^2	SS	df	MS	*F*	*p*	η^2
Anxious vs Control	0.02	1	0.02	0.02	.880	.000	1381.92	1	1381.92	1.91	.170	.015
DTC-Anxiety	15.46	1	15.46	18.11***	<.001	.125	190.39	1	190.39	0.26	.609	.002
Interaction	1.08	1	1.08	1.26	.264	.010	142.27	1	142.27	0.20	.658	.002
Gender	1.94	1	1.94	2.27	.134	.018	1615.63	1	1615.63	2.23	.138	.017
Alcohol Consumption	5.73	1	5.73	6.72*	.011	.050	829.15	1	829.15	1.14	.287	.009
Error	108.40	127	0.85				92009.81	127	724.49			

Note. **p* < .05; ***p* < .01; ****p* < .001. Attentional Bias = Positive difference scores indicate greater attention to the alcohol-related stimuli relative to the non-alcohol-related stimuli. Interaction = Anxious vs Control X DTC-Depression. Gender and alcohol consumption were entered as covariates.

DTC-depression as a moderator. Two additional custom ANCOVA models were constructed in which mood induction groups (i.e., anxious vs. control) and DTC-depression motives (covariate) and their interaction (i.e., mood group x DTC-depression) were entered as predictors of the both total craving scores and positive difference scores on the dot probe task at pre-mindfulness induction while controlling for gender and alcohol consumption. Across two custom ANCOVA models, there were no significant interactions between mood groups and DTC-depression on both incentive salience of alcohol outcomes (see Table 7). The only significant result was a main effect for DTC-depression on subjective alcohol craving, such that collapsing across mood groups (i.e., anxious vs mood control) there was a significant relationship between DTC-depression and subjective alcohol craving, $F(1,127) = 19.80$, $p < .001$, partial $\eta^2 = .14$, such that higher DTC-depression was associated with higher subjective alcohol craving, B = 0.33, 95% CI [0.03, 0.58].

Table 7.
Custom ANCOVA results for subjective alcohol craving and attentional bias at pre-mindfulness induction by anxious vs control X DTC-depression

	Subjective Alcohol Craving						Attentional Bias					
Source	SS	df	MS	*F*	*p*	η^2	SS	df	MS	*F*	*p*	η^2
Anxious vs Control	0.00	1	0.00	0.00	.997	.000	1291.71	1	1291.71	1.81	.181	.014
DTC-Depression	17.01	1	17.01	19.79***	<.001	.135	667.01	1	667.01	0.93	.336	.007
Interaction	0.75	1	0.75	0.87	.354	.007	1166.86	1	1166.86	1.63	.203	.013
Gender	1.32	1	1.32	1.54	.217	.012	1400.67	1	1400.67	1.96	.164	.015
Alcohol Consumption	5.97	1	5.97	6.95**	.009	.052	768.96	1	768.96	1.08	.301	.008
Error	109.17	127	0.86				90681.41	127	713.95			

Note. **p* < .05; ***p* < .01; ****p* < .001. Attentional Bias = Positive difference scores indicate greater attention to the alcohol-related stimuli relative to the non-alcohol-related stimuli. Interaction = Anxious vs Control X DTC-Depression. Gender and alcohol consumption were entered as covariates.

Mood x Mindfulness (Hypothesis 3)

Sadness mood induction and mindfulness. Hypothesis 3a suggested that mindfulness induction would buffer the associations between a sadness mood state and the incentive salience of alcohol (i.e., subjective alcohol craving and attentional bias for alcohol-related cues). In order to examine the protective effects of state mindfulness, change scores were calculated for incentive salience alcohol outcomes by subtracting the scores at pre-mindfulness induction from post-mindfulness induction with a negative value indicating a reduction in subjective alcohol craving and attentional bias for alcohol-related cues (done for all analyses with change scores as outcome). To test the present hypothesis, two (i.e., one for each alcohol outcome) custom 2 (mindfulness induction: mindfulness condition, control condition) X 2 (mood induction: sadness, control) ANCOVA models were constructed with gender, alcohol consumption, and the alcohol outcome scores (e.g., total craving scores) from the pre-mindfulness assessment as covariates. Across two custom ANCOVA models the present hypothesis was partially supported (see Table 8). For attentional bias as an outcome, no significant main effects were found. Further, there was also a non-significant interaction (i.e., mood group x mindfulness condition) on attentional bias, $F(1,124) = 2.43$, $p = .12$, partial $\eta^2 = .02$.

Subjective alcohol craving. Collapsing across mindfulness conditions, there was a non-significant main effect for mood induction on subjective alcohol craving. Further, there was a non-significant interaction (i.e., mood group x mindfulness condition) on subjective alcohol craving, $F(1,124) = 0.70$, $p = .79$, partial $\eta^2 = .00$. However, there was a significant main effect for mindfulness conditions, such that collapsing across mood groups (i.e., sadness vs mood control) there was a significant difference between mindfulness vs no-mindfulness conditions on subjective alcohol craving, $F(1,124) = 11.95$, $p < .01$, partial $\eta^2 = .09$. Specifically, there was a

significant mean difference (*M difference* = -0.40, 95% CI [-0.66, -0.17]), between the mindfulness group (*M* = -0.19) and the no-mindfulness group (*M* = 0.21). Further, the mean for individuals that received a mindfulness induction was statistically different from zero (*M* = -0.19, 95% CI [-0.36, -0.05]) as well as the mean for individuals in the no-mindfulness condition (*M* = 0.21, 95% CI [0.05, 0.40]). These results suggest that collapsing across mood groups (i.e., sadness vs mood control), individuals in the mindfulness condition reported as significant difference (i.e., reduction) in subjective alcohol crave scores at post-mindfulness induction compared to individuals in the no-mindfulness condition.

Table 8.

Custom ANCOVA results for subjective alcohol crave change and attentional bias change at post-mindfulness induction by sadness vs control X mindfulness vs no-mindfulness conditions

	Subjective Alcohol Crave Change						Attentional Bias Change					
Source	SS	df	MS	*F*	*p*	η^2	SS	df	MS	*F*	*p*	η^2
Sadness vs Control	0.26	1	0.26	0.59	.446	.05	11.48	1	11.48	0.01	.926	.000
Mindfulness vs No-Mindfulness	5.23	1	5.23	11.95	.001**	.088	2949.42	1	2949.42	2.22	.139	.018
Interaction	0.03	1	0.03	0.70	.791	.001	3220.77	1	3220.77	2.43	.122	.019
Gender	1.83	1	1.83	4.19	.043*	.016	1121.17	1	1121.17	0.84	.360	.007
Alcohol Consumption	0.68	1	0.68	1.56	.214	.033	286.63	1	286.63	0.22	.643	.002
Time 1 Scores	0.89	1	0.89	2.04	.156	.012	48767.74	1	48767.74	36.72***	<.001	.228
Error	54.23	124	0.44				164673.34	124	1328.01			

Note. *$p < .05$; **$p < .01$; ***$p < .001$. Attentional Bias = Positive difference scores indicate greater attention to the alcohol-related stimuli relative to the non-alcohol-related stimuli; Interaction = Sadness vs Control X Mindfulness vs No-Mindfulness; Time 1 = Pre-mindfulness induction scores for the respective alcohol outcome. Change scores in both alcohol outcomes were calculated by subtracting the scores at pre-mindfulness induction from post-mindfulness induction with a negative value indicating a reduction in subjective alcohol craving and attentional bias for alcohol-related cues. Gender, alcohol consumption, T1 scores were entered as covariates. See text for description of significant group means and significant group mean differences.

Anxious mood induction and mindfulness. Hypothesis 3b suggested that mindfulness induction would buffer the associations between an anxious mood state and the incentive salience of alcohol (i.e., subjective alcohol craving and attentional bias for alcohol-related cues). To test the present hypothesis, two (i.e., one for each alcohol outcome) custom 2 (mindfulness induction: mindfulness condition, control condition) X 2 (mood induction: anxious, control) ANCOVA models were constructed with gender, alcohol consumption, and the alcohol outcome scores from the pre-mindfulness assessment as covariates. Across two custom ANCOVA models the present hypothesis was not supported (see Table 9). For subjective alcohol craving as an outcome, no significant main effects were found. Further, there was also a non-significant interaction (i.e., mood group x mindfulness condition) on subjective alcohol craving, $F(1,126) = 1.95$, $p = .08$, partial $\eta^2 = .03$. For attentional bias as an outcome, no significant main effects were found. Further, there was also a non-significant interaction (i.e., mood group x mindfulness condition) on attentional bias, $F(1,126) = 0.08$, $p = .75$, partial $\eta^2 = .00$.

Table 9.

Custom ANCOVA results for subjective alcohol crave change and attentional bias change at post-mindfulness induction by anxious vs control X mindfulness vs no-mindfulness conditions

	Subjective Alcohol Crave Change						Attentional Bias Change					
Source	SS	df	MS	*F*	*p*	η^2	SS	df	MS	*F*	*p*	η^2
Anxious vs Control	0.58	1	0.58	0.10	.758	.001	1.551	1	1.551	0.00	.958	.000
Mindfulness vs No-Mindfulness	1.14	1	1.14	1.14	.174	.015	2.311	1	2.311	0.00	.948	.000
Interaction	1.95	1	1.95	1.95	.076	.025	41.41	1	41.41	0.08	.748	.001
Gender	0.00	1	0.00	0.00	.967	.000	361.94	1	361.94	0.66	.419	.005
Alcohol Consumption	1.20	1	1.20	1.96	.164	.015	462.75	1	462.75	0.84	.361	.007
Time 1 Scores	4.38	1	4.38	4.38	.008	.054	70387.17	1	70387.17	127.85***	<.001	.504
Error	77.03	126	0.61				69367.94	126	550.54			

Note. $*p < .05$; $**p < .01$; $***p < .001$. Attentional Bias = Positive difference scores indicate greater attention to the alcohol-related stimuli relative to the non-alcohol-related stimuli; Interaction = Anxious vs Control X Mindfulness vs No-Mindfulness; Time 1 = Pre-mindfulness induction scores for the respective alcohol outcome. Change scores in both alcohol outcomes were calculated by subtracting the scores at pre-mindfulness induction from post-mindfulness induction with a negative value indicating a reduction in subjective alcohol craving and attentional bias for alcohol-related cues. Gender, alcohol consumption, T1 scores were entered as covariates. See text for description of significant group means and significant group mean differences.

DTC Motives X Mindfulness (Hypothesis 4)

Mindfulness induction and DTC-depression motives. Hypothesis 4a suggested that mindfulness induction would buffer the associations between DTC-depression motives and the incentive salience of alcohol (i.e., subjective alcohol craving and attentional bias for alcohol-related cues). To test this hypothesis, two custom ANCOVA models were constructed in which mindfulness conditions (i.e., mindfulness vs. no mindfulness) and DTC-depression motives (covariate) and their interaction (i.e., mindfulness conditions x DTC-depression) were entered as predictors of the both total craving scores and positive difference scores on the dot probe task at post-mindfulness induction while controlling for gender and alcohol consumption. Across two custom ANCOVA models the present hypothesis was not supported (see Table 10). For attentional bias as an outcome, no significant main effects were found. Further, there was also a non-significant interaction (i.e., DTC-depression x mindfulness condition) on attentional bias, $F(1,199) = 0.11$, $p = .75$, partial $\eta^2 = .00$.

Subjective alcohol craving. At mean levels of DTC-depression, there was a non-significant main effect for mindfulness conditions on subjective alcohol craving. Further, there was a non-significant interaction (i.e., mindfulness condition x DTC-depression) on subjective alcohol craving, $F(1,199) = 0.11$, $p = .74$, partial $\eta^2 = .00$. However, there was a significant main effect for DTC-depression, such that collapsing across mindfulness conditions (i.e., mindfulness vs no-mindfulness) there was a significant relationship between DTC-depression and subjective alcohol craving, $F(1,199) = 14.95$, $p < .001$, partial $\eta^2 = .07$. Specifically, higher DTC-depression was associated with higher subjective alcohol craving scores at post-mindfulness induction while controlling for gender and alcohol consumption, B = .35, 95% CI [0.05, 0.88].

Table 10.

Custom ANCOVA results for subjective alcohol craving and attentional bias at post-mindfulness induction by mindfulness vs no-mindfulness conditions X DTC-depression

	Subjective Alcohol Craving						Attentional Bias					
Source	SS	df	MS	*F*	*p*	η^2	SS	df	MS	*F*	*p*	η^2
Mindfulness vs No-Mindfulness	0.20	1	0.20	0.17	.684	.001	2123.17	1	2123.17	1.88	.172	.009
DTC-Depression	18.10	1	18.10	14.95***	<.001	.070	30.42	1	30.42	0.03	.870	.000
Interaction	0.13	1	0.13	0.11	.740	.001	119.91	1	119.91	0.11	.745	.001
Gender	8.40	1	8.40	6.39**	.009	.034	1074.46	1	1074.46	0.95	.331	.005
Alcohol Consumption	23.15	1	23.15	19.13***	<.001	.088	195.98	1	195.98	0.17	.678	.001
Error	240.84	199	1.21				225393.37	199	1132.63			

Note. *p < .05; **p < .01; ***p < .001. Attentional Bias = Positive difference scores indicate greater attention to the alcohol-related stimuli relative to the non-alcohol-related stimuli. Interaction = Mindfulness vs No-Mindfulness X DTC-Depression. Gender and alcohol consumption were entered as covariates.

Mindfulness induction and DTC-anxiety motives. Hypothesis 4b suggested that mindfulness induction would buffer the associations between DTC-anxiety motives and the incentive salience of alcohol (i.e., subjective alcohol craving and attentional bias for alcohol-related cues). To test this hypothesis, two custom ANCOVA models were constructed in which mindfulness conditions (i.e., mindfulness vs. no mindfulness) and DTC-anxiety motives (covariate) and their interaction (i.e., mindfulness conditions x DTC-anxiety) were entered as predictors of the both total craving scores and positive difference scores on the dot probe task at post-mindfulness induction while controlling for gender and alcohol consumption. Across two custom ANCOVA models the present hypothesis was not supported (see Table 11). For attentional bias as an outcome, no significant main effects were found. Further, there was also a non-significant interaction (i.e., DTC-anxiety x mindfulness condition) on attentional bias, $F(1,199) = 0.03$, $p = .86$, partial $\eta^2 = .00$.

Subjective alcohol craving. At mean levels of DTC-anxiety, there was a non-significant main effect for mindfulness conditions on subjective alcohol craving. Further, there was a non-significant interaction (i.e., mindfulness condition x DTC-anxiety) on subjective alcohol craving, $F(1,199) = 0.29$, $p = .59$, partial $\eta^2 = .00$. However, there was a significant main effect for DTC-anxiety, such that collapsing across mindfulness conditions (i.e., mindfulness vs no-mindfulness) there was a significant relationship between DTC-anxiety and subjective alcohol craving, $F(1,199) = 9.16$, $p < .01$, partial $\eta^2 = .04$. Specifically, higher DTC-anxiety was associated with higher subjective alcohol craving scores at post-mindfulness induction while controlling for gender and alcohol consumption, B = .29, 95% CI [0.08, 0.57].

Table 11.

Custom ANCOVA results for subjective alcohol craving and attentional bias at post-mindfulness induction by mindfulness vs no-mindfulness conditions X DTC-anxiety

	Subjective Alcohol Craving						Attentional Bias					
Source	SS	df	MS	*F*	*p*	η^2	SS	df	MS	*F*	*p*	η^2
Mindfulness vs No-Mindfulness	0.37	1	0.37	0.30	.584	.002	2127.83	1	2127.83	1.89	.171	.009
DTC-Anxiety	11.37	1	11.37	9.16**	.003	.044	1402.02	1	1402.02	1.25	.266	.006
Interaction	0.36	1	0.36	0.29	.589	.001	35.21	1	35.21	0.03	.860	.000
Gender	7.73	1	7.73	6.22*	.013	.030	1051.00	1	1051.00	0.93	.335	.005
Alcohol Consumption	26.91	1	26.91	21.68**	<.001	.098	370.27	1	370.27	0.33	.567	.002
Error	247.00	199	1.21				224097.57	199	1126.12			

Note. *$p < .05$; **$p < .01$; ***$p < .001$. Attentional Bias = Positive difference scores indicate greater attention to the alcohol-related stimuli relative to the non-alcohol-related stimuli. Interaction = Mindfulness vs No-Mindfulness X DTC-Anxiety. Gender and alcohol consumption were entered as covariates.

Mood X Mindfulness X DTC Motives (Hypothesis 5)

Sadness mood state, mindfulness, and DTC-depression motives. Hypothesis 5a suggested that mindfulness induction would buffer the associations between a sadness mood state and the incentive salience of alcohol (i.e., subjective alcohol craving and attentional bias for alcohol-related cues) across levels of DTC-depression motivation. Specifically, compared to individuals in the non-mindfulness condition, non-mood condition, and low DTC-depression motives, participants who received mindfulness induction while in a sadness mood state and who reported higher levels of DTC-depression motives were expected to exhibit the greatest reduction (i.e., change score) in subjective alcohol craving and attentional bias toward alcohol-related cues from pre-mindfulness induction to post-mindfulness induction. Once again change scores were calculated for incentive salience alcohol outcomes by subtracting the scores at pre-mindfulness induction from post-mindfulness induction with a negative value indicating a reduction in subjective alcohol craving and attentional bias for alcohol-related cues. To test the present hypothesis, two custom ANCOVA models were constructed in which mood induction groups (i.e., sadness vs. mood control), mindfulness induction groups (i.e., mindfulness condition vs. no-mindfulness condition), and DTC-depression motives (covariate) and their interactions (e.g., mood groups X mindfulness groups X DTC-depression) were constructed with gender, alcohol consumption, and the alcohol outcome scores (e.g., total craving scores) from the pre-mindfulness assessment as covariates. Across two custom ANCOVA models the present hypothesis was partially supported (see Table 12). For attentional bias as an outcome, no significant main effects or two-way interactions were found. Further, there was also a non-significant three-way interaction (i.e., mood groups X DTC-depression X mindfulness condition) on attentional bias, $F(1,120) = 2.20$, $p = .14$, partial $\eta^2 = .02$.

Subjective alcohol craving. Within this model, most main effects and all two-way interactions were non-significant. Further, there was also a non-significant three-way interaction (i.e., mood groups X DTC-depression X mindfulness condition) on subjective alcohol craving, $F(1,120) = 1.20$, $p = .28$, partial $\eta^2 = .01$. However, there was a significant main effect for mindfulness conditions, such that collapsing across mood groups (i.e., sadness vs mood control) and at average levels of DTC-depression, there was a significant difference between mindfulness vs no-mindfulness conditions on subjective alcohol craving, $F(1,124) = 10.05$, $p < .01$, partial $\eta^2 = .08$ (see Table 12). Specifically, at average levels of DTC-depression there was a significant mean difference (*M difference* = -0.38, 95% CI [-0.63, -0.17]), between the mindfulness group ($M = -0.19$) and the no-mindfulness group ($M = 0.19$). Further, the mean for individuals that received a mindfulness induction was statistically different from zero ($M = -0.19$, 95% CI [-0.34, -0.03]) as well as the mean for individuals in the no-mindfulness condition ($M = 0.19$, 95% CI [0.03, 0.39]). These results suggest that collapsing across mood groups (i.e., sadness vs mood control) and at average levels of DTC-depression motives, individuals in the mindfulness condition reported as significant change score (i.e., reduction) in subjective alcohol crave scores at post-mindfulness induction compared to individuals in the no-mindfulness condition.

Table 12.

Custom ANCOVA results for subjective alcohol crave change and attentional bias change at post-mindfulness induction by sadness vs control X mindfulness vs no-mindfulness conditions X and DTC-depression

	Subjective Alcohol Crave Change						Attentional Bias Change					
Source	SS	df	MS	*F*	*p*	η^2	SS	df	MS	*F*	*p*	η^2
Sadness vs Control	0.18	1	0.18	0.41	.525	.003	135.63	1	135.63	0.10	.750	.001
Mindfulness vs No-Mindfulness	4.46	1	4.46	10.05**	.002	.077	2246.92	1	2246.92	1.69	.196	.014
DTC-Depression	0.20	1	0.20	0.46	.501	.004	383.17	1	383.17	0.29	.592	.002
Interaction 1	0.01	1	0.01	0.00	.959	.000	3327.66	1	3327.66	2.51	.116	.020
Interaction 2	0.29	1	0.29	0.66	.417	.005	856.43	1	856.43	0.65	.423	.005
Interaction 3	0.01	1	0.01	0.32	.859	.000	1523.91	1	1523.91	1.15	.286	.009
Interaction 4	0.53	1	0.53	1.20	.275	.010	2914.74	1	2914.74	2.20	.141	.018
Gender	2.01	1	2.01	4.54	.035	.036	1027.72	1	1027.72	0.78	.381	.006
Alcohol Consumption	0.81	1	0.81	1.82	.180	.015	630.45	1	630.45	0.48	.492	.004
Time 1 Scores	1.12	1	1.12	2.52	.15	.021	44218.61	1	44218.61	33.32***	<.001	.217
Error	53.17	120	0.44				159233.17	120	1326.94			

Note. $*p < .05$; $**p < .01$; $*** p < .001$. Attentional Bias = Positive difference scores indicate greater attention to the alcohol-related stimuli relative to the non-alcohol-related stimuli; Interaction 1 = Sadness vs Control X Mindfulness vs No-Mindfulness; Interaction 2 = Sadness vs Control X DTC-Depression; Interaction 3 = Mindfulness vs No-Mindfulness X DTC-Depression; Interaction 4 = Sadness vs Control X Mindfulness vs No-Mindfulness X DTC-Depression. Time 1 = Pre-mindfulness induction scores for the respective alcohol outcome. Change scores in both alcohol outcomes were calculated by subtracting the scores at pre-mindfulness induction from post-mindfulness induction with a negative value indicating a reduction in subjective alcohol craving and attentional bias for alcohol-related cues. Gender, alcohol consumption, T1 scores were entered as covariates. See text for description of significant group means and significant group mean differences.

DTC-anxiety as a moderator. Further, in an attempt to validate distinguishing between DTC-anxiety and DTC-depression motives, additional analyses were conducted testing whether the relationships between mood groups and mindfulness conditions and their interactions were moderated by a different negative affect subtype of DTC (i.e., mood X mindfulness condition X DTC-anxiety). For attentional bias as an outcome, no significant main effects or interactions were found (see Table 13). For subjective alcohol craving as the outcome, most main effects and all interactions were non-significant. However, there was a significant main effect for mindfulness conditions, such that collapsing across mood groups (i.e., sadness vs mood control) and at average levels of DTC-anxiety, there was a significant difference between mindfulness vs no-mindfulness conditions on subjective alcohol craving, $F(1,124) = 12.39$, $p < .01$, partial $\eta^2 = .09$ (see Table 13). Specifically, at average levels of DTC-anxiety there was a significant mean difference (*M difference* = -0.42, 95% CI [-0.66, -0.18]), between the mindfulness group ($M = -0.19$) and the no-mindfulness group ($M = 0.23$). Further, the mean for individuals that received a mindfulness induction was statistically different from zero ($M = -0.19$, 95% CI [-0.35, -0.04]) as well as the mean for individuals in the no-mindfulness condition ($M = 0.23$, 95% CI [0.04, 0.42]). These results suggest that collapsing across mood groups (i.e., sadness vs mood control) and at average levels of DTC-anxiety motives, individuals in the mindfulness condition reported a significant change score (i.e., reduction) in subjective alcohol crave scores at post-mindfulness induction compared to individuals in the no-mindfulness condition.

Table 13.

Custom ANCOVA results for subjective alcohol crave change and attentional bias change at post-mindfulness induction by sadness vs control X mindfulness vs no-mindfulness conditions X and DTC-anxiety

	Subjective Alcohol Crave Change						Attentional Bias Change					
Source	SS	df	MS	*F*	*p*	η^2	SS	df	MS	*F*	*p*	η^2
Sadness vs Control	0.45	1	0.45	1.01	.316	.008	184.89	1	184.89	0.14	.711	.001
Mindfulness vs No-Mindfulness	5.47	1	5.47	12.38**	.001	.093	2770.80	1	2770.80	2.06	.153	.017
DTC-Anxiety	0.56	1	0.56	1.26	.264	.010	7.82	1	7.82	0.01	.939	.000
Interaction 1	0.11	1	0.11	0.24	.624	.002	3312.06	1	3312.06	2.47	.119	.020
Interaction 2	0.05	1	0.05	0.10	.750	.001	18.67	1	18.67	0.01	.906	.000
Interaction 3	0.71	1	0.71	1.61	.207	.013	3520.50	1	3520.50	2.62	.108	.021
Interaction 4	0.02	1	0.02	0.05	.826	.000	46.45	1	46.45	0.04	.853	.000
Gender	1.66	1	1.66	3.75	.055	.030	1232.67	1	1232.67	0.92	.340	.008
Alcohol Consumption	0.66	1	0.66	1.49	.224	.012	269.98	1	269.98	0.20	.655	.002
Time 1 Scores	0.67	1	0.67	1.51	.221	.012	41182.18	1	41182.18	30.67***	<.001	.204
Error	52.99	120	0.44				161146.34	120	1342.89			

Note. **p* < .05; ***p* < .01; *** *p* < .001. Attentional Bias = Positive difference scores indicate greater attention to the alcohol-related stimuli relative to the non-alcohol-related stimuli; Interaction 1 = Sadness vs Control X Mindfulness vs No-Mindfulness; Interaction 2 = Sadness vs Control X DTC-Anxiety; Interaction 3 = Mindfulness vs No-Mindfulness X DTC-Anxiety; Interaction 4 = Sadness vs Control X Mindfulness vs No-Mindfulness X DTC-Anxiety. Time 1 = Pre-mindfulness induction scores for the respective alcohol outcome. Change scores in both alcohol outcomes were calculated by subtracting the scores at pre-mindfulness induction from post-mindfulness induction with a negative value indicating a reduction in subjective alcohol craving and attentional bias for alcohol-related cues. Gender, alcohol consumption, T1 scores were entered as covariates. See text for description of significant group means and significant group mean differences.

Anxiety mood state, mindfulness, and DTC-anxiety motives. Hypothesis 5b suggested that mindfulness induction will buffer the associations between an anxious mood state and the incentive salience of alcohol (i.e., subjective alcohol craving and attentional bias for alcohol-related cues) across levels of DTC-anxiety motivation. Specifically, compared to individuals in the non-mindfulness condition, non-mood condition, and low DTC-anxiety motives, participants who received mindfulness induction while in anxious mood state and who reported higher levels of DTC-anxiety motives were expected to exhibit the greatest reduction (i.e., change score) in subjective alcohol craving and attentional bias toward alcohol-related cues from pre-mindfulness induction to post-mindfulness induction. Once again change scores were calculated for incentive salience alcohol outcomes by subtracting the scores at pre-mindfulness induction from post-mindfulness induction with a negative value indicating a reduction in subjective alcohol craving and attentional bias for alcohol-related cues. To test the present hypothesis, two custom ANCOVA models were constructed in which mood induction groups (i.e., anxious vs. mood control), mindfulness induction groups (i.e., mindfulness condition vs. no-mindfulness condition), and DTC-anxiety motives (covariate) and their interactions (e.g., mood groups X mindfulness groups X DTC-anxiety) were constructed with gender, alcohol consumption, and the alcohol outcome scores (e.g., total craving scores) from the pre-mindfulness assessment as covariates. Across two custom ANCOVA models the present hypothesis was not supported (see Table 14). For subjective alcohol craving as an outcome no significant main effects or two-way interactions were found. Further, there was also a non-significant three-way interaction (i.e., mood groups X DTC-anxiety X mindfulness condition) on subjective alcohol craving, $F(1,122) = 1.11$, $p = .30$, partial $\eta^2 = .01$.

Table 14.

Custom ANCOVA results for subjective alcohol crave change and attentional bias change at post-mindfulness induction by anxious vs control X mindfulness vs no-mindfulness conditions X and DTC-anxiety

	Subjective Alcohol Crave Change						Attentional Bias Change					
Source	SS	df	MS	*F*	*p*	η^2	SS	df	MS	*F*	*p*	η^2
Anxious vs Control	0.14	1	0.14	0.23	.632	.002	69.26	1	69.26	0.14	.713	.001
Mindfulness vs No-Mindfulness	1.29	1	1.29	2.08	.152	.017	0.58	1	0.58	0.00	.973	.000
DTC-Anxiety	0.01	1	0.01	0.02	.898	.000	976.02	1	976.02	1.91	.169	.015
Interaction 1	2.19	1	2.19	3.53	.063	.028	20.26	1	20.26	0.04	.842	.000
Interaction 2	0.24	1	0.24	0.38	.538	.003	637.70	1	637.70	1.25	.266	.010
Interaction 3	0.40	1	0.40	0.65	.422	.005	14.51	1	14.51	0.03	.866	.000
Interaction 4	0.69	1	0.69	1.11	.295	.009	4765.30	1	4765.30	9.33**	.003	.071
Gender	0.01	1	0.01	0.01	.908	.000	376.04	1	376.04	0.74	.392	.006
Alcohol Consumption	0.93	1	0.93	1.50	.223	.012	841.74	1	841.74	1.65	.202	.013
Time 1 Scores	4.03	1	4.03	6.49**	.012	.050	67882.68	1	67882.68	132.95***	<.001	.521
Error	75.86	122	0.62				62289.68	122	510.57			

Note. **p* < .05; ***p* < .01; *** *p* < .001. Attentional Bias = Positive difference scores indicate greater attention to the alcohol-related stimuli relative to the non-alcohol-related stimuli; Interaction 1 = Anxious vs Control X Mindfulness vs No-Mindfulness; Interaction 2 = Anxious vs Control X DTC-Anxiety; Interaction 3 = Mindfulness vs No-Mindfulness X DTC-Anxiety; Interaction 4 = Anxious vs Control X Mindfulness vs No-Mindfulness X DTC-Anxiety. Time 1 = Pre-mindfulness induction scores for the respective alcohol outcome. Change scores in both alcohol outcomes were calculated by subtracting the scores at pre-mindfulness induction from post-mindfulness induction with a negative value indicating a reduction in subjective alcohol craving and attentional bias for alcohol-related cues. Gender, alcohol consumption, T1 scores were entered as covariates. See text for description of significant group means and significant group mean differences.

Attentional bias towards alcohol-related cues. Within this model, there were no significant main effects and only one significant interaction. Specifically, there was a significant three-way interaction between mood groups (i.e., anxious vs mood control), mindfulness conditions (i.e., mindfulness vs no-mindfulness), and DTC-anxiety on attentional bias, $F(1,122) = 9.33$, $p < .01$, partial $\eta^2 = .07$ (see Table 14). Surprisingly, although the ANCOVA indicated a significant three-way interaction, there were no significant mean differences between any of the groups (e.g., no-mindfulness and mood control) across levels of DTC-anxiety on attentional bias (see Figure 2 for means). However, simple slope analyses revealed that the relationship (i.e., slope) between DTC-anxiety and change score in attentional bias was significantly different from zero among individuals in the anxious mood group that did receive a mindfulness induction, B = 12.41, 95% CI [4.59, 20.24]. However, when examining the conditional effect of the DTC-anxiety and mood group interaction on change score in attentional bias (positive score indicating increase in bias towards alcohol), this relationship was significantly weaker (i.e., buffering) among individuals that did receive a mindfulness induction, B = -18.05, 95% CI [-30.21, -5.89]. Taken together with the non-significant mean differences, caution must be taken in interpreting the significant three-way interaction.

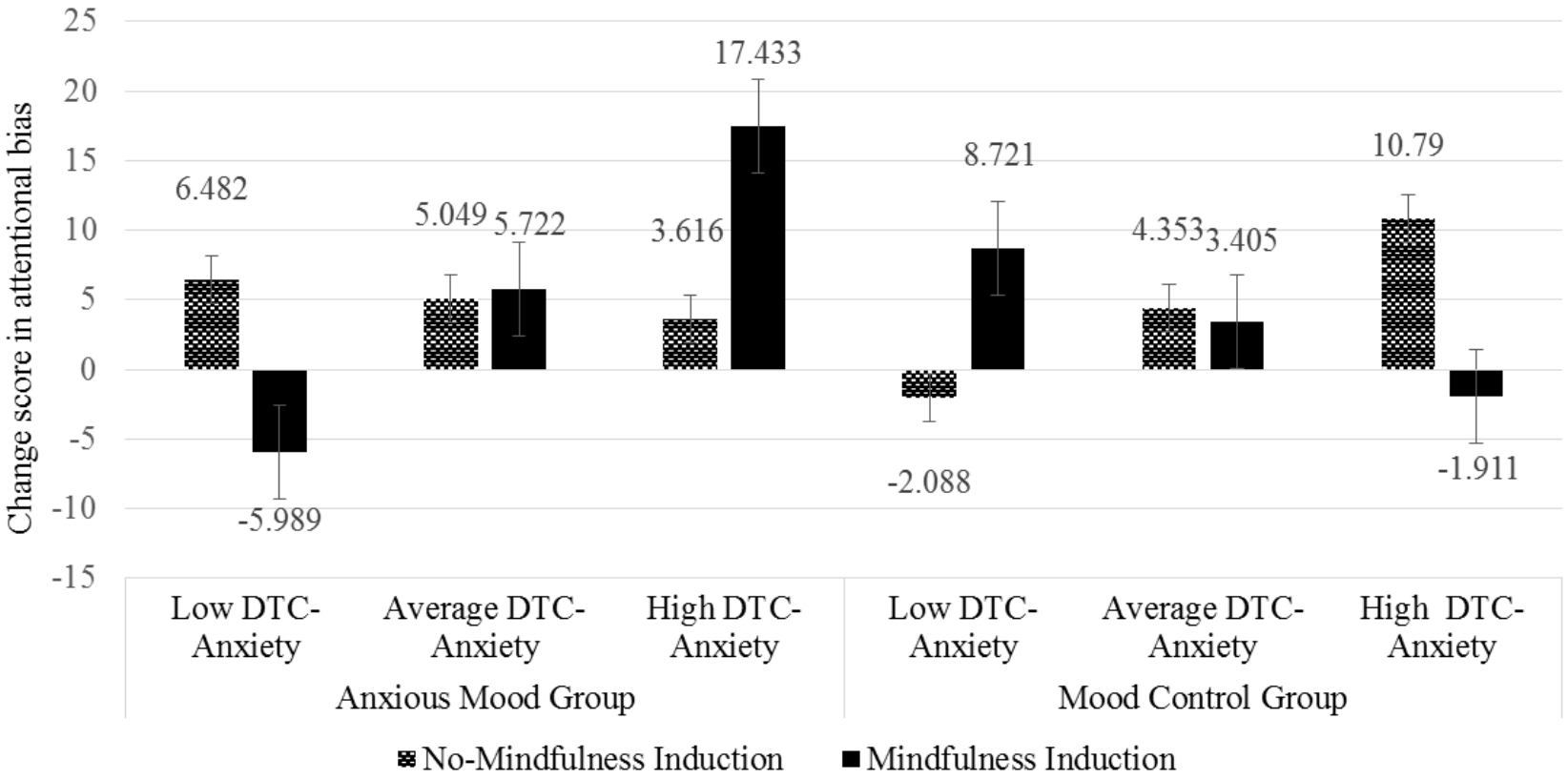

Figure 2. Depicts the significant three-way-interaction effects of Anxious vs Control X Mindfulness vs No-Mindfulness X DTC-Anxiety on the change score in attentional bias toward alcohol cues post-mindfulness induction. A negative value in this figure represents a reduction in attentional bias from pre-mindfulness induction to post-mindfulness induction. Gender, alcohol consumption, and pre-mindfulness induction attentional bias (T1) scores were entered as covariates. See text for significant group mean differences and slope differences.

DTC-depression as a moderator and subjective alcohol craving. Further, in an attempt to validate distinguishing between DTC-anxiety and DTC-depression motives, additional analyses were conducted testing whether the relationships between mood groups and mindfulness conditions and their interactions were moderated by a different negative affect subtype of DTC (i.e., mood X mindfulness condition X DTC-depression). For subjective alcohol craving as an outcome, most main effects and all interactions were non-significant (see Table 15). However, there was a significant main effect DTC-depression, such that collapsing across mood groups (i.e., anxious vs mood control) and mindfulness induction groups (i.e., mindfulness condition vs. no-mindfulness condition) there was a significant relationship between DTC-depression and subjective alcohol craving, $F(1,122) = 4.06$, $p < .05$, partial $\eta^2 = .03$; however, caution must be taken given a non-significant parameter estimate, B = 0.24, 95% CI [-0.39, 1.59].

Table 15.

Custom ANCOVA results for subjective alcohol crave change and attentional bias change at post-mindfulness induction by anxious vs control X mindfulness vs no-mindfulness conditions X and DTC-depression

	Subjective Alcohol Crave Change						Attentional Bias Change					
Source	SS	df	MS	*F*	*p*	η^2	SS	df	MS	*F*	*p*	η^2
Anxious vs Control	0.00	1	0.00	0.01	.945	.000	142.06	1	142.06	0.27	.606	.002
Mindfulness vs No-Mindfulness	0.47	1	0.47	0.78	.380	.006	21.70	1	21.70	0.04	.840	.000
DTC-Depression	2.47	1	2.47	4.06*	.046	.032	825.17	1	825.17	1.55	.215	.013
Interaction 1	1.68	1	1.68	2.76	.099	.022	14.69	1	14.69	0.03	.868	.000
Interaction 2	0.04	1	0.04	0.69	.794	.001	26.78	1	26.78	0.05	.823	.000
Interaction 3	0.06	1	0.06	0.10	.758	.001	1081.61	1	1081.61	2.03	.157	.016
Interaction 4	0.32	1	0.32	0.52	.472	.004	2478.80	1	2478.80	4.66*	.033	.037
Gender	0.00	1	0.00	0.00	.989	.000	488.97	1	488.97	0.92	.340	.007
Alcohol Consumption	0.72	1	0.72	1.19	.278	.010	567.86	1	567.86	1.07	.304	.009
Time 1 Scores	6.21	1	6.21	10.19**	.002	.077	68643.50	1	68643.50	128.99***	<.001	.514
Error	74.26	122	0.61				64822.77	122	532.15			

Note. $*p < .05$; $**p < .01$; $*** p < .001$. Attentional Bias = Positive difference scores indicate greater attention to the alcohol-related stimuli relative to the non-alcohol-related stimuli; Interaction 1 = Anxious vs Control X Mindfulness vs No-Mindfulness; Interaction 2 = Anxious vs Control X DTC-Depression; Interaction 3 = Mindfulness vs No-Mindfulness X DTC-Depression; Interaction 4 = Anxious vs Control X Mindfulness vs No-Mindfulness X DTC-Depression. Time 1 = Pre-mindfulness induction scores for the respective alcohol outcome. Change scores in both alcohol outcomes were calculated by subtracting the scores at pre-mindfulness induction from post-mindfulness induction with a negative value indicating a reduction in subjective alcohol craving and attentional bias for alcohol-related cues. Gender, alcohol consumption, T1 scores were entered as covariates. See text for description of significant group means and significant group mean differences.

DTC-depression as a moderator and alcohol bias. Within this model, there were no significant main effects and only one significant interaction. Specifically, there was a significant three-way interaction between mood groups (i.e., anxious vs mood control), mindfulness conditions (i.e., mindfulness vs no-mindfulness), and DTC-depression on attentional bias, $F(1,122) = 4.66$, $p = .03$, partial $\eta^2 = .04$ (see Table 15). Once again, although the ANCOVA indicated a significant three-way interaction, there were no significant mean differences between any of the groups (e.g., no-mindfulness and mood control) across levels of DTC-depression on attentional bias (see Figure 3 for means). However, simple slope analyses revealed that the relationship (i.e., slope) between DTC-depression and change score in attentional bias was significantly different from zero among individuals in the mood control group that did not receive a mindfulness induction, B = 10.97, 95% CI [1.922, 20.12]. However, when examining the conditional effect of the DTC-depression and mood group interaction on change score in attentional bias (positive score indicating increase in bias towards alcohol), this relationship was not significant across mindfulness conditions. Taken together with the non-significant mean differences, caution must be taken in interpreting the significant three-way interaction.

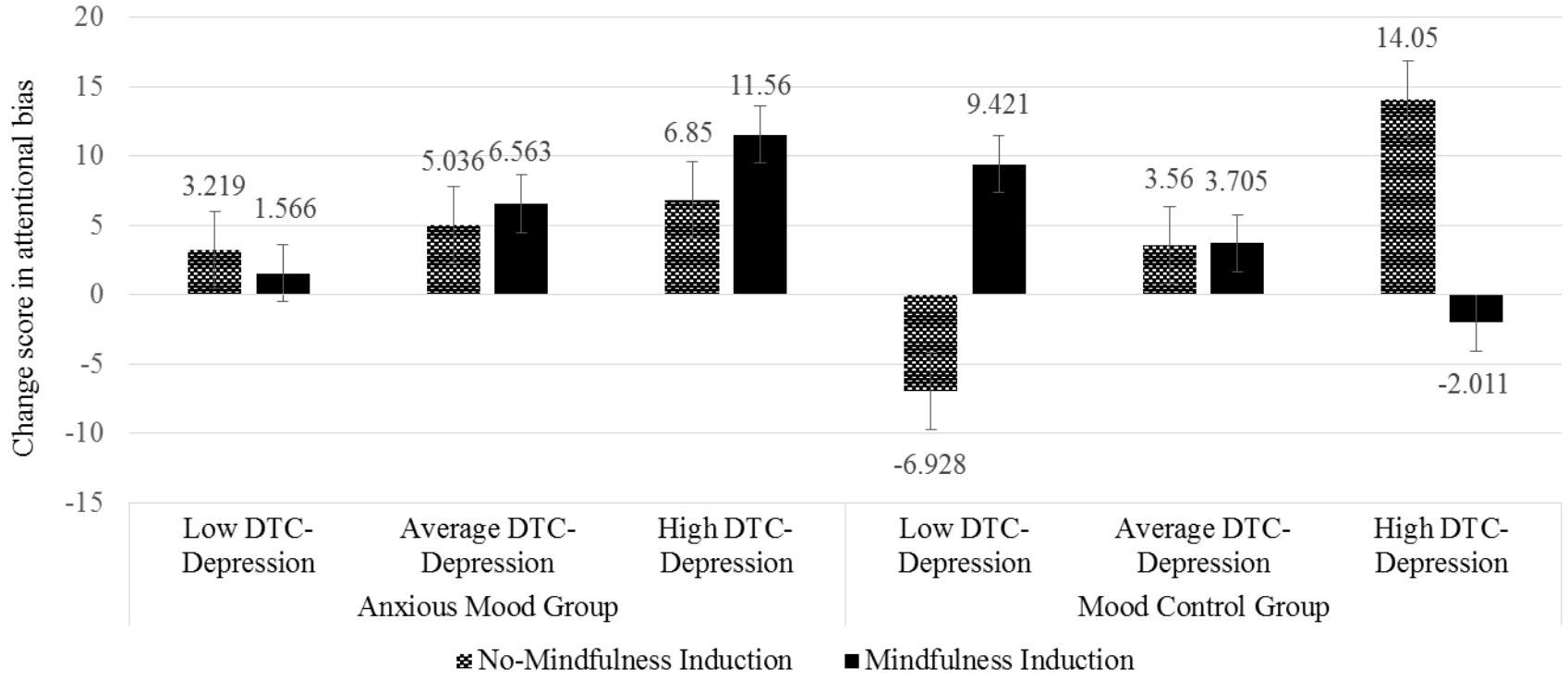

Figure 3. Depicts the significant three-way-interaction effects of Anxious vs Control X Mindfulness vs No-Mindfulness X DTC-Depression on the change score in attentional bias toward alcohol cues post-mindfulness induction. A negative value in this figure represents a reduction in attentional bias from pre-mindfulness induction to post-mindfulness induction. Gender, alcohol consumption, and pre-mindfulness induction attentional bias (T1) scores were entered as covariates. See text for significant group mean differences and slope differences.

CHAPTER 4

DISCUSSION

The purpose of the present study was to examine drinking to cope (DTC) motives and mindfulness as two distinct factors that may enhance (DTC) and reduce (state mindfulness) the association between negative mood states (i.e., sadness and anxiety) and the incentive salience of alcohol (i.e., subjective alcohol craving and attentional bias for alcohol-related cues) among college student drinkers. Specifically, the present study examined state mindfulness (via a brief mindfulness induction) as a conditional variable (i.e., buffer) between specific negative mood states (i.e., sadness and anxiety) and the incentive salience of alcohol (i.e., subjective alcohol craving and attentional bias for alcohol-related cues) across levels of DTC motives for a specific negative affect. Based on various models of addition (e.g., self-medication hypothesis; Conger, 1951, 1956; Khantzian, 1997; motivational models of alcohol use; Cooper, 1994; Cox & Klinger, 1988, 1990) and the Maladaptive Coping Hypothesis (Leventhal et al., 2010), it was expected that participants who received a mindfulness induction (i.e. induced state mindfulness) while in a negative mood state (i.e., anxious or sadness) and reported higher levels of DTC motives would exhibit the greatest change score (i.e., reduction) in subjective alcohol craving and attentional bias toward alcohol-related cues from pre-mindfulness induction to post-mindfulness induction. Results were partially consistent with hypotheses, such that collapsing across mood groups (i.e., sadness vs mood control) and at average levels of both DTC-depression and DTC-anxiety motives, individuals in the mindfulness condition reported a significant change score (i.e., reduction) in subjective alcohol crave scores at post-mindfulness induction compared to individuals in the no-mindfulness condition.

Drinking to Cope Motives and Negative Mood States

Despite successful mood inductions and significant correlations between negative moods (i.e., sadness and anxious) at post-mood induction with subjective alcohol craving and attentional bias, there was a non-significant relationship between negative mood inductions (i.e., both sadness and anxious) and alcohol outcomes after controlling for gender and alcohol consumption. This finding is consistent with a previous study that found a non-significant relationship between negative mood and implicit alcohol attention to alcohol cues (Birch et al., 2008). Surprisingly, these findings were further upheld (i.e., non-significant findings) when comparing these associations across levels of DTC motives. The present study's findings run counter to previous research that found that the relationship between negative mood states and alcohol craving (Field & Quigley, 2009; Willner et al., 1998) as well as negative mood and attentional bias towards alcohol-related cues (Field & Powell, 2007; Grant et al., 2007) is stronger among individuals with high DTC motives as compared to low. There a few possible explanations for these inconsistent findings.

A major difference between this study and previous studies is that the present study examined DTC motives as a continuous variable as opposed to previous research in which DTC motives who assessed dichotomously (e.g., median splits; Field & Powell, 2007; Field & Quigley, 2009). This is more than just a statistical nuance, given that dichotomization (e.g., median-split) of continuous variables assumes that those in one group (e.g., low DTC individuals) are qualitatively different from those in the other group (e.g., high DTC individuals; MacCallum, Zhang, Preacher, & Rucker, 2002) and dichotomization has been show to lead to higher Type 1 error probability (Royston, Altman, & Sauerbrei, 2006). Thus, perhaps if the present study dichotomized DTC motives previous findings may have been replicated. However, the present study assessed these relationships using an analysis of covariance (ANCOVA) model

with DTC motives measured continuously given that it is a more powerful test for treatment effects compared to an analysis of variance (ANOVA) model of change (Van Breukelen, 2006).

Another major difference between previous studies and the present study, was that DTC motives were examined for a specific subtype of negative affect (i.e., DTC-depression and DTC-anxiety) as conditional variables (i.e., moderators) as compared measuring DTC motives globally (Field & Powell, 2007; Field & Quigley, 2009). Of note, there was one study that examined DTC-anxiety as a moderator of mood conditions and attentional bias towards alcohol-related cues (Grant et al., 2007); however, they examined differences between DTC-anxiety and enhancement motives on the relationship between negative mood and alcohol outcomes as opposed to examining these relationships across levels of DTC-anxiety. Moreover, although the present study focused on both anxious and sadness mood inductions, others focused on stress induction (Field & Powell, 2007; Field & Quigley, 2009), which does differentially relate to alcohol outcomes (Bravo et al., 2016).

Nonetheless, at pre-mindfulness induction and collapsed across mood groups (i.e., anxious and control), higher DTC motives (both anxiety and depression) was associated with higher subjective alcohol craving scores while controlling for gender and alcohol consumption. Moreover, at post-mindfulness induction and collapsed across mindfulness conditions, higher DTC motives (both anxiety and depression) was associated with higher subjective alcohol craving scores while controlling for gender and alcohol consumption. These findings provide support for behavioral models of addiction (e.g., cognitive-behavioral model of relapse; Larimer, Palmer, & Marlatt, 1999; Marlatt & George, 1985) which posit that engaging in a maladaptive coping response (i.e., DTC) when coping with stressors leads to an increased probability of consuming a desired substance (Witkiewitz et al., 2005). Specific to the present study and at

both pre and post-mindfulness induction assessments, higher levels of DTC motives was related to higher subjective alcohol craving; which according to the Incentive Sensitization Theory (Robinson & Berridge, 1993) may place student drinkers at a heightened risk for alcohol consumption and alcohol-related problems. Taken together with previous research (see Bravo et al., 2016 for a review), it is important for clinicians and researchers to focus on mechanisms to deter student drinkers from engaging in high levels of DTC because it may be associated with higher subjective alcohol craving, which may lead to hazardous alcohol outcomes.

Operationalization of DTC Motives and Negative Mood

Experimentally, the present study attempted to validate distinguishing between DTC-anxiety and DTC-depression motives by testing whether the relationships between mood groups are moderated by a different negative affect subtype of DTC (e.g., anxious X DTC-depression). Conceptually, relationships between those in the anxious mood state and alcohol outcomes should not be moderated by DTC-depression motives given that it should only tap into sadness mood states; however, no significant interactions including between matching negative mood and DTC motive (i.e., anxious X DTC-anxiety) were found in the present study. However, and although each DTC motive was positively associated with increased subjective alcohol craving, there was a strong enough overlap to warrant combining them into a single index (i.e., $r = .69$), which is consistent with other studies finding a high overlap between DTC-depression and DTC-anxiety (Roos et al., 2015). Nonetheless, the present study was only one experimental study among college student drinkers. Clearly, more empirical work is needed to determine the degree to which DTC motives should be examined more generally (i.e., overall DTC motives) or specific to distinct affective states.

Further, results may have differed if a global negative mood induction paradigm was utilized; however, given that experimental research among college students have shown that specific negative mood inductions (i.e., stress, sadness, and anxiety) uniquely lead to increased alcohol craving and greater attentional bias towards alcohol-related cues (Field & Powell, 2007; Field & Quigley, 2009; Grant et al., 2007; Willner et al., 1998), it was warranted to examine specific subtypes of emotional states. Even so, more empirical work is needed to determine the degree to which mood inductions should be examined more generally (i.e., negative mood) or specific to distinct affective states (e.g., sadness, anxious, stress).

State Mindfulness as a Protective Factor

Behavioral models of addiction posit that engaging in an adaptive coping mechanism (i.e., mindfulness) might reduce the association between stressors and the probability of consuming a desired substance (e.g., alcohol; Witkiewitz et al., 2005). In support of these behavioral models of addiction, previous cross-sectional research has found that higher trait mindfulness is related to decreased alcohol outcomes, including alcohol cravings (Karyadi & Cyders, 2015). Further, brief mindfulness based interventions and training have been shown to be efficacious at reducing binge episodes and alcohol-related consequences among college student drinkers (Mermelstein & Garske, 2015). In an extension of these previous findings, the present study's results suggest that state mindfulness (via a brief mindfulness induction) may reduce the incentive salience of alcohol (i.e., subjective alcohol craving) among individuals with average levels of DTC motives (both depression and anxiety) regardless of their emotional mood state.

A possible explanation for these results is that for those in the mindfulness condition, being put into a mindful state may elicit individuals to decenter from their present thoughts and

emotions (i.e., stressors) that may reduce their subjective alcohol craving in the moment. Although not assessed within the present study and consistent with trait mindfulness research (Brown et al., 2015; Feldman et al., 2010; Pearson et al., 2015; Shapiro, 2009), decentering (i.e., a shift in perspective from one's thoughts or emotions; Fresco et al., 2007) may be an underlying mechanism that explains the health-promoting effects of state mindfulness (i.e., reduction in subjective alcohol craving) within the present study. Overall, converging evidence from trait mindfulness research (Bravo et al., in press; Reynolds et al., 2015; Roos et al., 2015), brief mindfulness based intervention and training studies (Mermelstein & Garske, 2015; Ostafin et al., 2012), and the present study, mindfulness is a protective factor that can decouple the conditioned associations between emotional states and subjective alcohol craving among college student drinkers.

Theoretical Implications

Recently, researchers have advocated for more research to determine why mindfulness (globally) and mindfulness-based interventions are effective in reducing substance use (Witkiewitz & Black, 2014). The present study's findings may provide one mechanism through which mindfulness has health-promoting effects in reducing alcohol consumption and alcohol-related problems (Bowen et al., 2009; Ostafin et al., 2012; Witkiewitz & Bowen, 2010). Albeit very preliminary, results foster support of the Maladaptive Coping Hypothesis (Leventhal et al., 2010), which posits that engaging in an adaptive coping strategy may buffer the relationship between emotional functioning and poor health outcomes because it may provide an alternative strategy to a maladaptive coping strategy. Specific to this study, being induced into a mindful state may have immediate benefits as at it may reduce subjective alcohol craving among college-student drinkers with average levels of DTC motives. This finding is important given that

subjective alcohol craving plays a role in the development of alcohol dependence (Robinson & Berridge, 1993). Further, according to the Attention-Allocation Model (Steele & Josephs, 1988, 1990), in the absence of distractors, alcohol-induced impairment facilitates individuals to allocate their attention on the most salient internal or external cues (e.g., focusing on their negative mood or thoughts), which may exacerbate their negative affect and lead to more problematic alcohol consumption. Based on the preliminary findings from the present study, state mindfulness (via a brief mindfulness exercise) may be considered a "distractor" that may prevent individuals from focusing on their moods or thoughts and thus reduce a reduce alcohol craving in the moment.

Clinical Implications and Future Directions

Although the majority of college students do not perceive heavy alcohol use as problematic or willing to seek services (Knight et al., 2002), there has been a plethora of individual-level interventions trying to reduce college student drinking (see Carey, Scott-Sheldon, Carey, & DeMartini, 2007 for a review). With regards to mindfulness interventions, Mermelstein and Garske (2015) found that a brief (4 weeks), mindfulness-intervention was efficacious at reducing binge episodes and alcohol-related problems among college students who report binge drinking. Within the present study and in a sample of college student drinkers (i.e., mostly non-dependent drinkers), a brief mindfulness induction (i.e., 8 minute mindfulness mediation exercise) was shown to create a reduction subjective alcohol craving within one session. However, future work is needed to examine these potential beneficiary mechanisms, especially among college student drinkers who might not be ready to change their drinking behavior.

Longitudinal studies are also needed to explore whether being induced into a mindful state has lingering effects beyond just a momentary reduction in subjective alcohol craving. Further, daily diary and ecological momentary assessment (EMA) methods are needed as these approaches would conceptually provide more accurate accounts of how DTC motives, emotional mood states, and state mindfulness interrelate among college students (Shiffman, 2009; Wray, Merrill, & Monti, 2014). For example, an EMA study could examine whether students that participated in a mindfulness exercise (i.e., induction of state mindfulness) prior to evening drinking report lower alcohol consumption and/or next day alcohol-related problems. Further, given that the field of psychology is currently undergoing a rather strong indictment regarding effects that are not reproducible (Simmons, Nelson, & Simonsohn, 2011), future research should attempt to replicate the present study's findings specifically given the statistical difficulties in detecting moderation effects in field studies vs experimentally controlled studies (McClelland & Judd, 1993).

Limitations

Some key limitations of the present study must be noted. First, given the convenient sample (i.e., volunteer college students selected from one university) it is unknown whether findings generalize to other populations (e.g., mandated college students, non-college students, and clinical populations). Second, a reliance on retrospective self-report measures for DTC motives is a major limitation that is associated with significant recall biases (e.g., Ekholm, 2004; Gmel & Daeppen, 2007). Further, the present study relied on change scores which has been criticized for poor reliability as well as issues with regression toward the mean (Cronbach & Furby, 1970); however, mood induction groups did not differ on any ratings of mood states pre-mood induction, which supports using change scores to test group differences and does allow for

intuitively correct inferences (Allison, 1990). Moreover, the present study did not control for mindfulness experience (30% of the analytic sample) which may account for the efficacy of state mindfulness on the reduction of subjective alcohol craving. Thus, future work should attempt to replicate the present study's findings among subsamples of meditation-naïve (i.e., non-meditators) and meditation-experienced (i.e., meditators), given that these groups have differential relations with mindfulness facets (e.g., observing; Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006; Bravo, Boothe, & Pearson, 2015) and mindfulness based interventions (Carmody & Baer, 2008). As with any study with multiple comparisons there is always the risk of Type 1 error; however, given that all hypotheses for the present study were a priori, researchers recommend that it is unnecessary to adjust the alpha level (i.e., increasing the confidence interval) to account for multiple comparisons (Cramer et al., 2015; Maxwell & Delaney, 2004).

Conclusions

Among college students who consume alcohol, experimental studies have confirmed an increase in alcohol craving and attentional bias for alcohol-related cues after negative mood inductions. Because attentional bias to alcohol-related cues and subjective alcohol craving play a role in the development of alcohol dependence (Robinson & Berridge, 1993), the present study sought to examine drinking to cope (DTC) motives and mindfulness as two distinct factors that may enhance (DTC) and reduce (mindfulness) the association between negative mood states (i.e., sadness and anxiety) and the incentive salience of alcohol (i.e., subjective alcohol craving and attentional bias for alcohol-related cues) among college student drinkers. Results suggests that higher levels of DTC motives is related to higher subjective alcohol craving; however, being induced into a mindful state may reduce subjective alcohol craving among college student

drinkers with average levels of DTC motives. Albeit preliminary, the present study offers support for mindfulness as a beneficial alternative coping strategy to drinking to cope among college student drinkers. Future work is needed to replicate these findings and examine how DTC motives, emotional mood states, and state mindfulness interrelate among college student drinkers within an ecological momentary framework.

References

Abrams, D. B., & Niaura, R. S. (1987). Social Learning Theory. In H. T. Blane & K. E. Leonard (Eds.), *Psychological Theories of Drinking and Alcoholism* (pp. 131–178). New York, NY: Guildford Press.

Allison, P. D. (1990). Change scores as dependent variables in regression analysis. *Sociology Methodology*, *20*(1), 93–114. http://doi.org/10.2307/271083

Arch, J. J., & Craske, M. G. (2006). Mechanisms of mindfulness: Emotion regulation following a focused breathing induction. *Behaviour Research and Therapy*, *44*, 1849–1858. http://doi.org/10.1016/j.brat.2005.12.007

Armeli, S., Conner, T. S., Cullum, J., & Tennen, H. (2010). A longitudinal analysis of drinking motives moderating the negative affect-drinking association among college students. *Psychology of Addictive Behaviors*, *24*, 38–47. http://doi.org/10.1037/a0017530

Armeli, S., Dranoff, E., Tennen, H., Austad, C. S., Fallahi, C. R., Raskin, S., … Pearlson, G. (2014). A longitudinal study of the effects of coping motives, negative affect and drinking level on drinking problems among college students. *Anxiety, Stress, and Coping*, *27*, 37–41. http://doi.org/10.1080/10615806.2014.895821

Armeli, S., Todd, M., Conner, T. S., & Tennen, H. (2008). Drinking to cope with negative moods and the immediacy of drinking within the weekly cycle among college students. *Journal of Studies on Alcohol and Drugs*, *69*, 313–22. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/18299774

Baer, R. A., Smith, G. T., Hopkins, J., Krietemeyer, J., & Toney, L. (2006). Using self-report assessment methods to explore facets of mindfulness. *Assessment*, *13*, 27–45. http://doi.org/10.1177/1073191105283504

Bandura, A. (1977). *Social Learning Theory*. Englewood Cliffs, NJ: Prentice-Hall.

Birch, C. D., Stewart, S. H., Wiers, R. W., Klein, R. M., MacLean, A. D., & Berish, M. J. (2008). The mood-induced activation of implicit alcohol cognition in enhancement and coping motivated drinkers. *Addictive Behaviors*, *33*, 565–581. http://doi.org/10.1016/j.addbeh.2007.11.004

Bishop, S. R., Lau, M., Shapiro, S. L., Carlson, L., Anderson, N. D., Carmody, J., … Devins, G. (2004). Mindfulness : A proposed operational definition. *Clinical Psychology: Science and Practice*, *11*, 230–241. http://doi.org/10.1093/clipsy/bph077

Bondelos, J. S., Noonan, M., & Wells, S. Y. (2013). Mindfulness and alcohol problems in college students: The mediating effects of stress. *Journal of American College Health*, *61*, 371–378. http://doi.org/10.1080/07448481.2013.805714

Bowen, S., N., C., Collin, S., Witkiewitz, K., Hsu, S. H., Grow, J., … Marlatt, A. (2009). Mindfulness-based relapse prevention for substance use disorders: A pilot efficacy trial. *Substance Abuse*, *30*, 295–305. http://doi.org/10.1080/08897070903250084

Bramm, S. M., Cohn, A. M., & Hagman, B. T. (2013). Can preoccupation with alcohol override the protective properties of mindful awareness on problematic drinking? *Addictive Disorders and Their Treatment*, *12*, 19–27. http://doi.org/10.1016/j.surg.2006.10.010.Use

Bravo, A. J., Boothe, L. G., & Pearson, M. R. (2015). Getting personal with mindfulness: A latent profile analysis of mindfulness and psychological outcomes. *Mindfulness*. http://doi.org/10.1007/s12671-015-0459-7

Bravo, A. J., Henson, J. M., & Pearson, M. R. (2016). In the process of frinking to cope: A review of drinking to cope motives among college students. *Mansucript Submitted for Publication*.

Bravo, A. J., Pearson, M. R., Stevens, L. E., & Henson, J. M. (n.d.). Depressive symptoms and alcohol-related problems among college students: A moderated mediated model of mindfulness and drinking to cope. *Journal of Studies on Alcohol and Drugs*.

Brown, D. B., Bravo, A. J., Roos, C. R., & Pearson, M. R. (2015). Five facets of mindfulness and psychological health: Evaluating a psychological model of the mechanisms of mindfulness. *Mindfulness, 6,* 1021–1032. http://doi.org/10.1007/s12671-014-0349-4

Carey, K. B., Scott-Sheldon, L. A. J., Carey, M. P., & DeMartini, K. S. (2007). Individual-level interventions to reduce college student drinking: A meta-analytic review. *Addictive Behaviors, 32,* 2469–2494. http://doi.org/10.1016/j.addbeh.2007.05.004

Carmody, J., & Baer, R. A. (2008). Relationships between mindfulness practice and levels of mindfulness, medical and psychological symptoms and well-being in a mindfulness-based stress reduction program. *Journal of Behavioral Medicine, 31,* 23–33. http://doi.org/10.1007/s10865-007-9130-7

Chen, L., & Peng, C. J. (2013). Constructing confidence intervals for effect sizes in ANOVA designs. *Journal of Modern Applied Statistical Methods, 12*(2), 82–104.

Chiesa, A. (2013). The Difficulty of Defining Mindfulness: Current Thought and Critical Issues. *Mindfulness, 4*, 255–268. http://doi.org/10.1007/s12671-012-0123-4

Chiesa, A., & Serretti, A. (2014). Are mindfulness-based interventions effective for substance use disorders? A systematic review of the evidence. *Substance Use and Misuse, 49,* 492–512. http://doi.org/10.3109/10826084.2013.770027

Christopher, M., Ramsey, M., & Antick, J. (2013). The role of dispositional mindfulness in mitigating the impact of stress and impulsivity on alcohol-related problems. *Addiction Research & Theory, 21,* 429–434. http://doi.org/10.3109/16066359.2012.737873

Collins, R. L., Marlatt, G. A., Parks, G. a, & Marlatt, G. A. (1985). Social determinants of alcohol consumption: The effects of social interaction and model status on the Self-administration of alcohol. *Journal of Consulting and Clinical Psychology, 53*, 189–200. http://doi.org/10.1037/0022-006X.53.2.189

Conger, J. J. (1951). The effect of alcohol on conflict behavior in the albino rat. *Quarterly Journal of Studies on Alcohol, 12*, 1–49.

Conger, J. J. (1956). Reinforcement theory and the dynamics of alcoholism. *Quarterly Journal of Studies on Alcohol, 17*, 296–305.

Considered, A. T. (2010). Fruit fly scientists swatted down over "cheap date." Washington, DC: National Public Radio. Retrieved from http://www.npr.org/templates/story/story.php?storyId=100468532

Cooper, M. L. (1994). Motivations for alcohol use among adolescents: Development and validation of a four-factor model. *Psychological Assessment, 6*, 117–128. http://doi.org/10.1037/1040-3590.6.2.117

Cooper, M. L., Russell, M., & George, W. H. (1988). Coping, expectancies, and alcohol abuse: A test of social learning formulations. *Journal of Abnormal Psychology*, *97*, 218–230. http://doi.org/10.1037/0021-843X.97.2.218

Cox, W. M., & Klinger, E. (1988). A motivational model of alcohol use. *Journal of Abnormal Psychology*, *97*, 168–180. http://doi.org/10.1037/0021-843X.97.2.168

Cox, W. M., & Klinger, E. (1990). Incentive motivation, affective change, and alcohol use: A model. In M. Cox (Ed.), *Why People Drink* (pp. 291–311). New York, NY: Gardner Press.

Cramer, A. O. J., van Ravenzwaaij, D., Matzke, D., Steingroever, H., Wetzels, R., Grasman, R. P. P. P., … Wagenmakers, E.-J. (2015). Hidden multiplicity in multiway ANOVA:

Prevalence, consequences, and remedies. *Psychonomic Bulletin & Review*, 1–8. http://doi.org/10.3758/s13423-015-0913-5

Cronbach, L. J., & Furby, L. (1970). How we should measure "change": Or should we? *Psychological Bulletin*, *74*, 68–80. http://doi.org/10.1037/h0029382

Curran, S. L., Andrykowski, M. A., & Studts, J. L. (1995). Short Form of the Profile of Mood States (POMS-SF): Psychometric information. *Psychological Assessment*, *7*, 80–83. http://doi.org/10.1037/1040-3590.7.1.80

Demme, J. (1991). *Silence of the Lambs*. United States: Orion Pictures. Retrieved from https://www.youtube.com/watch?v=OQZYz7qR0Fo

Dickter, C. L., Forestell, C. A., Hammett, P. J., & Young, C. M. (2014). Relationship between alcohol dependence, escape drinking, and early neural attention to alcohol-related cues. *Psychopharmacology*, *231*, 2031–2040. http://doi.org/10.1007/s00213-013-3348-6

Dilorenzo, T. A., Bovbjerg, D. H., Montgomery, G. H., Valdimarsdottir, H., & Jacobsen, P. B. (1999). The application of a shortened version of the profile of mood states in a sample of breast cancer chemotherapy patients. *British Journal of Health Psychology*, *4*, 315–325. http://doi.org/10.1348/135910799168669

Dvorak, R. D., Pearson, M. R., & Day, A. M. (2014). Ecological momentary assessment of acute alcohol use disorder symptoms: Associations with mood, motives, and use on planned drinking days. *Experimental and Clinical Psychopharmacology*, *22*, 285–97. http://doi.org/10.1037/a0037157

Efron, B., & Tibshirani, R. J. (1993). *An Introduction to the Bootstrap*. Boca Raton, Florida: CRC Press.

Ekholm, O. (2004). Influence of the recall period on self-reported alcohol intake. *European*

Journal of Clinical Nutrition, *58*, 60–3. http://doi.org/10.1038/sj.ejcn.1601746

Erceg-Hurn, D. M., & Mirosevich, V. M. (2008). Modern robust statistical methods: An easy way to maximize the accuracy and power of your research. *American Psychologist*, *63*, 591–601. http://doi.org/10.1037/0003-066X.63.7.591

Erisman, S. M., & Roemer, L. (2010). A preliminary investigation of the effects of experimentally induced mindfulness on emotional responding to film clips. *Emotion*, *10*, 72–82. http://doi.org/10.1037/a0017162

Feldman, G., Greeson, J., & Senville, J. (2010). Differential effects of mindful breathing, progressive muscle relaxation, and loving-kindness meditation on decentering and negative reactions to repetitive thoughts. *Behaviour Research and Therapy*, *48*, 1002–1011. http://doi.org/10.1016/j.brat.2010.06.006

Fernandez, A. C., Wood, M. D., Stein, L. a R., & Rossi, J. S. (2010). Measuring mindfulness and examining its relationship with alcohol use and negative consequences. *Psychology of Addictive Behaviors*, *24*, 608–616. http://doi.org/10.1037/a0021742

Field, M., & Cox, W. M. (2008). Attentional bias in addictive behaviors: A review of its development, causes, and consequences. *Drug and Alcohol Dependence*, *97*, 1–20. http://doi.org/10.1016/j.drugalcdep.2008.03.030

Field, M., & Eastwood, B. (2005). Experimental manipulation of attentional bias increases the motivation to drink alcohol. *Psychopharmacology*, *183*(3), 350–357. http://doi.org/10.1007/s00213-005-0202-5

Field, M., & Powell, H. (2007). Stress increases attentional bias for alcohol cues in social drinkers who drink to cope. *Alcohol and Alcoholism*, *42*, 560–566. http://doi.org/10.1093/alcalc/agm064

Field, M., & Quigley, M. (2009). Mild stress increases attentional bias in social drinkers who drink to cope: A replication and extension. *Experimental and Clinical Psychopharmacology*, *17*, 312–319. http://doi.org/10.1037/a0017090

Forestell, C. A., Dickter, C. L., & Young, C. M. (2012). Take me away: The relationship between escape drinking and attentional bias for alcohol-related cues. *Alcohol*, *46*, 543–549. http://doi.org/10.1016/j.alcohol.2012.05.001

Fresco, D. M., Moore, M. T., van Dulmen, M. H. M., Segal, Z. V., Ma, S. H., Teasdale, J. D., & Williams, J. M. G. (2007). Initial psychometric properties of the experiences questionnaire: Validation of a self-report measure of decentering. *Behavior Therapy*, *38*, 234–246. http://doi.org/10.1016/j.beth.2006.08.003

Gmel, G., & Daeppen, J.-B. (2007). Recall bias for seven-day recall measurement of alcohol consumption among emergency department patients: Implications for case-crossover designs. *Journal of Studies on Alcohol and Drugs*, *68*, 303–10. http://doi.org/10.15288/jsad.2007.68.303

Grant, V. V, Stewart, S. H., & Mohr, C. D. (2009). Coping-anxiety and coping-depression motives predict different daily mood-drinking relationships. *Psychology of Addictive Behaviors: Journal of the Society of Psychologists in Addictive Behaviors*, *23*, 226–237. http://doi.org/10.1037/a0015006

Grant, V. V., Stewart, S. H., & Birch, C. D. (2007). Impact of positive and anxious mood on implicit alcohol-related cognitions in internally motivated undergraduate drinkers. *Addictive Behaviors*, *32*, 2226–2237. http://doi.org/10.1016/j.addbeh.2007.02.012

Grant, V. V., Stewart, S. H., O'Connor, R. M., Blackwell, E., & Conrod, P. J. (2007). Psychometric evaluation of the five-factor Modified Drinking Motives Questionnaire -

Revised in undergraduates. *Addictive Behaviors*, *32*, 2611–2632. http://doi.org/10.1016/j.addbeh.2007.07.004

Greeley, J., & Oei, T. (1999). Alcohol and tension reduction. In K. E. Leonard & H. T. Blane (Eds.), *Psychological Theories of Drinking and Alcohol* (2nd ed., pp. 14–43). New York, NY: Guildford Press.

Gross, J. J., & Levenson, R. W. (1995). Emotion elicitation using films. *Cognition & Emotion*, *9*, 87–108. http://doi.org/10.1080/02699939508408966

Hardesty, T. (1997). *Alaska's Wild Denali*. United States: Alaska Video Postcard. Retrieved from https://www.youtube.com/watch?v=rbTCQrNOV_w

Hayes, A. F. (2012). PROCESS: A versatile computation tool for observed variable mediation, moderation, and conditional process modeling. *Unpublished Manuscript*, 1–39. http://doi.org/978-1-60918-230-4

Hewig, J., Hagemann, D., Seifert, J., Gollwitzer, M., Naumann, E., & Bartussek, D. (2005). A revised film set for the induction of basic emotions. *Cognition & Emotion*, *19*, 1095–1109. http://doi.org/10.1080/02699930541000084

Hingson, R. W., Zha, W., & Weitzman, E. R. (2009). Magnitude of and trends in alcohol-related mortality and morbidity among U.S. college students ages 18-24, 1998-2005. *Journal of Studies on Alcohol and Drugs. Supplement*, (16), 12–20. http://doi.org/10.1146/annurev.publhealth.26.021304.144652

Hussong, A. M. (2007). Predictors of drinking immediacy following daily sadness: An application of survival analysis to experience sampling data. *Addictive Behaviors*, *32*, 1054–1065. http://doi.org/10.1016/j.addbeh.2006.07.011

Kabat-Zinn, J. (1994). *Wherever you go, there you are: Mindfulness meditation in everyday life*.

New York, NY: Hyperion Books.

Karyadi, K. A., & Cyders, M. A. (2015). Elucidating the association between trait mindfulness and alcohol use behaviors among college students. *Mindfulness, 6*, 1242–1249. http://doi.org/10.1007/s12671-015-0386-7

Khantzian, E. J. (1997). The self-medication hypothesis of substance use disorders: A reconsideration and recent applications. *Harvard Review of Pschiatry*, *4*, 231–244. http://doi.org/10.3109/10673229709030550

Klinger, E., & Cox, W. M. (2004). Motivation and the theory of current concerns. In W. M. Cox & E. Klinger (Eds.), *Handbook of Motivational Counseling: Concepts, Approaches, and Assessment* (pp. 3–27). Chichester, UK: Wiley.

Knight, J. R., Wechsler, H., Kuo, M., Seibring, M., Weitzman, E. R., & Schuckit, M. A. (2002). Alcohol abuse and dependence among U.S. college students. *Journal of Studies on Alcohol, 63*, 263–270. http://doi.org/10.15288/jsa.2002.63.263

Kramer, J. R., Chan, G., Hesselbrock, V. M., Kuperman, S., Bucholz, K. K., Edenberg, H. J., … Porjesz, B. (2010). A principal components analysis of the abbreviated Desires for Alcohol Questionnaire (DAQ). *Journal of Studies on Alcohol and Drugs*, *71*, 150–155. http://doi.org/10.15288/jsad.2010.71.150

Kramer, R. S. S., Weger, U. W., & Sharma, D. (2013). The effect of mindfulness meditation on time perception. *Consciousness and Cognition*, *22*, 846–852. http://doi.org/10.1016/j.concog.2013.05.008

Larimer, M. E., Palmer, R. S., & Marlatt, G. A. (1999). Relapse prevention: An overview of Marlatt's cognitive-behavioral model. *Alcohol Research and Health*, *23*(2), 151–160.

Leventhal, A. M., Mickens, L., Dunton, G. F., Sussman, S., Riggs, N. R., & Pentz, M. A. (2010).

Tobacco use moderates the association between major depression and obesity. *Health Psychology : Official Journal of the Division of Health Psychology, American Psychological Association, 29*, 521–528. http://doi.org/10.1037/a0020854

Littlefield, A. K., Talley, A. E., & Jackson, K. M. (2012). Coping motives, negative moods, and time-to-drink: Exploring alternative analytic models of coping motives as a moderator of daily mood-drinking covariation. *Addictive Behaviors, 37*, 1371–1376. http://doi.org/10.1016/j.addbeh.2012.05.020

Love, a, James, D., & Willner, P. (1998). A comparison of two alcohol craving questionnaires. *Addiction, 93*, 1091–1102. http://doi.org/10.1046/j.1360-0443.1998.937109113.x

MacCallum, R. C., Zhang, S., Preacher, K. J., & Rucker, D. D. (2002). On the practice of dichotomization of quantitative variables. *Psychological Methods, 7*, 19–40. http://doi.org/10.1037/1082-989X.7.1.19

Maisto, S. A., Carey, K. B., & Bradizza, C. M. (1999). Social Learning Theory. In K. E. Leonard & H. T. Blane (Eds.), *Psychological Theories of Drinking and Alcoholism* (2nd ed., pp. 131–178). New York, NY: Guildford Press.

Marlatt, G. A., & George, W. H. (1985). Relapse prevention: Introduction and overview of the model. *British Journal of Addiction*, (79), 261–273. http://doi.org/10.1111/j.1360-0443.1984.tb00274.x

Maxwell, S. E., & Delaney, H. D. (2004). *Designing experiments and analyzing data: A model comparison perspective* (2nd ed.). Mahwah, NJ: Lawrence Erlbaum Associates.

McClelland, G. H., & Judd, C. M. (1993). Statistical difficulties of detecting interactions and moderator effects. *Psychological Bulletin, 114*, 376–390. http://doi.org/10.1037/0033-2909.114.2.376

McNair, D. M., Lorr, M., & Droppelman, L. (1971). *Manual: Profile of Mood States*. San Diego, California: Educational and Industrial Testing Service Inc.

Mermelstein, L. C., & Garske, J. P. (2015). A brief mindfulness intervention for college student binge drinkers: A pilot study. *Psychology of Addictive Behaviors, 29*, 259–269. http://doi.org/10.1037/adb0000040

Murphy, C., & MacKillop, J. (2012). Living in the here and now: Interrelationships between impulsivity, mindfulness, and alcohol misuse. *Psychopharmacology, 219*, 527–536. http://doi.org/10.1007/s00213-011-2573-0

National Institute on Alcohol Abuse and Alcoholism. (2015). *College Drinking*. Retrieved from http://pubs.niaaa.nih.gov/publications/CollegeFactSheet/Collegefactsheet.pdf

O'Hara, R. E., Armeli, S., & Tennen, H. (2014). Drinking-to-cope motivation and negative mood-drinking contingencies in a daily diary study of college students. *Journal of Studies on Alcohol and Drugs, 75*, 606–14. http://doi.org/10.15288/jsad.2014.75.606

Ostafin, B. D., Bauer, C., & Myxter, P. (2012). Mindfulness decouples the relation between automatic alcohol motivation and heavy drinking. *Journal of Social and Clinical Psychology*, *31*, 729–745. http://doi.org/10.1521/jscp.2012.31.7.729

Ostafin, B. D., & Brooks, J. J. (2011). Drinking for relief: Negative affect increases automatic alcohol motivation in coping-motivated drinkers. *Motivation and Emotion*, *35*, 285–295. http://doi.org/10.1007/s11031-010-9194-5

Pearson, M. R., Brown, D. B., Bravo, A. J., & Witkiewitz, K. (2015). Staying in the moment and finding purpose: The associations of trait mindfulness, decentering, and purpose in life with depressive symptoms, anxiety symptoms, and alcohol-related problems. *Mindfulness*, *6*, 645–653. http://doi.org/10.1007/s12671-014-0300-8

Ralston, T. E., Palfai, T. P., & Rinck, M. (2013). The influence of depressed mood on action tendencies toward alcohol: The moderational role of drinking motives. *Addictive Behaviors, 38,* 2810–2816. http://doi.org/10.1016/j.addbeh.2013.07.013

Reynolds, A., Keough, M. T., & O'Connor, R. M. (2015). Is being mindful associated with reduced risk for internally-motivated drinking and alcohol use among undergraduates? *Addictive Behaviors, 42,* 222–226. http://doi.org/10.1016/j.addbeh.2014.11.027

Reynolds, L. M., Lin, Y. S., Zhou, E., & Consedine, N. S. (2015). Does a brief state mindfulness induction moderate disgust-driven social avoidance and decision-making? An experimental investigation. *Journal of Behavioral Medicine, 38,* 98–109. http://doi.org/10.1007/s10865-014-9582-5

Robinson, T. E., & Berridge, K. C. (1993). The neural basis of drug craving: An incentive-sensitization theory of addiction. *Brain Research Reviews, 18,* 247–291. http://doi.org/10.1016/0165-0173(93)90013-P

Robinson, T. E., & Berridge, K. C. (2000). The psychology and neurobiology of addiction: an incentive-sensitization view. *Addiction, 95,* 91–117. http://doi.org/doi:10.1046/j.1360-0443.95.8s2.19.x

Roos, C. R., Pearson, M. R., & Brown, D. B. (2015). Drinking motives mediate the negative associations between mindfulness facets and alcohol outcomes among college students. *Psychology of Addictive Behaviors, 29,* 176–183. http://doi.org/10.1037/a0038529

Rottenberg, J., Ray, R. D., & Gross, J. J. (2007). Emotion elicitation using films. Handbook of emotion elicitation and assessment. *Handbook of Emotion Elicitation and Assessment Series in Affective Science*. http://doi.org/10.1080/02699939508408966

Royston, P., Altman, D. G., & Sauerbrei, W. (2006). Dichotomizing continuous predictors in

multiple regression: A bad idea. *Statistics in Medicine*, *25*, 127–141. http://doi.org/10.1002/sim.2331

Sauer, S., Walach, H., Schmidt, S., Hinterberger, T., Lynch, S., Büssing, A., & Kohls, N. (2013). Assessment of mindfulness: Review on state of the art. *Mindfulness*, *4*, 3–17. http://doi.org/10.1007/s12671-012-0122-5

Shacham, S. (1983). A shortened version of the Profile of Mood States. *Journal of Personality Assessment*, *47*, 305–306. http://doi.org/10.1207/s15327752jpa4703_14

Shapiro, S. L. (2009). The integration of mindfulness and psychology. *Journal of Clinical Psychology*, *65*, 555–560. http://doi.org/10.1002/jclp

Shapiro, S. L., Carlson, L. E., Astin, J. A., & Freedman, B. (2006). Mechanisms of Mindfulness. *Journal of Clinical Psychology*, *62*, 373–386. http://doi.org/10.1002/jclp

Shiffman, S. (2009). Ecological momentary assessment (EMA) in studies of substance use. *Psychological Assessment*, *21*, 486–497. http://doi.org/10.1037/a0017074

Simmons, J. P., Nelson, L. D., & Simonsohn, U. (2011). False-positive psychology: Undisclosed flexibility in data collection and analysis allows presenting anything as significant. *Psychological Science*, *22*, 1359–1366. http://doi.org/10.1177/0956797611417632

Steele, C. M., & Josephs, R. a. (1988). Drinking your troubles away. II: An attention-allocation model of alcohol's effect on psychological stress. *Journal of Abnormal Psychology*, *97*, 196–205. http://doi.org/10.1037/0021-843X.97.2.196

Steele, C. M., & Josephs, R. A. (1990). Alcohol myopia: Its prized and dangerous effects. *American Psychologist*, *45*, 921. http://doi.org/10.1037/0003-066X.45.8.921

Tanay, G., & Bernstein, A. (2013). State Mindfulness Scale (SMS): Development and initial validation. *Psychological Assessment*, *25*, 1286–99. http://doi.org/10.1037/a0034044

Thompson, B. L., & Waltz, J. (2007). Everyday mindfulness and mindfulness meditation: Overlapping constructs or not? *Personality and Individual Differences, 43,* 1875–1885. http://doi.org/10.1016/j.paid.2007.06.017

Todd, M., Armeli, S., & Tennen, H. (2009). Interpersonal problems and negative mood as predictors of within-day time to drinking. *Psychology of Addictive Behaviors*, *23*, 205–215. http://doi.org/10.1037/a0014792

Van Breukelen, G. J. P. (2006). ANCOVA versus change from baseline had more power in randomized studies and more bias in nonrandomized studies. *Journal of Clinical Epidemiology*, *59*, 920–925. http://doi.org/10.1016/j.jclinepi.2006.02.007

Verheul, R., Van Den Brink, W., & Geerlings, P. (1999). A three-pathway psychobiological model of craving for alcohol. *Alcohol and Alcoholism*, *34*, 197–222. http://doi.org/10.1093/alcalc/34.2.197

Vinci, C., Peltier, M. R., Shah, S., Kinsaul, J., Waldo, K., McVay, M. A., & Copeland, A. L. (2014). Effects of a brief mindfulness intervention on negative affect and urge to drink among college student drinkers. *Behaviour Research and Therapy*, *59*, 82–93. http://doi.org/10.1016/j.brat.2014.05.012

Williams, J., & Penman, D. (2011). *Mindfulness: A practical guide to finding peace in a frantic world.* London, England: Piatkus.

Willner, P., Field, M., Pitts, K., & Reeve, G. (1998). Mood, cue and gender influences on motivation, craving and liking for alcohol in recreational drinkers. *Behavioural Pharmacology*, *9*(7), 631–642.

Witkiewitz, K., & Black, D. S. (2014). Unresolved issues in the application of mindfulness-based interventions for substance use disorders. Apr 2014. *Subst Use Misuse, 49*, 601–604.

http://doi.org/10.3109/10826084.2014.852797 24611855

Witkiewitz, K., & Bowen, S. (2010). Depression, craving and substance use following a randomized trial of Mindfulness-based relapse prevention. *Journal of Consulting and Clinical Psychology, 78,* 362–374. http://doi.org/10.1037/a0019172.

Witkiewitz, K., Marlatt, G. A., & Walker, D. (2005). Mindfulness-based relapse prevention for alcohol and substance use disorders. *Journal of Cognitive Psychotherapy: An International Quarterly, 19,* 211–228.

Wray, T. B., Merrill, J. E., & Monti, P. M. (2014). Using ecological momentary assessment (EMA) to assess predictors of alcohol use and alcohol-related consequences. *Alcohol Research: Current Reviews, 36*(1), 19–27.

Yusainy, C., & Lawrence, C. (2015). Brief mindfulness induction could reduce aggression after depletion. *Consciousness and Cognition, 33,* 125–134. http://doi.org/10.1016/j.concog.2014.12.008

Zeffirelli, F. (1979). *The Champ*. United States: Metro-Goldwyn-Mayer. Retrieved from https://www.youtube.com/watch?v=FAhrqKqK_cA

APPENDIX A

DEMOGRAPHIC INFORMATION QUESTIONNAIRE

What is your gender?
{Choose one}
( ) Male
( ) Female

What is your age? ___

What is your class standing?
{Choose one}
( ) Freshman
( ) Sophomore
( ) Junior
( ) Senior
( ) Graduate

Are you in a Greek organization?
( ) Yes
( ) No

Are you Hispanic, Latino, or of Spanish Origin?
{Choose one}
( ) No, not of Hispanic, Latino, or Spanish Origin
( ) Yes, Mexican, Mexican American, Chicano
( ) Yes, Puerto Rican
( ) Yes, Cuban
( ) Yes, another Hispanic, Latino, or Spanish Origin

What racial group best describes you?
{Choose one}
( ) African-American or Black
( ) Asian or Pacific Islander
( ) Caucasian or White
( ) Native American
( ) Other [ ]

What is your marital status?
{Choose one}
( ) Single
( ) Married
( ) Divorced
( ) In a committed relationship

Do you have any previous or current experience with mindfulness meditation?

1. Yes
2. No

    If yes:

    How often do you practice meditation?

        1. Never
        2. Very rarely
        3. Sometimes
        4. Often
        5. Very much

Do you have experience with any other forms of meditation?

1. Yes
2. No

    If yes:

    Please describe:

APPENDIX B

ALCOHOL USE MEASURE

DAILY DRINKING QUESTIONNAIRE

Think about your drinking behaviors during the last month (i.e., past 30 days) for the following questions. With respect to alcohol consumption, 1 standard drink is equivalent to 12 oz beer OR 5 oz wine OR 1.5oz shot of liquor straight or in a mixed drink.
Please review the next page carefully as it will help you understand what exactly counts as a standard drink of alcohol.
[Participants will be shown a picture showing standard drink equivalency.]

Participants use the following response scale:
{Enter text answer}
[ ]

Think about your drinking behaviors during the last month (i.e., past 30 days) for the following questions. With respect to alcohol consumption, 1 standard drink is equivalent to 12 oz beer OR 4 oz wine OR 1 oz shot of liquor straight or in a mixed drink.

On how many days during the last 30 days did you consume alcohol? [0-30]
In the past 30 days, how many times have you consumed five or more drinks (if you are male) or four or more drinks (if you are female) on one drinking occasion?

We ask you to fill in the following grid with the typical and heaviest number of standard drinks you consume each day of the week. Enter a '0' to indicate days on which you do not drink.

Personal Alcohol Use

How many standard drinks did you consume each day during a TYPICAL week during the past month? - Monday
How many standard drinks did you consume each day during a TYPICAL week during the past month? - Tuesday
How many standard drinks did you consume each day during a TYPICAL week during the past month? - Wednesday
How many standard drinks did you consume each day during a TYPICAL week during the past month? - Thursday
How many standard drinks did you consume each day during a TYPICAL week during the past month? - Friday
How many standard drinks did you consume each day during a TYPICAL week during the past month? - Saturday
How many standard drinks did you consume each day during a TYPICAL week during the past month? – Sunday

APPENDIX C

MOOD STATES MEASURE

PROFILE OF MOOD STATES-SHORT FORM

Below is a list of words that describe feelings people have. Please read each one carefully. Using the five-point scale below, select which best describes HOW YOU HAVE BEEN FEELING DURING THE PAST WEEK INCLUDING TODAY?*

Participants use this scale to respond to the following items:
{Choose one}
( ) not at all
( ) a little
( ) moderately
( ) quite a bit
( ) extremely

1) Tense
2) On edge
3) Uneasy
4) Restless
5) Nervous
6) Anxious
7) Unhappy
8) Sad
9) Blue
10) Hopeless
11) Discouraged
12) Miserable
13) Helpless
14) Worthless

*The same measure will be adapted to assess present mood states. Specifically, the participants will be instructed, “Indicate to what extent you feel this way right now, that is, at the present moment”.

APPENDIX D

DRINKING TO COPE MEASURE

MODIFIED DRINKING MOTIVES QUESTIONNAIRE-REVISED

Listed below are 28 reasons people might be inclined to drink alcoholic beverages. Using the five-point scale below, decide how frequently your own drinking is motivated by each of the reasons listed.

Participants response using the following response scale
( ) almost never/never
( ) some of the time
( ) half of the time
( ) most of the time
( ) almost always/always

You Drink…

1. Because it helps me enjoy a party
2. To relax
3. Because I like the feeling
4. To be sociable
5. To forget my worries
6. Because it is exciting
7. Because it makes social gatherings more fun
8. Because I feel more self-confident or sure of myself
9. To get a high
10. Because it improves parties and celebrations
11. Because it helps me when I am feeling nervous
12. Because it's fun
13. To celebrate a special occasion with friends
14. To cheer me up when I'm in a bad mood
15. To be liked
16. To numb my pain
17. Because it helps me when I am feeling depressed
18. So that others won't kid me about not using
19. To reduce my anxiety
20. To stop me from dwelling on things
21. To turn off negative thoughts about myself
22. To help me feel more positive about things in my life
23. To stop me from feeling so hopeless about the future
24. Because my friends pressure me to use
25. To fit in with a group I like
26. Because it makes me feel good
27. To forget painful memories

28. So I won't feel left out

APPENDIX E

MOOD INDUCTION PARADIGMS

SAD AND ANXIOUS VIDEO CLIPS

The students will watch short clips of movies that have been shown to elicit certain moods in previous studies. Duration of clips are reported in minutes.

*Students will be informed prior to watching the clips that they have option of clicking out film clip at any time if they feel uncomfortable.

Mood: Sadness (Gross & Levenson, 1995; Hewig et al., 2005; Platte, Herbert, Pauli, & Breslin, 2013; Xing, 2014)
Clip: The Champ (1979)
Content: Shows a young boy facing the sudden death of his father after a boxing match
Duration: 2:44
Link: https://www.youtube.com/watch?v=FAhrqKqK_cA

Mood: Anxiety (Gross & Levenson, 1995; Hewig et al., 2005; Rottenberg, Ray, & Gross, 2007)
Clip: Silence of the Lambs (1991)
Content: Clarice, a young FBI agent, is searching for a serial killer and follows the dangerous killer into a basement.
Duration: 2:11
Link: https://www.youtube.com/watch?v=OQZYz7qR0Fo

Mood: Neutral (Gross & Levenson, 1995; Rottenberg, Ray, & Gross, 2007; Xing, 2014)
Clip: Alaska's Wild Denali (1997)
Content: Narration about Alaskan landscapes and wildlife
Duration: 2:16
Link: https://www.youtube.com/watch?v=rbTCQrNOV_w

APPENDIX F

BRIEF STATE MINDFULNESS INDUCTION PARADIGM

MINDFULNESS AUDIO AND CONTROL DOCUMENTARY

Students selected into the mindfulness condition will watch an eight minute Brief Mindfulness Task that has been used in a previous experimental study (Yusainy & Lawrence, 2015). Comparably, students in the control condition will listen to a seven and half minute documentary on fruit flies.

Mindfulness Induction: Mindfulness Meditation of the Body and Breath
Content: This eight-minute meditation is an introduction to Mindfulness and guides participants to direct their attention towards witnessing the full sensations of breathing without the intention of altering these experiences, and to notice in an accepting manner when their minds wander and gently return their focus to their breathing.
Duration: 7:59
Link: http://cdn.franticworld.com/wp-content/uploads/2012/02/Mindfulness-Of-Body-And-Breath-from-book-Mindfulness-Finding-Peace-in-a-Frantic-World-128k.mp3

Control Documentary: Fruit Fly Scientist Swatted Down Over "Cheap Date"
Content: Documentary on recent discoveries about fruit flies and their nomenclature.
Duration: 7:34
Link: http://www.npr.org/templates/story/story.php?storyId=100468532

APPENDIX G

STATE MINDFULNESS MEASURE

STATE MINDUFLNESS SCALE

Please indicate the degree to which each of the 21 statements below described what you just experienced.

Use the following scale to record your answers.
5-point scale (1-5)
( ) not at all
( ) Very little
( ) Fairly well
( ) Quite well
( ) Very well

State Mindfulness of Mind

1. I was aware of different emotions that arose in me.
2. I tried to pay attention to pleasant and unpleasant sensations.
3. I found some of my experiences interesting.
4. I noticed many small details of my experience.
5. I felt aware of what was happening inside of me.
6. I noticed pleasant and unpleasant emotions.
7. I was aware of what was going on in my mind.
8. I felt closely connected to the present moment.
9. I had moments when I felt alert and aware.
10. I actively explored my experience in the moment.
11. I felt that I was experiencing the present moment fully.
12. It was interesting to see the patterns of my thinking.
13. I noticed thoughts come and go.
14. I noticed pleasant and unpleasant thoughts.
15. I noticed emotions come and go.

State Mindfulness of Body

16. I noticed physical sensations come and go.
17. I noticed some pleasant and unpleasant physical sensations.
18. I noticed various sensations caused by my surroundings (e.g., heat, coolness, the wind on my face).
19. I clearly physically felt what was going on in my body.
20. I felt in contact with my body.

21. I changed my body posture and paid attention to the physical process of moving.

APPENDIX H

ALCOHOL ATTENTIONAL BIAS TASK

DOT PROBE TASK

Participants will begin by reading a brief summary of the task and then asked to press the spacebar when they are ready to begin. They will first be instructed to fixate their vision on a computer screen (fixation cross). Next, two pictures (one alcohol-related and one neutral) will appear with a dot probe appearing on the right or left side of the screen 500ms after the pictures are presented. Participants will have to identify which probe was displayed (i.e., ← or →) using button press ("E" and "I" key). Prior to beginning the critical trials, the participants will start with 20 practice trials in which neutral picture pairs will be presented. Next, 144 critical trials in which alcohol–control picture pairs will be presented. Probes will replace alcohol-related and control pictures with equal frequency, and there will be an equal number of probes of each type.

APPENDIX I

ALCOHOL CRAVING MEASURE

DESIRES FOR ALCOHOL QUESTIONNAIRE BRIEF

Participants use this scale to respond to the following items:
{Choose one}
( ) strongly disagree
( ) disagree
( ) somewhat disagree
( ) neither agree or disagree
( ) somewhat agree
( ) agree
( ) strongly agree

Right Now:

1. I want a drink so much I can almost taste it.
2. My desire to drink now seems overwhelming.
3. I would do almost anything to have a drink now.
4. I am going to drink as soon as I possibly can.
5. I would consider having a drink now.
6. I would accept any drink now if it was offered to me.
7. I would feel as if all the bad things in my life had disappeared if I drank now.
8. Even major problems in my life would not bother me if I drank now.
9. I would feel less worried about my daily problems if I drank now.
10. Drinking now would make me feel less tense.
11. If I started drinking now I would be able to stop.
12. I could easily limit how much I would drink if I drank now.
13. Drinking would be satisfying now.
14. Drinking would be pleasant now.

VITA

Adrian J. Bravo
Business Address: 250 Mills Godwin Building, Department of Psychology
Old Dominion University, Norfolk, VA 23529-0267
Work Phone: 757-683-4241
Email: abravo@odu.edu

EDUCATION

The College of William and Mary, Williamsburg, VA **Fall 2008 - Spring 2012**
- B.A., Psychology
- B.A., History

Old Dominion University, Norfolk, VA F**all 2012 – Summer 2014**
- M.S., Experimental Psychology

Old Dominion University, Norfolk, VA **Fall 2014 – Present**
- Ph.D., Applied Experimental Psychology (expected graduation: May 2016)

Publications

- **Bravo, A. J.,** Pearson, M. R., Stevens, L. E., & Henson, J. M. (in press). Depressive symptoms and alcohol-related problems among college students: A moderated mediated model of mindfulness and drinking to cope. *Journal of Studies on Alcohol and Drugs*.
- **Bravo, A. J.,** Boothe, L. G., & Pearson, M. R. (2016). Getting personal with mindfulness: A latent profile analysis of mindfulness and psychological outcomes. *Mindfulness*, *7*, 420-432. doi: 10.1007/s12671-015-0459-7
- Kelley, M. L., **Bravo, A. J.,** Braitman, A. L., Lawless, A. K., & Lawrence, H. R. (2016). Behavioral couples treatment for substance use disorder: Secondary effects on the reduction of risk for child abuse. *Journal of Substance Abuse Treatment*, *62*, 10-19. doi: 10.1016/j.jsat.2015.11.008
- **Bravo, A. J.,** Prince, M. A., & Pearson, M. R. (2015). Does the how mediate the why? A multiple replication examination of drinking motives, alcohol protective behavioral strategies, and alcohol outcomes. *Journal of Studies on Alcohol and Drugs*, *76*, 872-883. doi: 10.15288/jsad.2015.76.872
- Brown, D. B., **Bravo, A. J.,** Roos, C. R., & Pearson, M. R. (2015). Five facets of mindfulness and psychological health: Evaluating a psychological model of the mechanisms of mindfulness. *Mindfulness*, *6*, 1021-1032. doi: 10.1007/s12671-014-0349-4
- Pearson, M. R., Brown, D. B., **Bravo, A. J.,** & Witkiewitz, K. (2015). Staying in the moment and finding purpose: The associations of trait mindfulness, decentering, and purpose in life with depressive symptoms, anxiety symptoms, and alcohol-related problems. *Mindfulness*, *6*, 645-653. doi: 10.1007/s12671-014-0300-8