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An Experimental Investigation into the Impact of Acute Stress on Alcohol Craving through Implicit Coping Motives

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AN EXPERIMENTAL INVESTIGATION INTO THE IMPACT OF ACUTE STRESS ON ALCOHOL CRAVING THROUGH IMPLICIT COPING MOTIVES

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ABSTRACT

AN INVESTIGATION INTO THE IMPACT OF ACUTE STRESS ON ALCOHOL CRAVING THROUGH IMPLICIT COPING MOTIVES

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Drinking to cope with negative emotions is associated with many negative alcohol-related outcomes such as increased alcohol use, drinking-related problems, and alcohol use disorders. An acute stressor is one example of a stimulus leading to negative emotions that an individual may wish to avoid. Research has shown that acute stress positively relates to drinking. Specifically, previous experimental studies have shown that individuals exposed to a stressor drink more alcohol and have stronger urges to drink than those not exposed to a stressor. Thus, it may be that drinking to cope explains why people experience alcohol cravings after experiencing a stressor. Additionally, because it has been suggested that attitudes and behaviors sometimes occur implicitly, it is possible that implicit drinking to cope explains the association between stress and drinking urges beyond explicit, self-reported drinking to cope. To address this research question, the current study sought to: 1) test the impact of an acute stressor on alcohol craving, 2) investigate implicit drinking to cope as a mediator of the association between acute stress and alcohol craving, and 3) examine positive alcohol expectancies and adaptive coping as moderators of the indirect effect from acute stress to implicit coping motives to alcohol craving. Participants were 21 (52.4% female) college student drinkers. Using a between-subjects experimental design, participants were randomly assigned to an experimental (i.e., acute stress) condition or control (i.e., neutral) condition and completed baseline measures of alcohol-related attitudes and

psychological functioning as well as post-manipulation measures of implicit drinking to cope and alcohol craving. Results indicated that acute stress did not induce increased drinking urges in the experimental group. Additionally, implicit coping motives did not mediate the stress-craving association, regardless of level of adaptive coping or positive expectancies. However, a lack of power makes these findings tenuous. Efforts to replicate the current results should do so with a much larger sample size. Additionally, future research should examine the present models in heavier-drinking samples and include indicators of alcohol use other than alcohol craving.

This thesis is dedicated to Julia C. Rodil, 1995-2021. I am grateful to have known you and will always be inspired by your ambition.

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CHAPTER I

INTRODUCTION

Negative reinforcement theories of drinking attempt to explain situations in which individuals drink to avoid undesirable outcomes (e.g., Conger, 1956; Cooper, 1994; Cox & Klinger, 1988; Khantzian, 1985). Drinking to cope, or coping motives, is a negatively reinforced reason for drinking that describes the behavior of an individual who drinks alcohol to reduce an undesirable emotion (Cooper et al., 1992). College students are especially likely to endorse drinking as a way to cope (Park & Levenson, 2002). Drinking to cope is associated with negative drinking outcomes (Kuntsche et al., 2005; Merrill & Read, 2010; Park & Levenson, 2002; Patrick & Schulenberg, 2011), so addressing drinking to cope through intervention efforts may reduce harms associated with drinking by young adults.

There are many potential negative emotions that someone may wish to avoid by drinking. One such emotion to cope with is the negative feeling that results from acute stress. Stressful events have been found to be related to increased drinking (Armeli et al., 2000; Grzywacz & Almeida, 2008; Josè et al., 2000) and cravings for alcohol (Clay & Parker, 2018; Clay et al., 2018). However, more research is needed to understand the mechanisms of this association to determine why the negative emotions experienced from stress are linked to drinking. One potential factor explaining this stress-drinking association is that people may be drinking to cope with the stress, even without explicitly realizing that coping is their motivation. Consequently, the present study aimed to elucidate the stress-drinking association by examining the impact of acute stress on alcohol cravings, as well as examining implicit coping motivations (i.e., automatic motivations to drink in response to negative emotions; e.g., Lindgren et al., 2011) as a potential mechanism that explains the relation. A clearer understanding of the factors underlying

this association may aid researchers and clinicians in targeting, preventing, and intervening stress-related drinking behaviors.

Negative Reinforcement Drinking

Drinking behaviors may be driven by the behavioral principle of negative reinforcement (e.g., Skinner, 1953, 1958). Negative reinforcement refers to a mechanism of behavior in which an action is performed that causes an unpleasant stimulus to be removed from one's environment. Consequently, the action that is performed (i.e., the behavior) is more likely to occur in the future (Skinner, 1953). Thus, we say that the behavior has been reinforced. The means of removing something unpleasant to achieve reinforcement is what makes the reinforcement negative, and these types of behaviors are commonly referred to as negatively reinforced, avoidant, or escape behaviors (Skinner, 1958). In the context of alcohol use, a person may consume alcohol to rid themselves of a negative stimulus. As a result and according to the principles of negative reinforcement, that individual would be more likely to drink in the future when exposed to a similar stimulus. In this way, drinkers learn that alcohol provides some relief from undesirable situations. Thus, according to negative reinforcement theories of drinking, when faced with the choice to drink or to not drink when feeling discomfort, negatively reinforced drinkers are more likely to drink (Conger, 1956; Cooper, 1994; Cox & Klinger, 1988; Khantzian, 1985).

Motivational Model of Drinking

Cooper (1994) developed a four-factor motivational model of drinking based on earlier conceptual work by Cox and Klinger (1988, 1990). According to this model, individuals' reasons for drinking can be characterized along two dimensions (i.e., the valence and the source) of one's desired outcomes of drinking (Cooper, 1994; Cox & Klinger, 1988, 1990). The valence (i.e.,

positive or negative) of a desired drinking outcome refers to the mechanism of reinforcement that maintains the drinking behavior. That is, drinking may be maintained by positive reinforcement or negative reinforcement. The source (i.e., internal or external) of a desired drinking outcome refers to its level of relational involvement. That is, one's desired drinking outcome may relate to others (i.e., externally) or only to themselves (i.e., internally). By combining the valence of a desired outcome with the source of that desired outcome, there are four possible classes of drinking motives that stem from these two dimensions: enhancement, social, conformity, and coping.

Enhancement motives, or drinking to boost positive mood and well-being, are internally generated and positively reinforced. Social motives, or drinking to attain positive social attention, are externally generated and positively reinforced. Conformity motives, or drinking to avoid social isolation or rejection, are externally generated and negatively reinforced. Finally, coping motives, or drinking to decrease or eliminate negative emotions, are internally generated and negatively reinforced. Drinking to cope is particularly predictive of experiencing negative drinking outcomes (Crum et al., 2013; Kuntsche et al., 2005; Lyvers et al., 2010).

Drinking to Cope. Drinking to cope reflects a negative reinforcement behavior under Cooper's motivational model (Cooper, 1994) and can be thought of as a specific example of avoidant coping (Hasking et al., 2011). Drinking to cope occurs when an individual experiences a negative emotion of some kind (e.g., depression, anger, stress-related feelings) and seeks to avoid that emotion by consuming alcohol. This motive for drinking can be applied to a variety of negative emotions (e.g., Le & Iwamoto, 2019; Norberg et al., 2010; Pedrelli et al., 2016), but all cases of this behavior involve the alleviation of some discomfort through drinking. Drinking to cope is particularly problematic as compared to other drinking motives (e.g., Crum et al., 2013;

Lyvers et al., 2010) as it is associated with increased drinking (e.g., Desalu et al., 2019; Windle & Windle, 2015) and drinking-related consequences (e.g., Corbin et al., 2013; LaBrie et al., 2012).

Coping Motives and Alcohol Use. Drinking to cope has been found to be related to indices of drinking including quantity and frequency in both general adult and young adult populations. Among adult samples generally, coping motives are positively associated with alcohol quantity (Windle & Windle, 2015), drinks per heaviest drinking day (Crutzen et al., 2013), drinking severity (Lyvers et al., 2010), drinking frequency (Öster et al., 2017), and binge drinking (i.e., four/five or more drinks per occasion for women/men; Elliott et al., 2013). Among young adult samples (i.e., typically college students), drinking to cope has also been found to associate with alcohol use measures, such as drinking quantity, drinking frequency, and binge drinking. For example, Cooper and colleagues' (2016) meta-analysis reviewing studies on drinking motivations found coping motives to significantly relate to alcohol consumption and binge drinking in all studies considered. Additionally, relying on drinking to cope has also been shown to be related to a lower probability of "maturing out" of excessive drinking patterns among college students (Littlefield et al., 2010). Thus, the drinking outcomes for young adults with stronger motivations to drink to cope may be more consequential and pervasive.

Coping Motives and Alcohol-Related Problems. Drinking to cope is associated with alcohol-related problems that include consequences such as feelings of remorse, injury to self or others, neglecting responsibilities, physical or mental decline, and loss of behavioral control, among others (Kelley et al., 2018; Kenney et al., 2018; Merrill & Read, 2010). Although studies exist on the association between drinking to cope and alcohol-related consequences among general adult populations (Gilson et al., 2013; Kelley et al., 2018; Windle & Windle, 2015), there

exists a richer body of research among young adults and college students, specifically. Coping motives are especially predictive of experiencing negative consequences from drinking for young adults (Corbin et al., 2013; Kenney et al., 2018; LaBrie et al., 2012). In fact, among young adult samples, drinking to cope has been found to relate to alcohol-related problems even while controlling for alcohol consumption (LaBrie et al., 2012; Merrill & Read, 2010). For example, Merrill and Read (2010) found that coping motives uniquely explain differences in alcohol-related problems in college students above that which can be explained by alcohol use alone, and this result is congruent with seminal work among non-young adult populations (Cooper, 1994; Holahan et al., 2003).

Coping Motives and Alcohol Use Disorders. Drinking to cope is related to greater likelihood of an alcohol-related clinical diagnosis. Studies have shown that individuals who drink in isolation are at risk for increased drinking patterns such as clinically disordered drinking (Cranford et al., 2011; Creswell et al., 2013; Gonzalez & Skewes, 2013), and this is a behavior that is more common in individuals who drink to cope (Cooper, 1994). Specifically, Carpenter and Hasin (1999) reported that drinking to cope acts as a risk factor for a diagnosis of an alcohol use disorder. More recently, Crum and colleagues (2013) also found a relation between using alcohol to cope and the development of an alcohol use disorder. Furthermore, the authors reported that drinking to cope was associated with the persistence of clinically disordered drinking among those already diagnosed. For both the development and maintenance of alcohol use disorders, individuals who drink to cope were three times more at-risk than individuals who do not drink to cope (Crum et al., 2013). Additional research has found this link between coping motives and a physiological dependence on alcohol (Menary et al., 2015; Merrill et al., 2014). Based on models considering drinking to be a negative reinforcer, drinking to cope may be

highly reinforcing to individuals experiencing negative emotions. Additionally, they may not have healthy adaptive coping strategies (Hasking et al., 2011) which could make drinking to cope their only way to deal with negative affective states. In this case, a dependence on alcohol and, consequently, the development of an alcohol use disorder become strong possibilities.

Summary. Cooper's (1994) motivational model includes the principle of negative reinforcement drinking. Drinking to cope describes the motivation to drink to relieve oneself from experiencing negative emotions. Drinking to cope has been found to be associated with alcohol consumption and to be particularly associated with problematic drinking when compared to other drinking motivations. The experience of negative emotions (e.g., stress-related negative affect, a general negative mood) is associated with drinking as a way to cope; however, further research is needed to elucidate associational pathways through which negative emotions are associated with drinking or desires to drink.

Stress and Drinking

There is a robust body of research linking stress and drinking as a way to cope with the negative emotions that result from that stress. Stress, which broadly describes an association between an individual and their environment, can be viewed by the individual as taxing, overwhelming, and potentially harmful (Lazarus & Folkman, 1984). This conceptualization is supported by findings that psychological stress relates to negative, but not positive, emotionality (e.g., Chang et al., 2013). Stressors, then, are thought of as the identifiable environmental demands that antecede stress and its subsequent reactions. Furthermore, researchers in this area have distinguished stressors that are acute versus stressors that are chronic. Chronic stressors are problems or issues that a person experiences so regularly or that are so essential to their daily life that the problems seem continuous (Wheaton, 1994). On the other hand, acute stress is

characterized by a sudden and intense stressor but not necessarily occurring constantly over time (Lazarus & Cohen, 1977). As the word *acute* suggests, acute stress occurs suddenly wherein there is no gradual introduction to the feeling. Additionally, acute stressors may present themselves in many forms. Common examples of acute stressors that adults may experience include work-related stressors (e.g., a big meeting), financial-related stressors (e.g., a lost wallet), legal-related stressors (e.g., a driving citation), and interpersonal-related stressors (e.g., an argument with a spouse; Keyes et al., 2011). In differing from chronic stressors, it is most important to understand acute stressors as abrupt and intense. Because of its brevity and potency, acute stress may be especially important to focus on in associations with impulsive, risky behaviors, such as drinking (Jones et al., 2013).

Acute Stress and Alcohol Use

Prior research supports the positive association between stress and drinking. Their association has been demonstrated using cross-sectional (Jang et al., 2018; Obeid et al., 2020), micro-longitudinal (e.g., daily diary; Ayer et al., 2011; Grzywacz & Almeida, 2008), and experimental designs (Clay & Parker, 2018; Magrys & Olmstead, 2015). Although much of the correlational research that highlights this association investigates stress as chronic or as a generally perceived level, they do provide support for the general relation between stress and alcohol use. The experimental body of literature provides more robust research support as it largely focuses on acute stressors rather than general stress.

In cross-sectional research, although not always explicitly defined as “acute” stress, there is support for the positive association between stressors and alcohol outcomes. Although the support exists, only a handful of studies, most of which were performed outside of the United States, have investigated the relation between acute stress and drinking at the cross-sectional

level. This association has been found among Korean college students (Jang et al., 2018), Korean adults (Yoon et al., 2016), and Lebanese adults (Obeid et al., 2020). One cross-sectional study found that many acute life stressors, including legal, interpersonal, and financial stressors, were associated with more binge drinking (Josè et al., 2000). Interestingly, the same study found that some acute stressors, namely interpersonal stressors, were also associated with increased abstinence from alcohol. Although not investigated in the study, coping styles could have partially explained the observed duality of the interpersonal stressors. While there are a handful of cross-sectional studies that support a link between acute stress and drinking, much more research exists on general stress and its association with alcohol use. Although these stressors may be less intense and more pervasive, general stress (Frone, 2016; Hight & Park, 2019; McCaul et al., 2017) has been shown to relate to increased drinking.

Beyond cross-sectional research, studies implementing a daily diary design have found increased stress to relate to same-day and lagged (e.g., next-day) alcohol use increases. Daily diary studies are more useful for measuring acute (i.e., more proximal) types of stressors and for observing the stress-drinking association within individuals by collecting responses daily over a defined period. These studies have generally demonstrated that when individuals are more stressed, they tend to drink more. In particular, among general adults (Armeli et al., 2000; Ayer et al., 2011; Carney et al., 2000; Grzywacz & Almeida, 2008) and college students (Park et al., 2004), several studies have found that individuals tend to drink more alcohol on days characterized by high levels of stress. However, Armeli et al. (2000) found this to be the case only among men who expected positive outcomes from drinking. Another study found that the chances of an individual binge drinking were higher on days characterized by more intense stressors compared to no stressors (Grzywacz & Almeida, 2008). It was also found that binge

drinking odds increased as acute stressors "piled up" across the 8 days of data collection. That is, binge drinking was more likely on a day if that day was stressful, and binge drinking became more likely over time when many stressful days began to aggregate. An additional daily diary study found that stress predicted alcohol consumption the next day, albeit only to a significant extent for men (Ayer et al., 2011). Furthermore, alcohol consumption predicted lower levels of next-day stress. The results from the daily design literature suggest that drinking alcohol is a strategy used by individuals in response to proximal stressors and that alcohol seems to reinforce that behavior by reducing negative emotions felt from stress, at least temporarily.

The positive association between stressors and alcohol use have been more definitively tested using in-lab experimental designs. Experimental designs are extremely useful in that they allow for causal conclusions to be drawn – something which daily diary studies do not permit. The experimental body of research has generally found that drinkers tend to consume more alcohol in response to acute stress than in response to non-stressful stimuli (Brkic et al., 2015; Clay & Parker, 2018; Dickerson & Kemeny, 2004; Magrys & Olmstead, 2015). One study found that those participants who were exposed to a stressor drank more alcohol during a 30-minute free-drinking session than individuals who were in a no-stressor control group (Magrys & Olmstead, 2015).

In addition to examining actual drinking behavior in experimental studies of stress, researchers have also assessed alcohol craving as an outcome. Craving refers to one's current desire to use a substance (Rankin et al., 1979). Alcohol craving has been shown to predict typical (Adams et al., 2019) and subsequent drinking behaviors (Fatseas et al., 2015; Sloan et al., 2020; Witkiewitz, 2011). Additionally, craving is related to higher odds of relapsing among individuals with alcohol use disorders (Law et al., 2016), which underscores the relation between alcohol

craving and alcohol consumption for more hazardous drinkers. As such, alcohol craving can be a useful measure of momentary drinking and has been shown to relate to acute stress levels. Specifically, in a recent study by Clay and Parker (2018), those exposed to a stressor voluntarily drank more than those in the control group and reported higher alcohol craving than the control group, which corroborated findings on alcohol craving from earlier work (Chaplin et al., 2008; Clay et al., 2018; Fox et al., 2007; Law et al., 2016). For instance, in a study focusing on college students, Clay and colleagues (2018) found that alcohol craving scores increased after being exposed to a stressor when compared to participants' baseline craving levels. A similar association between acute stress and alcohol craving did not emerge in another experimental study with a sample of alcohol dependent individuals (Thomas, Randall, et al., 2011), potentially due to frequent alcohol cravings being a defining criteria of alcohol use disorders (American Psychiatric Association, 2013).

Although a majority of studies on this topic have demonstrated a positive, causal association between acute stress and drinking, a few similarly designed investigations did not provide support for this association. For instance, two studies found that stress induction did not lead to an increase in alcohol craving (Thomas, Randall, et al., 2011) or consumption (Thomas et al., 2014), and these findings were contrary to the authors' hypotheses. Another investigation found that participants who received a stressor, compared to a control group, were twice as likely to drink all of the beer provided to them; however, the stress and control groups did not significantly differ in terms of their amount of alcohol consumed (Thomas, Bacon, et al., 2011). However, this finding is potentially due to a flaw in the methodology whereby participants did not have enough beer to consume, potentially leading the stress group to max out their consumption. In addition to ceiling effects (as seen in Thomas, Bacon, et al., 2011), overly

restrictive samples, such as participants that drank too heavily (Thomas, Randall, et al., 2011), may have interfered with the researchers' expected results. These limitations underscore the importance in sampling participants who represent a subclinical heavy drinker, that is, an individual who drinks enough to have experienced alcohol's unique properties but also one who does not drink so heavily that their craving for alcohol is unchangingly high.

Summary. Experiencing acute stressors (i.e., sudden and intense stress-inducing events) has been shown to relate to alcohol consumption (Clay & Parker, 2018; Grzywacz & Almeida, 2008; Magrys & Olmstead, 2015; Obeid et al., 2020) and alcohol craving (Clay & Parker, 2018; Clay et al., 2018). These associations have been demonstrated using cross-sectional, daily diary, and experimental study designs. Despite their association, however, research is lacking on the potential explanations of this relation; thus, investigations examining mechanisms underlying the impact of stress on drinking-related outcomes, such as craving, are needed.

Coping Motives as an Explanation of the Stress and Drinking Association

Prior to Cooper (1994) identifying coping motives in their motivational model of alcohol use, several theories had been offered up noting and explaining that individuals sometimes drink to cope with stressful internal or external situations. For example, the tension-reduction hypothesis (Conger, 1956), the self-medication hypothesis (Khantzian, 1985), and the stressor-vulnerability model (Cooper et al., 1988) were early seminal works theorizing the phenomenon of drinking to cope. Cooper's (1994) motivational model succinctly describes drinking to cope as a reason that individuals drink in response to stress.

The overall body of literature focusing on coping motives supports drinking to cope as a mediator of associations between stress and drinking outcomes. For example, drinking to cope has been found to mediate the association between stress and drinking, such that higher levels of

stress relate to higher coping motives which, in turn, relate to more drinking (Corbin et al., 2013; Merrill & Thomas, 2013). Rice and Van Arsdale (2010) reported similar results with regards to alcohol-related problems, such that drinking to cope explained the association between stress and drinking problems. Furthermore, drinking to cope explains the association between stress and drinking when considering several types of stressors. Common stressors, such as occupational stress (Temmen & Crockett, 2019), and less common stressors, such as trauma symptoms (Kaysen et al., 2007) and global pandemic stress (Wardell et al., 2020), have both been found to relate to drinking through coping motives. These two studies highlight the varying spectrum of stressors that may be involved in an association with drinking. Additionally, drinking to cope mediates the stress-drinking relation among populations that may be especially likely to experience negative forms of stress, such as gender (Lindley et al., 2020) and sexual minorities (Feinstein & Newcomb, 2016).

Before Cooper's (1994) motivational model, Cooper et al. (1988) proposed the stressor-vulnerability model to explain conditions under which drinking to cope would be more likely to occur. With social learning theory (Bandura, 1969) as its foundation, the stressor-vulnerability model suggests that problematic drinking such as alcohol-related disorders can be predicted by a "chain" of predictors in which alcohol consumption and drinking to cope are proximal determinants while limited coping ability and positive expectancies of alcohol are more distal (Cooper et al., 1988). Specifically, the authors posited that drinking to cope with stress was a potential behavior for drinkers who have low adaptive coping skills and high positive expectancies of alcohol. That is, individuals who have few healthy coping strategies and who strongly believe in the perceived benefits of alcohol are more likely to drink in response to stress (Cooper et al., 1988). Empirical support for this model is seen in the association between

drinking to cope and positive expectancies (Hasking et al., 2011; Wilson et al., 2019) and findings that drinking to cope interacts with adaptive coping to predict drinking outcomes (Cooper et al., 1992; Merrill & Thomas, 2013). Thus, the stressor-vulnerability model illustrates two possible conditions underlying coping motivated drinking.

Summary. Several drinking-related theories, namely Cooper's (1994) motivational model, established drinking to cope with negative affect as one reason that an individual may drink. Cooper and colleagues' (1988) earlier stressor-vulnerability model provided two conditions conducive to drinking to cope: low adaptive coping skills and high positive alcohol expectancies. Many studies have demonstrated coping motives to act as a mediator in associations involving stress and drinking, although research is lacking on a similar pathway to alcohol coping. Although coping motives generally have been supported as a mechanism for drinking in response to the negative effects of stress, the self-report nature of drinking to cope measures neglects individuals who may not be aware of their drinking motivations.

Implicit Coping Motives

One's motivations for drinking may be understood as explicit attitudes or implicit attitudes. In general, explicit attitudes are self-reported and the result of deliberative processes while implicit attitudes are inferred and the result of automatic processes (Gawronski & Bodenhausen, 2006; Greenwald & Banaji, 1995). In the context of drinking motives, explicit motives are those that are self-identified by the individual as their reasons for drinking; thus, in order to allow for the individual's self-report, measures of explicit motives must be face valid (e.g., Comasco et al., 2010; Cooper, 1994; Kushner et al., 2000). In contrast, implicit motives are one's more automatic reasons for drinking, over which the individual may not have executive

control (Hendershot et al., 2012; Salemink & Wiers, 2014). This automatic nature allows for measures of implicit motives to be more subtle in their administration.

Much of the research on drinking to cope focuses on explicit coping motives, and there are a few reasons that measuring implicit motivational thought processes are critical to broaden our understanding of the stress-coping association. One major reason is that implicit measures of an individual's motives provide insight into their reasons for behavior when the person themselves may not be aware of such reasons. Many early addiction researchers posited that substance use behavior is not just a product of deliberate cognitions but also of nonvolitional thought processes (Oei & Baldwin, 1994; Tiffany, 1990; Widiger & Smith, 1994).

In addition to providing an assessment of processes unavailable to introspection, implicit cognitions have the benefit of minimizing risk for social desirability bias in participants (Wiers & Stacy, 2006). Implicit cognitions could also offer the explanation of unique variance in that implicit attitudes can predict outcomes even when the explicit cognition counterparts are controlled, and implicit cognitions allow for easier translation of findings from populations that cannot provide self-report measures (e.g., animals, nonverbal individuals; Wiers & Stacy, 2006). Additionally, participants may be unwilling to provide a fully detailed account of their motives for doing a particular behavior or may be unable to articulate their thoughts in such a way that a full account can be recorded (Lindgren, Neighbors, et al., 2013). This possibility can be seen in evidence that implicit measures and explicit measures of constructs sometimes correlate weakly (Nosek, 2007), suggesting the potential that the explicit measure alone could not paint the entire picture. In cases such as this, implicit measures of coping motives are needed to more completely assess the construct.

Implicit Motives on Drinking

Little research has involved implicit drinking motives and less research still has investigated the role that implicit drinking motives play in associations with alcohol outcomes. To date, only a small handful of studies have examined implicit coping motives (Hendershot et al., 2011; Lindgren et al., 2011; Lindgren, Foster, et al., 2013; Lindgren, Neighbors, et al., 2013; Salemink et al., 2015). These studies have generally focused on the use of computer-based tasks as a way to assess implicit attitudes such as drinking to cope. More specifically, researchers have used the Implicit Association Test (IAT; Greenwald et al., 1998), which is the most common way to assess implicit cognitions. Briefly, the IAT uses reaction times to assess the strength of associations between pairs of concept-specific words and assumes that a faster response time for a pair of words is representative of a stronger perceived association between the words' concepts. Implicit association tests, which can be administered over the internet in addition to traditional lab settings (Houben & Wiers, 2008), have been shown to be a valid (Lindgren et al., 2011) and reliable (Lindgren, Foster, et al., 2013) method for assessing implicit coping motives.

Several studies using the IAT found generally that stronger implicit coping motives were associated with increased drinking outcomes, although not always beyond explicit coping motives. Specifically, Lindgren and colleagues (2011) used an IAT in which a target category with images of beer or water as stimuli was used in combination with an attribute category with words evoking "ignore" or "cope" connotations as stimuli. In this case, a quicker response when pairing beer images with "cope" words than beer images with "ignore" words represented a stronger mental association of drinking as a coping mechanism. Findings showed implicit drinking to cope to be positively associated with drinking quantity and number of binge episodes in the past month, and these effects were significant even after accounting for explicit coping

motives. These findings suggest that there is incremental value in measuring implicit drinking to cope rather than only measuring explicit drinking to cope.

In another study, Lindgren, Neighbors, and colleagues (2013) used a similar design to further examine implicit coping motives. However, Lindgren, Neighbors, et al. used a Brief Implicit Association Test (BIAT; Menatti et al., 2012; Sriram & Greenwald, 2009), which differs from the IAT only in having fewer trials and one unlabeled category (e.g., "cope" versus unlabeled rather than "cope" versus "ignore"). Contrary to findings from Lindgren et al. (2011), results from Lindgren, Neighbors, et al. (2013) showed that implicit coping motives were only weakly related to alcohol consumption, problems, and craving. Moreover, implicit drinking to cope did not predict any drinking outcome beyond what explicit drinking to cope already predicted. The authors noted that the psychometric properties of the brief version of the implicit coping task were much poorer than the version used in Lindgren et al. (2011); thus, it is possible that the BIAT having fewer trials made it less reliable than the original IAT. Similar null results with implicit coping motives having no effect on drinking outcomes were found in a study among an adolescent sample using the BIAT (Salemink et al., 2015). Like the limitations of Lindgren, Neighbors, et al. (2013), the weak associations found in this study could be a product of a shorter, less reliable BIAT methodology.

In yet another similar study, Lindgren, Foster, et al. (2013) used the original IAT to investigate the unique predictive utility of three implicit alcohol-related cognitions (i.e., drinking identity, alcohol approach, and coping motives). Like Lindgren, Neighbors, and colleagues' (2013) findings, results showed implicit drinking to cope motives to be positively related to all drinking outcomes, although the associations were no longer significant when the effects of drinking identity and alcohol approach were accounted for. Though there was a marginally

significant unique effect of implicit coping motives on alcohol problems, the generally non-significant unique effects could be due to the significant correlations between the three implicit cognitions. Despite the lack of unique impact of implicit motives demonstrated in this study, Lindgren, Foster, et al. (2013) found much stronger psychometric properties using the original IAT, which provides support for using this method over the BIAT.

Finally, Hendershot et al. (2011) examined the role of genetics in implicit coping motives. Specifically, the study tested the interaction between a genetic predisposition to alcohol misuse and implicit coping motives on drinking outcomes. Findings showed that implicit drinking to cope relates to drinking outcomes most strongly in individuals with genetic indicators of a higher risk for alcohol use (Hendershot et al., 2011). Using the same general IAT procedure as prior research (Lindgren et al., 2011; Lindgren, Foster, et al., 2013), this study found implicit coping motives to significantly relate to weekly drinking quantity, binge drinking episode quantity, and peak lifetime drinks (i.e., highest 24-hour drinking quantity across one's lifetime).

Summary. Overall, although few studies have investigated implicit drinking to cope, the current body of literature suggests an association between implicit coping motives and drinking outcomes (Hendershot et al., 2011; Lindgren et al., 2011; Lindgren, Foster, et al., 2013; Lindgren, Neighbors, et al., 2013; Salemink et al., 2015). However, it remains unknown if implicit coping motives could act as a mechanism in alcohol-related pathways (e.g., stress-drinking). It also remains unclear if implicit coping motives are uniquely associated with drinking outcomes when the effects of explicit coping motives are taken into account.

The Present Study

The present study aimed to understand the role that implicit drinking to cope motivations play in the association between acute stress and urges to drink. Guided by the motivational

model of alcohol use (Cooper, 1994; Cox & Klinger, 1988) and the stressor-vulnerability model (Cooper et al., 1988), it was theorized that acute stress impacts drink cravings through drinking as a way to cope with the negative emotional state. Prior research suggests that stress (Ayer et al., 2011; Brkic et al., 2015; Clay et al., 2018; Grzywacz & Almeida, 2008; Magrys & Olmstead, 2015) and implicit drinking to cope (Hendershot et al., 2011; Lindgren et al., 2011; Lindgren, Foster, et al., 2013) are predictive of drinking outcomes, including craving; however, it remains to be tested whether acute stress relates to alcohol cravings through implicit coping motives.

The current study employed an experimental between-subjects design. To examine the impact of acute stress on drinking cravings, participants were randomly assigned to one of two study conditions: an acute anticipatory stress-inducing condition (i.e., anticipated virtual public speaking task) or a neutral condition. Following exposure to the stress or neutral condition, participants were administered an implicit associations task (IAT) to assess implicit coping motives. The IAT was then followed by a series of questions on their current alcohol craving, which has shown to be a valid correlate of later alcohol consumption (Fatseas et al., 2015; Sloan et al., 2020; Witkiewitz, 2011).

Specific aims and hypotheses were as follow:

Aim 1

To test the impact of an acute stressor on subsequent alcohol craving.

Hypothesis 1. Prior experimental evidence suggests that stress may induce alcohol consumption (Brkic et al., 2015; Clay & Parker, 2018; Magrys & Olmstead, 2015) and cravings for alcohol (Clay & Parker, 2018; Clay et al., 2018). As such, it was hypothesized that the stressed condition would report greater subsequent craving for alcohol than the control condition. Individuals' sex and trait anxiety were controlled for in the analysis.

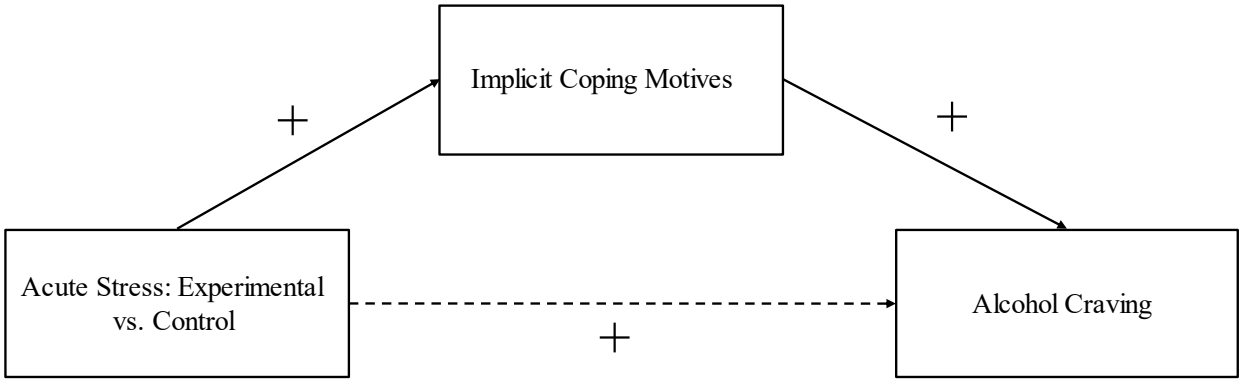
Aim 2

To examine implicit coping motives as a mediator explaining the association between acute stress and subsequent alcohol craving (see Figure 1).

Hypothesis 2. According to the motivational model of alcohol use (Cooper, 1994; Cox & Klinger, 1988), drinking to cope occurs when an individual drinks to avoid negative emotions, such as stress. Additionally, implicit alcohol cognitions, rather than explicitly self-reported alcohol cognitions, are important to include when considering alcohol outcomes (Wiers & Stacy, 2006). As such, it was hypothesized that implicit coping motives would mediate the association between acute stress and alcohol craving. That is, it was expected that exposure to the stress condition would predict increased implicit coping motives which would, in turn, predict increased craving. Sex and explicit coping motives were controlled for in the analysis. Sex was controlled for because of the universal sex-based differences in drinking quantity shown in the literature (e.g., Holmila & Raitasalo, 2005).

Figure 1

The Indirect Effect of Acute Stress on Alcohol Craving Through Implicit Coping Motives



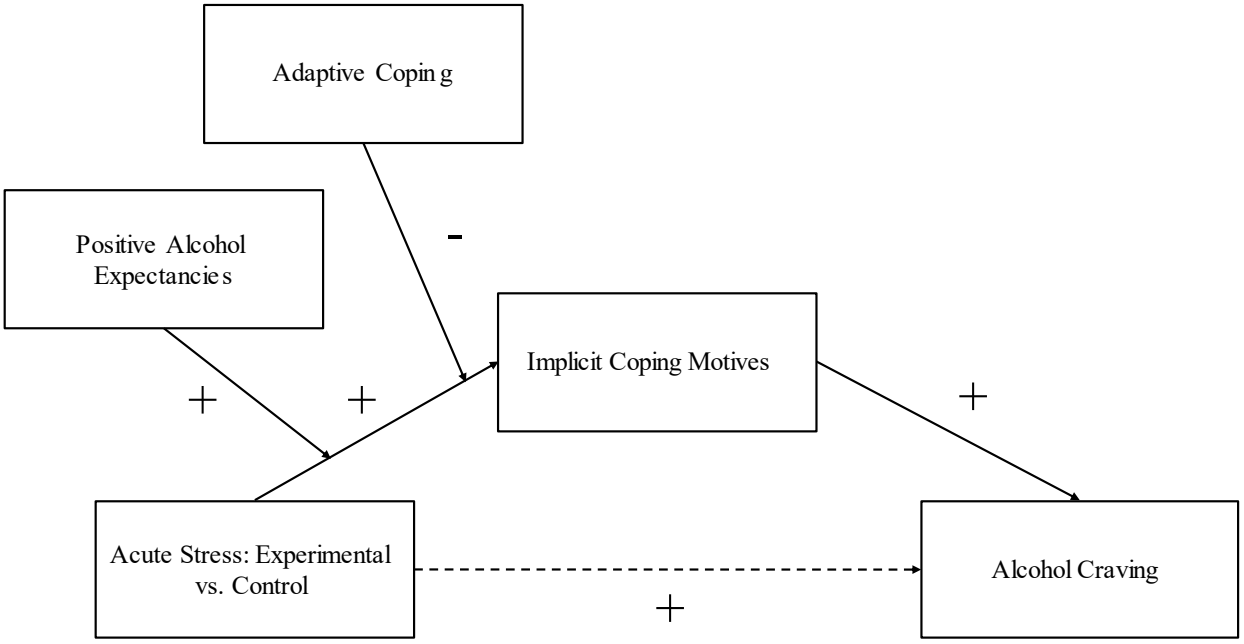
Aim 3

To test adaptive coping and positive alcohol expectancies as moderators of the indirect effect of acute stress on alcohol craving through implicit coping motives (see Figure 2).

Hypothesis 3. The stressor-vulnerability model (Cooper et al., 1988) provides two conditions under which drinking to cope with stress is most likely to occur: low adaptive coping ability and high positive alcohol expectancies. That is, the authors proposed that individuals would drink to cope with stress when they have poor adaptive coping skills and believe strongly in the benefits of alcohol. Consequently, for the present study, it was expected that the indirect effect of acute stress on alcohol craving through implicit coping motives would be strongest for drinkers with low adaptive coping and high positive alcohol expectancies. Sex and explicit coping motives were controlled for in the analysis.

Figure 2

Positive Alcohol Expectancies and Adaptive Coping as Moderators of the Mediation



CHAPTER II

METHOD

Design

The present study tested the impact of an acute stressor on alcohol craving using an experimental between-subjects design. Participants were randomly assigned to one of two conditions: acute stress and control. The experimental acute stress condition involved the anticipation of a virtual stressful public speaking task while the control condition simply thought about their last vacation. The study involved four parts, all of which took place virtually through a single Zoom session: a survey comprised of baseline measures, a description of the anticipatory event for the experimental condition and neutral task for the control condition, an implicit association test (IAT), and an alcohol craving assessment (see Figure 3). Specifically, participants first completed a baseline battery of measures and then were provided a cover story consistent with their group assignment. Then, individuals completed an IAT and an alcohol craving questionnaire before being debriefed and dismissed. The entire study took participants between 45 and 60 minutes. See Table 1 for an overview of the study procedures. The current study was approved by the university's institutional review board and followed all APA ethical guidelines (APA, 2017).

Table 1

Sequence of Battery and Procedures

Order	Task	Approximate Time (mins)
1	**Introduction** Study Orientation Instructions	**5**
2	**Baseline Battery** Demographics Questionnaire Comprehensive Effects of Alcohol Questionnaire Daily Drinking Questionnaire COVID drinking Drinking Motives Questionnaire COPE Inventory Alcohol Urge Questionnaire State-Trait Anxiety Inventory	**30**
3	**Experimental Manipulation**	**5**
4	**Manipulation Check** State-Trait Anxiety Inventory (Anxiety-S)	**2**
5	**IAT and Craving Assessment** Implicit Association Test – Coping Alcohol Urge Questionnaire	**10**
6	**Deception Assessment**	**5**
7	**Debriefing**	**3**
	Estimated total time =	**60**

Figure 3

Flow of Participant Tasks

Note. For clarity, this figure does not include tasks which were not specific to the current study, such as informed consent, deception assessment, and debriefing.

Participants

Individuals were considered eligible to participate if they were between 18 and 25 years old and reported drinking alcohol on at least one occasion in the past month (e.g., see drinking guidelines from the U.S. Department of Health and Human Services & U.S. Department of Agriculture [HHS & USDA], 2020). Additionally, individuals were excluded from the study if they had ever been diagnosed with an alcohol use disorder. This criterion was implemented in order to address sample limitations seen in similar investigations to the present study (e.g., Thomas, Randall, et al., 2011), such that participants would not typically drink to a clinically disordered level. Additionally, it would not have been ethical practice to expose individuals with a known alcohol use disorder to a stressful task while simultaneously exposing them to many alcohol-related stimuli. Similarly, potential participants were excluded if they endorsed ever being diagnosed with a social anxiety disorder as it would have been unethical to induce stress in these individuals.

Based on a medium effect size for multiple linear regression, G*Power (Faul et al., 2007) estimated that approximately 43 participants were needed for Aim 1. Regarding path analysis (e.g., mediation analyses), Kline (2015) suggests using a 20:1 ratio for calculating sample sizes for path analyses (e.g., mediation analyses), such that 20 participants are needed for each parameter in the analysis. Given that the present proposal utilized six parameters (i.e., group condition, implicit coping motives, alcohol craving, positive alcohol expectancies, adaptive coping, explicit coping motives), the current study aimed to recruit at least 120 participants.

Ultimately, the final sample included 21 participants who were randomly assigned to either the control (n = 10) or experimental (n = 11) condition. Of the overall sample, most were female (n = 52.4%). The average age of the sample was 20.95 (SD = 2.25) years. The sample

included 33.3% freshmen, 23.8% sophomores, 4.8% juniors, 23.8% seniors, and 14.3% graduate students. The racial breakdown of the participants was 47.6% White, 33.3% Black/African American, 9.5% Hispanic/Latinx, and 9.5% Asian/Pacific Islander. Data were collected from February to July of 2021.

Procedure

Recruitment

Participants were recruited through the psychology department's online subject pool (i.e., Sona) of currently enrolled psychology undergraduate students, advertisements in the university's student announcements, which are distributed to all enrolled students, and an online forum of various university clubs and groups. In exchange for study participation, participants recruited from Sona received one and a half research credits that could be applied to a psychology course upon completion of the study; all participants were entered into a raffle to win one of 10 $20 gift cards. Although the true purpose of the current study was to examine the impact of an acute stressor on alcohol craving, it was advertised as a study on the impact of behavioral extraversion on alcohol cognitions. Specifically, the informed consent form described the experimental manipulation as a behavioral test of extraversion and memory (i.e., "to see how outgoing you are"; Thomas et al., 2014, pp. 118). Additionally, participants were informed that they would complete a task (i.e., the IAT) that measures their general associations of alcohol and a series of questions about their current desire for alcohol. After their participation, individuals received a short debriefing in the session. At the conclusion of the entire study, a complete debriefing will be shared with the participants. The specifics of this debriefing are described later. For all researcher-participant correspondence, participants were contacted through email.

Eligibility Screening

A series of screening questions were administered through Qualtrics to determine study eligibility prior to participants signing up for a study timeslot (see Appendix A). Questions targeted the following inclusion criteria: participants must have been between 18 and 25 years old (i.e., young adults), must have drank alcohol on at least one occasion in the past month (e.g., HHS & USDA, 2020), and must not have ever been diagnosed with an alcohol use disorder or a social anxiety disorder. Any individual who did not meet all three criteria was not permitted to sign up for a study timeslot and, instead, automatically received a message thanking them for their consideration. If a participant did meet all three criteria, then they were contacted via email to set up a time to participate.

Random Assignment

Upon determining their eligibility for study inclusion, participants were randomly assigned to either an acute stress experimental condition or a neutral control condition. Random assignment was used with the goal of minimizing between group differences on baseline variables.

Virtual Session

The entire study occurred over the video conferencing platform Zoom and took between 45 and 60 minutes. After confirming their eligibility for the study through a screening survey via Qualtrics, participants were contacted to select a one-hour timeslot to match their availability over the remainder of the current week and the following week. That is, participants chose a participation time that was personally available to them. The researcher was available all seven days of the week and at various times throughout the day. After choosing a timeslot for their

participation in the study, participants received a Zoom link through email for their chosen day and time.

Upon arrival to the virtual session, participants were provided an informed consent document. They were told that their participation was voluntary, that they could withdraw consent at any time, and that the data and details from their session would be kept confidential. Once participants provided their informed consent, they were given an overview of the study and an agenda for the Zoom session. Specifically, participants were informed that the goal of the study was to understand how behavioral extraversion impacts one's associations of alcohol. Regarding informing participants of their specific tasks during the session, individuals were told that they would first complete a 30-minute survey about their psychological functioning and drinking habits followed by a computer task and questionnaire on their associations of alcohol. Additionally, they were told that the session would end with a behavioral test of extraversion and that they would receive further instructions on that portion after their first 30-minute survey. Finally, participants were told that they would complete a questionnaire on anxiety at some point during the session as a way for the researchers to monitor the participants' safety during the study. After being given an overview of the study, participants were sent a Qualtrics link to the baseline survey using Zoom's chat function.

Baseline Assessment. For their first task, participants were directed to complete a survey that was administered remotely using Qualtrics. The participant was told that the researcher would be staying on the Zoom session in case there were any questions or issues but that they would be working on something on their laptop rather than constantly observing the participant. The first measures in the survey targeted baseline constructs that were or were not included in analyses (i.e., demographics, drinking expectancies, typical drinking, drinking since the

pandemic, drinking motives, adaptive coping, alcohol craving, trait anxiety). Next, participants answered questions measuring their state anxiety. This was the first of two iterations of the state anxiety measure and was used as the pre-test component of a manipulation check which is described later. The baseline assessment took approximately 30 minutes.

Experimental Manipulation.

Experimental Condition. The experimental acute stress condition involved a modified version of the Trier Social Stress Test (TSST; Kirschbaum, 1993), in that participants were provided detailed instructions on an *anticipated* and *virtual* behavioral extraversion task but ultimately did not have to do any such task. Previous studies have employed a similar anticipatory stressor without participants actually completing the task and have shown such a paradigm to adequately elicit acute stress (Bernstein & Wood, 2017; Starcke et al., 2008). Similarly, the TSST has been conducted in a virtual manner before and proven to be effective at eliciting stress (Fallon et al., 2016; Hawn et al., 2015). Individuals in the experimental group were told that the following would happen: after completing the computer task and final questionnaire, participants would be given five minutes to prepare a 10-minute speech on why they were qualified for their dream job and would present this speech to three psychology professors from a different institution who would be critiquing their speech (see Starcke et al., 2008 for a similar procedure). Additionally, they were told that it was important that they use all 10 minutes for their speech and tried their best to impress the professors. Finally, participants were told that their speech would be recorded so that the professors could review and critique it later if needed. The researcher provided these instructions in a stoic and deliberate manner. After providing these instructions, participants were given a Qualtrics link to complete a questionnaire on their state anxiety as part of the manipulation check.

Control Condition. The control condition was neutral in stress and involved brief instructions on a task designed to take the same amount of time as the experimental condition's manipulation. Specifically, participants in the control condition were given five minutes to think about their last vacation (e.g., Starcke et al., 2008). Participants were told that this was "just to give you a brief break" and that the researcher would be setting up the next task during this time. The researcher provided these instructions in a friendly and casual manner. As in the experimental group, participants were then given a Qualtrics link to complete the manipulation check.

Manipulation Check. A manipulation check, using the state portion (Anxiety-S) of the State-Trait Anxiety Inventory (STAI; Spielberger et al., 1983), determined whether the anticipation of the public speaking task significantly affected the stress level of individuals in the experimental condition. The manipulation check involved a pretest and a posttest, which were identical in content. The pretest iteration, which was given during the baseline assessment, measured participants' initial level of stress before any experimental manipulations. Immediately after the manipulation, participants completed the Anxiety-S again to be used as the manipulation check. The participants were told that they would complete a short questionnaire that they have already responded to once, and it was reiterated that these questionnaires allow us to monitor the participants' safety during the study. If the manipulation truly induced stress in the experimental condition, then scores on the second iteration of the Anxiety-S should have been significantly higher than scores on the first iteration of the Anxiety-S for individuals in the experimental condition only. Likewise, if the control condition was truly neutral with regards to stress, then scores on the second iteration of the Anxiety-S should not have significantly differed from scores on the first iteration of the Anxiety-S for individuals in the control condition only.

The Anxiety-S has been used as a manipulation check in other experimental studies which employed the original TSST (e.g., Bacon & Thomas, 2013; Magrys & Olmstead, 2015; Thomas, Bacon, et al., 2011). The analyses for the manipulation check were run for the groups as a whole rather than for each participant individually. The manipulation check indicated that the manipulation was *not* successful; however, a trending effect suggests this was likely due to a lack of power (see Limitations). After completing the manipulation check measure, all participants were provided with a link to a Qualtrics survey containing an implicit association test.

Implicit Association Test and Alcohol Craving Assessment. The Implicit Association Test was administered to assess an individual's implicit motivation to drink to cope with negative emotions. The task, adapted using Lindgren et al. (2011)'s cues, involved rapidly sorting stimuli (i.e., images representing the targets "alcohol" and "water" and words representing the attributes "cope" and "ignore"). The stimuli appeared in the middle of the screen and should have been sorted into their corresponding concept labeled on either the left (using the "E" key) or right (using the "I" key) side of the screen. See Appendix B for screenshot examples of the program.

The IAT had seven stages, with five serving as practice stages and two as critical test stages. Only data from the test stages were used in analyses. The first was a practice stage consisting of twenty trials requiring participants to assign target stimuli (i.e., images of alcohol or water) to the correctly labeled target concepts (e.g., assigning images of alcohol to the "alcohol" label). The second stage was a similar practice, also consisting of twenty trials, requiring participants to assign attribute stimuli (i.e., words representing "cope" or "ignore") to the correctly labeled attribute concepts (e.g., assigning a cope-related word to the "cope" label). The third stage was a practice stage comprised of 20 trials in which participants should have

assigned target and attribute stimuli to the correctly labeled concepts (e.g., assigning either images of alcohol or words representing "cope" to the "alcohol, cope" label). The fourth block was a critical (i.e., test) stage containing 40 trials, with the task having the same objective as the third block. The fifth block was a practice set consisting of 40 trials and reverses the location of the labeled target concepts from their position in the first stage (e.g., the "alcohol" label is now on the right side of the screen if it was on the left side of the screen in the first stage). The sixth stage was the final practice stage containing 20 trials and was followed by the seventh and final block, which had 40 critical (i.e., test) trials. This last stage required participants to assign target and attribute stimuli to the correctly labeled concepts as in the fourth stage, albeit in a different combination than the third stage (e.g., the left side of the screen now has a "alcohol, ignore" label if the left side was previously labeled "alcohol, cope"). After completing the IAT, the Qualtrics survey proceeded to a questionnaire assessing participants' current alcohol craving. After finishing the craving questionnaire, a deception assessment began.

Deception Assessment. A deception assessment was conducted to determine the extent to which the participants knew the true purpose of the study. The assessment was administered via a Qualtrics link immediately following the alcohol craving measure. Participants completed an open-ended questionnaire regarding their beliefs of the study's purpose (see Appendix C). The questionnaire had one question that stated, "What do you believe the tasks you are completing today are about?" There were then four lines for responses, corresponding to the four general tasks individuals engaged in. Participants had the following headings for the four lines: "Questionnaires," "Computer Task," "Speech to Professors," and "Conversation with Researcher." The lead researcher and one additional research assistant reviewed participant responses to the deception assessment and found no evidence that any participant should be

excluded from analyses due to their awareness of deception. After completing the deception assessment, participants were debriefed.

Debriefing. The researcher provided a debriefing at the end of the Zoom session (see Appendix D). The first thing participants were told during the Zoom session is that there was no speech to professors (i.e., if in the experimental group) and consequently, that the participant had finished the study. They were informed that the study was concerned with reactions to stressful situations and drinking in college students. Additionally, they were told that they participated in an Implicit Association Test, which measured their implicitly-held association of alcohol. Participants were told that their responses are confidential and would be aggregated for analyses rather than looked at individually. This debriefing session encouraged participants to not share any information about the study with anyone, as this could have compromised the integrity of the study. Finally, they were told that their Sona credit would be assigned immediately (if applicable), that they would be entered in the drawing for one of 10 $20 Amazon gift cards at the study's conclusion, and that a more complete debriefing of the study would be emailed to them once the study ended. This complete debriefing will reiterate the same points discussed in the partial briefing but will add the study's specific hypotheses and empirical resources. Contact information for the researcher and ODU Counseling Center was provided to all participants in-session and in this final debriefing document.

Measures

Demographics

Participants reported their background information including age, ethnicity, biological sex, and student status. Additionally, participants indicated how they were recruited (i.e., Sona vs. university announcements) and entered a personalized identification number that was used to

connect their answers on each Qualtrics survey. See Appendix E for the specific demographic items.

Positive Alcohol Expectancies

The Comprehensive Effects of Alcohol questionnaire (CEOA; Fromme et al., 1993; see Appendix F) measured participants' alcohol expectancies. The CEOA is a 38-item measure with four positive subscales and three negative subscales. The measure has adequate construct and criterion validity (Fromme et al., 1993) and internal consistency, though internal consistency varies across subscales (α ranging from .63 to .81; Valdivia & Stewart, 2005). The four subscales comprising "positive expectancies" were used in the current study and are as follows: sociability (e.g., "I would be friendly"), tension reduction (e.g., "I would feel calm"), liquid courage (e.g., "I would feel creative"), and sexuality (e.g., "I would feel sexy"). Response options were on a 4-point Likert scale, ranging from "disagree" (1) to "agree" (4). Scores were totaled for the four "positive expectancies" subscales with higher scores indicative of a greater belief in alcohol's perceived benefits. Internal consistency for the positive expectancies subscale in the current study was $\alpha = .89$.

Typical Alcohol Use

The Daily Drinking Questionnaire (DDQ; Collins et al., 1985; see Appendix G) assessed participants' typical alcohol consumption. Participants reported the number of drinks consumed for each day of a typical week over the past three months. The DDQ has been widely used in the alcohol literature. The DDQ has adequate test-retest reliability ($r = .72$; Collins et al., 1985) and convergent validity ($r = .72$; Marlatt et al., 1998). Participants were asked additional questions to determine if their drinking-related behaviors had changed since the onset of the COVID-19 pandemic (see Appendix H).

Coping Motives

The Drinking Motives Questionnaire-Revised (DMQ-R; Cooper, 1994; see Appendix I) measured participants' explicit motives for drinking alcohol. The DMQ-R contains 20 items and has adequate internal consistency ($\alpha \geq .84$ for each of the four factors; Cooper, 1994). Specifically, the five-item Coping subscale of the DMQ-R was used to measure participants' baseline levels of drinking as a way to cope with negative emotions ($\alpha = .84$, Cooper, 1994) and has been shown to have adequate predictive and discriminant validity (Cooper et al., 1988; Cooper et al., 1992). Participants were able to respond to motive prompts (e.g., "To forget your worries") with the response options "almost never/never" (0), "some of the time" (1), "half of the time" (2), "most of the time" (3), or "almost always/always" (4). Scores were averaged with higher scores indicating a higher frequency of explicitly drinking to cope with negative emotions. The Coping subscale was included as a covariate in analyses for Aim 2 and Aim 3. Internal consistency for the coping motives subscale in the current study was $\alpha = .80$.

Adaptive Coping

The COPE inventory (Carver et al., 1989; see Appendix J) assessed participants' general coping skills. The COPE contains 60 items across 14 subscales, has shown to have sufficient convergent and discriminant validity, and has adequate internal consistency overall, though varying across subscales ($\alpha \geq .62$ for 13 subscales, $\alpha = .45$ for one subscale; Carver et al., 1989). Specifically, nine subscales from the COPE commonly identified as adaptive (e.g., Carver et al., 1989; Litman, 2006; Lyne & Roger, 2000; Merrill & Thomas, 2013) were summed to create a composite adaptive coping score. Those "adaptive coping" subscales are as follows: active coping (e.g., "I do what has to be done, one step at a time"), planning (e.g., "I make a plan of action"), suppression of competing activities (e.g., "I put aside other activities in order to

concentrate on this"), restraint coping (e.g., "I restrain myself from doing anything too quickly"), seeking social support for instrumental reasons (e.g., "I try to get advice from someone about what to do"), seeking social support for emotional reasons (e.g., "I talk to someone about how I feel"), positive reinterpretation and growth (e.g., "I learn something from the experience"), acceptance (e.g., "I learn to live with it"), and turning to religion (e.g., "I seek God's help"). Response options were "I usually don't do this at all" (1), "I usually do this a little bit" (2), "I usually do this a medium amount" (3), or "I usually do this a lot" (4). Scores were summed for the nine "adaptive coping" subscales with higher scores indicating a greater tendency to use adaptive coping skills. Internal consistency for the adaptive coping subscale in the current study was $\alpha = .88$.

State and Trait Anxiety

The state and trait portions of the State-Trait Anxiety Inventory (Anxiety-S & Anxiety-T, respectively; Spielberger et al., 1983; see Appendix K) each contain 20 questions regarding participants' current (e.g., "I feel tense," "I feel nervous," "I am worried") and typical (e.g., "I feel inadequate," "I feel like a failure") feelings of anxiety, respectively. The overall, combined STAI has adequate internal consistency (average $\alpha > .89$; Grös et al., 2007) and validity (Rossi & Pourtois, 2012). Participants reported their current anxiety severity "*right now*, at this moment" and their typical anxiety "*generally*" through 4-point Likert scales ranging from "not at all" (1) to "very much so" (4) on the Anxiety-S and from "almost never" (1) to "almost always" (4) on the Anxiety-T. The Anxiety-S has been used as a manipulation check in experimental studies as a proxy for acute stress (e.g., Bacon & Thomas, 2013; Magrys & Olmstead, 2015; Thomas, Bacon, et al., 2011), providing evidence that the Anxiety-S can be used in observational designs, like the current study, to measure acute stress. The second time the participants

completed the Anxiety-S (i.e., the manipulation check) they also reported their personalized identification number to connect their answers across surveys. Internal consistency for the Anxiety-T in the current study was $\alpha = .91$. Regarding the Anxiety-S at baseline, internal consistency was $\alpha = .86$. This same scale (i.e., Anxiety-S) showed an internal consistency of $\alpha = .95$ during the post-manipulation administration.

Implicit Coping Motives

An Implicit Association Test (IAT; Greenwald et al., 1998) measured participants' implicit coping motives, customized through the iatgen program (see Appendix B for examples; Carpenter et al., 2019). The IAT measured implicit coping motives by calculating the *D* score (Greenwald et al., 2003). This score is the difference in average response time (RT; in milliseconds) between the two test stages (i.e., the "alcohol, cope" stage and the "alcohol, ignore" stage) divided by the pooled standard deviation (see Greenwald et al., 2003 for more details). A larger *D* score indicated a stronger association between alcohol and coping. In order to control for participants who may not be responding in a valid manner, 1) trials with RTs greater than 10,000 ms were omitted and 2) participants who responded quicker than 300 ms on more than 10% of their trials were excluded (Greenwald et al., 2003). The scoring of the IAT procedure has been shown to be independent of various methodological nuances. Specifically, the *D* score is unaffected by which hand is used to press the key that sorts the stimuli and the order of the stimuli presented within a stage (Greenwald & Nosek, 2001). Scores on similar coping motives IATs have correlated significantly with explicit measures of coping motives (Lindgren et al., 2011), providing evidence for the validity of the IAT method. Additionally, IATs measuring implicit drinking to cope have reported adequate internal consistency ($r = .58$;

Lindgren, Foster, et al., 2013), with respect to the reliabilities of general IATs (Greenwald et al., 2003).

Alcohol Craving

The Alcohol Urge Questionnaire (AUQ; Bohn et al., 1995; see Appendix L) assessed participants' subjective craving. The AUQ is an 8-item measure that assesses an individual's momentary urge to drink alcohol within their current context, "right now." A 7-point Likert scale, ranging from "strongly disagree" (0) to "strongly agree" (6) was used to rate each item. Item scores were averaged for a total score, with higher scores indicating a stronger craving for alcohol. The AUQ has adequate internal reliability ($\alpha = 0.91$) and concurrent validity with measures of similar constructs (Bohn et al., 1995). The survey containing the IAT and craving assessment also required participants to report their personalized identification number to connect their answers across surveys. Regarding the AUQ at baseline, internal consistency was $\alpha = .74$. This same scale (i.e., AUQ) also showed an internal consistency of $\alpha = .74$ during the post-manipulation administration. It is possible that the lower internal consistency observed in the current study is a product of the small number of items and my small sample size.

CHAPTER III

RESULTS

Assumption analyses, descriptive statistics, bivariate correlations, and ANCOVA analyses were performed using SPSS 27. Within SPSS 27, mediation analyses and conditional process analyses (moderated mediation) were conducted using the PROCESS macro (Hayes, 2017). Before any analysis was run, data were cleaned by recoding and aggregating items appropriately. Additionally, one missing value was found and labeled as missing on each of the following variables: adaptive coping, baseline craving, trait anxiety, baseline state anxiety, and post-manipulation state anxiety. Because the number of missing values were few, items were coded as missing and omitted from their respective sum scores.

Statistical assumptions of ANCOVA are as follows: normality, linearity, independence of observations, and homogeneity of the regression slopes. Histograms, Q-Q plots, and skewness and kurtosis statistics were used to assess normality. All study variables were approximately normally distributed. To confirm the linearity of a bivariate association, scatterplots with fitted Lowess lines for each variable on the residuals were examined. The assumption of independence of observations was met by randomly assigning participants to the experimental or control condition. A participant could not take part in the study more than one time; therefore, the two groups consisted of different individuals. Possible interactions between the CV and the IV were ruled out to meet the assumption of homogeneity of the regression slopes, which states that the association between a CV (e.g., trait anxiety and sex) and the DV (i.e., subjective alcohol craving) do not depend upon the IV (i.e., condition).

There are six assumptions of regression: linearity, completeness of model, reliability of measurement, homoscedasticity, independence of residuals, and normality of residuals. The first

three assumptions refer to the model itself. Linearity was confirmed visually by a scatterplot of each IV on the unstandardized residuals. Theory and prior research assured that all relevant variables had been included in the model. Similarly, prior research was used to assume that reliable measures had been chosen and that all variables were to be measured without error. The last three assumptions refer to the residuals. Homoscedasticity was confirmed visually through scatterplots of the unstandardized residuals for each predictor. Independence of residuals were tested using the Durbin-Watson statistic. All values were in the acceptable range. Finally, normality of residuals was confirmed visually by using histograms. No univariate outliers outside the three interquartile rangers were found; thus, no values were Winsorized. Additionally, no multivariate outliers were found after assessing discrepancy, leverage, and influence values.

Before conducting the analyses of interest, *t*-tests were performed to identify any baseline differences between the control (i.e., coded as 0) and experimental (i.e., coded as 1) groups. The groups did not differ by typical alcohol use (i.e., typical drinking quantity [$t(19) = -0.74$, $p = .468$], drinking frequency [$t(19) = -1.06$, $p = .303$], and binge drinking frequency [$t(19) = -0.69$, $p = .499$]). The sample reported consuming 7.87 drinks on average ($SD = 6.88$) in a typical week. Participants drank on an average of 2.38 days ($SD = 1.32$) during a typical week. Regarding weekly binge frequency, the sample reported 0.90 days ($SD = 1.22$) on which a binge drinking episode occurred during a typical week. There were also no group differences on baseline trait anxiety ($t[19] = -1.30$, $p = .210$), baseline state anxiety ($t[19] = -0.86$, $p = .399$), baseline craving ($t[19] = -1.72$, $p = .101$), baseline coping motives ($t[19] = -0.17$, $p = .868$), adaptive coping ($t[19] = -0.99$, $p = .337$), or positive alcohol expectancies ($t[19] = 0.67$, $p = .510$).

To ensure that the stressor was effective in eliciting anxious feelings in the experimental group, state anxiety was measured before and after the manipulation. Three manipulation checks were conducted to test the effectiveness of the manipulation. The conditions did not significantly differ on the post-manipulation measure of state anxiety, $t(19) = 1.36$, $p = .190$. That is, even after the stressor task was administered to the experimental group, the groups' levels of state anxiety were not significantly different. However, when controlling for baseline state anxiety, there was a significant effect whereby the experimental condition was associated with an increased post-manipulation state anxiety score, $t(18) = 2.68$, $p = .015$. Additionally, when looking at the control group only, there was a significant difference between the pre-manipulation scores ($M = 38.40$) and the post-manipulation scores ($M = 34.90$) such that state anxiety in the control group *decreased* after the manipulation, $t(9) = -3.49$, $p = .007$. Conversely, when only considering the experimental group, there was a trending difference between the pre-manipulation scores ($M = 35.09$) and the post-manipulation scores ($M = 42.18$) such that state anxiety in the experimental group seemed to *increase* after the manipulation, $t(10) = 2.05$, $p = .068$. Overall, there is mixed support for the effectiveness of the manipulation. Although some evidence suggested that the manipulation was effective, a larger sample size is likely needed to more conclusively confirm its effectiveness. Sample and group means and standard deviations for study variables can be found in Table 2. Bivariate correlations between study variables can be found in Table 3.

Table 2

Means and Standard Deviations of Measures by Group Condition

	Overall M(SD)	**Control M(SD)**	**Experimental M(SD)**
Typical Weekly Alcohol Quantity	7.87(6.88)	9.05(8.27)	6.80(5.51)
Typical Weekly Alcohol Frequency	2.38(1.32)	2.70(1.77)	2.09(0.70)
Typical Weekly Alcohol Binge Frequency	0.90(1.22)	1.10(1.60)	0.73(0.79)
Trait Anxiety	42.38(12.73)	46.10(13.64)	39.00(11.42)
T1 State Anxiety	36.67(8.73)	38.40(8.10)	35.09(9.35)
T2 State Anxiety	38.71(12.53)	34.90(7.68)	42.18(15.27)
T1 Alcohol Craving	1.68(0.69)	1.94(0.84)	1.44(0.43)
T2 Alcohol Craving	1.87(0.93)	1.99(0.84)	1.76(1.03)
Explicit Coping Motives	1.77(0.72)	1.80(0.54)	1.75(0.89)
Implicit Coping Motives (*d* score)	-0.57(0.29)	-0.60(0.29)	-0.54(0.31)
Adaptive Coping	93.05(15.29)	96.50(11.40)	89.91(18.10)
Positive Alcohol Expectancies	55.76(10.01)	54.20(11.47)	57.18(8.81)

Note. *T1* = pre-manipulation (baseline) assessment, *T2* = post-manipulation assessment.

Table 3

Intercorrelations Among Study Variables

	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Condition	---												
2. Alcohol Quantity	-.17	---											
3. Alcohol Frequency	-.24	**.66***	---										
4. Binge Frequency	-.16	**.94****	**.67***	---									
5. Trait Anxiety	-.29	.01	.36	.14	---								
6. *T1* State Anxiety	-.19	.17	**.46**	.24	**.79****	---							
7. *T2* State Anxiety	.30	.04	.08	.15	**.53**	**.61***	---						
8. *T1* Alcohol Craving	-.37	.35	**.66***	.36	.41	**.62***	.03	---					
9. *T2* Alcohol Craving	-.13	.01	.13	-.04	.31	**.45**	.31	**.51**	---				
10. Explicit Coping Motives	-.04	**.49**	.40	.45	.39	**.50**	.07	**.50**	-.03	---			
11. Implicit Coping Motives	.12	.31	.32	.35	-.10	-.12	-.14	.09	-.27	.23	---		
12. Adaptive Coping	-.22	-.15	-.10	.00	.22	-.04	-.26	.02	-.34	.18	.28	---	
13. Positive Expectancies	.15	**.46**	.09	.38	-.08	-.08	-.09	-.13	-.34	**.45**	.20	.07	---

Note. Condition: 0 = *Control*, 1 = *Experimental*. *T1* = pre-manipulation (baseline) assessment, *T2* = post-manipulation assessment.

Typical weekly values were reported for alcohol quantity, alcohol frequency, and binge frequency.

Bolded intercorrelations represent $p < .05$.; *$p < .01$.; **$p < .001$.

Testing Study Aim 1

The first aim of the study was to investigate the effect of an acute stressor on alcohol craving. It was hypothesized that those in the experimental stress condition would report significantly greater alcohol craving than the control condition, while controlling for sex and trait anxiety. To test group differences in alcohol craving, an ANCOVA was performed using linear multiple regression (i.e., dummy coding the control and experimental groups). The predictor was acute stress condition (i.e., non-stress [0] vs. stress [1]). The outcome was subjective alcohol craving, and trait anxiety and sex were entered as covariates (CVs). Trait anxiety was grand mean centered to reduce nonessential multicollinearity and improve interpretability. The regression was run and led to the following unstandardized regression line equation:

$$\textbf{Craving} = 1.44 + 0.09(\textbf{condition}) + 0.80(\textbf{sex}) + 0.04(\textbf{anxietyT})$$

Overall, condition, sex, and trait anxiety, together, did not significantly predict alcohol craving and accounted for 23.1% of the variance in craving, $F(3, 17) = 1.70$, $p = .205$, $R^2 = .231$. For females in the control condition who reported average trait anxiety (i.e., the intercept), the expected alcohol craving score was 1.44, and this was significant, $t(17) = 3.69$, $p = .002$. On average, when controlling for sex and trait anxiety, participants assigned to the experimental condition reported a 0.09-unit greater craving score than the control condition, but this difference was not significant, $t(17) = 0.22$, $p = .831$. Results for Aim 1 can be found in Table 4.

Table 4

Unstandardized Regression Coefficients for Condition on T2 Alcohol Craving

	B	*SE*	*p*	*partial* r^2
Intercept	1.44	0.39	.002	
Condition	0.09	0.41	.831	.05
Trait Anxiety	0.04	0.02	.056	.45
Sex	0.80	0.46	.10	.39

Note. Condition: 0 = *Control*, 1 = *Experimental*. Sex: 0 = *Female*, 1 = *Male*. *T2* = post-manipulation assessment.

Testing Study Aim 2

The second aim of the study was to investigate the indirect effect of acute stress on alcohol craving through implicit coping motives. It was predicted that implicit drinking to cope would mediate the association between acute stress and alcohol craving, such that being in the experimental group would predict higher implicit coping motives which would, in turn, predict greater alcohol craving. A mediation model (i.e., model four) was run in PROCESS (Hayes, 2017) to test this hypothesis. The significance of the indirect effect was tested by using nonparametric bootstrapping analyses, which uses a sample-based estimated sampling distribution of the mediator (MacKinnon et al., 2007). Mediation was considered significant if the confidence intervals for the indirect effect based on 10,000 bootstrapped samples did not include zero (Preacher & Hayes, 2004). Controlling for sex and explicit coping motives, my model tested if implicit coping motives mediated the association between acute stress and alcohol craving. Explicit coping motives was grand mean centered to reduce nonessential multicollinearity and improve interpretability. Results for Aim 2 can be found in Table 5.

Direct Effects on Implicit Coping Motives

Regarding the direct effect of condition, participants assigned to the experimental stress condition had implicit coping motives scores that were 0.07 points greater than the control condition while controlling for sex and explicit coping motives, but this was not significantly different from zero, $t(17) = 0.53$, $p = .605$.

Direct Effects on Alcohol Craving

With regards to the direct effect of implicit coping motives, a one-point increase in implicit coping motives was associated with a 0.86-point decrease in alcohol craving when controlling for condition, sex, and explicit coping motives. However, this association was not

significant, $t(16) = -1.13$, $p = .276$. Regarding the direct effect of condition, participants assigned to the experimental stress condition had an alcohol craving score that was 0.14 points less than the control condition while controlling for implicit coping motives, sex, and explicit coping motives. This was also not significantly different from zero, $t(16) = -0.33$, $p = .743$.

Indirect Effect of Acute Stress on Alcohol Craving Through Implicit Coping Motives

There was not a significant indirect effect of condition (i.e., acute stress [1] vs. control [0]) on alcohol craving through implicit coping motives, while controlling for sex and trait anxiety, $B = -0.06$, 95% CI [-0.61, 0.15]. This indirect effect is a product of the direct effect of condition on implicit coping motives and the direct effect of implicit coping motives on alcohol craving; its lack of significance can be seen in that the 95% Confidence Interval does contain zero.

Table 5

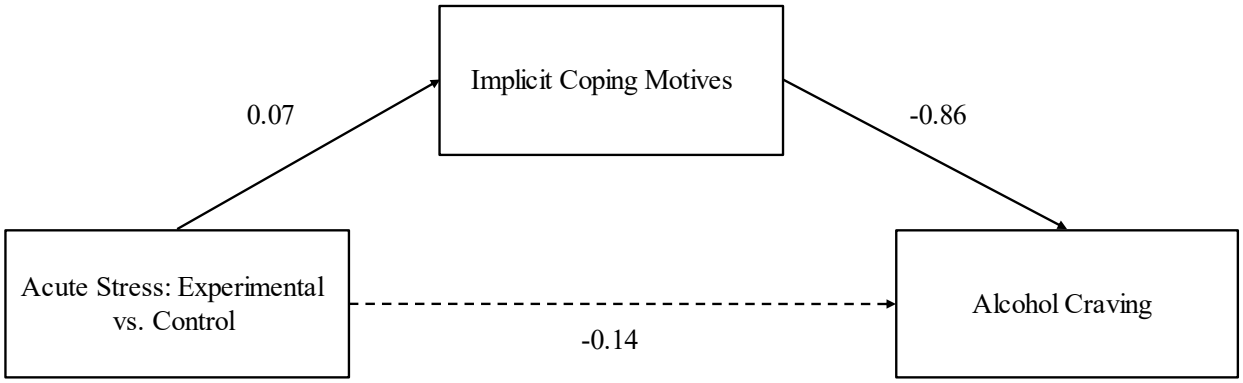
Unstandardized Regression Coefficients for Direct and Indirect Paths of Aim 2

	B	*SE*	*p* or 95% CI
Implicit Coping Motives			
Intercept	-0.60	0.12	< .001
Condition	0.07	0.14	.605
Sex	-0.01	0.14	.956
Explicit Coping Motives	0.09	0.10	.375
T2 Alcohol Craving			
Intercept	1.30	0.60	.046
Condition	-0.14	0.43	.743
Implicit Coping Motives	-0.86	0.77	.276
Sex	0.33	0.45	.473
Explicit Coping Motives	0.19	0.32	.571
Condition → Implicit Coping Motives → *T2* Alcohol Craving	-0.06	0.19	-0.61, 0.15

Note. Condition: 0 = *Control*, 1 = *Experimental*. Sex: 0 = *Female*, 1 = *Male*. *T2* = post-manipulation assessment.

Figure 4

Unstandardized Regression Coefficients for Pathways Involved in Aim 2



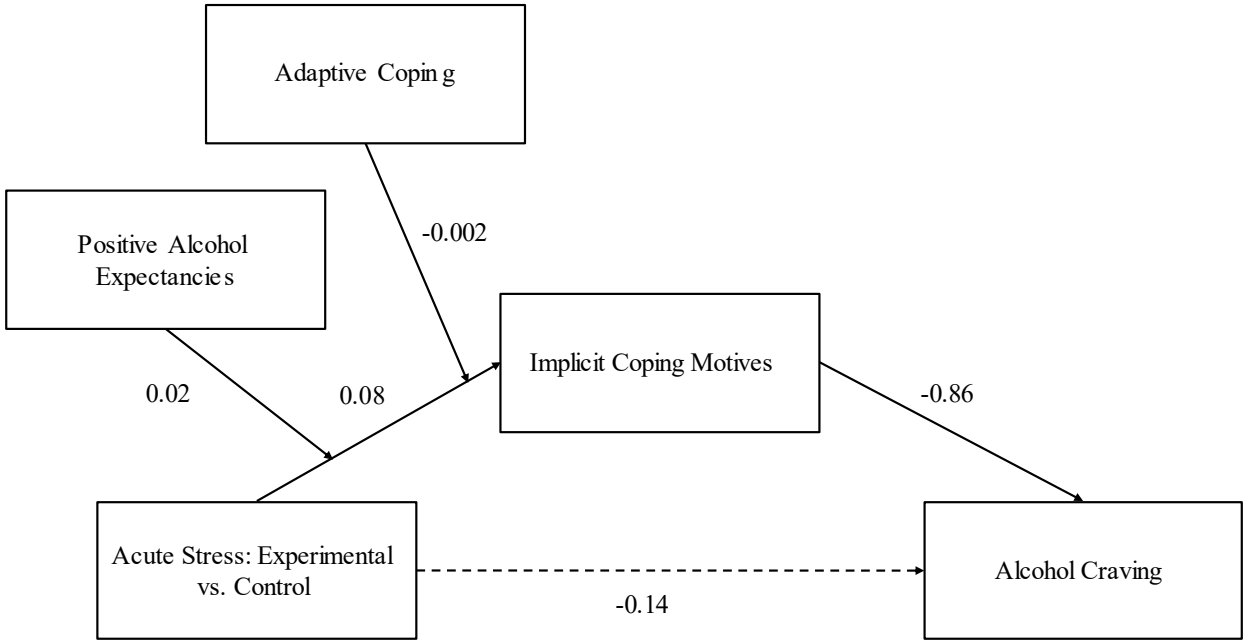
Note. Control = 0; Experimental = 1. For clarity, the covariates sex and explicit drinking motives were omitted from the figure but included in analyses.

Testing Study Aim 3

The third aim of the study was to test a moderated mediation model in which positive alcohol expectancies and adaptive coping moderate the indirect effect of acute stress on alcohol craving through implicit coping motives. It was predicted that this indirect effect would be stronger for individuals with high positive alcohol expectancies and low adaptive coping ability. A moderated-mediation model (i.e., model nine) was run in PROCESS (Hayes, 2017) to statistically examine this prediction. As with Aim 2, the significance of the moderated mediation was tested with nonparametric bootstrapping analyses, and the moderated mediation would be considered significant if the confidence interval for the moderated mediation did not include zero. Conditional indirect effects, presented by PROCESS, were used to determine for which types of individuals (e.g., high positive expectancies, low adaptive coping) implicit coping motives mediated the effect of acute stress on alcohol craving, while controlling for sex and explicit coping motives. Positive expectancies, adaptive coping, and explicit coping motives were grand mean centered to reduce nonessential multicollinearity and improve interpretability. The unstandardized regression coefficients for Aim 3 can be found in Figure 5.

Figure 5

Unstandardized Regression Coefficients for Pathways Involved in Aim 3



Note. Control = 0; Experimental = 1. For clarity, the covariates sex and explicit drinking motives were omitted from the figure but included in analyses.

Conditional Indirect Effects by Positive Alcohol Expectancies

Positive alcohol expectancies was not found to significantly moderate the effect of condition on implicit coping motives, which represented path *a* in the mediation model. That is, the difference in implicit coping motives between acute stress and control conditions was 0.02 points greater for individuals with a one-point increase in positive alcohol expectancies, which was not significant, $t(13) = 1.26$, $p = .231$. Positive alcohol expectancies was also not found to be a significant moderator of the indirect effect of condition on craving through implicit coping motives. The index of partial (i.e., controlling for adaptive coping) moderated mediation for positive alcohol expectancies was -0.02, 95% CI [-0.14, 0.03].

Conditional Indirect Effects by Adaptive Coping

Adaptive coping was also not found to significantly moderate the effect of condition on implicit coping motives, which again represented path *a* in the mediation model. That is, the difference in implicit coping motives between acute stress and control conditions was 0.002 points lower for individuals with a one-point increase in adaptive coping, which was not significant, $t(13) = -0.16$, $p = .876$. Adaptive coping was also not found to be a significant moderator of the indirect effect of condition on craving through implicit coping motives. The index of partial (i.e., controlling for positive alcohol expectancies) moderated mediation for adaptive coping was 0.002, 95% CI [-0.05, 0.06].

Conditional Indirect Effects by Both Moderators

While the indices of partial moderated mediation describe the conditional indirect effects for one moderator while controlling for the other, it is important to consider both moderators at the same time by observing the specific conditional indirect effects. These conditional parameters provide an estimate of the indirect effect at low (i.e., 16th percentile), average (i.e.,

50th percentile), and high (i.e., 84th percentile) levels of each moderator. Conditional indirect effects at the 16th, 50th, and 84th percentiles of each moderator can be found in Table 6.

Table 6

Conditional Indirect Effects by Adaptive Coping and Positive Expectancies

	B	*SE*	95% CI
Low Adaptive Coping			
Low Positive Expectancies	0.04	1.33	-1.14, 1.19
Average Positive Expectancies	-0.07	1.23	-1.23, 0.89
High Positive Expectancies	-0.31	1.56	-2.22, 0.66
Average Adaptive Coping			
Low Positive Expectancies	0.06	0.78	-0.82, 0.96
Average Positive Expectancies	-0.05	0.50	-0.84, 0.44
High Positive Expectancies	-0.29	0.98	-1.80, 0.31
High Adaptive Coping			
Low Positive Expectancies	0.09	1.36	-0.97, 1.48
Average Positive Expectancies	-0.03	1.17	-1.01, 1.00
High Positive Expectancies	-0.26	1.34	-1.76, 0.78

Note. *Low* = 16th percentile, *Average* = 50th percentile, *High* = 84th percentile.

CHAPTER IV

DISCUSSION

The present study was the first, to my knowledge, to experimentally examine the mechanisms and conditions of the impact of acute stress on alcohol craving among a sample of college drinkers. Specifically, it was expected that exposure to an acute stressor would result in a greater level of self-reported alcohol craving (i.e., when compared to a control condition) and that this association would be explained (i.e., mediated) by implicit coping motives. Additionally, this hypothesized pathway from acute stress to implicit coping motives to alcohol craving was predicted to be strongest for individuals who had lower adaptive coping abilities and higher positive alcohol expectancies. That is, adaptive coping and positive expectancies were hypothesized to moderate the indirect effect of acute stress on craving through implicit coping motives.

Aim 1: Acute Stress on Alcohol Craving

The study's first aim was to test the impact of an acute stressor (i.e., versus a stress-neutral control condition) on subsequent alcohol craving while controlling for participants' trait anxiety and biological sex. Theory surrounding stress (Lazarus & Cohen, 1977; Lazarus & Folkman, 1984) and motives for drinking (Cooper, 1994; Cox & Klinger, 1988) supported the hypothesis that the acute stress group would crave alcohol more strongly than the control group. Stress-related theory defines stress as the interaction between an individual and their environment and is often perceived as taxing, overwhelming, or even harmful (Lazarus & Cohen, 1977; Lazarus & Folkman, 1984). Simultaneously, the motivational model of drinking proposes that individuals may drink alcohol to cope with negative emotions, such as those often associated with stress (Cooper, 1994; Cox & Klinger, 1988). Furthermore, previous experimental studies

had demonstrated that stressors could induce alcohol consumption (Brkic et al., 2015; Clay & Parker, 2018; Magrys & Olmstead, 2015) and alcohol cravings (Clay & Parker, 2018; Clay et al., 2018). Based on prior research (Brkic et al., 2015, Clay & Parker, 2018; Clay et al., 2018; Magrys & Olmstead, 2015), the present study predicted that exposure to a stressful task, rather than a neutral task, would result in a greater craving for alcohol while holding the effects of biological sex and trait anxiety constant.

Inconsistent with my hypothesis, the experimental stress condition and the neutral control condition did not significantly differ with regards to their alcohol craving. This finding is also inconsistent with the prior literature, which generally found group differences on alcohol-related outcome measures such as consumption (Brkic et al., 2015; Clay & Parker, 2018; Magrys & Olmstead, 2015) and craving (Clay & Parker, 2018; Clay et al., 2018). Although the current experiment utilized a similar design to those previous studies, the present findings did not find a similar difference in conditions.

This inconsistency may be explained by several factors. Perhaps the most consequential explanation is the current study's notably low power. Although we hoped to recruit at least 120 students, we ultimately ended up with only 21 participants. As such, a post-hoc power analysis revealed that a power of .27 was achieved for the Aim 1 analysis, which was the least-advanced analysis performed. Thus, it is likely that significant effects would not have been found if they existed in the sample because of a major inflation in the probability of a Type II error (i.e., incorrectly retaining a false null hypothesis). Specifically, a power of .27 indicates that if a significant effect truly existed in the sample, my statistical tests would miss this effect approximately 73% (i.e., 1-power) of the time. Considering that Aim 2 and Aim 3 were more advanced analyses, the power for these tests would be even lower. Thus, the results of the current

study, especially null findings, must be interpreted cautiously as the low sample size results in a high probability of making a Type II error.

Even when ignoring the current study's low power, other factors may explain the lack of an observed effect of condition on craving. Though the current study employed a similar experimental design as previous work, using a virtual (i.e., through Zoom) and anticipatory version of the stressor deviated from prior studies and, therefore, may have been less salient of a manipulation. A virtual version (Fallon et al., 2016; Hawn et al., 2015) and an anticipatory version (Bernstein & Wood, 2017; Starcke et al., 2008) of the TSST had independently been shown to be effective in eliciting stress; however, combining those modifications into one could have led to an ineffective stressor. A manipulation check, which tested the effectiveness of the stress task, was not conclusive. There was some evidence that the groups were not significantly different in their post-manipulation state anxiety, which was contrary to the goal of the manipulation. In contrast, other evidence showed that the manipulation had the desired effect on the two conditions such that the control group decreased their state anxiety and the experimental group increased their state anxiety after the manipulation. Thus, it is likely that the manipulation sufficiently did its job and would have proven conclusively effective if the current study were adequately powered. However, because the control group and experimental group did not significantly differ in their post-manipulation state anxiety levels, this could have contributed to the nonsignificant group difference in alcohol craving.

Another reason for the null findings may be related to a discrepancy in drinking levels of the samples. Prior research showing group differences in alcohol craving (Clay & Parker, 2018; Clay et al., 2018) utilized samples that reported higher typical drinking levels than the current study's sample. Consequently, the current study's use of a sample of regular drinkers (i.e., at

least one drink in the past month) may have resulted in the overall sample reporting lower craving than those from previous research (e.g., 1.68 out of 7 in my sample versus 2.56 out of 9 [Clay and Parker, 2018], 4.30 out of 10 [Law et al., 2016], and 2.71 out of 7 [Lindgren, Neighbors et al., 2013] in prior research on craving). Given that alcohol craving correlates strongly with alcohol consumption (Adams et al., 2019; Fatseas et al., 2015; Sloan et al., 2020; Witkiewitz, 2011), the current sample may have generally had a depressed alcohol craving because of their infrequent drinking pattern. That is, the sample may not have been experienced enough as drinkers to crave alcohol at a meaningful level when compared to previous research.

Overall, findings from the current study suggest that a stressor, when administered virtually and in an anticipatory manner, does not elicit an increased craving for alcohol when compared to a stress-neutral condition. This finding was inconsistent with prior theoretical (Cooper, 1994; Cox & Klinger, 1988; Lazarus & Cohen, 1977; Lazarus & Folkman, 1984) and experimental (Clay & Parker, 2018; Clay et al., 2018) literature that had suggested the ability of a stressor to induce alcohol outcomes such as craving. Future research efforts should replicate the present study with a fully-powered sample given my lack of power. If a fully-powered replication also revealed null findings, then researchers may wish to utilize an in-person and experienced stressor procedure as well as a sample of moderate-to-heavy drinkers given that the current study's stressor procedure and sample were potential limitations.

Aim 2: Implicit Drinking to Cope as a Mediator

The second aim of the current study was to test implicit coping motives (i.e., implicit drinking to cope) as a mediator of the association between condition (i.e., control vs. acute stress) and alcohol craving. In addition to theory suggesting an association between stress and drinking outcomes (Cooper, 1994; Cox & Klinger, 1988), prior literature on the utility of implicit

measures of attitudes and beliefs (Oei & Baldwin, 1994; Tiffany, 1990; Widiger & Smith, 1994) guided the prediction that a significant indirect effect would emerge. Prior research that incorporated implicit coping motives into studies of alcohol outcomes generally found that implicit coping motives related to drinking (Hendershot et al., 2011; Lindgren et al., 2011; Lindgren, Foster, et al., 2013; Lindgren, Neighbors, et al., 2013; Salemink et al., 2015). However, there were mixed findings (e.g., Lindgren et al., 2011; Lindgren, Neighbors, et al., 2013) as to whether this association still existed when controlling for explicit coping motives. Additionally, no research to my knowledge had tested implicit coping motives as a mediator until the present study. Extensive research, however, had shown that explicit drinking motives could explain the association between stress and alcohol outcomes (Corbin et al., 2013; Feinstein & Newcomb, 2016; Kaysen et al., 2007; Lindley et al., 2020; Merrill & Thomas, 2013; Rice & Van Arsdale, 2010; Temmen & Crockett, 2019; Wardell et al., 2020). Given these findings and theory's suggestion that measures of implicit attitudes could add incremental value to a model (Oei & Baldwin, 1994; Tiffany, 1990; Widiger & Smith, 1994), it was hypothesized that implicit coping motives would mediate the association between condition (i.e., control vs. acute stress) and alcohol craving.

In contrast with my hypothesis, results indicated that there was no indirect effect of acute stress on alcohol craving through implicit drinking to cope. This finding held true when all covariates (i.e., sex and explicit coping motives) were removed from the model, suggesting that the variance these variables explained could not have accounted for the lack of an indirect effect of implicit coping motives. Although this pathway from acute stress to craving through implicit coping motives had never, to the best of my knowledge, been tested before, the current findings are inconsistent with theory on implicit alcohol-related attitudes (Oei & Baldwin, 1994; Tiffany,

1990; Widiger & Smith, 1994) and the motivational model of drinking (Cooper, 1994; Cox & Klinger, 1988). Specifically, given prior research showing explicit coping motives to mediate the stress-drinking association (e.g., Lindley et al., 2020; Merrill & Thomas, 2013; Temmen & Crockett, 2019; Wardell et al., 2020), it was somewhat surprising that implicit coping motives did not function similarly in the current study.

Again, the current study's lack of power likely played a key role in my null findings, but other contributing limitations may exist. For example, one potential explanation for this finding is that the implicit coping motives mean was negative which indicates that, on average, participants associated alcohol as neutral more strongly than they associated it as a coping mechanism. In fact, no participant scored positive on the IAT for implicit coping motives. Therefore, it can be stated that the overall sample did not associate alcohol with coping. This is inconsistent with Cooper's (1994) assertion that individuals drink to cope with negative emotions, but it does provide an explanation for my null finding. If one does not associate alcohol with coping, then it would be unlikely for the drinking to cope behavior to explain any stress-craving association in that individual. Prior literature on alcohol cognitions has shown a similar phenomenon whereby those with lower coping motives have lower alcohol craving (Field & Quigley, 2009) and attentional bias towards alcohol stimuli (Field & Powell, 2007; Field & Quigley, 2009) after a stressor.

Additionally, given the lack of prior research on implicit coping motives as a mediator, it is possible that implicit coping motives truly does not explain the stress-craving association. In some studies involving implicit drinking to cope, there was a weak association between implicit coping motives and alcohol outcomes (Lindgren, Neighbors, et al., 2013; Salemink et al., 2015) which disappeared entirely when explicit coping motives were controlled for. Thus, it is possible

that drinking to cope only explains the association between stress and drinking when it is explicitly held. If this were the case, related interventions may actually be easier to employ as explicit attitudes are more malleable than implicitly-held attitudes (Rydell et al., 2007).

Summarily, the current study found that implicit coping motives, measured via an IAT, does not mediate the association between acute stress and alcohol craving. Although these results were somewhat inconsistent with theory (Oei & Baldwin, 1994; Tiffany, 1990; Widiger & Smith, 1994) and prior studies (Hendershot et al., 2011; Lindgren et al., 2011; Lindgren, Foster, et al., 2013), the present study serves as the first to investigate this specific pathway. In addition to achieving adequate power, future studies may wish to sample heavier drinkers than the present sample, as more experienced drinkers may be more likely to associate alcohol with coping. Additionally, future research should continue to test implicit coping motives as a mediator of the association between stress and alcohol outcomes, especially those other than alcohol craving.

Aim 3: Adaptive Coping and Positive Alcohol Expectancies as Moderators

Study aim 3 sought to test adaptive coping and positive expectancies of alcohol as moderators of the indirect effect of condition (i.e., control vs. acute stress) on alcohol craving through implicit coping motives. The stressor-vulnerability model (Cooper et al., 1988) postulates that low adaptive coping results in individuals having few healthy alternatives to drinking to cope while high positive expectancies results in individuals believing more strongly in the perceived benefits of alcohol, such as tension-reduction. Additionally, empirical support exists for this model, such as research on the interaction between coping motives and adaptive coping when predicting drinking outcomes (Cooper et al., 1992; Merrill & Thomas, 2013) and on the associations between coping motives and positive expectancies (Hasking et al., 2011; Wilson et al., 2019). However, no studies, to my knowledge, have tested adaptive coping and

positive expectancies simultaneously as moderators of a drinking to cope pathway, especially when considering implicit coping motives as a mediator of the stress-craving association. Rooted in the stressor-vulnerability model (Cooper et al., 1988), it was expected that the indirect effect would be strongest for those with low adaptive coping and high positive expectancies.

Inconsistent with my hypothesis, neither adaptive coping nor positive expectancies significantly moderated the indirect effect of condition (i.e., control vs. acute stress) on alcohol craving through implicit coping motives. Despite the current study being the first to test this model, the results are incongruent with theory on the optimal conditions for drinking to cope (Cooper et al., 1988) and empirical research on the constructs at hand (Cooper et al., 1992; Hasking et al., 2011; Merrill & Thomas, 2013; Wilson et al., 2019).

In addition to my study's underpowered statistical tests, which may not be detecting a significant effect, there are a few potential reasons for the lack of significant findings for this aim. As mentioned before, the overall sample did not associate alcohol with coping, as seen in the globally negative values on the implicit coping measure. Given that moderated mediation (i.e., conditional process analysis) tests an indirect effect at low, average, and high levels of a moderator (Hayes, 2017), it is possible that the sample's low implicit coping motive levels resulted in an insignificant indirect effect regardless of the level of adaptive coping or positive expectancies. Furthermore, the indirect effect of acute stress on alcohol craving may truly not vary as a function of the two moderators. Although the stressor-vulnerability model (Cooper et al., 1988) supported the current study's hypothesis, the lack of empirical studies testing this model results in a dearth of information on the accuracy of Cooper and colleague's theory. As such, it may be that adaptive coping and positive expectancies do not function as moderators of

this implicit drinking to cope pathway. However, because of the extremely low power in the current study, these results are tenuous and should not be interpreted as definitive.

General Discussion

Overall, none of the three current study hypotheses were supported by the results. Specifically, it was found that the administration of an acute stressor did not lead to an increase in alcohol craving when compared to a neutral control condition. That is, there was not a significant difference in alcohol craving between groups after the experimental manipulation. Additionally, implicit coping motives did not mediate the association between acute stress and craving, and there was no direct effect of acute stress on craving when controlling for implicit coping motives. Finally, adaptive coping and positive expectancies did not moderate this indirect effect. That is, regardless of the levels of adaptive coping and positive expectancies, implicit coping motives did not mediate the association between acute stress and craving.

Although the current study found no significant results, my findings contribute to the literature in several ways, particularly regarding methodology. For instance, the implementation of a virtual and anticipatory stressor had never been done before, to the best of my knowledge. Although prior research on in-person and experienced stressors had shown the stressful task to induce increases in alcohol consumption (Brkic et al., 2015; Clay & Parker, 2018; Magrys & Olmstead, 2015) and craving (Clay & Parker, 2018; Clay et al., 2018), my results could not conclusively verify the same effect for a virtual and anticipated stressor, likely due to a lack of power. We used this modified version of the TSST procedure in response to COVID-19 research restrictions. The results of my manipulation check, were the study fully powered, would seem to suggest that the manipulation would have been statistically effective had the sample size been larger. Additionally, the results of my study provided the literature with further information

about the types of drinkers that may be particularly important to sample in the general alcohol literature. By excluding individuals who had ever been diagnosed with an alcohol use disorder, we addressed a limitation in prior research whereby participants may have drunk too heavily for significant group differences to emerge (e.g., Thomas, Randall, et al., 2011). However, my study may have had the opposite problem in that my sample of regular drinkers (i.e., at least one drink in the past month) may have, overall, been too inexperienced with alcohol to associate alcohol with coping. Thus, my results coupled with the limitations of previous research (e.g., Thomas, Randall, et al., 2011) imply that a sample of moderate-to-heavy drinkers may be ideal for research involving alcohol-related cognitions and behaviors. In this way, these drinkers would be experienced enough to have salient attitudes towards alcohol without maintaining static and potentially disordered drinking patterns.

Finally, a conceptual, nonmethodological impact of my study regards implicit coping motives. Despite theory's suggestion that implicit attitudes contribute uniquely to constructs of interest (Oei & Baldwin, 1994; Tiffany, 1990; Widiger & Smith, 1994), my findings may cast doubt on this assertion, at least regarding the utility of implicit coping motives. We found that implicit coping motives may not serve as a mediating factor of the stress-craving association, regardless of level of adaptive coping or positive expectancies. This could potentially contribute to the literature's mixed findings on implicit coping motives (e.g., Lindgren et al., 2011; Lindgren, Neighbors, et al., 2013) and may suggest that implicit drinking to cope does not contribute to one's craving for alcohol beyond that of explicit drinking to cope. However, these conclusions are tentative and further, fully-powered research is needed to understand the utility, or lack thereof, of implicit coping motives.

Limitations

The results of the present study should be interpreted with several limitations in mind. It is likely that the most impactful limitation of my study was the extremely undersized sample. Recruiting research participants was challenging during the COVID-19 pandemic. Previously, all psychology classes required undergraduate participation in research studies while many prerequisite classes also required participation in face-to-face, typically experimental studies. However, due to COVID-19-related research restrictions, the requirement for face-to-face participation was waived. Furthermore, of the 71 individuals who expressed written interest in the study and provided their contact information, only 25 (i.e., 35.21%) responded to emails/texts to schedule their participation and only 21 of those followed through by completing the study. Although Kline's (2015) recommendations for path analysis sample sizes indicated that we needed approximately 120 participants for the current study, we ultimately obtained data from only 21 individuals after no-shows and dropouts were considered. As such, each aim and associated analysis was vastly underpowered. A post-hoc power analysis revealed that a power of .27 was achieved for the Aim 1 analysis (i.e., the simplest analysis conducted), meaning that any significant effects would only be found 27% of the time with my low sample size. Thus, it is likely that significant effects would not have emerged even if they truly existed in the sample. Consequently, the null findings throughout the present study should be considered with caution given my overall lack of power.

Because my study occurred over the COVID-19 global pandemic, there were study limitations due to national and institutional restrictions. For example, institutional research guidelines prevented this study from being conducted face-to-face, leading to an entirely virtual (i.e., via Zoom) experiment. Consequently, the Trier Social Stress Test (TSST) that was used as

the current study's experimental manipulation may not have been as effective as an in-person study would have allowed. Although the original procedure is considered to be the gold standard for stress induction (Dickerson & Kemeny, 2004), the modified version we used was untested and may have resulted in a less effective manipulation. Additionally, the instructions the control group received (i.e., "think about your last vacation"; Starcke et al., 2008) may have possibly been interpreted as either a positive or negative stimulus rather than a truly neutral stimulus, depending on the individual participant's experience. However, it should be noted that there was some evidence that the manipulation was successful (i.e., significant effects while controlling for baseline state anxiety and when examining conditions individually), and a fully-powered sample likely would have resulted in firmer conclusions regarding the effectiveness of the manipulation (i.e., significant differences in post-manipulation state anxiety without controlling for baseline state anxiety). Similarly, because in-person measures of alcohol consumption were not available, we used alcohol craving as my primary dependent variable. Though alcohol craving has been robustly supported as a proximal predictor of alcohol use (Adams et al., 2019; Fatseas et al., 2015; Sloan et al., 2020; Witkiewitz, 2011), it may not have been as influenced by my stressor as actual alcohol consumption might have been. Relatedly, a solely virtual design left my study with only a single indicator of alcohol behavior. The addition of other alcohol use indicators (e.g., ad libitum alcohol consumption, alcohol taste perception, attentional bias towards alcohol) may have resulted in significant findings and would have, at the least, allowed for a more complete observation of participants' momentary alcohol-related attitudes and behaviors. A final potential limitation related to the COVID-19 pandemic exists in that 47.6% of my sample was living with their parents or other relatives at the time of the study. As such, changes in stress or drinking levels due to living arrangements may be present in my sample. For example, White et

al. (2020) found that individuals who transitioned from living with peers to living with parents experienced a significant decrease in their drinking quantity and frequency. Although my study did not assess for changes in living situation, a sizable portion of the sample (i.e., 38.1%) reported that the way they drank alcohol had changed since the onset of the pandemic.

Limitations that are unrelated to COVID-19 also exist for the current study. For example, the sample included emerging adult (i.e., 18-25 years old) college students who were considered regular drinkers (i.e., at least one drink in the past month). As such, findings from this study may not generalize to other populations such as adolescents, non-emerging adults, and heavy or clinically disordered drinkers. Similarly, participants were mostly White (47.6%) or Black (33.3%); thus, findings may not generalize to drinkers from other racial backgrounds. Additionally, the current study did not sample nonstudent drinkers, an underserved population to whom my results may not apply. A final limitation of my study involved the timing of the measures administered. Specifically, the measure of alcohol craving was given to the experimental participants before they were told that they would not actually be giving a speech. Thus, it is possible that participants in the acute stress condition were too mentally preoccupied by the anticipation of the speech that they did not crave alcohol. Similarly, it may be the case that participants evaluated alcohol as something that would interfere with their public speaking ability rather than view it as a coping mechanism. A potentially better design for the current study may have used the Trier Social Stress Test (TSST) in its original format followed by an immediate ad libitum alcohol consumption task. In this way, the stressful task would have ended before participants' alcohol-related outcomes were measured, preventing any performance-related hesitation to drink.

Future Directions

Several recommendations are offered that may inform future research in this area. Perhaps most importantly, replication of the present study with a much larger sample and, thus, much higher power, is necessary to confirm my results. A drastically inflated Type-II error chance (e.g., the power of my simplest analysis was .27) makes all present findings tentative at best as my statistical tests were not powered sufficiently to find significant effects had they existed. Likely as a result, the stressor task employed in the present study did not elicit increased alcohol craving in the experimental group when compared to the control group as was hypothesized. However, the results of manipulation checks suggest that my modified manipulation likely was sufficient and would have been more robust had we obtained a larger sample size. Thus, it is recommended that future researchers continue to investigate the effectiveness of virtual and anticipatory modifications to the TSST. It should be determined if these modifications result in a manipulation that is as ecologically valid and stress-inducing as the original protocol. Additionally, to ensure that participants typically drink enough to experience some level of craving for alcohol, we suggest that future research samples moderate-to-heavy drinkers. Given that my sample of regular drinkers (i.e., at least one drink in the past month) may have drunk too lightly, it may be more appropriate to sample based on typical drinking quantity or binge episode frequency to ensure that experienced drinkers are obtained. Contrary to my hypotheses, the current study did not find implicit coping motives to mediate the association between acute stress and alcohol craving, regardless of level of adaptive coping or positive expectancies. However, because implicit coping motives had been shown to be associated with drinking outcomes (Hendershot et al., 2011; Lindgren et al., 2011; Lindgren, Foster, et al., 2013) and theory suggested its utility in research (Oei & Baldwin, 1994; Tiffany,

1990; Widiger & Smith, 1994), future research should continue to study implicit coping motives in alcohol-related pathways. Specifically, researchers may wish to consider implicit coping motives as a mediator of the association between stress and alcohol outcomes other than craving (e.g., alcohol consumption, alcohol-related consequences). Replication of the current study among heavier drinking samples is also needed. For the current sample, implicit coping motives were very low, such that participants associated alcohol as neutral more strongly than they associated it with coping. Samples of more experienced drinkers may yield greater implicit coping motives and thus, more definitive results.

CHAPTER V

CONCLUSIONS

The present study was the first to experimentally test the mechanisms and conditions of the stress-craving association. Specifically, the study examined the effect of an acute stressor on alcohol craving through implicit coping motives while considering adaptive coping and positive expectancies to be moderators of this indirect effect. Overall, the acute stressor did not elicit higher craving in the experimental group when compared to the control group. Additionally, implicit coping motives were not found to mediate the stress-craving association, regardless of the level of adaptive coping and positive expectancies. Potential study limitations including very low power, a modified stress task, and a light-to-moderate drinker sample may explain some of the null results. As such, future research might benefit from further investigation of my modified stress task, sampling moderate-to-heavy drinkers, and including other indices of alcohol-related cognitions and behaviors as outcomes.

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APPENDIX A

SCREENING SURVEY

1. If applicable, please enter your **Sona ID number.** This is NOT your student ID number. If you do not know your Sona ID number, please click My Profile at the top of the Sona screen. Once you click My Profile, you will be able to see your Sona ID number. You will NOT be issued Sona credit if you do not enter the correct Sona ID number.

If this does not apply to you, leave this question blank. ____

2. What is your current age? ____

3. What is your college major? ____

4. How many hours a week do you spend studying? ____

5. Have you ever been diagnosed with an alcohol use disorder or a social anxiety disorder? ____

Yes ____ No

6. In the past month, have you had one or more standard alcoholic drinks on at least one occasion? ____ Yes ____ No

<u>If screen passed:</u>

7. Thank you for completing this brief questionnaire. According to your responses, you are **ELIGIBLE** to participate in the current study. If you choose to participate, you will be required to attend a one-hour Zoom session on a day of your choosing. This session, in which you will be guided by a researcher, will include more questionnaires and a computer-based task.

If you would like to participate further, please select **YES** below.

Would you like to participate further? ____ Yes ____ No

<u>If yes:</u>

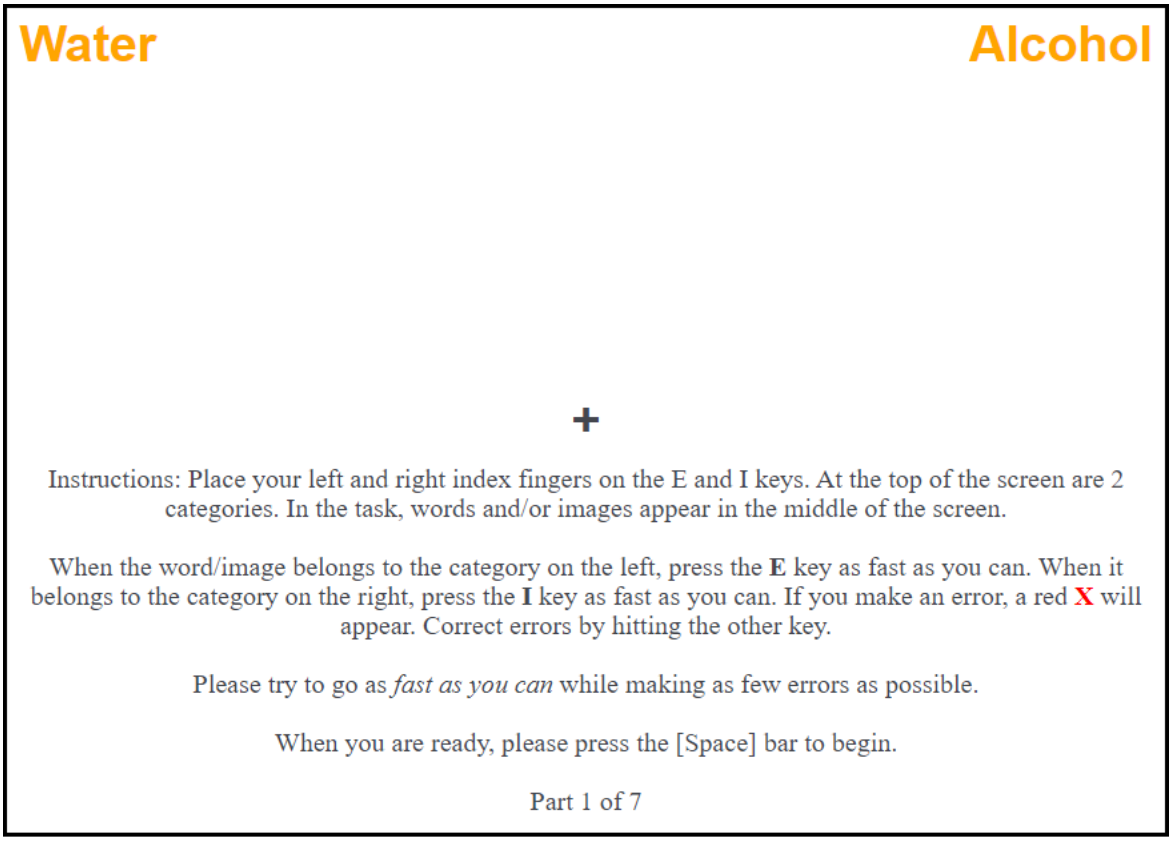
8. In order for a researcher to contact you for scheduling a timeslot, please provide your **email address** AND **phone number** (for text message reminders) below.

Email address: _____

Phone number: _____

APPENDIX B

IMPLICIT COPING MOTIVES



Note. This is an example of the instructions that participants will receive at the beginning of the IAT.

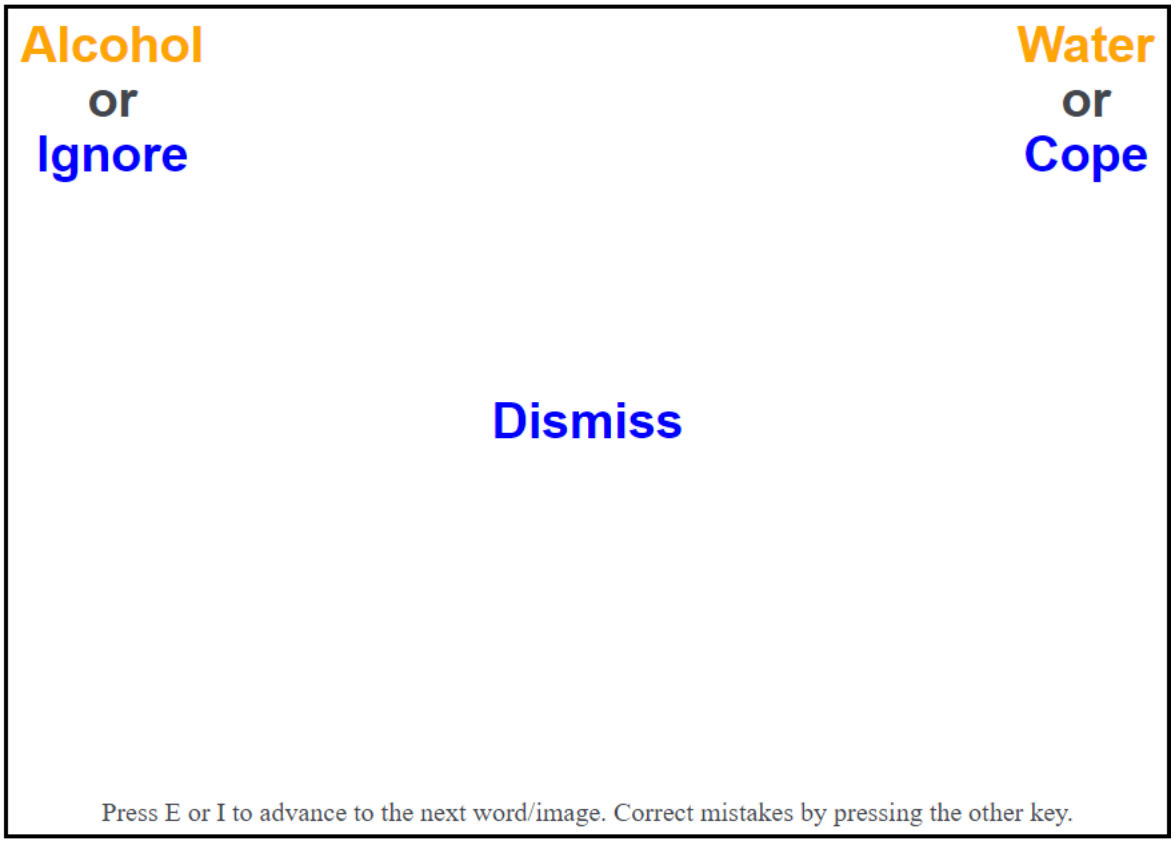
APPENDIX B (CONTINUED)

IMPLICIT COPING MOTIVES

Note. This is an example of a critical stage (i.e., to be used in scoring). Notice that participants should sort an image or a word to the correct target categories. Here, participants should press the "I" key to sort the image of alcohol to the category on the right – "Alcohol or Cope."

APPENDIX B (CONTINUED)

IMPLICIT COPING MOTIVES



Note. This is an example of a second critical stage (i.e., to be used in scoring). Again, participants should sort an image or a word to the correct target categories. Here, participants should press the "E" key to sort the word "dismiss" to the category on the left – "Alcohol or Ignore." Notice in the second critical stage how "alcohol" is now paired with "ignore," instead of being paired with "cope" as in the first critical stage.

APPENDIX B (CONTINUED)

IMPLICIT COPING MOTIVES

idid	ResponseID	dscore
3	R_11Y3JSlx57eo4BZ	0.828952421924052
4	R_UZ5ooLMGCmZVgml	-0.7128650934034
5	R_ywiK5gxYOTnol7r	-0.985495210098873
6	R_30nH3OlR3kGTTc9	0.576568660212831

Note. This is an example of the scoring output from the IAT. A positive D-score indicates a stronger association between alcohol and coping while a negative D-score indicates a stronger association between water and coping.

APPENDIX C

DECEPTION ASSESSMENT

What do you believe the tasks you are completing today are about? (If one or more of the following does not apply to you, please enter "N/A" for that item.)

Questionnaires: _____

Computer task: _____

Speech: _____

Last vacation: _____

For experimental group only:

1. To what extent did you believe that you would actually have to give a 10-minute speech to professors?

____ I did not believe it whatsoever. (1) ____ (2) ____ (3) ____ (4) ____ (5) ____ (6) ____ I completely believed it. (7)

APPENDIX D

SHORT DEBRIEFING HANDOUT

This study is focused on acute stress, alcohol-related cognitions, coping, and alcohol craving among college students. In this study, you participated in an implicit association test (the computer-based activity), which measured your automatic associations of alcohol.

This study was advertised as having to do with outgoingness. That is, the true focus of the study, acute stress, was not mentioned in the recruitment advertisement, the informed consent document, or in conversation with the researcher. Additionally, this study was advertised and described to you as being titled "Project Outgoing." This deception was necessary so to not have your knowledge of a potential stressor influence the way you answered the questionnaires. Any knowledge of a stress-drinking relationship may have caused you to knowingly or unknowingly answer in a particular way on the surveys. Additionally, because some participants were assigned to a stress condition and some were assigned to a control condition, deception was necessary to ensure that you would not know which group you were in. If you have concerns or questions about this deception, please contact Douglas Glenn, B.A., at dglen002@odu.edu.

Findings from this study will further our understanding of college students' reactions to stress – particularly in the context of their alcohol use.

All the data we collected today will be kept confidential. We are not interested in any one individual's data; instead, we are concerned with general patterns that emerged when many participants' data are combined.

We ask that you do not discuss this study with any other individuals. To maintain the integrity and accuracy of the research, it is vital that participants are not aware of the study's true purpose prior to joining the study.

If your participation in the current study has caused you concerns, anxiety, or distress, you may wish to contact the ODU Counseling Center at (757) 683-4401.

If you have questions about your participation or the current study generally, please email Douglas Glenn, B.A., at dglen002@odu.edu.

Thank you again for your participation!

APPENDIX E

DEMOGRAPHICS

1. Where did you hear about this study? ____ Sona ____ University Announcements

2. If applicable, please enter your **Sona ID number.** This is NOT your student ID number. If you do not know your Sona ID number, please click My Profile at the top of the Sona screen. Once you click My Profile, you will be able to see your Sona ID number. You will NOT be issued Sona credit if you do not enter the correct Sona ID number. _____

3. What is your current age? ____

4. What is your biological sex? ____ Male ____ Female

5. What is your identified gender? ____ Male ____ Female ____ Other

6. Are you of Hispanic or Latinx descent (e.g., Cuban, Mexican, Puerto Rican, South or Central American, or other Spanish culture)? ____ Yes ____ No

7. What is your race? ____ Caucasian ____ African American ____ Hispanic/Latinx ____ Asian/Pacific Islander ____ Native American/Indian ____ Other

8. What is your class standing? ____ Freshman ____ Sophomore ____ Junior ____ Senior ____ Graduate

9. What is your height? ____ Feet ____ Inches

10. What is your weight? ____ Pounds

11. Where is your current residence? ____ a parent or relative's home ____ on-campus housing (e.g., dorm, apartment, residence hall) ____ off-campus housing (e.g., house, apartment, room not affiliated with the university) ____ a fraternity or sorority house

12. Are you currently a member of a fraternity or sorority on campus? ____ Yes ____ No

13. What is your relationship status? ____ Single/never married ____ Living with partner ____ Married ____ Separated/Divorced ____ Widowed

14. Are you employed now? ____ Yes, part-time only ____ Yes, full-time only ____ Yes, part- and full-time ____ No

15. In the past month, how many standard drinks have you had? ____

16. In the past two weeks, how many times did you have 4 or more (if female)/5 or more (if male) standard alcoholic drinks in a single sitting? ____

17. Have you ever been diagnosed with an alcohol use disorder or a social anxiety disorder? ____ Yes ____ No

18. Have you used alcohol today? ____ Yes ____ No

19. Have you used marijuana today? ____ Yes ____ No

20. Have you used another substance other than alcohol or marijuana today? ____ Yes ____ No

21. Create (and **remember**) an ID number using your birth month, birth date, and the last four digits of your cell phone number (e.g., if someone were born on January 2nd with the last four digits of 1234, their ID number would be 01021234). ____

APPENDIX F

POSITIVE ALCOHOL EXPECTANCIES

The following section assesses what you would expect to happen if you were under the influence of alcohol.

Check from disagree to agree – depending on whether you expect the effect to happen to you if you were under the influence of alcohol. These effects will vary, depending upon the amount of alcohol you typically consume.

This is not a personality assessment. We want to know what you expect to happen if you were to drink alcohol, not how you are when you are sober. Example: If you are always emotional, you would not check agree as your answer unless you expected to become MORE EMOTIONAL if you drank.

If I were under the influence from alcohol:

	Disagree	**Slightly disagree**	**Slightly agree**	**Agree**
1. I would be outgoing *	1	2	3	4
2. My senses would be dulled	1	2	3	4
3. I would be humorous *	1	2	3	4
4. My problems would seem worse	1	2	3	4
5. It would be easier to express my feelings *	1	2	3	4
6. My writing would be impaired	1	2	3	4
7. I would feel sexy *	1	2	3	4
8. I would have difficulty thinking	1	2	3	4
9. I would neglect my obligations	1	2	3	4
10. I would feel dominant	1	2	3	4
11. My head would feel fuzzy	1	2	3	4

12. I would enjoy sex more *	1	2	3	4
13. I would feel dizzy	1	2	3	4
14. I would be friendly *	1	2	3	4
15. I would be clumsy	1	2	3	4
16. It would be easier to act out my fantasies *	1	2	3	4
17. I would be loud, boisterous, or noisy	1	2	3	4
18. I would feel peaceful *	1	2	3	4
19. I would be brave and daring *	1	2	3	4
20. I would feel unafraid *	1	2	3	4
21. I would feel creative *	1	2	3	4
22. I would be courageous *	1	2	3	4
23. I would feel shaky or jittery the next day	1	2	3	4
24. I would feel energetic *	1	2	3	4
25. I would act aggressively	1	2	3	4
26. My responses would be slow	1	2	3	4
27. My body will be relaxed *	1	2	3	4
28. I would feel guilty	1	2	3	4
29. I would feel calm *	1	2	3	4
30. I would feel moody	1	2	3	4
31. It would be easier to talk to people *	1	2	3	4

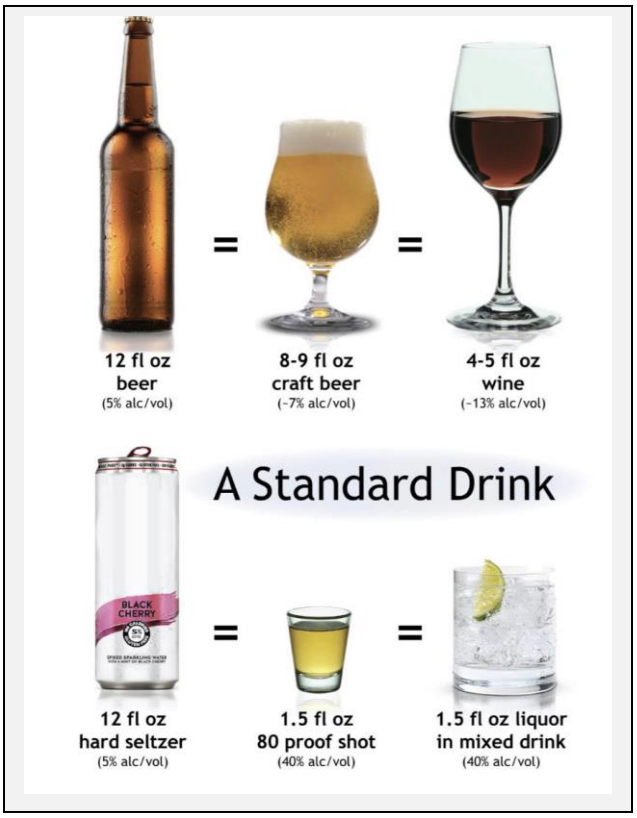
32. I would be a better lover *	1	2	3	4
33. I would feel self-critical	1	2	3	4
34. I would be talkative *	1	2	3	4
35. I would act tough	1	2	3	4
36. I would take risks	1	2	3	4
37. I would feel powerful *	1	2	3	4
38. I would act sociable *	1	2	3	4

Note. The items used in the current study are indicated by an asterisk (*).

APPENDIX G

ALCOHOL USE

The following questions have to do with alcohol use. For these questions, please choose the answer that best describes your drinking in the **past month**.



Please think about your typical drinking over the **PAST MONTH**. On a typical day, how many drinks would you have? That is, how many drinks would you typically have on each day in the past three months?

Over the PAST MONTH, on a….

	TYPICAL MONDAY	TYPICAL TUESDAY	TYPICAL WEDNESDAY	TYPICAL THURSDAY	TYPICAL FRIDAY	TYPICAL SATURDAY	TYPICAL SUNDAY
NUMBER OF DRINKS							

APPENDIX H

COVID-RELATED DRINKING

The following questions relate to how your drinking may have changed as a result of the COVID-19 pandemic.

1. Compared to before the pandemic, would you say you are drinking…
   - ☐ More OFTEN
   - ☐ Less OFTEN
   - ☐ About the same

2. Compared to before the pandemic, when you drink, would you say your quantity (number of drinks) is…
   - ☐ More than usual
   - ☐ Less than usual
   - ☐ About the same

3. Are you going to bars and restaurants for in-person dining/drinking?
   - ☐ No, I'm not interested even if I felt it was safe
   - ☐ No, that seems unsafe given the number of coronavirus cases in the area
   - ☐ Yes, it seems safe to do so given the number of coronavirus cases in the area
   - ☐ Yes, I would be doing this regardless of the number of coronavirus cases in the area

4. Are you drinking with others IN PERSON?
   - ☐ Yes
   - ☐ No

5. Is drinking with others in person a typical occurrence or for special occasions only?
   - ☐ Typical
   - ☐ Special occasions only

6. Has the WAY you drink alcohol (for example, in bars with friends, in other people's houses/apartments, in your own home with others, in your own home alone) changed since the pandemic started in March?
   - ☐ Yes
   - ☐ No

APPENDIX I

EXPLICIT COPING MOTIVES

Instructions: The following is a list of reasons that some people give for drinking alcohol. Thinking of all the times you drink, how often would you say that you drink for each of the following reasons?

	Almost never/never	Some of the time	Half of the time	Most of the time	All of the time
1. To forget your worries. *	1	2	3	4	5
2. Because your friends pressure you to drink.	1	2	3	4	5
3. Because it helps you to enjoy a party.	1	2	3	4	5
4. Because it helps you when you feel depressed or nervous. *	1	2	3	4	5
5. To be sociable.	1	2	3	4	5
6. To cheer up when you are in a bad mood. *	1	2	3	4	5
7. Because you like the feeling.	1	2	3	4	5
8. So that others won't kid you about not drinking.	1	2	3	4	5
9. Because it's exciting.	1	2	3	4	5
10. To get high.	1	2	3	4	5
11. Because it makes social gatherings more fun.	1	2	3	4	5
12. To fit in with a group you like.	1	2	3	4	5
13. Because it gives you a pleasant feeling.	1	2	3	4	5
14. Because it improves parties and celebrations.	1	2	3	4	5
15. Because you feel more self-confident and sure of yourself. *	1	2	3	4	5
16. To celebrate special occasions with friends.	1	2	3	4	5
17. To forget about your problems. *	1	2	3	4	5
18. Because it's fun.	1	2	3	4	5
19. To be liked.	1	2	3	4	5
20. So you won't feel left out.	1	2	3	4	5

Note. The items used in the current study are indicated by an asterisk (*).

APPENDIX J

ADAPTIVE COPING

We are interested in how people respond when they confront difficult or stressful events in their lives. There are lots of ways to try to deal with stress. This questionnaire asks you to indicate what you generally do and feel, when you experience stressful events. Obviously, different events bring out somewhat different responses, but think about what you usually do when you are under a lot of stress.

Then respond to each of the following items by choosing one number for each, using the response choices listed just below. Please try to respond to each item separately in your mind from each other item. Choose your answers thoughtfully, and make your answers as true FOR YOU as you can. Please answer every item. There are no "right" or "wrong" answers, so choose the most accurate answer for YOU--not what you think "most people" would say or do. Indicate what YOU usually do when YOU experience a stressful event.

1 = I usually don't do this at all
2 = I usually do this a little bit
3 = I usually do this a medium amount
4 = I usually do this a lot

	1	**2**	**3**	**4**
1. I try to grow as a person as a result of the experience. *	1	2	3	4
2. I turn to work or other substitute activities to take my mind off things.	1	2	3	4
3. I get upset and let my emotions out. *	1	2	3	4
4. I try to get advice from someone about what to do. *	1	2	3	4
5. I concentrate my efforts on doing something about it. *	1	2	3	4
6. I say to myself "this isn't real."	1	2	3	4
7. I put my trust in God. *	1	2	3	4
8. I laugh about the situation. *	1	2	3	4
9. I admit to myself that I can't deal with it, and quit trying.	1	2	3	4
10. I restrain myself from doing anything too quickly. *	1	2	3	4
11. I discuss my feelings with someone. *	1	2	3	4
12. I use alcohol or drugs to make myself feel better.	1	2	3	4
13. I get used to the idea that it happened. *	1	2	3	4
14. I talk to someone to find out more about the situation. *	1	2	3	4

15. I keep myself from getting distracted by other thoughts or activities. *	1	2	3	4
16. I daydream about things other than this.	1	2	3	4
17. I get upset, and am really aware of it. *	1	2	3	4
18. I seek God's help. *	1	2	3	4
19. I make a plan of action. *	1	2	3	4
20. I make jokes about it. *	1	2	3	4
21. I accept that this has happened and that it can't be changed. *	1	2	3	4
22. I hold off doing anything about it until the situation permits. *	1	2	3	4
23. I try to get emotional support from friends or relatives. *	1	2	3	4
24. I just give up trying to reach my goal.	1	2	3	4
25. I take additional action to try to get rid of the problem. *	1	2	3	4
26. I try to lose myself for a while by drinking alcohol or taking drugs.	1	2	3	4
27. I refuse to believe that it has happened.	1	2	3	4
28. I let my feelings out. *	1	2	3	4
29. I try to see it in a different light, to make it seem more positive. *	1	2	3	4
30. I talk to someone who could do something concrete about the problem. *	1	2	3	4
31. I sleep more than usual.	1	2	3	4
32. I try to come up with a strategy about what to do. *	1	2	3	4
33. I focus on dealing with this problem, and if necessary let other things slide a little. *	1	2	3	4
34. I get sympathy and understanding from someone. *	1	2	3	4
35. I drink alcohol or take drugs, in order to think about it less.	1	2	3	4
36. I kid around about it. *	1	2	3	4
37. I give up the attempt to get what I want.	1	2	3	4
38. I look for something good in what is happening. *	1	2	3	4
39. I think about how I might best handle the problem. *	1	2	3	4
40. I pretend that it hasn't really happened.	1	2	3	4
41. I make sure not to make matters worse by acting too soon. *	1	2	3	4

42. I try hard to prevent other things from interfering with my efforts at dealing with this. *	1	2	3	4
43. I go to movies or watch TV, to think about it less.	1	2	3	4
44. I accept the reality of the fact that it happened. *	1	2	3	4
45. I ask people who have had similar experiences what they did. *	1	2	3	4
46. I feel a lot of emotional distress and I find myself expressing those feelings a lot. *	1	2	3	4
47. I take direct action to get around the problem. *	1	2	3	4
48. I try to find comfort in my religion. *	1	2	3	4
49. I force myself to wait for the right time to do something. *	1	2	3	4
50. I make fun of the situation. *	1	2	3	4
51. I reduce the amount of effort I'm putting into solving the problem.	1	2	3	4
52. I talk to someone about how I feel. *	1	2	3	4
53. I use alcohol or drugs to help me get through it.	1	2	3	4
54. I learn to live with it. *	1	2	3	4
55. I put aside other activities in order to concentrate on this. *	1	2	3	4
56. I think hard about what steps to take. *	1	2	3	4
57. I act as though it hasn't even happened.	1	2	3	4
58. I do what has to be done, one step at a time. *	1	2	3	4
59. I learn something from the experience. *	1	2	3	4
60. I pray more than usual. *	1	2	3	4

Note. The items used in the current study are indicated by an asterisk (*).

APPENDIX K

STATE AND TRAIT ANXIETY

Trait Anxiety

DIRECTIONS: A number of statements which people have used to describe themselves are given below. Read each statement and then circle the appropriate number to the right of the statement to indicate how you *generally* feel.

	Almost never	**Sometimes**	**Often**	**Almost always**
1. I feel pleasant	1	2	3	4
2. I feel nervous and restless	1	2	3	4
3. I feel satisfied with myself	1	2	3	4
4. I wish I could be as happy as others seem to be	1	2	3	4
5. I feel like a failure	1	2	3	4
6. I feel rested	1	2	3	4
7. I am “calm, cool, and collected”	1	2	3	4
8. I feel that difficulties are piling up so that I cannot overcome them	1	2	3	4
9. I worry too much over something that really doesn’t matter	1	2	3	4
10. I am happy	1	2	3	4
11. I have disturbing thoughts	1	2	3	4
12. I lack self-confidence	1	2	3	4
13. I feel secure	1	2	3	4
14. I make decisions easily	1	2	3	4
15. I feel inadequate	1	2	3	4
16. I am content	1	2	3	4
17. Some unimportant thought runs through my mind and bothers me	1	2	3	4
18. I take disappointments so keenly that I can’t put them out of my mind	1	2	3	4
19. I am a steady person	1	2	3	4
20. I get in a state of tension or turmoil as I think over my recent concerns and interests	1	2	3	4

State Anxiety

DIRECTIONS: A number of statements which people have used to describe themselves are given below. Read each statement and then identify the appropriate number to the right of the statement to indicate how you feel *right* now, that is, *at this moment*. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe your present feelings best.

	Not at all	**Somewhat**	**Moderately so**	**Very much so**
1. I feel calm	1	2	3	4
2. I feel secure	1	2	3	4
3. I am tense	1	2	3	4
4. I feel strained	1	2	3	4
5. I feel at ease	1	2	3	4
6. I feel upset	1	2	3	4
7. I am presently worrying over possible misfortunes	1	2	3	4
8. I feel satisfied	1	2	3	4
9. I feel frightened	1	2	3	4
10. I feel comfortable	1	2	3	4
11. I feel self-confident	1	2	3	4
12. I feel nervous	1	2	3	4
13. I am jittery	1	2	3	4
14. I feel indecisive	1	2	3	4
15. I am relaxed	1	2	3	4
16. I feel content	1	2	3	4
17. I am worried	1	2	3	4
18. I feel confused	1	2	3	4
19. I feel steady	1	2	3	4
20. I feel pleasant	1	2	3	4

APPENDIX L

ALCOHOL CRAVING

INSTRUCTIONS: Listed below are questions that ask about your feelings about drinking. The words "drinking" and "have a drink" refer to having a drink containing alcohol, such as beer, wine, or liquor. Please indicate how much you agree or disagree with each of the following statements. The closer you place your mark to one end or the other indicates the strength of your disagreement or agreement. Please complete every item. **We are interested in how you are thinking or feeling <u>right now</u> as you are filling out the questionnaire**.

RIGHT NOW

	Strongly Disagree (1)	**2**	**3**	**4**	**5**	**6**	**Strongly Agree (7)**
1. All I want to do now is have a drink.	1	2	3	4	5	6	7
2. I do not need to have a drink now.	1	2	3	4	5	6	7
3. It would be difficult to turn down a drink this minute.	1	2	3	4	5	6	7
4. Having a drink now would make things seem just perfect.	1	2	3	4	5	6	7
5. I was a drink so bad I can almost taste it.	1	2	3	4	5	6	7
6. Nothing would be better than having a drink right now.	1	2	3	4	5	6	7
7. If I had the chance to have a drink, I don't think I would drink it.	1	2	3	4	5	6	7
8. I crave a drink right now.	1	2	3	4	5	6	7

APPENDIX M

STUDY SCRIPT

Control Group Script

Introduction

"*Hi, my name is _____, and I will be coordinating your participation in today's study. There is also a tech person on the call right now, but you may or may not be able to see them. Although they are on our call, they are not here to participate in the session. I first want to thank you for your willingness to participate. As a housekeeping thing, I want to let you know that should we get disconnected from Zoom, I will email you immediately to try to reconnect with you, okay? To ensure that everybody has the same understanding of the study, I am going to read some information to you. It is anticipated that today's session will last one hour. Your responsibilities today include answering some questionnaires and completing a computer task. At the end of the session, you will complete a survey asking for your email, and this will enter you in the raffle for one of 10 $20 Amazon gift cards. Once all students have completed the study, the raffle will be conducted, and winners will be notified via email. If you were recruited from Sona, you will also receive 1.5 Sona credits within the next two weeks. If you have any questions throughout the study, please do not hesitate to ask. I will now send you a link to your first survey, and this survey will take approximately 30 minutes.*

[send "Baseline" survey]

Baseline Survey

https://odu.co1.qualtrics.com/jfe/form/SV_0HYWNlV3tw7rVIh

The first page will be your informed consent document, which describes the study further and makes you aware of your rights as a participant. By clicking "Next" on this page, you are providing consent to participate in today's study. However, you may withdraw your consent at any time without penalty. Should you choose to click "next" and provide your consent, the survey will begin. Let me know if you have questions about the informed consent or anything else. And we ask you to not close any surveys unless we instruct you to do so, okay? You can read the informed consent and begin the surveys, and again, please ask if you have any questions about the informed consent."

Baseline Questionnaires

[about 30 minutes should pass]

[participant should hit a stop sign]

Experimental Manipulation

Control group: "*Click the next arrow, and the survey should end. You can close out of this survey if you see a screen that says 'your response has been recorded.'*

Now I want you to spend the next few minutes thinking about your last vacation while I get the next task set up. This is just to give you a brief break from the surveys."

[Continue after 5 minutes have passed from the time you began reading the correct manipulation passage]

Manipulation Check

"*Your next task is a computer-based activity, but first you will answer a short questionnaire. This short survey is just a way for us to make sure all the participants are safe throughout the study. It should only take a few minutes – just let me know once you finish it. Please do not exit out of this survey until I tell you to do so. You will see some stop signs occasionally – these just mean to pause and let me know that you've reached a stop sign. These do not mean that you should exit out of the survey.*"

[send "IAT+" survey]

Survey 2

https://odu.co1.qualtrics.com/jfe/form/SV_2sHAl3eWrK3anvT

[participant should hit a stop sign]

IAT and Craving Assessment

"*Now you will complete a computer-based activity. The instructions for the activity will be provided to you in the survey, so be sure to read them carefully. Please ask any questions you may have before starting this task. I do not want to interrupt you during the task. Let me know once you finish both the computer activity and the short questionnaire afterward. Please continue with the survey.*"

[participant should hit a stop sign]

Deception Assessment

"*Okay, you're doing awesome so far! Now you will answer a few questions about your experience in the study so far. Continue on.*"

[participant should hit a stop sign]

Short Debriefing Form

Control group: "*The study is over, and your participation is complete. There are no more tasks for you, so I will now provide you more information about the study. Then, you will be free to go! Click the next arrow. Read this document carefully. Once you have finished reading this document and all of your questions have been answered, click the next arrow, and the survey should end. You can close out of this survey once you see a screen that says 'your response has been recorded.'*"

Raffle Entry

"*Before you go, I want to confirm that you'd like to enter the raffle for a chance to win a $20 Amazon gift card. If so, I am going to send one last survey link. This survey will just ask you for the email address that you would like to be notified at if you win a gift card.*"

[send "Raffle" survey]

Final Survey

https://odu.co1.qualtrics.com/jfe/form/SV_d4PJXDKizliXrls

Experimental Group Script

Introduction

"*Hi, my name is _____, and I will be coordinating your participation in today's study. There is also a tech person on the call right now, but you may or may not be able to see them. Although they are on our call, they are not here to participate in the session. I first want to thank you for your willingness to participate. As a housekeeping thing, I want to let you know that should we get disconnected from Zoom, I will email you immediately to try to reconnect with you, okay? To ensure that everybody has the same understanding of the study, I am going to read some information to you. It is anticipated that today's session will last one hour. Your responsibilities today include answering some questionnaires and completing a computer task. At the end of the session, you will complete a survey asking for your email, and this will enter you in the raffle for one of 10 $20 Amazon gift cards. Once all students have completed the study, the raffle will be conducted, and winners will be notified via email. If you were recruited from Sona, you will also receive 1.5 Sona credits within the next two weeks. If you have any questions throughout the study, please do not hesitate to ask. I will now send you a link to your first survey, and this survey will take approximately 30 minutes.*

[send "Baseline" survey]

Baseline Survey

https://odu.co1.qualtrics.com/jfe/form/SV_0HYWNlV3tw7rVIh

The first page will be your informed consent document, which describes the study further and makes you aware of your rights as a participant. By clicking "Next" on this page, you are providing consent to participate in today's study. However, you may withdraw your consent at any time without penalty. Should you choose to click "next" and provide your consent, the survey will begin. Let me know if you have questions about the informed consent or anything else. And we ask you to not close any surveys unless we instruct you to do so, okay? You can read the informed consent and begin the surveys, and again, please ask if you have any questions about the informed consent."

Baseline Questionnaires

[about 30 minutes should pass]

[participant should hit a stop sign]

Experimental Manipulation

Experimental group: "*Click the next arrow, and the survey should end. You can close out of this survey if you see a screen that says 'your response has been recorded.'*

Now, I am going to give you instructions for a task that will happen at the end of today's session. After completing the computer task and your final questionnaire, you will be given five minutes to prepare a 10-minute speech on why you are qualified for your dream job. You will present this speech to three psychology professors from a different local university who will be critiquing your speech. It is important that you use all 10 minutes for your speech and try your best to impress the professors. Your speech will be recorded so that the professors can review and critique it later if needed. Much more detailed instructions will be provided as we get closer to that portion. If you have questions or concerns, we can talk more about that later, but we will move on for now. Give me a few minutes while I get the next task set up. If you'd like, you may use this time to get a head start on preparing any notes for the speech."

[Continue after 5 minutes have passed from the time you began reading the correct manipulation passage]

Manipulation Check

"*Okay, I am ready to move on for now. We will revisit that task in just a few minutes. Your next task is a computer-based activity, but first you will answer a short questionnaire. This short survey is just a way for us to make sure all the participants are safe throughout the study. It should only take a few minutes – just let me know once you finish it. Please do not exit out of this survey until I tell you to do so. You will see some stop signs occasionally – these just mean to pause and let me know that you've reached a stop sign. These do not mean that you should exit out of the survey.*"

[send "IAT+" survey]

Survey 2

https://odu.co1.qualtrics.com/jfe/form/SV_2sHAl3eWrK3anvT

[participant should hit a stop sign]

IAT and Craving Assessment

"*Now you will complete a computer-based activity. The instructions for the activity will be provided to you in the survey, so be sure to read them carefully. Please ask any questions you may have before starting this task. I do not want to interrupt you during the task. Let me know once you finish both the computer activity and the short questionnaire afterward. Please continue with the survey.*"

[participant should hit a stop sign]

Deception Assessment

"*Okay, you're doing awesome so far! Now, you will answer a few questions about your experience in the study up to this point. Continue on.*"

[participant should hit a stop sign]

Experimental Group Deception

Experimental group ONLY: "*You will not actually be presenting a speech to any professors. However, there is one more question for you to answer. I will paste a link to this question in the chat. However, please do not exit out of the other survey. Remember to enter your unique ID number."*

[send "Experimental Extra Link" survey]

Survey 3

https://odu.co1.qualtrics.com/jfe/form/SV_2rfgTSjAyF2LbAq

Short Debriefing Form

Experimental group: "*You can close out of this survey if you see a screen that says 'your response has been recorded.'*

Please go back to the original survey you had open. The study is over, and your participation is complete. There are no more tasks for you which means that you will not actually have to give a presentation to three professors. I will provide you some information about the study, and then, you will be free to go! Click the next arrow. Read this document carefully. Once you have finished reading this document and all of your questions have been answered, click the next arrow, and the survey should end. You can close out of this survey once you see a screen that says 'your response has been recorded.'"

Raffle Entry

"*Before you go, I want to confirm that you'd like to enter the raffle for a chance to win a $20 Amazon gift card. If so, I am going to send one last survey link. This survey will just ask you for the email address that you would like to be notified at if you win a gift card.*"

[send "Raffle" survey]

Final Survey

https://odu.co1.qualtrics.com/jfe/form/SV_d4PJXDKizliXrls

APPENDIX N

FULL DEBRIEFING HANDOUT

The current study is focused on the effect of acute stress, alcohol-related cognitions, and coping strategies on alcohol craving in college students. Prior research has indicated that acute stress can lead to subsequent drinking behaviors, especially for those with maladaptive coping skills. When under stress, one's coping skills and alcohol behaviors may be affected.

How was this tested?

In this study, you may have been told that you would be completing a stressful public speaking task. Additionally, you completed an implicit association test to measure your automatic associations of alcohol and answered questions about your alcohol-related cognitions, coping strategies, and alcohol craving. All participants performed the same tasks, although one group was told to expect a stressful final task while the other was told to think of something neutral.

Hypotheses:

We expect to find that exposure to acute stress will increase one's motivation to drink to cope and thus increase one's desire to drink. We also expected this to be stronger in individuals who use less adaptive coping strategies and who believe strongly in alcohol's positive properties.

Why is this important to study?

Findings from the current study will further our understanding of the development of and context surrounding risky alcohol use. By understanding the triggers of risky alcohol behaviors, we can help individuals identify why they engage in risky drinking and make their drinking habits safer.

Why was I told that this study was about outgoingness, not stress?

This deception (e.g., using the title "Project Outgoing") was necessary so to not have your knowledge of a potential stressor influence the way you answered the questionnaires. Any knowledge of a stress-drinking relationship may have caused you to knowingly or unknowingly answer in a particular way on the surveys. Additionally, because some participants were assigned to a stress condition and some were assigned to a control condition, deception was necessary to ensure that you would not know which group you were in. If you have concerns or questions about this deception, please contact Douglas Glenn, B.A., at dglen002@odu.edu.

What if I want to know more?

If you are interested in learning more about how acute stress may influence drinking, you may wish to explore the following:

1) Clay, J. M., & Parker, M. O. (2018). The role of stress-reactivity, stress-recovery and risky decision-making in psychosocial stress-induced alcohol consumption in social drinkers. *Psychopharmacology*, *235*(11), 3243-3257. https://doi.org/10.1007/s00213-018-5027-0

2) Grzywacz, J. G., & Almeida, D. M. (2008). Stress and binge drinking: A daily process examination of stressor pile-up and socioeconomic status in affect regulation. *International Journal of Stress Management*, *15*(4), 364. https://doi.org/10.1037/a0013368

All the data collected for this study will be kept confidential and will be investigated by looking at general patterns rather than any one individual's responses.

If your participation in the current study has caused you concerns, anxiety, or distress, you may wish to contact the ODU Counseling Center at (757) 683-4401. If you have further questions about your participation or the current study generally, please email Douglas Glenn, B.A., at dglen002@odu.edu. Thank you again for your participation!

VITA

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EDUCATION

Ph.D.	The Virginia Consortium Program in Clinical Psychology	Expected 2025
M.S.	Old Dominion University	Expected 2021
B.A.	Auburn University, Psychology *Summa Cum Laude*	December 2018

BACKGROUND

Douglas J. Glenn is a third-year graduate student in the Virginia Consortium Program in Clinical Psychology. He is currently pursuing his M.S. in Psychology and, in Spring 2022, his Ph.D. in Clinical Psychology. His research interests involve simultaneous substance use and using experimental designs to study the factors that impact individuals who drink as a way to cope with negative emotions.

SELECTED PUBLICATIONS

Lewis, R. J., Romano, K. A., Ehlke, S. J., Lau-Barraco, C., Sandoval, C. M., **Glenn, D. J.**, & Heron, K. E. (in press). Minority stress and alcohol use in sexual minority women's daily lives. *Experimental and Clinical Psychopharmacology*.

Lau-Barraco, C., Braitman, A. L., Junkin, E., **Glenn, D. J.**, & Stamates, A. L. (in press). Social network moderators of brief alcohol intervention impact. *Psychology of Addictive Behaviors*.

Lau-Barraco, C., Stamates, A. L., Ehlke, S., & **Glenn, D. J.** (2021). *Differential pathways of risky drinking via coping motives in college and noncollege young adults* [Manuscript submitted for publication]. Department of Psychology, Old Dominion University.

Kendricks, D. R., Boomhower, S. R., Arnold, M. A., **Glenn, D. J.**, & Newland, M. C. (2020). Adolescent methylmercury exposure alters short-term remembering, but not sustained attention, in male Long-Evans rats. *NeuroToxicology*, *78*, 186-194.