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Examining Trait Mindfulness as a Moderator of the Mediating Relationship Between Social Anxiety, Coping Motives, and Substance-Related Consequences

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**EXAMINING TRAIT MINDFULNESS AS A MODERATOR OF THE MEDIATING
RELATIONSHIP BETWEEN SOCIAL ANXIETY, COPING MOTIVES, AND
SUBSTANCE-RELATED CONSEQUENCES**

by

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B.S. December 2015, North Dakota State University

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ABSTRACT

EXAMINING TRAIT MINDFULNESS AS A MODERATOR OF THE MEDIATING RELATIONSHIP BETWEEN SOCIAL ANXIETY, COPING MOTIVES, AND SUBSTANCE-RELATED CONSEQUENCES

Cody A. Raeder
Old Dominion University, 2019
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The present research examined the mediating relationship between social anxiety, drinking to cope with social anxiety, and alcohol-related consequences. Additionally, this study examined the mediating relationship between social anxiety, using cannabis to cope with social anxiety and cannabis-related consequences. Furthermore, this study examined whether or not trait mindfulness exhibited a moderating effect on both of these mediation relationships which have been previously observed in the literature. The study consisted of students recruited through the psychology research participant pool at a mid-sized southeastern university. Two data sets were created based on type of substance use (alcohol or cannabis). The majority of participants in each sample were female ($n = 166$, 68.3% for alcohol; $n = 168$, 67.5% for cannabis) and reported a mean age of 21. Participants completed measures of social anxiety, alcohol use, cannabis use, drinking to cope with social anxiety, using cannabis to cope with social anxiety, alcohol-related consequences, cannabis-related consequences, and trait mindfulness. The present study found partial support for The Biopsychosocial model of social anxiety and substance use, as well as cognitive models of both social anxiety and substance abuse. In particular, it was found that the relationship between social anxiety and alcohol-related consequences was mediated by drinking to cope with social anxiety. This same pattern of mediation was also observed in the relationship between social anxiety and cannabis-related consequences, which was mediated by using

cannabis to cope with social anxiety. Further, this study examined relationships between trait mindfulness and both alcohol- and cannabis-related variables, including alcohol and cannabis use, using alcohol and cannabis to cope, and alcohol- and cannabis-related consequences. It was found that trait mindfulness moderated the mediating effect of using cannabis to cope with social anxiety on the relationship between social anxiety and cannabis related problems.

Keywords: Social Anxiety, drinking to cope, using cannabis to cope, alcohol-related consequences, cannabis-related consequences, trait mindfulness.

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This Thesis is dedicated to my Aunt Dorothy, and Uncle Tom;
Dorothy, you taught me to love science.
Tom, you helped me to survive math.
Without the two of you, none of this would have been possible

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CHAPTER 1 INTRODUCTION

Alcohol misuse is common among college students. Nearly 60% of college students ages 18-22 report consuming alcohol in the past month, with nearly two-thirds of this group admitting to binge drinking (NIAAA, 2015). Furthermore, college alcohol misuse has been linked to numerous negative consequences. Minor consequences include missing classes and poor academic performance, whereas more serious consequences include Alcohol Use Disorder, (a chronic disorder characterized by compulsive alcohol use, loss of control of alcohol intake, and negative affect when not drinking; NIAAA, n.d.), unsafe sex, physical injuries, sexual assault, and death. Cannabis use is also common among college students with 19.8% reporting use in the past month (Substance Abuse and Mental Health Services Administration, 2015), which can lead to deficits in working memory, learning, and information processing (Crean, Crane, & Mason, 2011; Jager, Block, Luijten, & Ramsey, 2013; Solowij et al., 2011). Among college student populations, those with Social Anxiety Disorder (SAD) are particularly vulnerable to experiencing both alcohol and cannabis problems; nearly 28% of individuals with SAD meet criteria for AUD (Schneier et al., 2010) and 25% to 33.3% of individuals with SAD meet criteria for cannabis dependence (Agosti, Nunes, & Levin, 2002)

Individuals with high alcohol and cannabis coping motives are motivated to use a substance to cope with negative affect (Cooper, 1994). Such motives have been among the most consistent mediators of the link between social anxiety and substance use problems. Previous research has shown that higher levels of social anxiety lead to greater endorsement of coping motives for use, which in turn leads to higher numbers of alcohol- or cannabis-related consequences (Buckner & Heimberg, 2010; Buckner, Bonn-Miller, Zvolensky, & Schmidt, 2007). A possible moderator of the relationship between social anxiety and coping motives for

alcohol use and cannabis use (*path a* in Figures 5, 6, 7, and 8) and both alcohol- and cannabis-related consequences comes from research on mindfulness.

Mindfulness is commonly defined as the ability to direct non-judgmental attention and awareness to moment-by-moment experiences (Bishop et al., 2004; Kabat-Zinn, 1994). Regarding substance use, mindfulness has been linked to a reduction in alcohol and cannabis use through mindfulness-meditation interventions (Bowen et al., 2006; de Dios et al., 2012). Furthermore, higher levels of trait mindfulness have been linked to lower levels of anxiety, depression, and alcohol-related consequences (Pearson, Brown, Bravo, & Witkiewitz, 2015), and has also been shown to be negatively related to coping motives for alcohol use (Reynolds, Keough, & O'Connor, 2015; Roos, Pearson, & Brown, 2015) and coping motives for cannabis use (Bonn-Miller, Vujanovic, Twohig, Medina, & Huggins, 2010). Researchers have already established that coping motives for substance use mediate the relationship between social anxiety and both alcohol- and cannabis-related consequences (Buckner & Heimberg, 2010; Buckner, Bonn-Miller, Zvolensky, & Schmidt, 2007). Trait mindfulness has shown negative relationships to both social anxiety (Brown & Ryan, 2003) and substance use (Fernandez, Wood, Stein, & Rossi, 2010; Murphy & Mackillop 2012; Pearson et al., 2015) in previous research. For this reason, the current research examined whether trait mindfulness moderated this mediation relationship.

The Biopsychosocial Model of Social Anxiety and Substance Abuse

Although there have been numerous models posited for both social anxiety and substance use separately, Buckner, Heimberg, Ecker, and Vinci (2013) conceptualized a model aimed at addressing the high comorbidity of social anxiety and substance abuse. This model conceptualizes social anxiety as a higher-order factor composed of biological (e.g., high levels of

physiological arousal), psychological (e.g., fear of negative evaluation, low positive affect), and social (e.g., perceived social deficits, avoidance of social situations) facets. As a response to experiencing any of these facets of social anxiety, an individual may engage in coping motivated use in order to manage their social anxiety symptoms. This includes using substances to cope with increased physiological arousal or evaluation fears, to increase positive affect, for social facilitation, or to avoid social scrutiny. By engaging in coping-motivated use, the socially anxious individual in time becomes reliant on that substance, which in turn eventually leads to a substance use disorder. Although this model has not been fully tested to date, it can be used as an illustration of how social anxiety may lead to a substance use disorder.

Although not every mechanism in the Biopsychosocial Model has been tested directly, it remains clear that social anxiety is related to substance use disorders. As previously mentioned, 28% of individuals with SAD meet criteria for AUD (Schneier et al., 2010), whereas 25% to 33.3% of individuals with SAD meet criteria for cannabis dependence (Agosti et al., 2002). There is also limited evidence of elevated social anxiety in those seeking treatment for more serious illicit substances, such as cocaine and heroin. In cocaine-dependent individuals seeking treatment, 13.9% were found to have SAD (Myrick & Brady, 1997). Further, patients undergoing pharmacotherapy for opiate dependence were found to have more social anxiety symptoms than a control group (Shand, Degenhardt, Nelson, & Mattick, 2010). However, because most of the evidence for elevated social anxiety for both cocaine and heroin users comes from those individuals seeking substance use treatment, it seems unlikely to observe strong effects among a typical college population.

Further, there is evidence for temporal precedence in the relationship between SAD and AUD. A 13-year longitudinal study examining non-clinical individuals found that those with

greater levels of social anxiety symptoms showed a greater risk for developing an AUD (Crum & Pratt, 2001). Another longitudinal study among adolescents with clinical SAD found that they were more likely to develop alcohol dependence and cannabis dependence by age 30 compared to adolescents without SAD (Buckner et al., 2008).

Social Anxiety and Alcohol Use

Even though SAD has been shown to be concurrent with AUD at a greater rate than most other types of anxiety disorders (Kessler et al., 1997), studies on the relationship between social anxiety and alcohol use have yielded conflicting findings depending on how alcohol consumption is assessed. For example, when problem drinking is assessed using frequency and quantity of alcohol consumed, some studies have found a positive relationship with social anxiety (Neighbors et al., 2007), some have found a negative relationship (Eggleston, Woolaway-Bickel & Schmidt, 2004; Ham & Hope, 2006), and others have found no relationship at all (Bruch, Rivet, Heimberg, & Levin, 1997; Buckner, Schmidt, & Eggleston, 2006; Gilles, Turk, & Fresco, 2006). Subsequent research, including a meta-analysis by Schry and White (2013) has concluded that social anxiety is not associated with greater quantity or frequency of alcohol use overall; rather, individuals high in social anxiety are more likely to experience alcohol-related consequences despite drinking less than their low-social anxiety counterparts. More consistent results have been found when examining social anxiety's relationship to alcohol-related consequences through drinking motives (Buckner & Heimberg, 2010; Lewis et al., 2008, Villarosa, Madson, Zeigler-Hill, Noble, & Mohn, 2014).

Social Anxiety and Drinking Motives. One of the most commonly studied aspects of social anxiety's relationship to alcohol is through the examination of drinking motives.

According to Motivational Models of Alcohol Use (Cox & Klinger, 1988), a person's decision to

consume alcohol may be based on their expectation that the increases in positive affect or decreases in negative affect brought about by drinking will outweigh their incentives not to drink. Therefore, individuals with higher levels of negative affect, such as those with social anxiety, may be particularly motivated to drink in order to alleviate negative affect (i.e., coping motives for substance use).

Based on Cox and Klinger's model (1988), Cooper (1994) identified four drinking motives: coping and conformity motives (negative reinforcement motives) and enhancement and social motives (positive reinforcement motives). Negative reinforcement motives (i.e., coping and conformity) have been found to mediate the relationship between social anxiety and alcohol-related consequences (Lewis et al., 2008). Specifically, coping motives were found to mediate the relationship between social anxiety and alcohol-related consequences (Buckner & Heimberg, 2010), such that those higher in social anxiety endorsed greater coping motives for use which, in turn, predicted more alcohol-related consequences.

A negative relationship has been found between drinking to cope and social anxiety when individuals expected alcohol to lead to deficits in social skills (Cludius et al., 2013). Other researchers have established that the desire to drink to cope depends on the type of situation, with socially-anxious individuals feeling less motivated to drink to cope in performance situations (e.g., public speaking) relative to social situations (Buckner & Heimberg, 2010). Furthermore, a potential danger for individuals with high levels of social anxiety and who use alcohol as a coping mechanism is that they may attribute social success to the effects of alcohol rather than internal factors. This, in turn, may prevent them from learning more effective coping strategies in the future (Buckner & Heimberg, 2010; Cludius et al., 2013).

Social Anxiety and Cognition. Cognitive models of social anxiety also suggest that the maintenance of social anxiety involves several persistent psychological factors, including heightened self-focused attention, negative self-perception, low perceived emotional control, and post-event rumination (Hofman, 2007). These negative cognitive processes lead to the use of safety behaviors (e.g., drinking to cope) and social avoidance. Further, experimental research has shown that the endorsement of drinking to cope with social anxiety is associated with longer response latencies to social threat stimuli and alcohol-related cues on a modified Stroop task (Carrigan, Drobles, & Randall, 2004). This finding indicates that those with higher levels of social anxiety who endorse drinking to cope display biased processing of alcohol-related cues. In other words, when a socially anxious person who endorses drinking to cope reads a word related to alcohol while trying to read the ink color the word is printed in, they take longer to respond due to an automatic preference for the alcohol-related cue. This suggests that drinking to cope with social anxiety may be influenced by automatic cognitive processes.

Possible Covariates

Two important variables to consider in regards to social anxiety are gender and depression. Women have been found to have higher levels of social anxiety (Schneier, Johnson, Hornig, Liebowitz, & Weissman, 1992), have greater clinical severity, and are less likely to seek treatment than men (for a review see Asher, Asnaani, & Aderka, 2017). Additionally, women high in social anxiety experience more alcohol-related consequences, despite drinking less than men with similar levels of social anxiety (Norberg et al., 2009).

Social anxiety frequently co-occurs with depression, with 20% of those with SAD also meeting criteria for major depressive disorder (Merikangas & Angst, 1995). In addition, those with social anxiety experience more suicidal ideation when controlling for other comorbidities

(Schneier, et al., 1992). For these reasons, both gender and anxiety should be considered as covariates in analyses involving social anxiety.

Hypothesis 1: Based on the Biopsychosocial Model (Buckner et al., 2013) as well as motivational models of alcohol use and replicating extant research (Buckner & Heimberg, 2010), coping motives for alcohol use will mediate the relationship between social anxiety and alcohol-related consequences. Specifically, individuals with greater levels of social anxiety will endorse greater amounts of coping motives for alcohol use, which in turn corresponds to increased alcohol-related consequences after controlling for alcohol use, gender, and depression. I expected a significant, positive indirect effect as determined through 95% bootstrapped confidence intervals that do not contain zero. (see Figure 1).

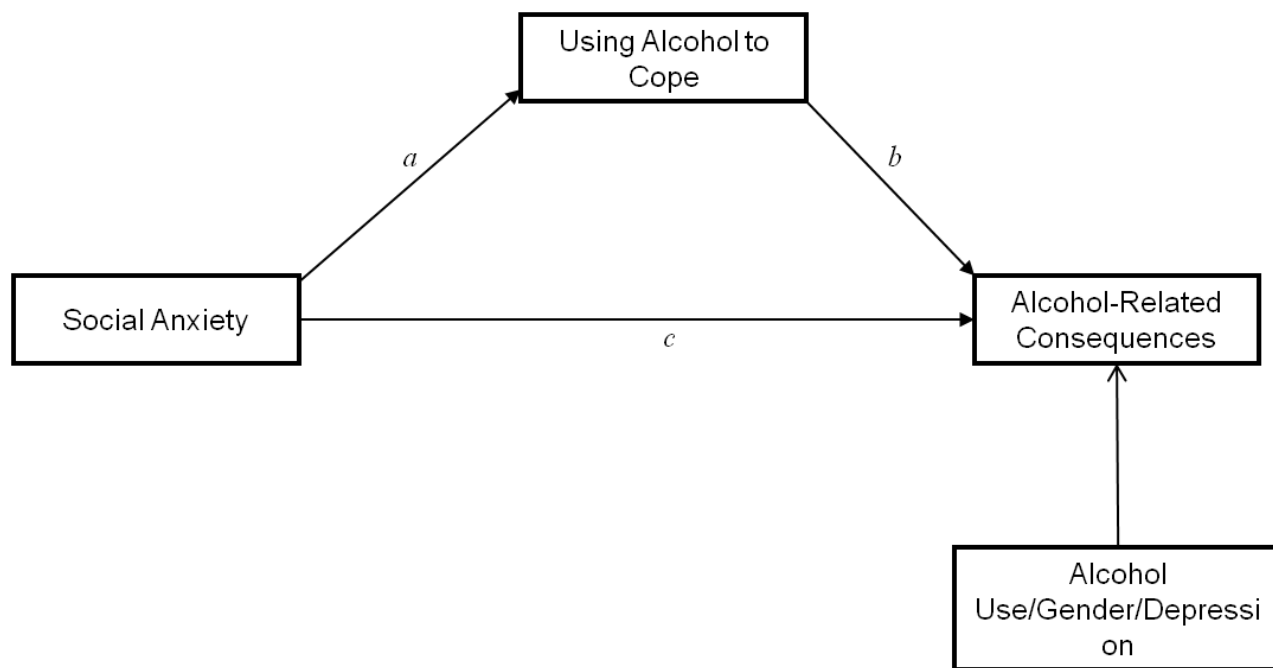


Figure 1. Proposed alcohol mediation model.

Social Anxiety and Cannabis

Social anxiety has been consistently linked to increased cannabis-related consequences (Buckner, et al., 2007; Buckner, Heimberg, Matthews, & Silgado, 2012; Buckner & Schmidt,

2008). Similar to the relationship between social anxiety and alcohol, the relationship between social anxiety and cannabis use can be understood primarily through cannabis use motives.

Simons, Correia, Carey, and Borsari (2000) identified five distinct motives for cannabis use, four of which are congruent with alcohol use (i.e., coping, conformity, social, and enhancement) with one addition known as the expansion motive (or to “expand” the user’s awareness).

Similar to alcohol, the relationship between social anxiety and cannabis-related consequences is mediated by coping motives for cannabis use (Buckner et al., 2007; Buckner et al., 2012). Further, experimental research focused on recent cannabis users (past three months) has found that cannabis craving can be induced during a social anxiety-provoking task (Buckner, Ecker, & Vinci, 2013). Cravings, an important aspect of addictive disorders (Baker, Morse, & Sherman, 1987), indicate the possibility that an individual has developed an automatic drug-use action schema (Tiffany, 1990). Interestingly, findings have shown that social anxiety does not predict alcohol problems among those who use cannabis to cope with social anxiety (Buckner, et al., 2013), which suggests that those with social anxiety who do use substances for coping motives may stick to a particular substance of choice.

Another difference between those who use cannabis to cope with social anxiety as compared to those who use alcohol to cope is the relationship between impairment expectancies. As described above, individuals with high levels of social anxiety become less likely to use alcohol to cope if they have negative performance expectancies for use; however, the opposite trend can be seen among cannabis users. Individuals higher in social anxiety are more likely to have used cannabis if they endorsed greater expectancies for cognitive impairment (Buckner & Schmidt, 2008; Buckner & Schmidt, 2009). These results suggest that alcohol users want to avoid impairment, whereas cannabis users may be seeking impairment. A possible explanation

for why cannabis users may wish to experience cognitive impairment comes from the Self-Handicapping Theory of substance use (Jones & Berglas, 1978). Cannabis users may believe that by using cannabis in social situations others will attribute any social awkwardness or embarrassing behavior to the effects of the drug rather than to internal personality characteristics (Buckner & Schmidt, 2008; Buckner & Schmidt, 2009).

Hypothesis 2: Based on the Biopsychosocial Model (Buckner et al., 2013), coping motives for cannabis use will mediate the relationship between social anxiety and cannabis-related consequences, such that those with greater levels of social anxiety will endorse greater amounts of coping motives for use, which should lead to increased cannabis-related consequences after controlling for cannabis use, gender, and depression. I expected a significant, positive indirect effect. (see Figure 2).

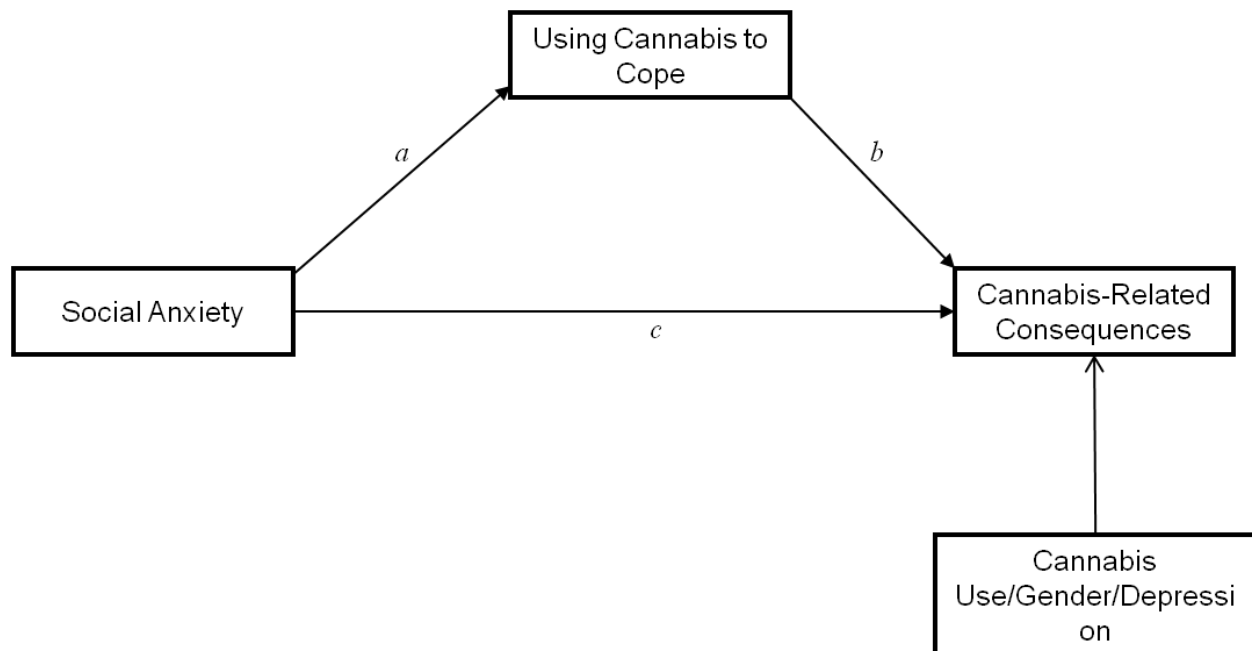


Figure 2. Proposed cannabis mediation model.

Mindfulness

The concept of mindfulness originated with Buddhist spiritual practices, but has been adapted for use in interventions designed to alleviate both physical and psychological ailments, with its first notable use in the treatment of chronic pain (Kabat-Zinn, 1982). As previously stated, researchers typically refer to mindfulness as the ability to direct non-judgmental attention and awareness to moment-by-moment experiences (Bishop et al., 2004; Kabat-Zinn, 1994). Researchers have faced challenges when agreeing upon an operational definition for mindfulness. The term has been used to describe practices that cultivate mindfulness (e.g., mindfulness interventions, meditation practice), to describe a mental state (e.g., state mindfulness), and to describe a psychological process (Germer, Siegel, & Fulton, 2005). Further, mindfulness may be conceptualized as one's general predisposition towards acting with mindfulness, which is called trait mindfulness (Baer, Smith, Hopkins, Krietmeyer, & Toney, 2006). Trait mindfulness can vary both within and between persons (Weinstein, Brown, & Ryan, 2009). In other words, individuals can differ regarding their typical level of the trait. Increases in trait mindfulness following mindfulness interventions have been linked to decreases in depression, rumination, and stress (Kiken, Garland, Bluth, Palsson, & Gaylord, 2015; Shahar, Britton, Sbarra, Figueredo, & Bootzin, 2010; Shapiro, Oman, Thoreson, Plante, & Flinders, 2008).

Cross-sectional research exploring trait mindfulness has shown a negative relationship with depression (Brown & Ryan, 2003; Dekeyser et al., 2008; Pearson et al., 2015), anxiety (Brown & Ryan, 2003; Cash & Wittingham, 2010; Pearson et al., 2015), as well as alcohol use and alcohol problems (Fernandez et al., 2010; Murphy & Mackillop 2012; Pearson et al., 2015). However, there have been mixed results in the literature between how specific facets of

mindfulness relate to alcohol use with inconsistent results being obtained across studies using different assessments of trait mindfulness.

Mindfulness and Alcohol. In research that assessed mindfulness using the Freiburg Mindfulness Inventory (FMI), a three-facet measure of mindfulness (Buccheld, Grossman, & Walach, 2001), the mind/body awareness facet of mindfulness was actually shown to predict greater weekly drinking, whereas non-attachment was unrelated to both drinking and drinking motives (Leigh & Neighbors, 2009). In studies using the four-factor Kentucky Inventory of Mindfulness Skills (KIMS; Baer, Smith, & Allen, 2004), results suggested that accepting oneself without judgment was negatively related to coping motives after controlling for other drinking motives. In comparison, acting with awareness was negatively related to alcohol use (Reynolds et al., 2015). No other KIMS facets of mindfulness were significantly associated with measures of alcohol use in Reynolds et al.'s study.

The Five Facet Mindfulness Questionnaire (FFMQ; Baer et al., 2006), which breaks trait mindfulness into five distinct aspects (i.e., observing, describing with words, acting with awareness, nonjudging of internal experiences, and nonreactivity to inner experiences) has been found by a systematic review to have the highest internal consistency and construct validity ratings across studies (Park, Reilly-Spong, & Gross, 2013). Unlike the KIMS, the FFMQ uses two distinct facets of accepting without judgment (i.e., nonjudging of internal experiences and nonreactivity towards inner experiences). The FFMQ was originally developed through factor analysis by combining the psychometrically strongest items from five existing mindfulness scales, including the FMI, the KIMS, the Mindfulness Attention Awareness Scale (MAAS; Brown & Ryan, 2003), the Cognitive and Affective Mindfulness Scale-Revised (CAMS; Feldman, Hayes, Kumar, & Greeson, 2004) and The Mindfulness Questionnaire (MQ;

Chadwick, Hember, Mead, Lilley, & Dagnan, 2005). The FFMQ is also arguably the most theoretically fitting operationalization of the Buddhist concept of mindfulness because of its complex, multifaceted conceptualization (Baer et al., 2006; Kabat-Zinn, 1994).

The five facets of the FFMQ (Baer et al., 2006) include Observing, Describing with Words, Acting with Awareness, Nonjudging of Inner Experience and Nonreactivity to Inner Experience. Observing refers to noticing both internal and external stimuli, such as sensations and emotions as well as sights and sounds. Describing with Words refers to being able to describe internal stimuli with words. Acting with Awareness refers to carrying out activities in a purposeful, single-minded manner, as opposed to ruminating or being lost in thought. Nonjudging of Inner Experience refers to the ability to view one's thoughts and feelings in a neutral, non-judgmental manner. Nonreactivity to Experiences refers to the ability to refrain from reacting to thoughts and emotions.

When trait mindfulness is assessed with the FFMQ, results suggest that the facets of Acting with Awareness, Nonjudgment of Inner Experience and Describing with Words are negatively related with alcohol-related constructs (Fernandez et al., 2010; Roos et al., 2015; Clerkin, Sarfan, Parson, & Magee, 2017). Fernandez et al. (2010) found that the acting with awareness facet and the describing with words facet were negatively related to alcohol use and were also indirectly related to alcohol-related consequences through alcohol use. Further, this study found that the Describing with Words facet and the Nonjudgment of Inner Experience facet were directly negatively related to alcohol-related consequences. Roos et al. (2015) found that coping motives mediate the relationship between these facets of mindfulness (Acting with Awareness, Nonjudgement of Inner Experience & Describing with Words) and alcohol-related problems, such that higher levels of these facets of trait mindfulness lead to lower endorsement

of coping motives and fewer alcohol-related problems. Clerkin et al. (2017) found that low levels of these facets of trait mindfulness predicted more social anxiety, greater endorsement of coping motives, and more alcohol-related consequences in three separate serial mediation models. These models are described in more detail below.

Cognitive models of substance use, such as Tiffany's Model of Drug Urges and Drug-Use Behavior (1990) propose that drug use behaviors are controlled by substance use action schemata. In other words, drug use behaviors become automatic processes over time, and a drug user's ability to avoid using substances depends on their ability to disrupt these processes once they become activated. As previously described, cognitive models of social anxiety also posit that behaviors related to social anxiety and using substances to cope with social anxiety rely on automatic, repetitive cognitions related to one's perceived social inadequacy. Mindfulness has been shown to be positively associated with greater executive control (Ostafin, Kassman, & Wessel, 2013) and the ability to resist alcohol-related cues (Garland, 2011; Ostafin et al., 2013).

Because of the role automaticity plays in both social anxiety and substance use behaviors, it seems likely that facets of trait mindfulness, such as Acting with Awareness, may decouple the relationship between negative affect due to social anxiety and the desire to drink to alleviate this negative affect (Path A in Figures 5 & 6). Being able to describe internal experiences with words may suggest that an individual is more in tune with bodily processes and thus more likely to recognize when negative affect is influencing their decision making. Additionally, maintenance of social anxiety depends on negative self-perception and low perceived social skills (Hofman, 2007), making it plausible that facets of mindfulness that relate to self-acceptance, such as Nonjudgmental of Inner Experience, would also buffer the relationship between social anxiety symptoms and drinking to cope.

To examine these assertions, recent work (Clerkin et al., 2017) tested multiple serial mediation models in which the Acting with Awareness, Nonjudgement of Inner Experience, and the Describing with Words facets of trait mindfulness served as mediators in the relationship between social anxiety, coping motives for alcohol use, and alcohol-related consequences (social anxiety → mindfulness facet → drinking to cope → alcohol-related consequences, see Figure 3, Model A);

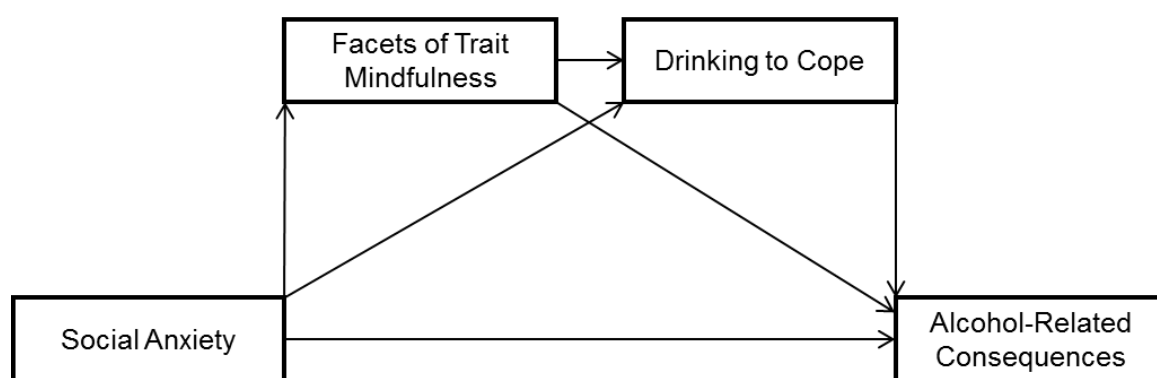


Figure 3. Clerkin et al., (2017). Hypothesized serial mediation Model A (non-significant).

an additional model included trait mindfulness as a predictor of the relationship between social anxiety, drinking to cope, and alcohol-related consequences (mindfulness facet → social anxiety → drinking to cope → alcohol-related consequences, see Figure 4, Model B).

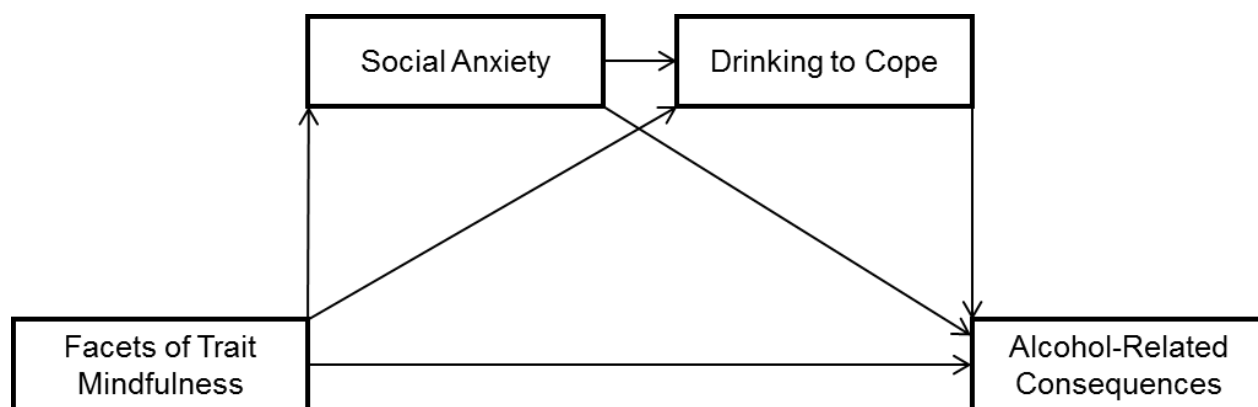


Figure 4. Clerkin et al., (2017) Hypothesized serial mediation Model B (significant).

Although results showed that low trait mindfulness predicted higher social anxiety, coping motives for alcohol use, and alcohol-related consequences (Model B), the models in which trait mindfulness was modeled as a mediator (Model A) were not significant. These results suggest that although high trait mindfulness may not have a causal relationship in predicting lower coping motives, it may be possible that trait mindfulness measured as a unitary construct may buffer the mediating relationship.

Hypothesis 3: Replicating previous work, trait mindfulness, assessed as a total score by the FFMQ, will be negatively related to alcohol-related consequences, alcohol use, and coping motives for alcohol use. I expected significant, negative Pearson Product Moment Correlations.

Hypothesis 4: Trait Mindfulness will moderate the mediated relationship between social anxiety, coping motives for alcohol use, and alcohol-related consequences, such that those higher in trait mindfulness will show a reduced relationship between social anxiety and drinking to cope (*path a*; see Figure 5). I expected a significant index of moderated mediation (Hayes, 2015).

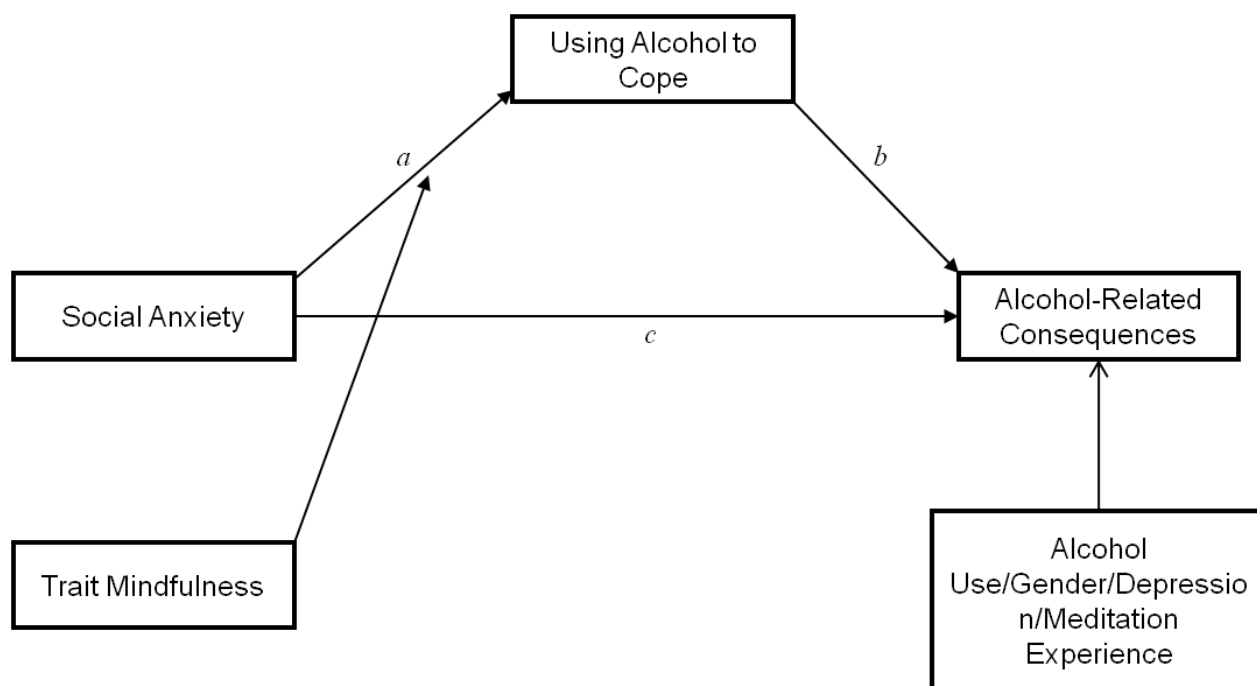


Figure 5. Proposed alcohol moderated mediation model.

Research Question 1: Which of the individual facets of mindfulness moderate the mediated relationship between social anxiety, coping motives for alcohol use, and alcohol-related consequences, such that those higher in a specific facet of trait mindfulness show a reduced relationship between social anxiety and drinking to cope (*path a*; see Figure 6)? Statistical significance will be determined through a significant index of moderated mediation (Hayes, 2015).

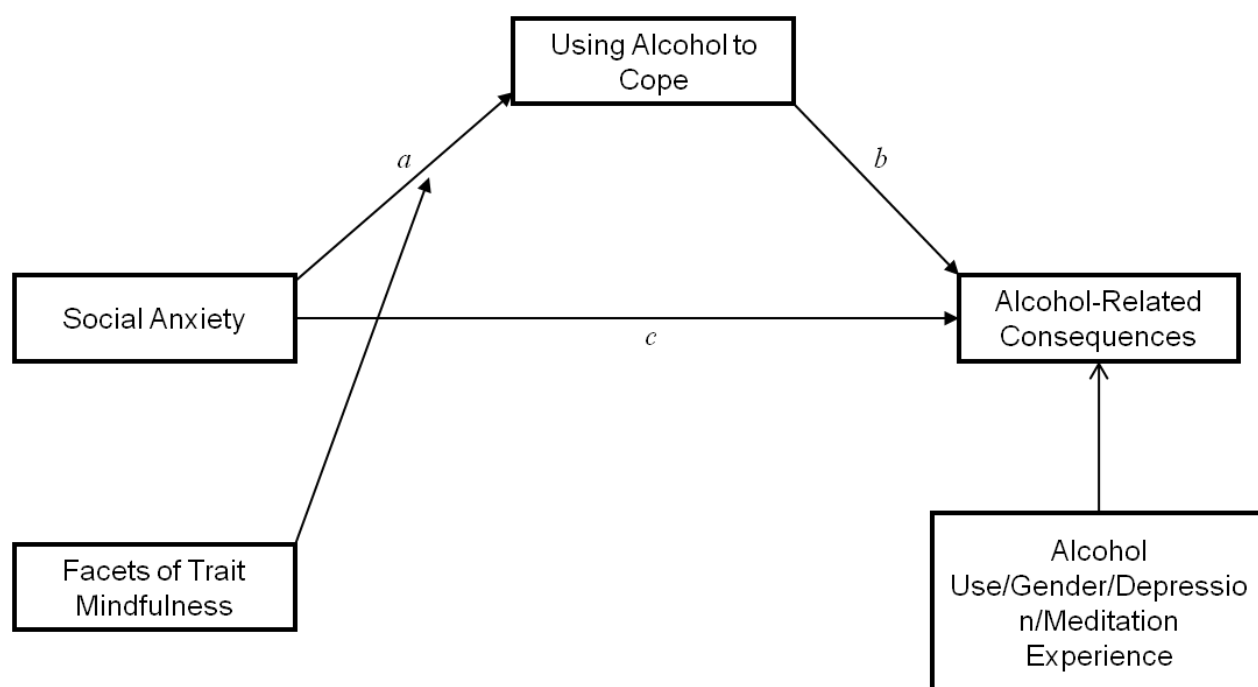


Figure 6. Exploratory alcohol moderated mediation model.

Mindfulness and Cannabis. Research concerning the relationship between trait mindfulness and cannabis use is limited. Although some studies have shown that mindfulness interventions are successful in reducing cannabis use (Bowen et al., 2006; de Dios et al., 2012), a meta-analysis (Karyadi, VanderVeen, & Cyders, 2014) has shown that the effects of mindfulness interventions on cannabis are significantly smaller than those seen in studies involving alcohol or tobacco; however, the authors acknowledge that the inclusion of only six extant articles may have limited the power to appropriately characterize the effect size.

To date, very few articles have examined the relationship between trait mindfulness and cannabis use. One study has examined the Nonjudgmental Acceptance facet of mindfulness as it relates to coping motives, and it found that this facet partially mediates the relationship between posttraumatic stress symptom severity and coping motives for cannabis use (Bonn-Miller et al., 2010). A Turkish study (Paltun, Altunsoy, Özdemir, & Okay, 2017) found that trait mindfulness, assessed with the Mindfulness Acceptance and Awareness Scales (MAAS; Brown & Ryan, 2003), was associated with successful cessation of cannabis use. Additionally, a pilot study suggests that mindfulness interventions can reduce cannabis use by providing an alternative to using cannabis to cope with anxiety (de Dios et al., 2012). Combined with evidence that cannabis use to cope with social anxiety involves a cognitive component (Buckner et al., 2013), it seems plausible that trait mindfulness may influence the relationship between social anxiety and coping motives for cannabis use in a similar manner to coping motives for alcohol use.

Hypothesis 5: Trait mindfulness, assessed as a total score by the FFMQ, will show a negative relationship to cannabis-related consequences, cannabis use, and coping motives for cannabis use. I expected significant, negative Pearson Product Moment Correlations.

Hypothesis 6: Trait Mindfulness will moderate the mediated relationship between social anxiety, coping motives for cannabis use, and cannabis-related consequences such that those higher in trait mindfulness will show a reduced relationship between social anxiety and using cannabis to cope (*path a*; see Figure 7). I expected a significant index of moderated mediation (Hayes, 2015).

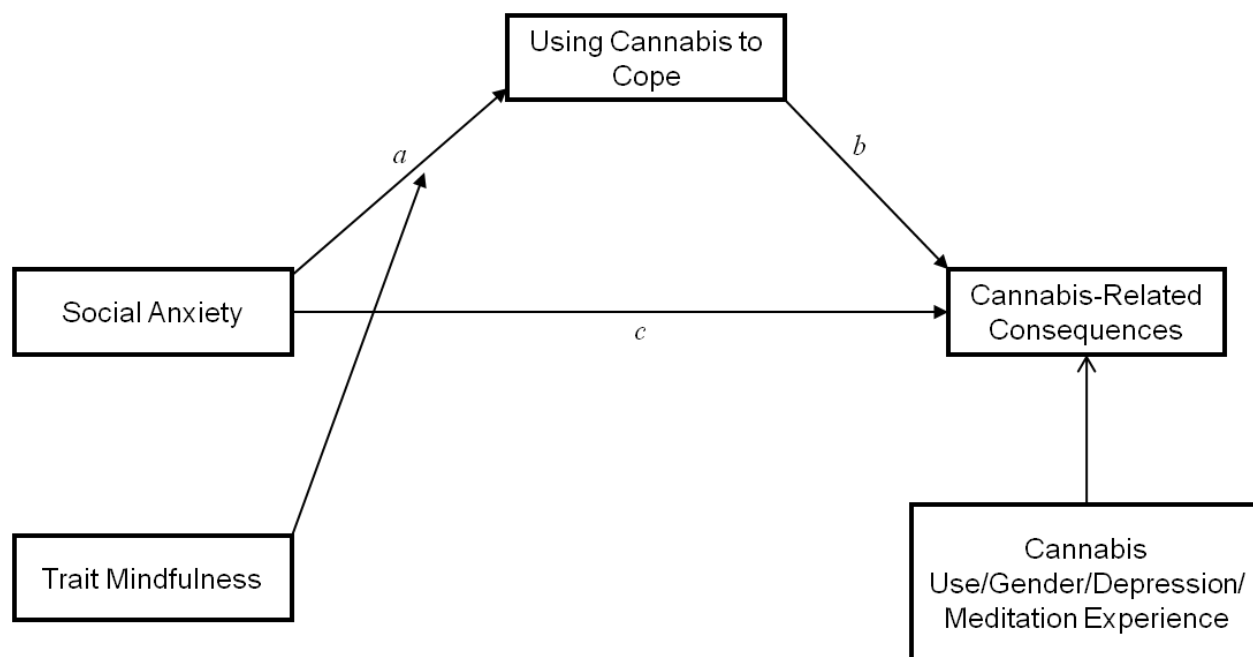


Figure 7. Proposed cannabis moderated mediation model.

Research Question 2: Do the individual facets of mindfulness moderate the mediated relationship between social anxiety, coping motives for cannabis use, and cannabis-related consequences, such that those higher in a specific facet of trait mindfulness show a reduced relationship between social anxiety and using cannabis to cope (*Path A*; see Figure 8)? Statistical significance will be determined through a significant index of moderated mediation (Hayes, 2015).

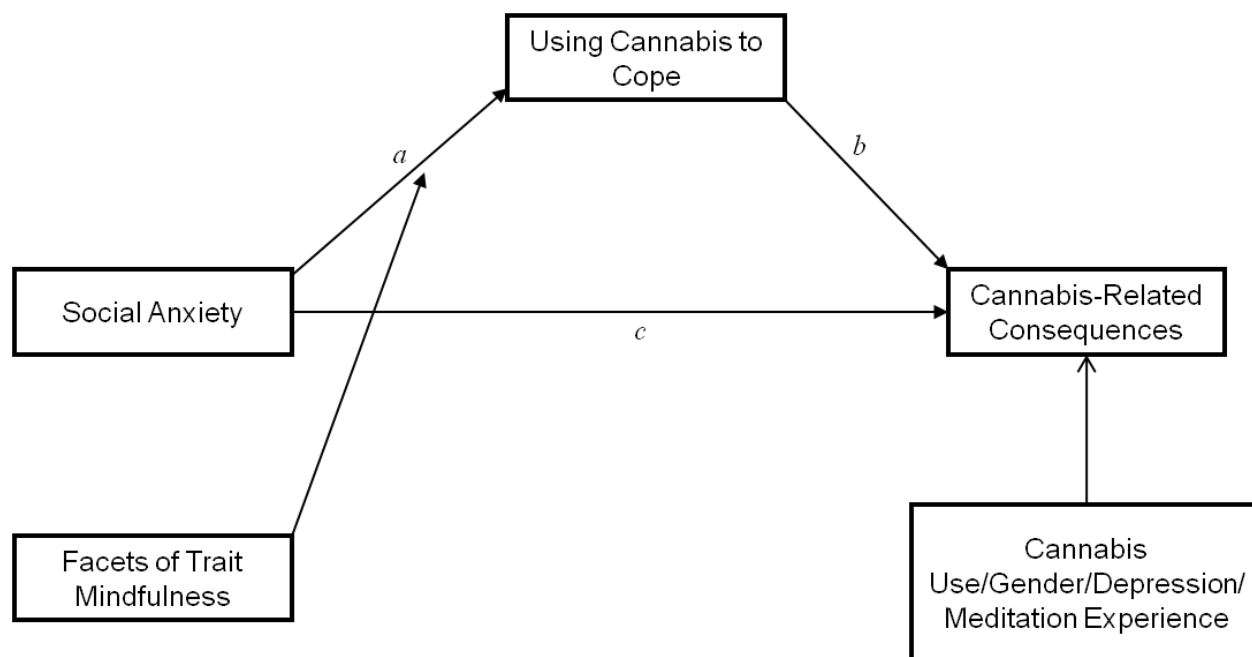


Figure 8. Exploratory cannabis moderated mediation model.

The current research aimed to replicate previous findings that a significant positive relationship exists between social anxiety and both alcohol- and cannabis-related consequences after controlling for use, gender, and depression. I also aimed to replicate findings that facets of mindfulness are significantly negatively related to alcohol constructs (alcohol use, drinking to cope with social anxiety, and alcohol-related consequences), and also examined if this relationship exists for cannabis constructs (cannabis use, using cannabis to cope with social anxiety, cannabis-related consequences) as well. I further hypothesized that mindfulness would moderate this relationship, such that those higher in trait mindfulness will show a reduced relationship between levels of social anxiety and using substances to cope with social anxiety in both alcohol and cannabis models.

CHAPTER 2 METHOD

Participants and Procedure

Participants were recruited through the Psychology Department participant pool at a large university located in the southeastern United States. Undergraduate students received course credit for participation in the study. Out the individuals who initially responded to the survey ($n = 451$), only individuals who were 18 years of age, had used alcohol in the past 30 days, or cannabis in the past 90 days were eligible to participate ($n = 380$). Additionally, participants who completed the survey in less than 10 minutes ($n = 36$) or completed less than 30% of survey items ($n = 13$) were excluded. After initial data cleaning, the sample was split into two data sets; an alcohol use group and a cannabis use group. In each of these data sets, participants were list-wise deleted if they had not completed all of the alcohol or cannabis use variables. The final samples for each data set were $n = 243$ and $n = 249$, respectively. Among the final samples, the majority of participants were female ($n = 166$, 68.3% for alcohol; $n = 168$, 67.5% for cannabis) and reported a mean age of 21 for both data sets. The majority of participants who reported race identified as being either Caucasian or White ($n = 112$, 46.1% for alcohol; $n = 101$, 40.6 for cannabis) or Black/African American ($n = 95$, 39.1% for alcohol; $n = 97$, 39.0% for cannabis). Demographics information is displayed in Table 1.

IRB approval was obtained prior to beginning this study. All questionnaires were given online using *Qualtrics* Survey software. Participants were initially informed via a notification statement that all aspects of the study were completely voluntary and that they may withdraw from participation at any time. Given that cannabis use and underage drinking are illegal activities for this age group, all data were collected anonymously with no identifying information attached to survey materials. Participants were provided with researcher contact information in

the event that they had questions or concerns about the study materials. Participants provided consent by clicking “next” after reading the notification statement. All participants received course credit for completing the survey.

Measures

Social Anxiety. Social anxiety was assessed using the Social Interaction Anxiety Scale (SIAS; Mattick & Clarke, 1998). The SIAS uses a 20-item, Likert-type scale ranging from 0 (*not characteristic of me at all*) to 4 (*extremely characteristic of me*) and includes statements such as “I have difficulty talking with other people” and “I feel tense if I am alone with just one other person”. Total scores range from 0-80, with higher scores indicating greater levels of social anxiety. The SIAS shows excellent internal consistency ($\alpha = .94$; Mattick & Clark, 1998), as well as test-retest reliability at 4 weeks ($r = .91$), and 12 weeks ($r = .93$) (Mattick & Clarke, 1998). In this sample, a total score was created as an average of responses to all items ($\alpha = .90$)

Trait Mindfulness. Trait mindfulness was assessed using the Five Facet Mindfulness Questionnaire (FFMQ; Baer et al., 2006). The FFMQ is a 39-item scale that asks participants to indicate how true a statement is of them using a Likert-type scale ranging from 1 (*rarely true*) to 5 (*very often or always true*). Confirmatory factor analysis has confirmed that trait mindfulness is modeled as a hierarchical factor with five distinct facets (Baer et al., 2006; Baer et al., 2008; Fernandez et al., 2010). The five facets of mindfulness show adequate internal consistency: Nonreactivity to Experience (7-items, $\alpha = .75$, e.g., “I perceive my feelings and emotions without having to react to them”), Acting with Awareness (8-items, $\alpha = .87$, e.g., “I find it difficult to stay focused on what's happening in the present”; reverse scored), Describing with Words (8-items, $\alpha = .75$ e.g., “I'm good at finding words to describe my feelings”), Nonjudging of Inner Experience (8-items, $\alpha = .88$, e.g., “I criticize myself for having irrational or inappropriate

emotions”; reverse scored), and Observing (8-items, $\alpha = .84$, e.g., “I pay attention to how my emotions affect my thoughts and behavior”) (Baer et al., 2006). Facets of mindfulness show concurrent validity through significant positive correlations with openness to experience ($r = .18$ - $r = .42$, $p < .001$), emotional intelligence ($r = .21$ - $.60$, $p < .001$), and self-compassion ($r = .14$ - $r = .53$, $p < .001$), as well as significant negative correlations between facets of mindfulness and psychological symptoms ($r = -.27$ - $r = -.55$, $p < .001$), neuroticism ($r = -.27$ - $r = -.55$, $p < .001$), and difficulties with emotional regulation ($r = -.23$ - $r = -.52$, $p < .001$; Baer et al., 2006). In this sample, a total score was created as an average of responses to all items for each facet ($\alpha = .68$ - $.91$). After each facet score was calculated, a total mindfulness score was created by averaging scores on the five facet scales ($\alpha = .77$).

Meditation Practice. Because previous findings suggest that scores on the Observe facet of the FFMQ may vary between meditation-naïve participants and experienced meditators (Baer et al., 2006; Baer et al., 2008), levels of meditation experience will be controlled for as a covariate in all analysis that assess mindfulness as a single construct (see Figures 3 and 5). Meditation experience will be assessed using a 1-item question that asks participants “How much experience do you have with meditation?” Participants responded on a Likert-type scale with scores ranging from 1 (*none*) to 4 (*a considerable amount*).

Alcohol Use. Alcohol quantity and frequency was assessed using a modified version of the Daily Drinking Questionnaire (DDQ; Collins, Parks, & Marlatt, 1985). The DDQ assesses participants’ drinking behavior for the past week by asking how many standard drinks they consumed for each day of the week. Total number of drinks for the week is calculated by summing the number of standard drinks consumed per day for each day of the week. The DDQ has shown excellent one-week test-retest reliability for a typical drinking week ($r = .93$; Miller et

al., 1998). The DDQ demonstrates convergent validity with other measures of drinking like the Drinking Practices Questionnaire ($r = .50, p = .001$; Collins, Parks, & Marlatt, 1985).

Alcohol –Related Consequences. Alcohol-related consequences was assessed using the brief version of the Young Adult Alcohol Consequences Questionnaire (B-YAACQ; Kahler, Strong, & Read, 2005). The B-YAACQ is a 24-item measure that asks whether or not a particular alcohol-related consequence (e.g., blackouts, hangovers, etc.) has occurred in the past year. This measure demonstrates good internal consistency ($\alpha = .83$), as well as convergent validity through strong correlations to the Rutgers Alcohol Problems Index (White & Labouvie, 1989; $r = 0.78, p < .001$), as well as the original YAACQ ($r = .79, p < .001$). The original YAACQ (Read, Kahler, Strong, & Colder, 2006) shows significant positive correlations to alcohol-related constructs such as frequency of drinking to intoxication ($r = 0.33$) and heavy episodic drinking ($r = 0.33, p < .001$) as well as significant negative correlations to academic outcomes such as grade point average ($r = -0.16, p < .01$). In this sample, a total score was created as an average of responses to all items ($\alpha = .89$).

Coping Motives for Alcohol Use. Coping motives for alcohol use was assessed using the Drinking to Cope with Social Anxiety Scale (DCSAS; Buckner & Heimberg, 2010). The DCSAS is a modified version of the Liebowitz Social Anxiety Scale (LSAS; Liebowitz, 1987). Using the same 24 situations from the LSAS, this scale asks participants to rate their desire to drink to cope with a given situation, as well as their desire to avoid that type of situation if alcohol were not available. This measure uses a Likert-type rating scale ranging from 0 (*Never*) to 3 (*Usually/68-100% of the time*). In this sample, a total score was created as an average of responses to all items ($\alpha = .97$).

Cannabis Use. Cannabis use was assessed with a DDQ-like grid, a measure that was used by Simons, Dvorak, Merrill, & Read (2012). This measure assesses cannabis use intensity on a one-week grid with 4, 6-hour periods per day for a typical week in the past 90 days. Similar measures of marijuana use have shown good test-retest reliability over a six month period ($r = 0.88, p < 0.05$; Williams, Adams, Stephens & Roffman, 2000). This measure is significantly correlated with measures of cannabis-related consequences for the dimensions of frequency ($r = 0.41, p < 0.05$) and intensity ($r = 0.39, p < 0.05$; Simons et al., 2012). Additionally, participants were asked a one item question indicating “On how many days during the last 90 days did you use marijuana?”

Cannabis-Related Consequences. Cannabis-related consequences was assessed using the brief version of the Marijuana Consequences Questionnaire (B-MACQ; Simons, Dvorak, Merrill, & Read, 2012). The MACQ is a modified version of the YAACQ that has been tailored for use in cannabis research. Cannabis problems are assessed using a 21-item scale over a 90-day time frame. Questions use a dichotomous yes/no rating system to indicate if a specific problem (e.g., memory loss, driving while high, etc.) has occurred in that time frame. The B-MACQ shows excellent internal consistency ($\alpha = .95$). Significant positive relationships with cannabis use frequency ($r = .41, p < .05$) cannabis use intensity ($r = 0.39, p < .05$) as well as the Marijuana Problems Index ($r = 0.59, p < .05$) demonstrate convergent validity. The B-MACQ shows substantially higher correlations with cannabis problems measures like the MPI ($r = 0.59, p < .05$) than with the YAACQ ($r = 0.30, p < .05$) or the DDQ ($r = 0.14, p < .05$) demonstrating discriminant validity. The measure also showed good test-retest intra-class correlations ($r = 0.80, p < .05$) over a 19 day period. In this sample, a total score was created as an average of responses to all items ($\alpha = .89$).

Coping Motives for Cannabis Use. Coping motives for cannabis use was assessed using the Marijuana Use to Cope with Social Anxiety Scale (MCSAS; Buckner et al., 2012). Like the DCSAS, The MCSAS uses the same 24 situations from the LSAS and asks participants to rate their desire to use cannabis to cope with a given situation, as well as their desire to avoid that type of situation if cannabis were not available. This measure uses a Likert-type rating scale ranging from 0 (*Never*) to 3 (*Usually/68-100% of the time*). In this sample, a total score was created as an average of responses to all items ($\alpha = .97$).

Depression. Depression was assessed using the Center for Epidemiological Studies Depression Scale (CES-D; Radloff, 1977). The CES-D scale was designed using items from previously validated measures of depression and is intended for the measurement of depressive symptomatology over the past week within a general population. This 20-item measure uses a Likert-type rating scale ranging from 0 (*rarely or none of the time [less than 1 day]*) to 3 (*most or all of the time [5-7 day]*). Possible scores range from 0 to 60, with higher levels indicating greater amounts of depressive symptoms occurring within the last week. The CES-D has shown high internal consistency in both non-clinical ($\alpha = .85$) and clinical samples ($\alpha = .90$). Test-retest correlations for 2 to 8 week interval range from $r = .51$ through $r = .67$. The CES-D shows convergent validity through strong positive correlations with the Bradburn Negative Affect Scale (Bradburn, 1969; $r = .63$) and divergent validity through weak-moderate correlations with the Bradburn Positive Affect Scale (Bradburn, 1969; $r = -.25$). In this sample, a total score was created as an average of responses to all items ($\alpha = .91$).

Data Analysis Plan

The data were cleaned and statistical assumptions were addressed before analyses were conducted. The linear relationships between the predictor and criterion variables was assessed

using scatter plots. Outliers were identified using boxplots. All statistical outliers were winsorized to the next highest value. Normality was assessed using histograms and skewness and kurtosis statistics. All values for skewness and kurtosis statistics fell within acceptable ranges. Normality of residuals was assessed using a normal P-P plot. Residual conformed reasonably well to the normality line. A scatterplot of the residuals showed no visible pattern, indicating homoscedasticity. Multicollinearity was assessed using VIF values. All values were relatively close to 1, indicating multicollinearity was not an issue. Because no form of imputation was used to address missing data, mean scores were used to limit bias.

All mediation and moderated mediation models were analyzed using PROCESS V3.3, an SPSS Macro developed by Hayes (2018). PROCESS examines the total, direct, indirect, and conditional indirect effects using 10,000 bootstrapped estimates calculated using the percentile method. Hayes and Scharkow (2013) suggest the percentile method as a middle-ground alternative to the Sobel Test (Sobel, 1982), which can be seen as overly conservative, and bias-corrected bootstrapped estimates, which have been argued to be overly liberal (Fritz, Taylor, & MacKinnon 2012). Gender (1 = male, 0 = female) and depression were modeled as control variables throughout all analyses. All analyses including either alcohol- or cannabis-related variables featured typical weekly use (alcohol) and past 90 day use (cannabis) as covariates, respectively. Additionally, meditation experience was modeled as a covariate in models where total mindfulness or the Observe facet was modeled as a moderator. Although meditation experience was originally collected as a Likert-type item, there was a large floor effect, where 58.1% of valid responders reported no meditation experience. For this reason, meditation experience was dichotomized (1 = meditation experience, 0 = no meditation experience).

Statistical significance for Hypotheses 1, 2, 4, and 6 were determined using 95% bootstrapped confidence intervals calculated using the percentile method that do not contain zero. Evidence for moderation of the indirect effect in all moderated-mediation models was determined using the index of moderated mediation (Hayes, 2015). The index of moderated mediation not only determines that an indirect effect is moderated, but that any conditional indirect effects estimated at different levels of the moderator are also significantly different from each other. The index of moderated mediation is determined using bootstrapped confidence intervals. The Statistical significance for Research Questions for 1 and 2 were determined using 99% bootstrapped confidence intervals calculated using the percentile method that do not contain zero, based on Bonferonni corrections ($\alpha = .05/5 = .01$).

CHAPTER 3 RESULTS

Descriptive Statistics and Bivariate Correlations

Descriptive statistics and correlations for alcohol study variables are displayed in Table 2. Descriptive statistics and correlations for cannabis study variables are displayed in Table 3. Social Anxiety displayed moderate positive correlations with drinking to cope with social anxiety ($r = .43, p < .001$), cannabis-related consequences ($r = .22, p = .001$), and using cannabis to cope with social anxiety ($r = .33, p < .001$). Social Anxiety also displayed moderate negative correlations with total trait mindfulness ($r = -.37, p < .001$ for alcohol; $r = -.34, p < .001$ for cannabis), as well as the describe facet ($r = -.27, p < .001$ for alcohol; $r = -.27, p < .001$ for cannabis), the awareness facet ($r = -.33, p < .001$ for alcohol; $r = -.34, p < .001$ for cannabis), and the nonjudging of inner experiences facet ($r = -.41, p < .001$ for alcohol; $r = -.39, p < .001$ for cannabis). Furthermore, Social anxiety also displayed a weak positive correlation with the observe facet ($r = .16, p = .02$ for alcohol; $r = .19, p = .003$ for cannabis).

Drinking to Cope with Social Anxiety as a Mediator

Replicating previous research (Buckner & Heimberg, 2010), Hypothesis 1 predicted that drinking to cope with social anxiety would mediate the relationship between social anxiety and alcohol-related consequences. Social anxiety was modeled as the most distal predictor of alcohol-related consequences, with drinking to cope with social anxiety modeled as the most proximal predictor of alcohol-related consequences. Typical alcohol use, gender, and depression were modeled as covariates. Standardized path coefficients for this model can be seen in Figure 9.

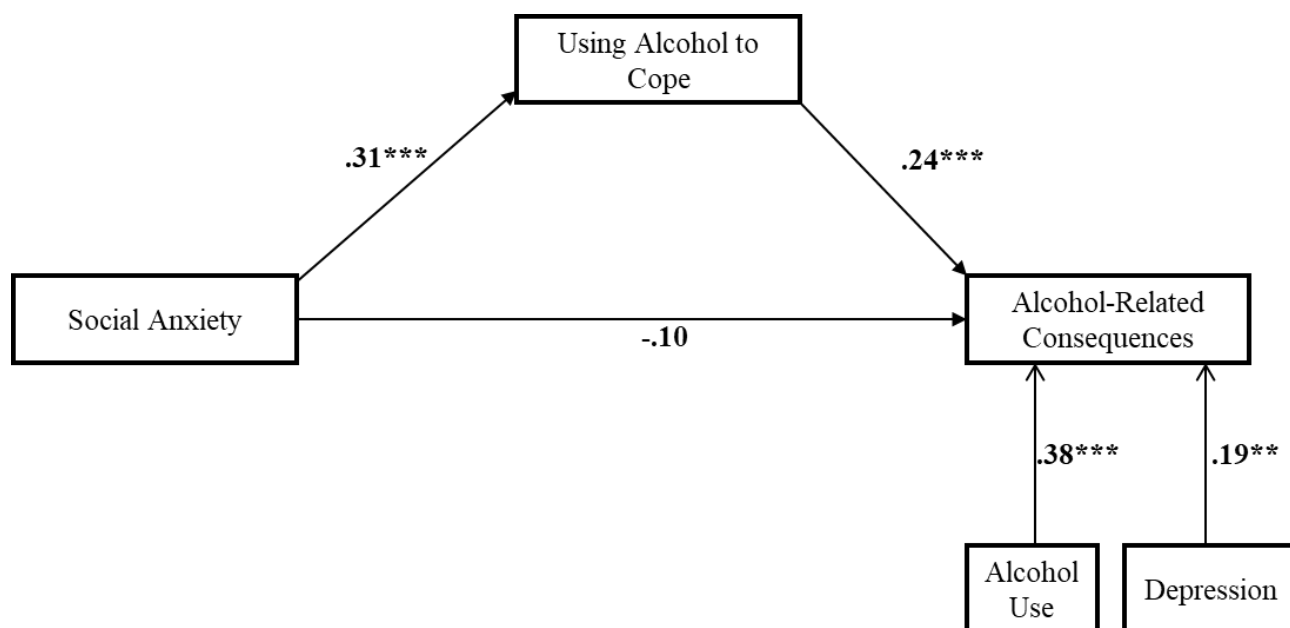


Figure 9. Depicts standardized relationships in the alcohol meditation model ($n = 234$). Gender ($\beta = -.14$) was not a significant predictors of alcohol-related consequences. This path is not shown for reasons of parsimony. * $p = .05$, ** $p = .01$, *** $p < .001$

The model using drinking to cope with social anxiety as the outcome was significant ($F(4, 229) = 15.39, p < .001, R^2 = .21$). The model with alcohol-related consequences as the outcome was significant ($F(5, 228) = 14.86, p < .001, R^2 = .25$). Consistent with Hypothesis 1 the indirect effect was significant ($\beta = .08, B = .02, 95\% \text{ CI } [.01, .03]$), indicating that those with higher levels of social anxiety endorsed more drinking to cope with social anxiety, and in turn experienced greater numbers of alcohol-related consequences.

Using Cannabis to Cope with Social Anxiety as a Mediator

Also replicating previous research (Buckner, et al., 2012), Hypothesis 2 predicted that using cannabis to cope with social anxiety would mediate the relationship between social anxiety and cannabis-related consequences. Social anxiety was modeled as the most distal predictor of cannabis-related consequences, with using cannabis to cope with social anxiety modeled as the most proximal predictor of alcohol-related consequences. Because of the low amount of

participants who completed the DDQ-like cannabis use grid ($n = 93$), 90-day cannabis use was instead modeled as a covariate of cannabis use. Gender and depression were also modeled as covariates. Standardized path coefficients for this model can be seen in Figure 10.

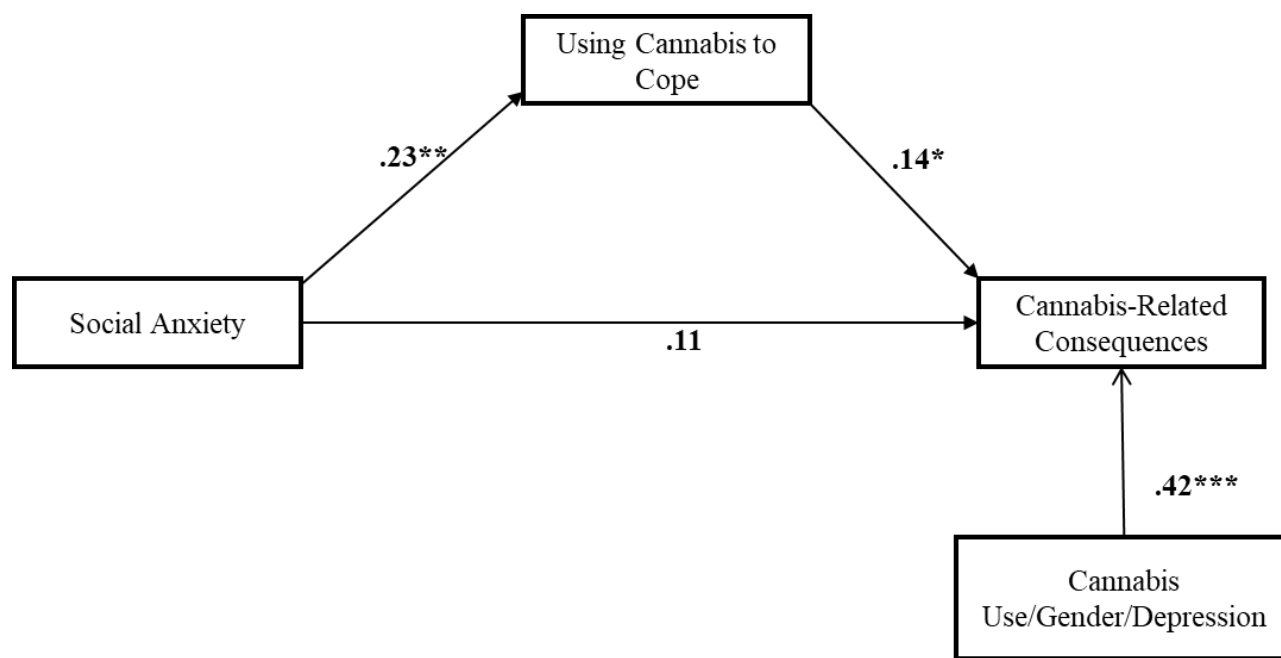


Figure 10. Depicts standardized relationships in the cannabis meditation model ($n = 236$). Gender ($\beta = -.15$), and Depression ($\beta = .05$), were not significant predictors of cannabis-related consequences. These paths are not shown for reasons of parsimony. * $p = .05$, ** $p = .01$, *** $p < .001$

For the model with using cannabis to cope with social anxiety as the outcome, the overall model was significant ($F(4, 231) = 9.98, p < .001, R^2 = .15$). For the model with cannabis-related consequences as the outcome the overall model was significant ($F(5, 230) = 17.91, p < .001, R^2 = .28$). In support of Hypothesis 2, the indirect effect was significant ($\beta = .03, B = .01, 95\% \text{ CI } [.001, .02]$) indicating that those with higher levels of social anxiety endorsed more using cannabis to cope with social anxiety, and in turn experienced greater numbers of cannabis-related consequences.

Trait Mindfulness and Alcohol Use Variables

Hypothesis 3 predicted negative correlations among total trait mindfulness and alcohol-related consequence, alcohol use, and using alcohol to cope with social anxiety. In partial support of this hypothesis, drinking to cope with social anxiety ($r = -.13, p = .04$) displayed weak negative correlations with total trait mindfulness. In addition, alcohol-related consequences showed a weak negative relationship with the Acting with Awareness facet ($r = -.14, p = .04$) and the Nonjudging of Inner Experience facet ($r = -.16, p = .02$), whereas drinking to cope with social anxiety showed weak-moderate correlations with the Acting with Awareness facet ($r = -.22, p = .001$) and the Nonjudging of Inner Experience facet ($r = -.18, p = .004$). Alcohol use did not have significant correlations with any mindfulness variable.

Trait Mindfulness as a Moderator of the Social Anxiety → Drinking to Cope with Social Anxiety → Alcohol-Related Consequences Relationship

Hypothesis 4 predicted that total trait mindfulness would moderate the mediation relationship previously observed between social anxiety, drinking to cope with social anxiety, and alcohol-related problems (Buckner & Heimberg, 2010). Specifically, I predicted that those with higher levels of trait mindfulness would show a reduced relationship between social anxiety and drinking to cope with social anxiety. Typical alcohol use, gender, depression, and meditation experience were modeled as covariates. Standardized path coefficients for this model can be seen in Figure 11.

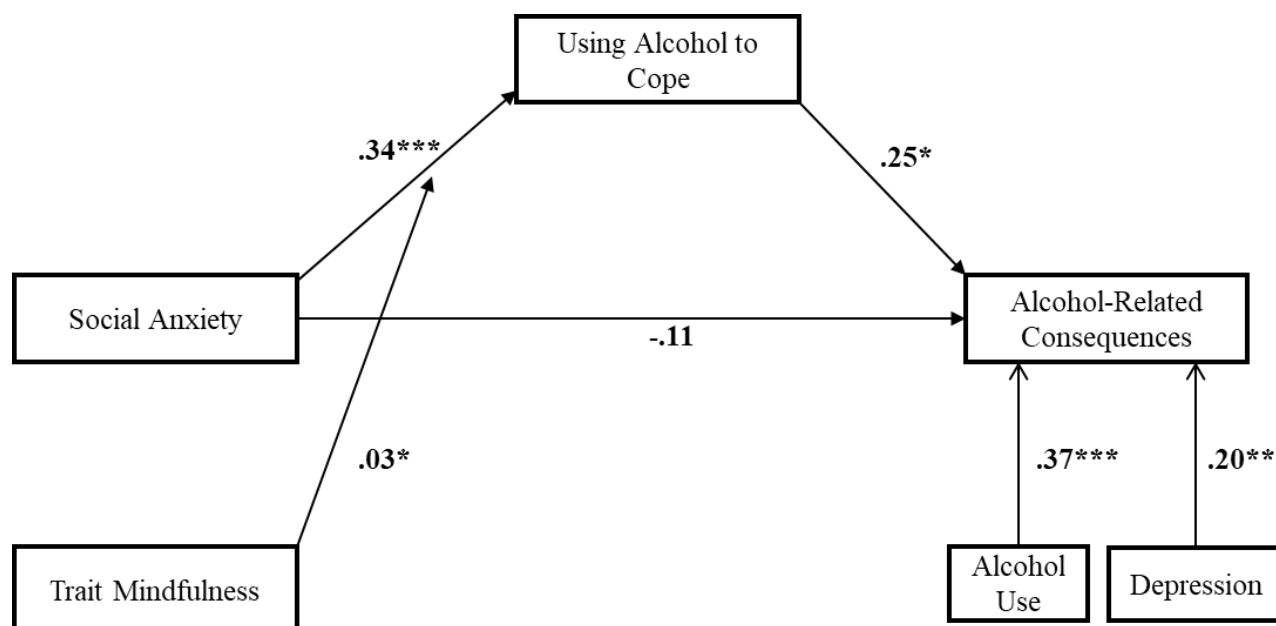


Figure 11. Depicts standardized relationships in the alcohol moderated meditation model ($n = 233$). Gender ($\beta = -.14$) and Meditation Experience ($\beta = -.16$) were not significant predictors of alcohol-related consequences. These paths are not shown for reasons of parsimony. * $p = .05$, ** $p = .01$, *** $p < .001$

For the model using drinking to cope with social anxiety as the outcome, the overall model was significant ($F(7, 225) = 9.55, p < .001, R^2 = .23$). For the model with alcohol-related consequences as the outcome the overall model was significant ($F(6, 226) = 12.65, p < .001, R^2 = .25$). In support of Hypothesis 4, the index of moderated mediation indicated a significant difference in the indirect effect at different levels of trait mindfulness (index of moderated mediation = .003, 95% CI [.0001, .006]).

Facets of Trait Mindfulness as a Moderator of the Social Anxiety → Drinking to Cope with Social Anxiety → Alcohol-Related Consequences Relationship.

Research Question 1 aimed to explore whether any of the five individual facets of trait mindfulness would moderate the mediation relationship previously observed between social anxiety, drinking to cope with social anxiety, and alcohol-related problems (Buckner & Heimberg, 2010). Although no specific hypotheses were made, it was generally expected that

those with higher levels of facets of trait mindfulness would show a reduced relationship between social anxiety and drinking to cope with social anxiety. Typical alcohol use, gender, and depression were modeled as covariates in all analyses. Meditation experience was modeled as a covariate only in the analysis that modeled the Observing facet of trait mindfulness as a moderator. This was due to previous findings that scores on the observing facet of the FFMQ may vary between meditation-naïve participants and experienced meditators (Baer et al., 2006; Baer et al., 2008). Because these analyses were considered follow-up analyses to Hypothesis 4, Bonferonni corrections were applied, ($\alpha = .05/5 = .01$). Thus, significance was determined using 99% confidence intervals that do not contain zero.

No facet of trait mindfulness was found to individually moderate the indirect effect between social anxiety, drinking to cope with social anxiety, and alcohol-related consequences in terms of the index of moderated mediation (Hayes, 2015). However, the Johnson-Neyman technique showed that the conditional effect was significantly moderated at levels of the Acting with Awareness facet greater than 3.85 and levels of the Nonreactivity to Inner Experience facet greater than 1.98. Although Hayes (2015) acknowledges that the index of moderated mediation and Johnson-Neyman technique do not always agree, he recommends the use of the index of moderated mediation to determine significance when there is conflict.

Trait Mindfulness and Cannabis Use Variables

Hypothesis 5 predicted negative correlations among total trait mindfulness and cannabis-related consequences, cannabis use, and using cannabis to cope with social anxiety. In partial support of this hypothesis, cannabis-related consequences showed a weak negative correlation with total trait mindfulness ($r = -.13, p = .04$). Additionally, cannabis-related consequences showed a weak negative correlation with the Nonjudging of Inner Experience facet ($r = -.16, p =$

.01), whereas using cannabis to cope with social anxiety displayed weak negative correlations with the Acting with Awareness facet ($r = -.18, p = .004$) and the Nonjudging of Inner Experience facet ($r = -.13, p = .04$). Counterintuitively, using marijuana to cope with social anxiety yielded a weak positive correlation to the Observing facet ($r = .15, p = .02$), whereas typical marijuana use yielded positive weak-moderate correlations with the Observing facet ($r = .24, p = .02$) and the Nonreacting to Inner Experience facet ($r = .24, p = .02$).

Trait Mindfulness as a Moderator of the Social Anxiety → Using Cannabis to Cope with Social Anxiety → Cannabis-Related Consequences Relationship

Hypothesis 6 predicted that total trait mindfulness would moderate the mediation relationship previously observed between social anxiety, using cannabis to cope with social anxiety, and cannabis-related problems (Buckner, et al., 2012). Specifically, I predicted that those with higher levels of trait mindfulness would show a reduced relationship between social anxiety and using cannabis to cope with social anxiety. Ninety-day cannabis use, gender, depression, and meditation experience were modeled as covariates. Standardized path coefficients for this model can be seen in Figure 12.

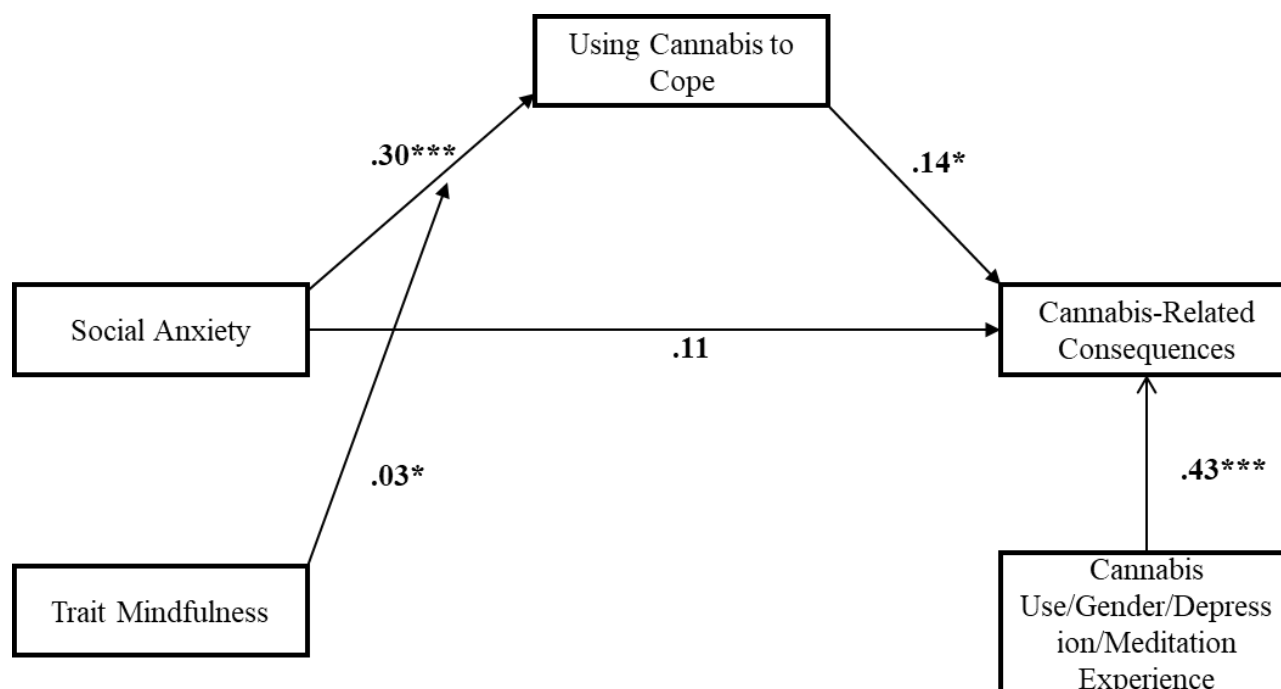


Figure 12. Depicts standardized relationships in the cannabis moderated meditation model ($n = 234$). Gender ($\beta = -.21$), Depression ($\beta = .12$), and Meditation Experience ($\beta = -.09$) were not significant predictors of alcohol-related consequences. These paths are not shown for reasons of parsimony. * $p = .05$, ** $p = .01$, *** $p < .001$

For the model with using cannabis to cope with social anxiety as the outcome, the overall model was significant ($F(7, 226) = 8.11, p < .001, R^2 = .20$). For the model with cannabis-related consequences as the outcome the overall model fit was significant ($F(6, 227) = 15.25, p < .001, R^2 = .29$). In support of Hypothesis 6, the index of moderated mediation indicated a significant difference in the indirect effect at different levels of trait mindfulness (index of moderated mediation = .002, 95% CI [.0002, .005]).

Facets of Trait Mindfulness as a Moderator of the Social Anxiety → Using Cannabis to Cope with Social Anxiety → Cannabis-Related Consequences Relationship

Research Question 2 aimed to explore whether any of the five individual facets of trait mindfulness would moderate the mediation relationship previously observed between social anxiety, using cannabis to cope with social anxiety, and cannabis-related problems (Buckner, et

al., 2012). Although no specific hypotheses were made, it was generally expected that those with higher levels of facets of trait mindfulness would show a reduced relationship between social anxiety and using cannabis to cope with social anxiety (e.g., *Path A* in figures 7 and 8). Ninety-day cannabis use, gender, and depression were modeled as covariates in all analyses. Meditation experience was modeled as a covariate only in the analysis that modeled the Observing facet of trait mindfulness as a moderator. This was due to previous findings that scores on the observing facet of the FFMQ may vary between meditation-naïve participants and experienced meditators (Baer et al., 2006; Baer et al., 2008). Given that these analyses were considered follow-up analyses to Hypothesis 4, Bonferonni corrections were applied, ($\alpha = .05/5 = .01$). Thus, significance was determined using 99% confidence intervals that do not contain zero. No facet of trait mindfulness was found to individually moderate the indirect effect between social anxiety, using cannabis to cope with social anxiety, and cannabis-related consequences in terms of the index of moderated mediation (Hayes, 2015). However, the Johnson-Neyman technique showed that the indirect effect was significantly moderated at levels of the Observe facet greater than 2.77 levels of the Describing with Words facet greater than 2.63, and levels of the Nonreactivity to Inner Experience facet greater than 2.40. However, as previously mentioned, Hayes (2015) recommends the use of the index of moderated mediation over the Johnson-Neyman in conditional process analysis.

CHAPTER 4 DISCUSSION

The present research aimed to expand upon the social anxiety and substance use literature by examining trait mindfulness as a potential moderator of the previously observed mediating relationship between social anxiety, coping motives, and substance-use consequences. Based on the Biopsychosocial Model of Social Anxiety and Substance Abuse (Buckner et al., 2013), Motivational Models of Substance use (Cox & Klinger, 1988), cognitive models of social anxiety (Hofman, 2007), and Tiffany's Model of Drug Urges and Drug-Use Behavior (1990), I posited that those with social anxiety who experience high levels of negative affect and low levels of positive affect due to persistent cognitive mechanisms underlying their social anxiety symptoms (Hofman, 2007) are particularly motivated to engage in coping motivated use of a substance (Cox & Clinger, 1988; Buckner et al., 2013). Using substances in this manner eventually leads to a drug-use action schema (Tiffany, 1990), in which the individual automatically associates a certain substance with the relief of negative affect in social situation. Becoming reliant on this substance will in turn lead to a SUD (Buckner et al., 2013). It was proposed that trait mindfulness, which is positively associated with greater executive control (Ostafin, Kassman, & Wessel, 2013) and the ability to resist alcohol-related cues (Garland, 2011; Ostafin et al., 2013), may decouple the relationship between social anxiety and the urge to use substances to cope.

Drinking to Cope with Social Anxiety

Replicating previous research (Buckner & Heimberg, 2010), drinking to cope was found to mediate the relationship between social anxiety and alcohol-related consequences, which supported Hypothesis 1. Specifically, it was found that those with social anxiety were more likely to drink to cope with social anxiety and in turn experienced more alcohol-related

consequences. This finding lends support to the Biopsychosocial Model of Social Anxiety (Buckner et al., 2013).

Using Cannabis to Cope with Social Anxiety

Replicating previous research (Buckner et al., 2012), using cannabis to cope with social anxiety significantly mediated the relationship between social anxiety and cannabis-related consequences. Thus, Hypothesis 2 was supported. As with Hypothesis 1, this finding lends support to the Biopsychosocial Model of Social Anxiety (Buckner et al., 2013).

Relationships between Mindfulness and Alcohol-Related Variables

I proposed that there would be significant negative correlations between trait mindfulness (assessed as a total score) and alcohol-related consequences, using alcohol to cope with social anxiety, and alcohol use (Hypothesis 3). In partial support of this hypothesis, using alcohol to cope with social anxiety was found to have a negative relationship with total trait mindfulness. In addition, alcohol-related consequences showed a negative relationship with the Nonjudgmental Acceptance facet of trait mindfulness, whereas drinking to cope with social anxiety showed a negative relationship with the Acting with Awareness facet. These findings provide further evidence that mindfulness in general is negatively related to alcohol-use constructs, and that the Nonjudgmental Acceptance and Acting with Awareness facets of trait mindfulness are two of the more important facets of mindfulness involved in this relationship.

However, neither total trait mindfulness nor any individual facet was related with alcohol use. These findings support previous literature that has generally shown that trait mindfulness is negatively related to measures of alcohol-related consequences (Fernandez et al., 2010; Murphy & MacKillop 2012; Reynolds et al., 2015; Roos et al., 2015) as well as drinking motives

(Reynolds et al., 2015; Roos et al., 2015), but unrelated to alcohol use (Reynolds et al., 2015; Roos et al., 2015).

Relationship between Mindfulness and Cannabis-Related Variables

I proposed that there would be significant negative correlations between trait mindfulness (assessed as a total score) and cannabis-related consequences, using cannabis to cope with social anxiety, and cannabis use (Hypothesis 5). In partial support of this hypothesis, cannabis-related consequences showed a small, significant negative relationship with total trait mindfulness. In addition, cannabis-related consequences showed a significant, negative relationship with the Nonjudgmental Acceptance facet of trait mindfulness.

Using cannabis to cope with social anxiety and both measures of cannabis use included in the study (typical weekly use and past 90 day use) showed no meaningful relationships with total trait mindfulness; however, there were significant relationships observed with individual facets of trait mindfulness. Using cannabis to cope with social anxiety was significantly negatively correlated with the Acting with Awareness facet of trait mindfulness and the Nonjudging of Inner Experience facet. Both using cannabis to cope with social anxiety and typical cannabis use showed significant positive correlations with the Observe facet of trait mindfulness, going against expectation. However, this finding may be attributable to the fact that the Observe facet has been shown to load negatively on to the other facets of trait mindfulness in non-meditating samples (Baer et al., 2006; Baer et al., 2008).

In addition, typical marijuana use was found to have a significant, positive relationship with the Nonreactivity to Experience facet of trait mindfulness, another counterintuitive finding. There are a number of possible explanations for this finding. One possible explanation comes from the psychoactive properties of cannabis. Cannabidiol (CBD), one of the more commonly

known cannabinoids in cannabis, has been shown to have anxiolytic (anxiety reducing) properties. Among individuals with SAD, CBD had been shown to reduce heart rate prior to a speech task (Zuardi, Cosme, Graef, & Guimarães, 1993; Bergamaschi et al., 2011) as well as reducing levels of state social anxiety (Bergamaschi et al., 2011). Further, tetrahydrocannabinol (THC) the main psychoactive component of cannabis, has been shown to have dose dependent effects, such that users experience anxiolytic effects at low doses, while experiencing anxiogenic (anxiety-producing) effects at higher doses (Witkin, Tzavara, & Nomikos, 2005).

It is possible that in a sample that uses low levels of cannabis in a session one might see increased nonreactivity to experience due to the anxiolytic effects of the drug. However, because there is no measure of cannabis quantity in this study, we cannot determine whether or not this is the case. An alternative interpretation for this unexpected finding is due to irregularities in the sample's response to the FFMQ. Specifically, the Nonjudgmental Acceptance facet and Nonreactivity to Inner Experience facet, two highly similar measures that previously comprised a single facet in the KIMS (Baer et al., 2004), showed a strong, significant negative correlation with one another ($r = -.44, p < .001$). This relationship is highly unusual and may indicate a validity issue in which one or more of the subscales is not measuring the construct it is intended to. Future work should aim to clarify this finding.

Despite these counterintuitive results, these findings represent a notable advancement in the literature regarding cannabis-related variables and trait mindfulness. To date, this is the first study to examine cannabis-related variables using a multifaceted measure of trait mindfulness. This information can be used to guide future work as to which aspects of mindfulness are most important in the study of cannabis-related variables.

Trait Mindfulness as a Moderator

I proposed that total trait mindfulness would moderate the previously observed mediation relationships between social anxiety, drinking to cope with social anxiety, and alcohol-related consequences (Buckner & Heimberg, 2010; Hypothesis 4). Likewise, Hypothesis 6 proposed that total trait mindfulness would moderate the previously observed mediation relationships between social anxiety, using cannabis to cope with social anxiety, and cannabis-related consequences (Buckner et al., 2012). Research questions one and two proposed similar models, with individual facets tested as moderators. Hypotheses 4 and 6 were significant, but the effect sizes for these models were very small. For this reason, this result should be interpreted with caution, and should be replicated to confirm the effect. No individual facet of trait mindfulness was a significant moderator in either alcohol or cannabis models. Additionally, although these models were suggested by cognitive models of social anxiety (Hofman, 2007) and substance abuse (Tiffany, 1990), there was no single theory that linked mindfulness and social anxiety. Therefore, it is difficult to frame results on either theory's success or failure of prediction.

There are few theories of mindfulness in the extant literature that can be used to help examine the current findings. One such theory, proposed by Shapiro, Carlson, Astin, & Freedman (2006) asserts that the benefits of trait mindfulness on mental health act indirectly through the process of reperiencing, which they define as a fundamental shift in perspective. Through this shift in perspective, one is able to step back from one's personal narrative, rather than becoming immersed in the "drama of our lives". In support of this theory, Brown, Bravo, Roos, & Pearson (2015) found that reperiencing directly mediated the relationship between four of the five facets of trait mindfulness (excluding the observe facet) and anxiety symptoms and indirectly mediated the relationship between these four facets and alcohol-related problems through distress intolerance. Similarly, Pearson et al. (2015) found that decentering (an

alternative term for reperiencing) indirectly mediated the link between trait mindfulness and alcohol-related consequences through purpose in life. Thus, it may be important for future studies examining the benefits of trait mindfulness on anxiety and substance use consequences to include reperiencing in the model because trait mindfulness may not produce benefits directly.

One alternative interpretation for these non-significant findings may come from methodological issues associated with the FFMQ. Although the FFMQ has been validated in a number of studies (Baer et al., 2006; Baer et al., 2008; Fernandez et al., 2010), some still argue against its utility in non-meditating samples. Grossman (2008) argues that the understanding of mindfulness is contingent on the practice of mindfulness meditation. Due to this disparity in understanding, he argues that self-report measures of mindfulness may take on entirely different meanings depending on if the sample has meditation experience or not. As evidence of this notion, he references the disparate findings on the Observe facet between meditating and non-meditating samples. To test Grossman's (2008) assertions as to whether meditating samples understand the items of the FFMQ differently than non-meditating samples, future work may use invariance testing of the FFMQ to test for differences between meditating and non-meditating samples.

Limitations

One of the main limitations with the present research is the cross-sectional nature of the data, which prevents causal inferences and establishing temporal precedence. Although previous longitudinal research (Buckner et al., 2008; Crum & Pratt, 2001) has established that social anxiety precedes alcohol and cannabis use disorders, no study to date has examined the social anxiety, using substances to cope, and substance-related consequences relationship using

longitudinal data. Future work in this area should implement such designs to establish stronger evidence for causal inference among these variables.

Another limitation of the present research was the use of self-report measures. Therefore, it is possible that results were subject to retrospective self-report biases, such as recall bias for alcohol (Ekholm, 2004). It is also possible that given stigma associated with high levels of alcohol and drug use, participants may have under-reported these behaviors due to social desirability. Further, it is unclear to what extent these results would extend to those with clinical levels of social anxiety or substance use disorder.

One further limitation of the present research is its generalizability to a general population. When computed as a total score, the mean for the Social Interaction Anxiety Scale (Mattick & Clarke, 1998) in this sample was 31; The empirically supported cutoff score for clinical levels of social anxiety measured with the Social Interaction Anxiety Scale is 34 (Heimberg, Mueller, Holt, Hope, & Liebowitz, 1992). Due to the fact that the sample's mean is only 3 points away from the clinical cutoff, these results may be considered more applicable to populations with clinically elevated social anxiety rather than a general population.

Future Directions

As previously discussed, it is important that these findings, especially the moderated mediation of the social anxiety, using cannabis to cope, and cannabis-related consequences model be replicated due to how close the model was to non-significance. However, this research does provide interesting avenues of further research for the study of mindfulness. By identifying which facets of mindfulness relate to which alcohol and cannabis constructs, future researchers can guide their hypotheses to make stronger a priori predictions.

However, perhaps the most important implications for future research seen in these findings are in the measurement of mindfulness. As previously mentioned, the repeated finding that one of the five facets of mindfulness is dependent on having meditating sample presents a problem. This is because trait mindfulness is a construct that should be measurable in both meditators and non-meditators alike. In the future, Grossman's (2008) assertion that measures of trait mindfulness carry different meanings based on meditation experience should be assessed using invariance testing.

On an even more fundamental level, it is possible that the measurement of trait mindfulness itself is flawed. Although the systematic review by Park et al. (2013) found the FFMQ to be to have the highest ratings for internal consistency and construct validity among the measures tested, they also acknowledged that no one measure of mindfulness can be recommended over another based solely on psychometric properties. Further, they conclude that key problems in the measurement of mindfulness, including conceptual differences in what mindfulness is, lack of confirmation that participants understand the items on mindfulness scales, and conflation of the effects of valuing mindfulness versus actual increases in mindfulness are caused by a lack of content validation across all mindfulness measures. In the future, it may be necessary to create new, more psychometrically valid measures of mindfulness with better content validation.

Career Implications

In terms of my aspirations as a researcher, the results of this study have several implications for my future career. Although there was evidence of moderated mediation between trait mindfulness and the social anxiety, using cannabis to cope, and cannabis-related

consequences relationship, I am cautious to conclude that trait mindfulness is an important variable in this relationship.

The ultimate goal for researchers in specifying which facets of mindfulness are involved in certain types of psychopathology is the construction of mindfulness interventions that specifically aim to enhance the mindfulness skills most appropriate for reducing that particular psychopathology. This process will involve not only identifying which facets affect which types of psychopathology, but also which mindfulness interventions work to enhance specific aspects of mindfulness. Working to develop this kind of specialized intervention within the social anxiety and substance use relationship was one of my future aspirations as a result of this research.

However, I believe that before this goal can be accomplished the issues identified with the measurement of mindfulness must be addressed. I believe I can start this process by performing invariance testing of the FFMQ to assess Grossman's (2008) aforementioned hypothesis about the nature of the FFMQ.

Besides working in the field of mindfulness, I plan to continue research on the relationship between social anxiety and substance abuse. There are a number of possible avenues for future research identified by the Biopsychosocial Model (2013), including identifying differences in the relationships between social anxiety as it relates to alcohol and social anxiety as it relates to cannabis. Further, certain aspects of the model remain untested, such as the prospect that an individual who chooses to engage in coping motivated use of a substance for one of the five facets of social anxiety (physiological arousal, evaluation fears, low positive affect, perceived social deficits, and social avoidance) may be different types of substance users, or may experience different substance use outcomes.

Conclusions

In conclusion, the present study replicated previous literature that drinking to cope with social anxiety mediates the relationship between social anxiety and alcohol related consequences. In addition, I also replicated previous research that found a similar mediation for using cannabis to cope and social anxiety and cannabis-related consequences.

Further, this study contributes to the literature examining relationships between substance use and trait mindfulness. We confirmed what previous literature has found in that trait mindfulness is negatively related to alcohol-related consequences, as well as coping motives, but not necessarily to use. We also provided novel findings by examining a multifaceted measure of trait mindfulness as it relates to cannabis use and found total trait mindfulness to be negatively related to cannabis-related consequences. We also found varying relationships among individual facets of trait mindfulness and cannabis-use variables, some of which seem contradictory to expectations. Future research should seek to confirm these relationships, as well as to improve the measurement of trait mindfulness.

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Table 1
Demographics.

| Substance Type | Alcohol | Cannabis |
|----------------------------------|--------------|--------------|
| Gender | n (%) | n (%) |
| Male | 68 (28.0) | 69 (27.7) |
| Female | 166 (68.3) | 168 (67.5) |
| Transgender | 2 (0.8) | 3 (1.2%) |
| Other | 1 (0.4) | 0 (0%) |
| Missing | 6 (2.5) | 9 (3.6) |
| Age | n (%) | n (%) |
| <i>M</i> | 21.00 (13.6) | 21.00 (12.9) |
| 18 | 58 (23.9) | 63 (25.3) |
| 19 | 39 (16.0) | 43 (17.3) |
| 20 | 35 (14.4) | 35 (14.1) |
| 21 | 33 (13.6) | 32 (12.9) |
| 22 | 28 (11.5) | 25 (10.0) |
| 23+ | 35 (14.4) | 32 (12.9) |
| Missing | 15 (6.2) | 19 (7.6) |
| Race | n (%) | n (%) |
| American Indian/Alaska Native | 0 (0.0) | 2 (0.8) |
| Asian | 8 (3.3) | 8 (3.2) |
| Black/African American | 95 (39.1) | 97 (39.0) |
| Native Hawaiian/Pacific Islander | 0 (0.0) | 1 (0.4) |
| Caucasian or White | 112 (46.1) | 101 (40.6) |
| Multiracial | 15 (6.2) | 22 (10.4) |
| Other | 6 (2.5) | 8 (3.2) |
| Missing | 7 (2.9) | 10 (4.0) |
| Ethnicity | n (%) | n (%) |
| Non-Hispanic/Latino | 214 (88.1) | 212 (85.1) |
| Hispanic/Latino | 22 (9.0) | 28 (11.3) |
| Missing | 7 (2.9) | 9 (3.6) |
| Class Standing | n (%) | n (%) |
| Freshman | 74 (30.5) | 86 (34.5) |
| Sophomore | 44 (18.1) | 44 (17.7) |
| Junior | 52 (21.4) | 49 (19.7) |
| Senior | 62 (25.5) | 57 (22.9) |
| Grad Student | 4 (1.6) | 4 (1.6) |
| Missing | 7 (2.9) | 9 (3.6) |
| Marital Status | n (%) | n (%) |
| Never Married | 221 (90.9) | 223 (89.6) |
| Married | 11 (4.5) | 12 (4.8) |
| Separated | 0 (0) | 0 (0%) |
| Divorced | 5 (2.1) | 5 (2.6) |
| Widowed | 0 (0.0) | 0 (0%) |
| Missing | 6 (2.5) | 9 (3.6) |
| Sexual Orientation | n (%) | n (%) |
| Exclusively Heterosexual | 164 (67.5) | 170 (68.3) |
| Mostly Heterosexual | 38 (15.6) | 36 (14.5) |

| | | |
|---------------------------------|----------|-----------|
| Equally Heterosexual/Homosexual | 24 (9.9) | 25 (10.0) |
| Mostly Homosexual | 2 (0.8) | 1 (0.4) |
| Exclusively Homosexual | 8 (3.3) | 7 (2.8) |
| Missing | 7 (2.9) | 10 (4.0) |

Table 2
Bivariate correlations and descriptive statistics among alcohol study variables

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | M | SD | Range |
|---|-------------|-------------|-------------|------|------------|-------------|------------|-------------|-------------|------------|-------|------|----------|
| 1. Social Anxiety | <u>.90</u> | | | | | | | | | | 1.32 | 0.89 | 0-4.00 |
| 2. Alcohol-Related Consequences | .11 | <u>.89</u> | | | | | | | | | 0.25 | 0.20 | 0-0.79 |
| 3. Drinking to Cope with Social Anxiety | .43 | .30 | <u>.97</u> | | | | | | | | 0.36 | 0.47 | 0-2.15 |
| 4. DDQ Weekly Average | .06 | .39 | .17 | --- | | | | | | | 1.04 | 1.25 | 0-8.57 |
| 5. Trait Mindfulness | -.37 | -.11 | -.13 | -.04 | <u>.77</u> | | | | | | 23.46 | 2.63 | 16.50-30 |
| 6. Observe | .16 | -.10 | .07 | -.01 | .29 | <u>.86</u> | | | | | 2.92 | 0.85 | 1-5 |
| 7. Describe | -.27 | -.07 | -.03 | -.08 | .77 | .29 | <u>.68</u> | | | | 2.97 | 0.66 | 1-5 |
| 8. Awareness | -.33 | -.14 | -.22 | -.02 | .44 | -.52 | .16 | <u>.89</u> | | | 3.31 | 0.80 | 1-5 |
| 9. Nonjudge | -.41 | -.16 | -.18 | -.10 | .40 | -.57 | .16 | .73 | <u>.91</u> | | 3.22 | 0.87 | 1-5 |
| 10. Nonreact | -.03 | .05 | .01 | .02 | .43 | .65 | .41 | -.39 | -.38 | <u>.87</u> | 2.75 | 0.74 | 1-5 |

Note. Gender was coded 1 = men, 0 = women. Significant correlations ($p < .05$) are bolded for emphasis. Cronbach's alphas are underlined and shown on the diagonals.

Table 3
Bivariate correlations and descriptive statistics among cannabis study variables

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | M | SD | Range |
|--|-------------|-------------|-------------|------------|------|------------|-------------|------------|-------------|-------------|------------|-------|------|-------------|
| 1. Social Anxiety | <u>.90</u> | | | | | | | | | | | 1.37 | 0.88 | 0-3.65 |
| 2. Cannabis-related Consequences | .22 | <u>.89</u> | | | | | | | | | | 0.19 | 0.18 | 0-0.64 |
| 3. Using Marijuana to Cope with Social Anxiety | .33 | .25 | <u>.97</u> | | | | | | | | | 0.46 | 0.62 | 0-2.88 |
| 4. Typical Cannabis Use Week | -.17 | .36 | .15 | --- | | | | | | | | 7.52 | 9.01 | 0-28 |
| 5. 90 Day Cannabis Use | -.03 | .45 | .10 | .78 | --- | | | | | | | 27.35 | 33.0 | 0-90 |
| 6. Trait Mindfulness | -.34 | -.13 | -.04 | .15 | .03 | <u>.77</u> | | | | | | 23.37 | 2.45 | 16.50-29.90 |
| 7. Observe | .19 | .04 | .15 | .24 | .12 | .25 | <u>.86</u> | | | | | 2.90 | 0.82 | 1-5 |
| 8. Describe | -.26 | -.09 | -.00 | .06 | -.06 | .75 | .30 | <u>.68</u> | | | | 2.96 | 0.63 | 1.13-4.75 |
| 9. Awareness | -.35 | -.08 | -.18 | .01 | .06 | .44 | -.58 | .14 | <u>.89</u> | | | 3.28 | 0.79 | 1-5 |
| 10. Nonjudge | -.39 | -.16 | -.13 | -.10 | -.08 | .42 | -.60 | .11 | .74 | <u>.91</u> | | 3.19 | 0.86 | 1-5 |
| 11. Nonreact | -.01 | -.03 | .05 | .24 | .06 | .34 | .64 | .31 | -.45 | -.46 | <u>.87</u> | 2.76 | 0.76 | 1-5 |

Note. Gender was coded 1 = men, 0 = women. Significant correlations ($p < .05$) are bolded for emphasis. Cronbach's alphas are underlined and shown on the diagonals.

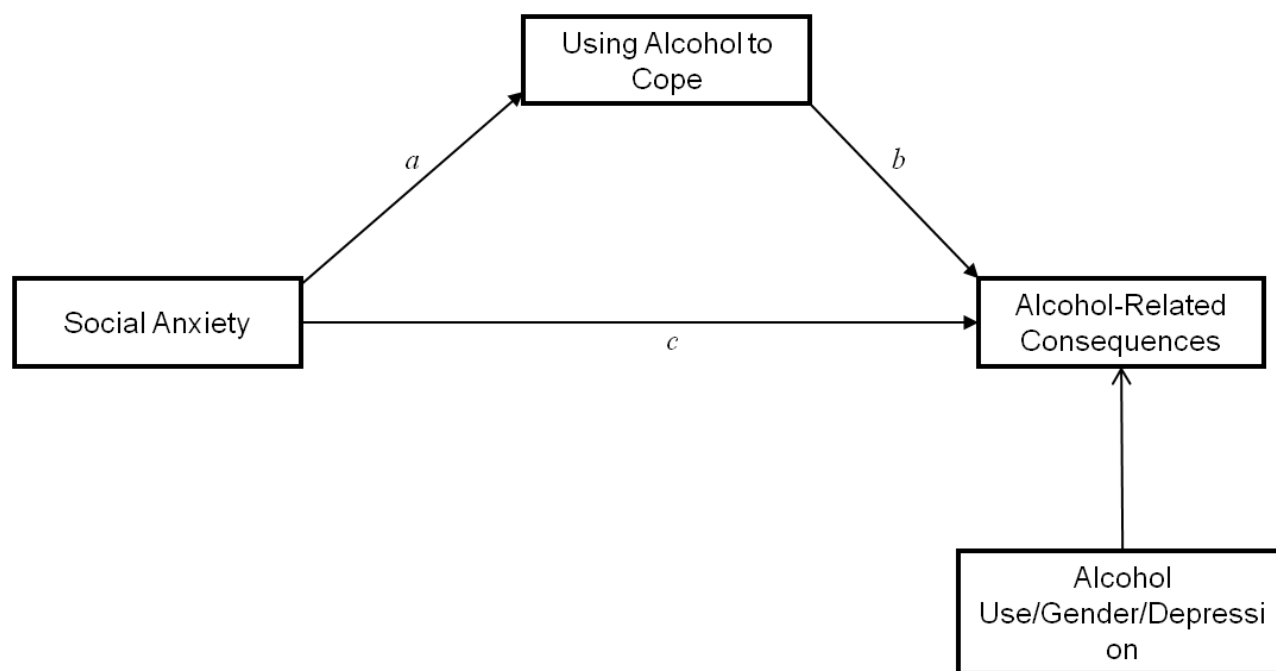


Figure 1. Proposed alcohol mediation model.

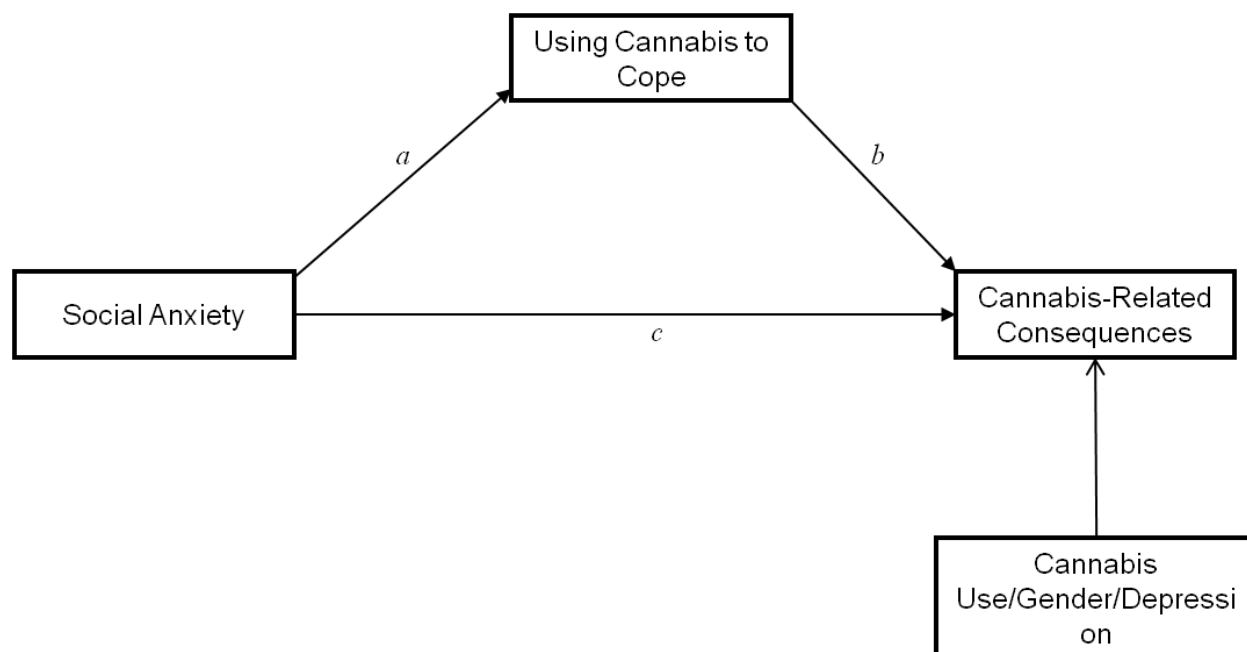


Figure 1. Proposed cannabis mediation model.

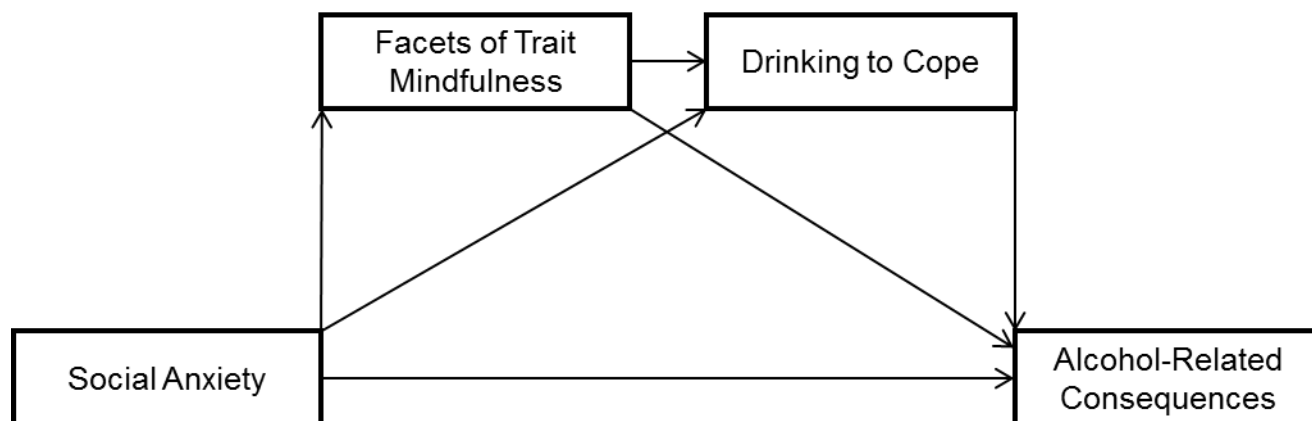


Figure 3. (Clerkin et al., 2017). Hypothesized serial mediation Model A (non-significant).

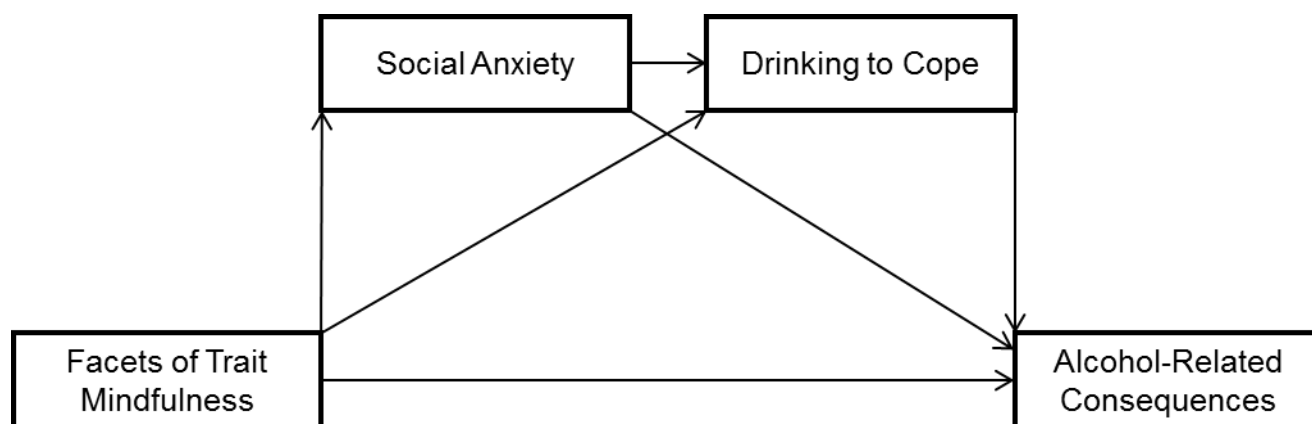


Figure 4. (Clerkin et al., 2017). Hypothesized serial mediation Model B (significant).

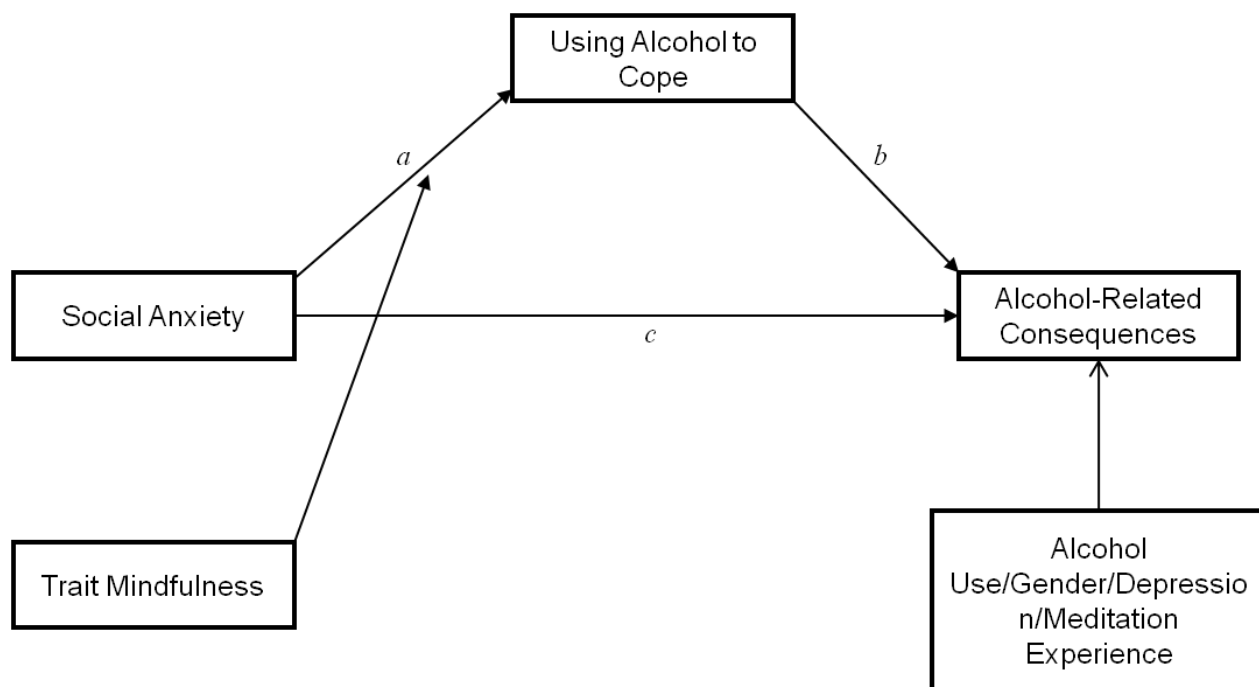


Figure 5. Proposed alcohol moderated mediation model.

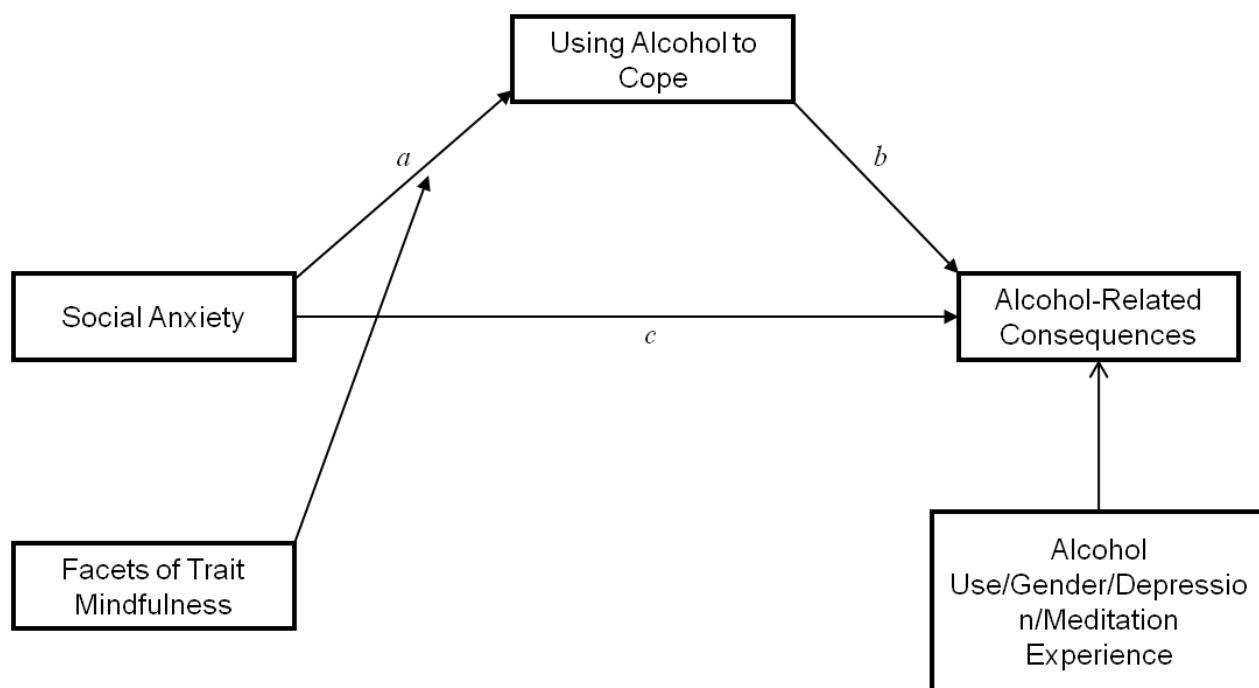


Figure 6. Exploratory moderated mediation model.

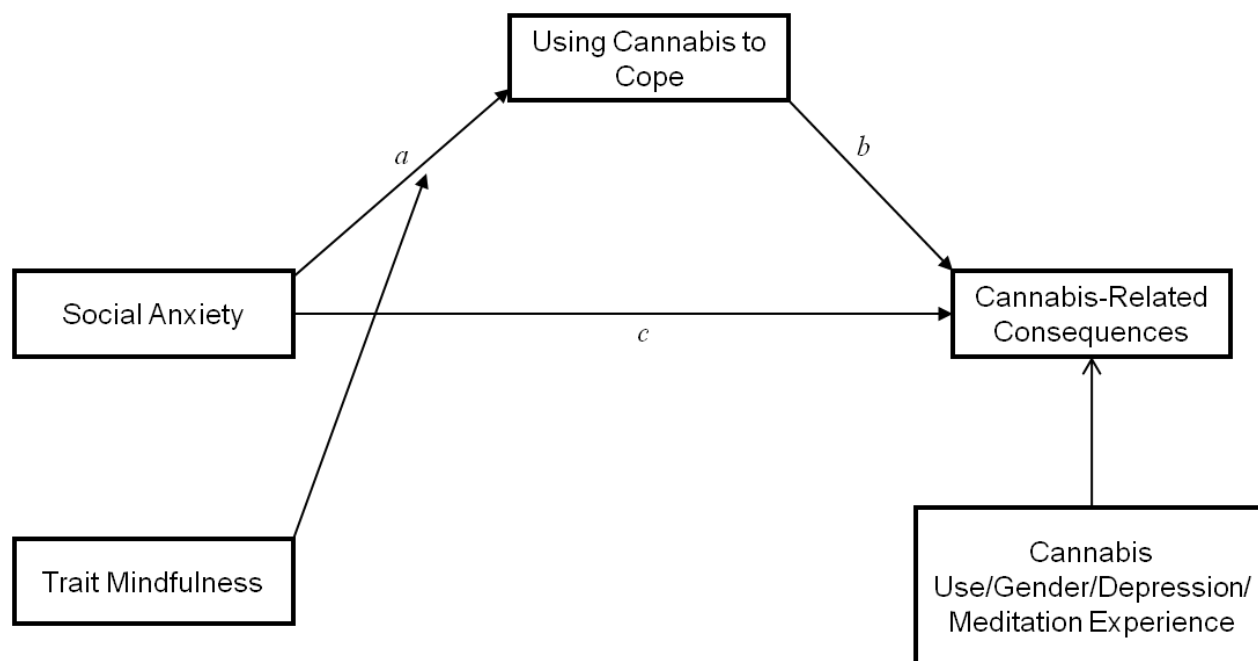


Figure 7. Proposed cannabis moderated mediation model.

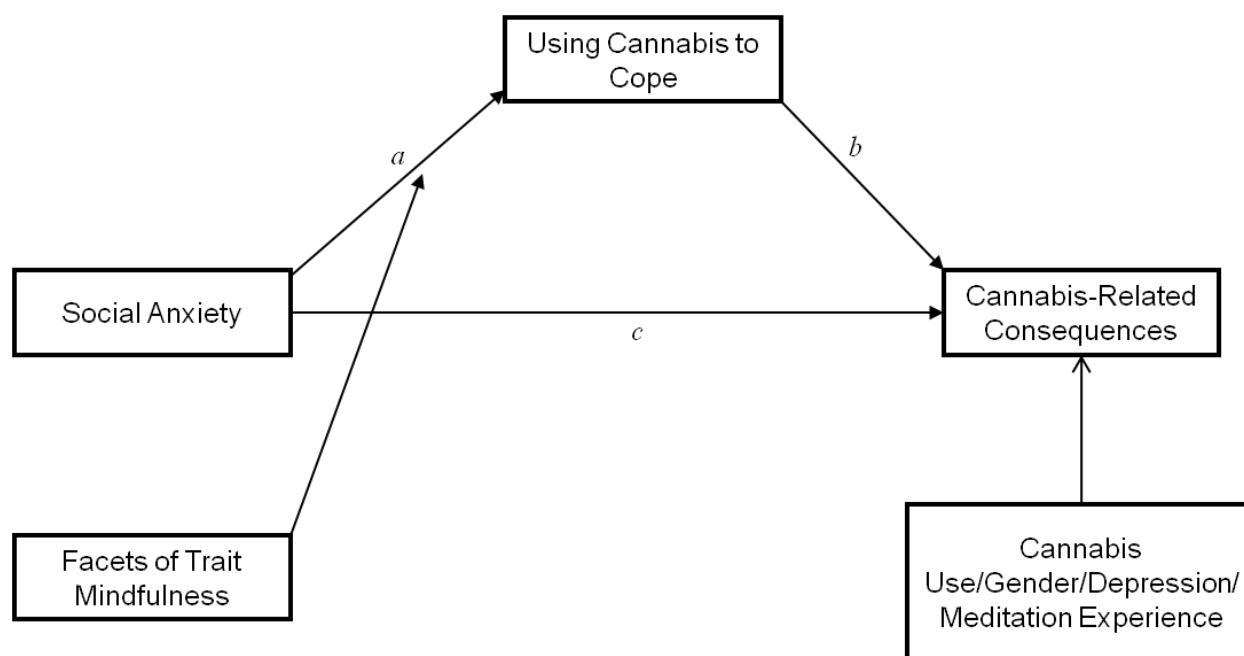


Figure 8. Exploratory cannabis moderated mediation model.

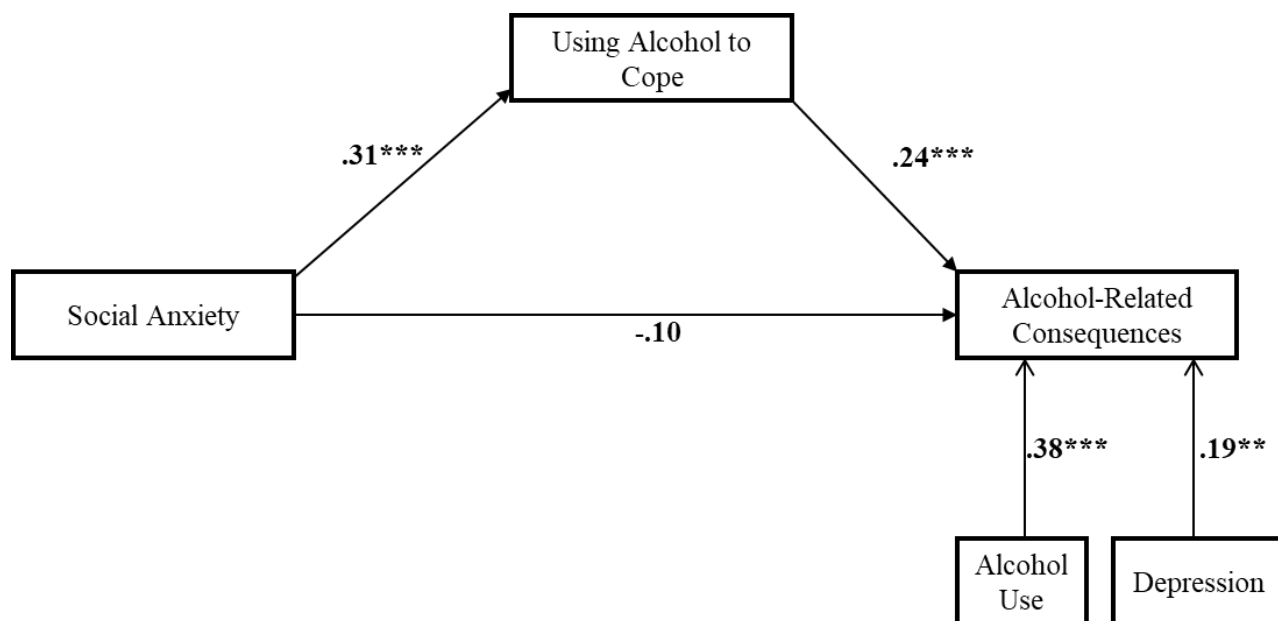


Figure 9. Depicts standardized relationships in the alcohol meditation model ($n = 234$). Gender ($\beta = -.14$) was not a significant predictor of alcohol-related consequences. This path is not shown for reasons of parsimony. * $p = .05$, ** $p = .01$, *** $p < .001$

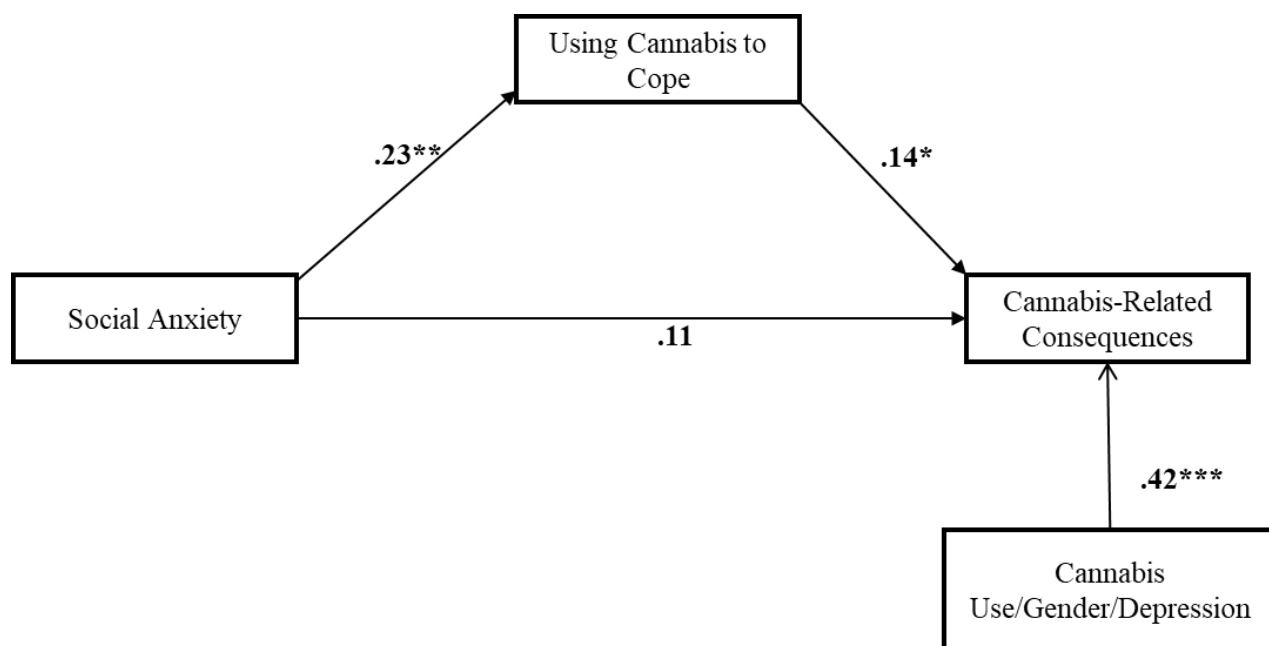


Figure 10. Depicts standardized relationships in the cannabis meditation model ($n = 232$). Gender ($\beta = -.15$) and Depression ($\beta = .05$) were not significant predictors of cannabis-related consequences. These paths are not shown for reasons of parsimony. * $p = .05$, ** $p = .01$, *** $p < .001$

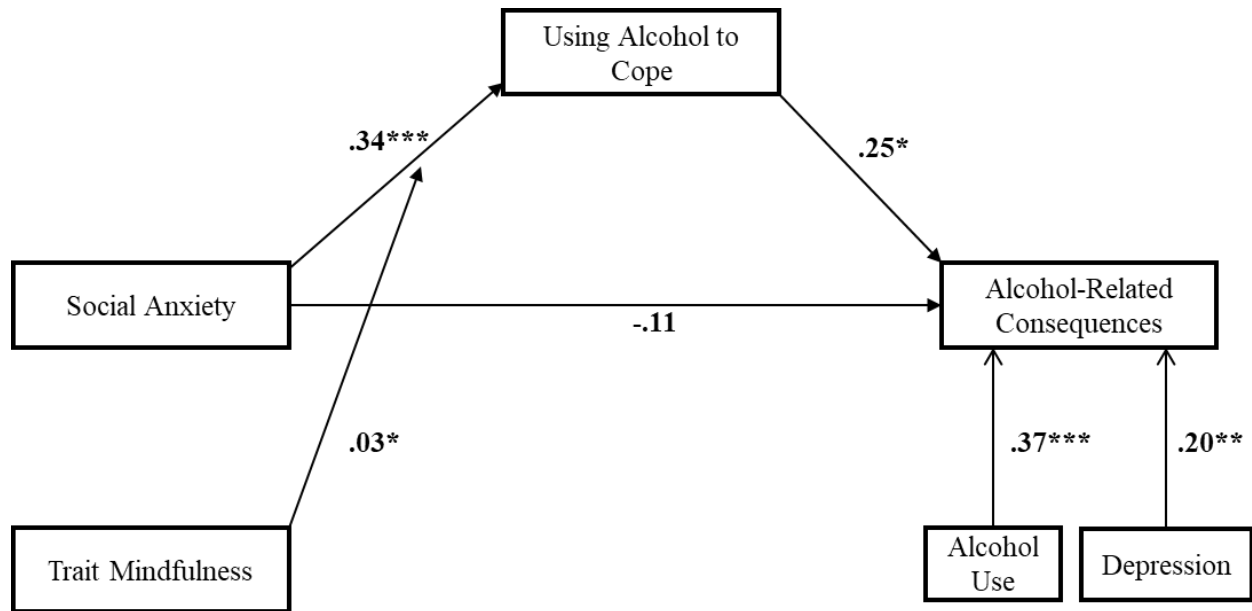


Figure 11. Depicts standardized relationships in the alcohol moderated meditation model ($n = 233$). Gender ($\beta = -.14$) and Meditation Experience ($\beta = -.16$) were not significant predictors of alcohol-related consequences. These paths are not shown for reasons of parsimony. * $p = .05$, ** $p = .01$, *** $p < .001$

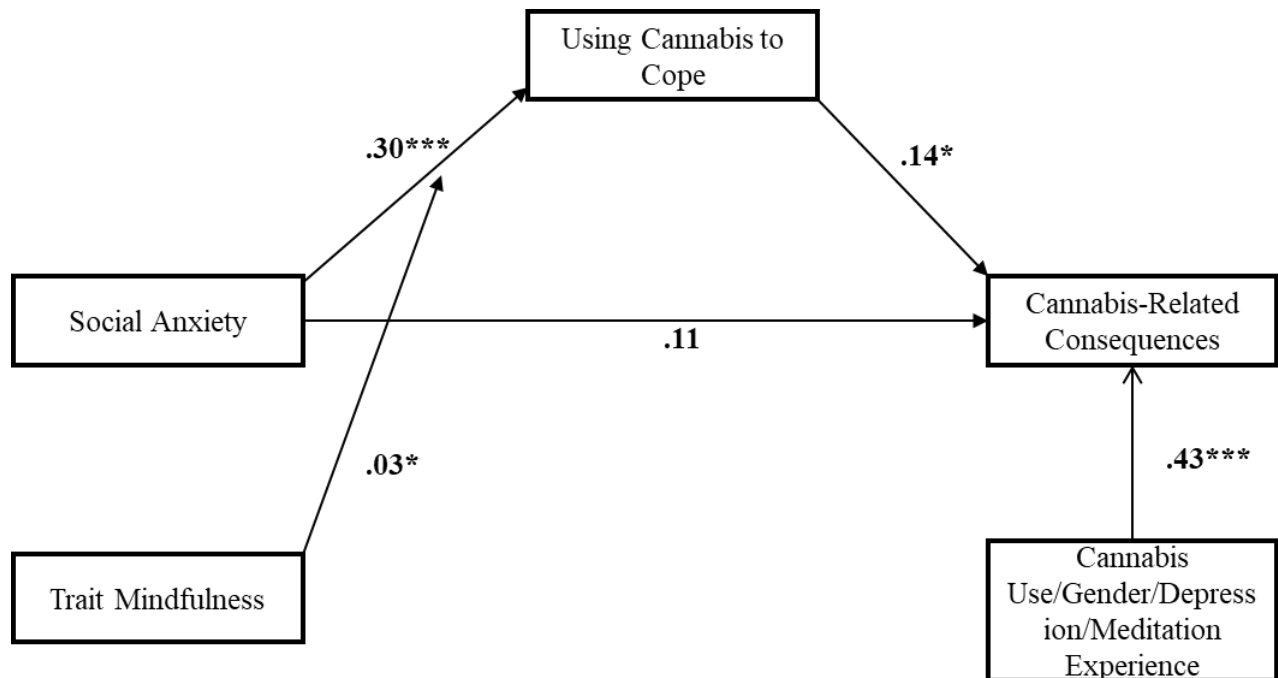


Figure 12. Depicts standardized relationships in the cannabis moderated meditation model ($n = 234$). Gender ($\beta = -.21$), Depression ($\beta = .12$), and Meditation Experience ($\beta = -.09$) were not significant predictors of alcohol-related consequences. These paths are not shown for reasons of parsimony. * $p = .05$, ** $p = .01$, *** $p < .001$

APPENDIX A

SOCIAL ANXIETY MEASURE

SOCIAL INTERACTION ANXIETY SCALE

For each item, please circle the number to indicate the degree to which you feel the statement is characteristic or true for you. The rating scale is as follows:

- 0 = Not at all characteristic or true of me.
- 1 = Slightly characteristic or true of me.
- 2 = Moderately characteristic or true of me.
- 3 = Very characteristic or true of me.
- 4 = Extremely characteristic or true of me.

1. I get nervous if I have to speak with someone in authority (teacher, boss, etc.).
2. I have difficulty making eye contact with others.
3. I become tense if I have to talk about myself or my feelings.
4. I find it difficult to mix comfortably with the people I work with.
5. I find it easy to make friends my own age.
6. I tense up if I meet an acquaintance in the street.
7. When mixing socially, I am uncomfortable.
8. I feel tense if I am alone with just one other person.
9. I am at ease meeting people at parties, etc.
10. I have difficulty talking with other people.
11. I find it easy to think of things to talk about.
12. I worry about expressing myself in case I appear awkward.
13. I find it difficult to disagree with another's point of view.
14. I have difficulty talking to attractive persons of the opposite sex.
15. I find myself worrying that I won't know what to say in social situations.
16. I am nervous mixing with people I don't know well.
17. I feel I'll say something embarrassing when talking.
18. When mixing in a group, I find myself worrying I will be ignored.
19. I am tense mixing in a group.
20. I am unsure whether to greet someone I know only slightly

APPENDIX B

TRAIT MINDFULNESS MEASURE

FIVE FACET MINDFULNESS QUESTIONNAIRE

Please rate each of the following items using the scale provided. Indicate which number best describes your opinion of what is generally true for you.

1 = never or very rarely true

2 = rarely true

3 = sometimes true

4 = often true

5 = very often or always true

Facet 1: Nonreactivity to Inner experience:

1. I perceive my feelings and emotions without having to react to them.
2. I watch my feelings without getting lost in them.
3. In difficult situations, I can pause without immediately reacting.
4. Usually when I have distressing thoughts or images, I am able to just notice them without reacting
5. Usually when I have distressing thoughts or images, I feel calm soon after.
6. Usually when I have distressing thoughts or images, I “step back” and am aware of the thoughts or image without getting taken over by it.
7. Usually when I have distressing thoughts or images, I just notice them and let them go.

Facet 2: Observing:

1. When I'm walking, I deliberately notice the sensations of my body moving.
2. When I take a shower or bath, I stay alert to the sensations of my body moving.
3. I notice how foods and drinks affect my thoughts, bodily sensations, and emotions.
4. I pay attention to sensations, such as the wind in my hair or the sun on my face.
5. I pay attention to sounds, such as clocks ticking, birds chirping, or cars passing.
6. I notice the smells and aromas of things.
7. I notice visual elements in art or nature, such as colors, shapes, textures, or patterns of light and shadow.
8. I pay attention to how my emotions affect my thoughts and behavior.

Facet 3: Acting with Awareness (Reverse Scored)

1. I find it difficult to stay focused on what's happening in the present.
2. It seems I am “running on automatic” without much awareness of what I am doing.
3. I rush through activities without being really attentive to them.
4. I do jobs or tasks automatically, without being aware of what I'm doing.
5. I find myself doing things without paying attention.
6. When I do things, my mind wanders off and I'm easily distracted.

7. I don't pay attention to what I'm doing because I'm daydreaming, worrying, or otherwise distracted.
8. I am easily distracted.

Facet 4: Describing with Words

1. I'm good at finding the words to describe my feelings.
2. I can easily put my beliefs, opinions, and expectations into words.
3. It's hard for me to find words to describe what I am feeling (reverse scored)
4. I have trouble thinking of the right words to express how I feel about things (reverse scored).
5. When I have a sensation in my body, it's hard for me to describe it because I can't find the right words (reverse scored).
6. Even when I'm feeling terribly upset, I can't find a way to put it into words (reverse scored).
7. My natural tendency is to put my experiences into words.
8. I can usually describe how I feel at the moment in considerable detail.

Facet 5: Nonjudgment of Inner Experience (Reverse Scored)

1. I criticize myself for having irrational or inappropriate emotions.
2. I tell myself that I shouldn't be feeling the way I'm feeling.
3. I believe some of my thoughts are abnormal or bad and I shouldn't think that way.
4. I make judgments about whether my thoughts are good or bad.
5. I tell myself I shouldn't be thinking the way I'm thinking.
6. I think some of my emotions are bad or inappropriate and I shouldn't feel them.
7. I disapprove of myself when I have irrational ideas.

APPENDIX C

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.]

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 D

ALCOHOL-RELATED CONSEQUENCES MEASURE

BRIEF-YOUNG ADULT ALCOHOL CONSEQUENCES QUESTIONNAIRE

Please indicate if you experienced any of the following problems within the past month (i.e., past 30 days).

Participants use the following response scale

{Choose all that apply}

() Yes

1. While drinking, I have said or done embarrassing things.
2. I have had a hangover (headache, sick stomach) the morning after I had been drinking.
3. I have felt very sick to my stomach or thrown up after drinking.
4. I often have ended up drinking on nights when I had planned not to drink.
5. I have taken foolish risks when I have been drinking.
6. I have passed out from drinking.
7. I have found that I needed larger amounts of alcohol to feel any effect, or that I could no longer get high or drunk on the amount that used to get me high or drunk.
8. When drinking, I have done impulsive things that I regretted later.
9. I've not been able to remember large stretches of time while drinking heavily.
10. I have driven a car when I knew I had too much to drink to drive safely.
11. I have not gone to work or missed classes at school because of drinking, a hangover, or illness caused by drinking.
12. My drinking has gotten me into sexual situations I later regretted.
13. I have become very rude, obnoxious or insulting after drinking.
14. I have often found it difficult to limit how much I drink.
15. I have woken up in an unexpected place after heavy drinking.
16. I have felt badly about myself because of my drinking.
17. I have had less energy or felt tired because of my drinking.
18. The quality of my work or schoolwork has suffered because of my drinking.
19. I have spent too much time drinking.
20. I have neglected my obligations to family, work, or school because of drinking.
21. My drinking has created problems between myself and my boyfriend/girlfriend/spouse, parents, or other near relatives.
22. I have been overweight because of drinking.
23. My physical appearance has been harmed by my drinking.
24. I have felt like I needed a drink after I'd gotten up (that is, before breakfast).

APPENDIX E

COPING MOTIVES FOR ALCOHOL USE MEASURE

DRINKING TO COPE WITH SOCIAL ANXIETY SCALE

Please rate the degree to which the following 24 situations would a) cause you to drink to cope with fear/anxiety and b) cause you to avoid that situation if alcohol were not available. Please use the following rating scale for your responses:

- 0 = never (0%)
 1 = occasionally (10%)
 2 = often (33 - 67%)
 3 = usually (67 - 100%)

Items

| | Fear or anxiety | Avoidance |
|---|-----------------|-----------|
| 2. Participating in small groups (P)..... | _____ | _____ |
| 3. Eating in Public Places (P)..... | _____ | _____ |
| 4. Drinking with others in public (P)..... | _____ | _____ |
| 5. Talking to people in authority (S)..... | _____ | _____ |
| 6. Acting, performing, or giving a talk..... in front of an audience (P) | _____ | _____ |
| 7. Going to a party (S)..... | _____ | _____ |
| 8. Working while being observed (P)..... | _____ | _____ |
| 9. Calling someone you don't know..... very well (S) | _____ | _____ |
| 10. Calling someone you don't know..... very well (S) | _____ | _____ |
| 11. Talking with people you don't know..... | _____ | _____ |
| 12. Meeting strangers..... | _____ | _____ |
| 13. Urinating in public..... | _____ | _____ |
| 14. Entering a room when others..... are already seated (P) | _____ | _____ |
| 15. Being the center of attention (S)..... | _____ | _____ |
| 16. Speaking up at a meeting (P)..... | _____ | _____ |
| 17. Taking a test (P)..... | _____ | _____ |
| 18. Expressing disagreement or disapproval..... of people you don't know very well (S) | _____ | _____ |
| 19. Looking at people you don't know..... very well in the eyes (S) | _____ | _____ |
| 20. Giving a report to a group (P)..... | _____ | _____ |
| 21. Trying to pick up someone (P)..... | _____ | _____ |

22. Returning goods to a store (S)..... _____
23. Giving a party (S)..... _____
24. Resisting a high pressure sales person... _____

APPENDIX F
CANNABIS USE MEASURE

Think about your marijuana use during the last three months (i.e., past 90 days) for the following questions.

Please indicate the number of time periods each day that you used marijuana during a typical week during the previous three months:

12am-6am -Monday
6am-12pm -Monday
12pm-6pm -Monday
6pm-12am -Monday

12am-6am-Tuesday
6am-12pm-Tuesday
12pm-6pm -Tuesday
6pm-12am -Tuesday

12am-6am-Wednesday
6am-12pm-Wednesday
12pm-6pm-Wednesday
6pm-12am-Wednesday

12am-6am-Thursday
6am-12pm-Thursday
12pm-6pm-Thursday
6pm-12am-Thursday

12am-6am-Friday
6am-12pm-Friday
12pm-6pm-Friday
6pm-12am-Friday

12am-6am-Saturday
6am-12pm-Saturday
12pm-6pm-Saturday
6pm-12am-Saturday

12am-6am-Sunday
6am-12pm-Sunday
12pm-6pm-Sunday

6pm-12am-Sunday

APPENDIX G

CANNABIS-RELATED CONSEQUENCES MEASURE

BRIEF-MARIJUANA CONSEQUENCES QUESTIONNAIRE

Participants use the following response scale

{Choose all that apply}

() Yes

1. The quality of my work or schoolwork has suffered because of my marijuana use.
2. I have driven a car while I was high.
3. I have felt in a fog, sluggish, tired, or dazed the morning after using marijuana.
4. I have been unhappy because of my marijuana use.
5. I have gotten into physical fights because of my marijuana use.
6. I have spent too much time using marijuana.
7. I have felt like I needed a hit of marijuana after I'd gotten up.
8. I have become very rude, obnoxious, or insulting after using marijuana.
9. I have been less physically active because of my marijuana use.
10. I have had trouble sleeping after stopping or cutting down on marijuana use.
11. I have neglected obligations to family, work, or school because of my marijuana use.
12. When using marijuana I have done impulsive things that I regretted later.
13. I have awakened the day after using marijuana and found I could not remember a part of the evening before
14. I have been overweight because of my marijuana use.
15. I haven't been as sharp mentally because of my marijuana use.
16. I have received a lower grade on an exam or paper than I ordinarily could have because of marijuana use.
17. I have tried to quit using marijuana because I thought I was using too much.
18. I have felt anxious, irritable, lost my appetite, or had stomach pains after stopping or cutting down on marijuana use.
19. I often have thoughts about needing to cut down or to stop using marijuana.
20. I have had less energy or felt tired because of my marijuana use.
21. I have lost motivation to do things because of my marijuana use.

APPENDIX H

COPING MOTIVES FOR CANNABIS USE MEASURE

MARIJUANA USE TO COPE WITH SOCIAL ANXIETY SCALE

Please rate the degree to which the following 24 situations would a) cause you to use marijuana to cope with fear/anxiety and b) cause you to avoid that situation if marijuana were not available. Please use the following rating scale for your responses:

- 0 = never (0%)
 1 = occasionally (10%)
 2 = often (33 - 67%)
 3 = usually (67 - 100%)

Items

| | Fear or anxiety | Avoidance |
|---|-----------------|-----------|
| 2. Participating in small groups (P)..... | _____ | _____ |
| 3. Eating in Public Places (P)..... | _____ | _____ |
| 4. Drinking with others in public (P)..... | _____ | _____ |
| 5. Talking to people in authority (S)..... | _____ | _____ |
| 6. Acting, performing, or giving a talk..... in front of an audience (P) | _____ | _____ |
| 7. Going to a party (S)..... | _____ | _____ |
| 8. Working while being observed (P)..... | _____ | _____ |
| 9. Calling someone you don't know..... very well (S) | _____ | _____ |
| 10. Calling someone you don't know..... very well (S) | _____ | _____ |
| 11. Talking with people you don't know..... | _____ | _____ |
| 12. Meeting strangers..... | _____ | _____ |
| 13. Urinating in public..... | _____ | _____ |
| 14. Entering a room when others..... are already seated (P) | _____ | _____ |
| 15. Being the center of attention (S)..... | _____ | _____ |
| 16. Speaking up at a meeting (P)..... | _____ | _____ |
| 17. Taking a test (P)..... | _____ | _____ |
| 18. Expressing disagreement or disapproval..... of people you don't know very well (S) | _____ | _____ |
| 19. Looking at people you don't know..... very well in the eyes (S) | _____ | _____ |
| 20. Giving a report to a group (P)..... | _____ | _____ |
| 21. Trying to pick up someone (P)..... | _____ | _____ |

22. Returning goods to a store (S)..... _____
23. Giving a party (S)..... _____
24. Resisting a high pressure sales person... _____

APPENDIX I

DEPRESSION MEASURE

CENTER FOR EPIDEMIOLOGICAL STUDIES DEPRESSION SCALE

Below is a list of ways you might have felt or behaved. Please indicate how often you have felt this way during the past week using the following ratings scale for your responses:

- 0 = Rarely or none of the time (less than one day)
 1 = Some or a little of the time (1-2 days)
 2 = Occasionally or a moderate amount of time (3-4 days)
 3 = Most of the time (5-7 days)

1. I was bothered by things that usually don't bother me.
2. I did not feel like eating; my appetite was poor.
3. I felt that I could not shake off the blues even with help from my family or friends.
4. I felt I was just as good as other people (reverse scored).
5. I had trouble keeping my mind on what I was doing.
6. I felt depressed.
7. I felt that everything I did was an effort.
8. I felt hopeful about the future (reverse scored).
9. I thought my life had been a failure.
10. I felt fearful.
11. My sleep was restless.
12. I was happy (reverse scored).
13. I talked less than usual.
14. I felt lonely.
15. People were unfriendly.
16. I enjoyed life (reverse scored).
17. I had crying spells.
18. I felt sad.
19. I felt that people dislike me.
20. I could not get "going".

APPENDIX J**MEDITATION EXPERIENCE**

How much experience do you have with meditation? Please use the following rating scale:

- 1 = None
- 2 = A small amount
- 3 = A moderate amount
- 4 = A considerable amount

APPENDIX K**DEMOGRAPHIC INFORMATION QUESTIONNAIRE**

What is your gender?

{Choose one}

- Male
- Female
- Transgender
- Other ____

What is your age? ____

What is your class standing?

{Choose one}

- Freshman
- Sophomore
- Junior
- Senior
- Graduate

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

VITA

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Publications:

- Dvorak, R. D., Raeder, C. A., Kramer, M., Sargent, E., Stevens, B. (2018). Using deviance regulation theory to target marijuana use intentions. *Experimental and Clinical Psychopharmacology*, 26, 29-35.

Conference Presentations:

Poster Presentations

- Raeder, C. A., Colangelo, M. R., & Henson, J. M. (2019). *Examining trait mindfulness as a moderator of the mediating relationship between social anxiety, drinking to cope, and alcohol-related consequences*. Poster to be presented at the 42nd annual scientific meeting of the Research Society on Alcoholism, Minneapolis, MN.
- Raeder, C. A., Pearson, M. R., Bravo, A. J., & Protective Strategies Study Team (PSST). (2018). *Examining Protective Behavioral Strategies as a Mediator in the Relationship Between Social Anxiety and Cannabis-Related Consequences*. Poster presented at the 2nd annual Scientific Meeting of the Research Society on Marijuana, Fort Collins, CO.
- Dvorak, R. D., Raeder, C. A., Kramer, M., Sargent, E., Stevens, B. (2018). *Using deviance regulation theory to target marijuana use intentions*. Poster Presented at the 1st annual Scientific Meeting of the Research Society on Marijuana, Fort Collins, CO.