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# Posttraumatic Stress and Hazardous Alcohol Use in College Students: The Moderating Role of Alcohol Protective Behavioral Strategies

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Posttraumatic Stress and Hazardous Alcohol Use in College Students: The  
Moderating Role of Alcohol Protective Behavioral Strategies

by

Hallie Ray Jordan

A Thesis

Submitted to the Graduate School,  
the College of Education and Psychology  
and the Department of Psychology  
at The University of Southern Mississippi  
in Partial Fulfillment of the Requirements  
for the Degree of Master of Arts

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## ABSTRACT

The present study evaluated the moderating role of alcohol protective behavioral strategy subtypes (AI-PBS; Serious Harm Reduction [SHR], Manner of Drinking [MOD], Stopping/Limiting Drinking [SLD]) and gender on the relationships between traumatic stress symptoms and both hazardous drinking and alcohol-related negative consequences. Participants were 915 traditional age (18 to 25 years old) college students from nine universities in the United States who reported drinking in the past. All participants reported their gender and completed measures of traumatic stress symptoms, AI-PBS use, hazardous drinking, and alcohol-related negative consequences through an online survey. Experiencing greater traumatic stress symptoms was associated with both increased hazardous drinking and alcohol-related negative consequences. While AI-PBS subtypes did not moderate the relationship between traumatic stress symptoms and hazardous drinking, gender was a significant three-way moderator such that males with greater levels of traumatic stress symptoms using higher amounts of AI-PBS-MOD and AI-PBS-SLD reported less hazardous drinking. AI-PBS-SHR moderated the relationship between traumatic stress symptoms and alcohol-related negative consequences such that there was a weaker association between traumatic stress symptoms and alcohol-related negative consequences for those using more AI-PBS-SHR. While AI-PBS appear beneficial for all college student drinkers, these findings highlight the additional protective value of certain AI-PBS for students experiencing traumatic stress symptoms.

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## DEDICATION

The author would like to dedicate this thesis to her parents, Shawn and Amy Jordan. Their unwavering love and steadfast support were undoubtedly a contribution to the successful completion of this project.

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## CHAPTER I - INTRODUCTION

According to the National Institute on Alcohol Abuse and Alcoholism (NIAAA), alcohol use on college campuses is a major public health concern (2015). Overall, 81% of college students report trying alcohol annually (Johnston, O'Malley, Bachman, Schulenberg, & Miech, 2016). Additionally, 32% of college students report alcohol consumption consistent with binge drinking standards, which consists of four or more standard drinks in less than two hours for women and five or more standard drinks in less than two hours for men (Johnston et al., 2016; NIAAA, 2015). Drinking at these levels is identified as harmful because of the immediate and long-term associated negative consequences (White & Hingson, 2014).

Alcohol-related consequences occur during or after drinking and can be positive or negative (White & Hingson, 2014). Alcohol-related negative consequences can include minor experiences such as a hangover, but also range to more severe experiences, such as injury to self or others and even death, which is particularly concerning. Barnett and colleagues (2014) found 82% of first-year college students reported experiencing at least one alcohol-related negative consequence in their lifetime. In Barnett and colleagues' study, over 50% of the sample reported getting physically sick after drinking and not remembering at least some part of a drinking experience at least once in their life (2014). Further, nearly 100,000 students report sexual assault in the context of an alcohol-related environment each year (White & Hingson, 2014). Thus, it is clear that alcohol-related negative consequences occur to many individuals and can be quite severe.

Alcohol-related negative consequences can be harmful not only to the individual consuming alcohol, but also to other individuals in that consumer's environment as well

as society (e.g., Ham & Hope, 2003; White & Hingson, 2014). Overall, college student drinking is associated with harmful drinking behaviors and subsequent alcohol-related negative consequences that endanger the well-being of both the individual and society (White & Hingson, 2014). Because of the dangers of alcohol-related negative consequences, it is necessary to continue exploring contextual factors that increase the negative effects of alcohol use, such as mental health status (Pearson, 2013).

### Mental Health and Harmful Alcohol Use in College Students

Although college can be a time of personal, professional, and social growth and development, it can also involve many stressful life events such as moving away from home, strains of independent living, and exposure to new situations, experiences, and people (Blanco et al., 2008; Eisenberg, Hunt, & Speer, 2013). According to the American Psychiatric Association (APA), the traditional college student's age is also the age of onset for many psychological disorders, including depression and schizophrenia (2013). Researchers have found rates of mental health problems as high as 50% in college student samples (Blanco et al., 2008), showing that psychological distress is common in college student populations. College students experience myriad of mental health problems, including, but not limited to, symptoms of major depressive disorder, general anxiety disorder, social anxiety disorder, and posttraumatic stress disorder (PTSD; Blanco et al., 2008; Eisenberg et al., 2013).

While a subset of college students meet clinical criteria for these disorders, some students deal with these problems on a subclinical level that still result in distressing symptoms (Borsari, Read, & Campbell, 2008). While nearly half of college students report experiencing distressing symptoms consistent with mental health disorders, fewer

than 20% of college students report seeking psychological treatment (Blanco et al., 2008). These students may instead resort to other methods such as substance use to cope with this distress (e.g., Grayson & Nolen-Hoeksema, 2005; Kuntsche, Knibbe, Gmel, & Engles, 2005; O'Hare & Sherrer, 2011). Overall, both clinical and subclinical mental health problems in college student populations are cause for concern; however, in the context of the college experience, the relationship between mental health problems and alcohol use is a unique element to further examine (Borsari et al., 2008).

Some researchers have found a positive relationship between mental health problems and alcohol-related problems (Kenney & LaBrie, 2013) and others have similarly discovered that mental health problems mediate or moderate the relationship between additional variables, such as use of protective behavioral strategies (PBS), and alcohol-related problems (e.g., see LaBrie, Kenney, Lac, Garcia, & Ferraiolo, 2009). This relationship between mental health problems and alcohol-related problems can be partially explained by drinking motives, specifically drinking to cope (Grayson & Nolen-Hoeksema, 2005; O'Hare & Sherrer, 2011). Because fewer than half of college students with mental health problems seek treatment (Blanco et al., 2008), the remaining students with distressing psychological symptoms may turn to substance use as a method of coping with the distress (Kuntsche et al., 2005; Smith, Smith, & Grekin, 2014). This strategy can help reduce the overall negative affect an individual experiences in the moment, but can also be linked to future alcohol use and alcohol-related negative consequences (Kuntsche et al., 2005; Smith et al., 2014). Overall, there is not only a direct relationship between mental health problems and alcohol-related variables, but this relationship can put individuals already experiencing psychological distress at even

greater risk for harm (Pearson, 2013; Villarosa, Moorer, Madson, Zeigler-Hill, & Noble, 2014).

### Traumatic Stress and Harmful Alcohol Use

Post-traumatic stress disorder (PTSD), psychological distress related to traumatic experiences, and its subclinical manifestation – traumatic stress – has been linked with substance use problems (American Psychological Association [APA], 2016; Borsari et al., 2008). There is a well-established relationship between traumatic stress symptoms and substance use problems, such that greater traumatic stress symptoms are associated with greater substance use problems (e.g., Berenz et al., 2016; Grayson & Nolen-Hoeksema, 2005; Tripp, McDevitt-Murphy, Avery, & Bracken, 2015).

The co-occurrence of traumatic stress and alcohol use problems is also present in the college student population (Borsari et al., 2008). Given the pre-existing concerns and dangers of college student alcohol use, this added element of traumatic stress can increase the potency of alcohol use. The relationship between traumatic stress and alcohol-related problems has been established in college students, such that students who have experienced a potentially traumatic event endorse greater rates of alcohol use and alcohol-related negative consequences (Berenz et al., 2016; Kaysen et al., 2013; Tripp et al., 2015). This fits with Self-Medication Theory (SMT), which posits that individuals use substances to cope with negative affect (Haller & Chassin, 2014). Among college students, increased symptoms of traumatic stress have been linked to increased alcohol use, negatively reinforcing drinking motives (i.e. coping), and experience of alcohol-related negative consequences (Borsari et al., 2008; Berenz et al., 2016; Tripp et al., 2015). Essentially, individuals with a history of traumatic stress who report clinical or

subclinical levels of PTSD along with harmful drinking report greater alcohol-related negative consequences, which places these individuals at risk for experiencing another future trauma (Borsari et al., 2008).

There is also evidence of gender differences in the relationship between traumatic stress and alcohol use (Berenz et al., 2016). Both women and men experience greater increases in alcohol use related to a traumatic event, but women tend to be particularly susceptible to greater alcohol use compared to men (Berenz et al., 2016). However, given that the relationship between traumatic stress and alcohol use also exists in men, it is important to continue studying the negative co-occurrence of traumatic stress and alcohol use in both groups to help inform treatment interventions (Berenz et al., 2016).

Previous researchers have also established a relationship between mental health problems and alcohol use in college students (e.g. Berenz et al., 2016; Grayson & Nolen-Hoeksema, 2005; Kaysen et al., 2013; Tripp et al., 2015). Therefore, it is important to further examine the relationship between traumatic stress and substance use, specifically alcohol use. This could help identify additional correlates and factors contributing to this relationship to best inform foci for prevention and intervention (Vujanovik, Bonn-Miller, & Petry, 2016). Because of the potential for increasing risk of future trauma when engaging in harmful drinking, it is important to examine protective options for individuals experiencing traumatic stress and also engaging in alcohol use. One such way is through alcohol protective behavioral strategy use (AI-PBS; Pearson, 2013).

#### Protective Behavioral Strategies

There remains an increasing emphasis on the importance of exploring the ways in which protective factors can reduce the negative effects of alcohol use and promote

safety in those who choose to consume alcohol (e.g., Pearson, 2013). One such domain of safe drinking is AI-PBS (Martens et al., 2004; Pearson, 2013), which are behaviors an individual can engage in to promote their safety while consuming alcohol (Madson, Arnau, & Lambert, 2013; Martens et al., 2004; Pearson, 2013). Overall, it appears that individuals engaging in more AI-PBS typically report experiencing less harm when consuming alcohol (e.g., Madson & Zeigler-Hill, 2013; Madson, Moorer, Zeigler-Hill, Bonnell, & Villarosa, 2013b; Martens et al., 2004).

A significant relationship exists between AI-PBS use and harmful drinking and alcohol-related negative consequences, such that students who employ more AI-PBS report less harmful drinking and fewer alcohol-related negative consequences (e.g., Madson et al., 2013b; Martens et al., 2004). Specifically, increased use of AI-PBS appears to alleviate alcohol-related negative consequences such as poor academic performance, showing utility for incorporating AI-PBS education in college alcohol awareness programs (Martin et al., 2012). More severely, there is a link between alcohol consumption, risky sex, and alcohol-related sexual victimization for women that appears to be weakened by AI-PBS use, especially those directly related to consumption (Moorer, Madson, Mohn, & Nicholson, 2013). This is important given alcohol-related negative consequences related to sexual assault may consist of events that could likely have lasting traumatic implications (Moorer et al., 2013). The inverse relationship between AI-PBS use and alcohol-related negative consequences has consistently been shown to be stronger in college women compared to college men, as college women tend to report using AI-PBS more often than college men (e.g., Delva et al., 2004; Madson et al., 2013b; Pearson, 2013; Walters, Roudsari, Vader, & Harris, 2007). Gender differences in

AI-PBS use are important to consider in conjunction with college student gender differences in traumatic stress experiences.

Additionally, evidence has emerged supporting three subtypes of AI-PBS – manner of drinking (MOD), stopping/limiting drinking (SLD), and serious harm reduction (SHR) (Treloar, Martens, & McCarthy, 2015). AI-PBS-MOD strategies focus on the way alcohol is consumed, for example, not chugging (Treloar et al., 2015). AI-PBS-SLD strategies involve some manner of reducing the amount of alcohol consumed without completely abstaining, for example, setting a limit on the number of drinks consumed per drinking occasion (Treloar et al., 2015). AI-PBS-SHR, on the other hand, do not necessarily limit drinking, but rather focus on reducing the negative consequences related to consuming alcohol, for example, coordinating a designated driver (Madson et al., 2013; Pearson, 2013; Treloar et al., 2015).

The subtypes of AI-PBS are important to explore because they provide insight into specific mechanisms of protective behaviors. While AI-PBS has been found to be protective as a whole construct, such that increased AI-PBS use is associated with less alcohol consumption, less harmful drinking, and fewer alcohol-related negative consequences (e.g., Zeigler-Hill, Madson, & Ricedorf, 2012), there is evidence that the subtypes function in different ways and have different implications of alcohol outcomes (e.g., DeMartini et al., 2012; Villarosa et al., 2014). Indirect AI-PBS (AI-PBS-SHR), which are the strategies that are used in the context of drinking but not directly with alcohol use, have been found to reduce the experience of alcohol-related negative consequences but not harmful drinking (DeMartini et al., 2012). On the other hand, direct

AI-PBS (AI-PBS-MOD and AI-PBS SLD), which are strategies directly related to alcohol consumption, have been found to reduce harmful drinking (DeMartini et al., 2012).

There is evidence that using AI-PBS-SHR and AI-PBS-MOD, but not AI-PBS-SLD, is associated with continuously less alcohol consumption and fewer alcohol-related negative consequences (Martens, Martin, Littlefield, Murphy, & Cimini, 2011).

Similarly, Villarosa and colleagues (2014) found that only AI-PBS-SHR mediated the relationship between social anxiety symptoms and alcohol-related negative consequences and AI-PBS-CC (a broad category that collapses AI-PBS-MOD and AI-PBS-SLD into one; Madson et al., 2013) did not impact alcohol outcomes. AI-PBS-SHR has consistently been shown to reduce alcohol-related negative consequences but not alcohol consumption (e.g. Napper, Kenney, Lac, Lewis, & LaBrie, 2014; Villarosa et al., 2014). Evidence shows that AI-PBS-MOD and AI-PBS-SLD are associated with less alcohol consumption, but are not associated with alcohol-related consequences (Pearson, D'Lima, & Kelley, 2013). In a longitudinal study, AI-PBS-MOD has been found to predict both reduced alcohol consumption and alcohol-related negative consequences (Napper et al., 2014). In this same study though, AI-PBS-SLD were not found to predict alcohol consumption or consequences (Napper et al., 2014). Finally, there is evidence that individuals employ more indirect strategies (AI-PBS-SHR) than direct AI-PBS strategies (i.e. AI-PBS-CC or AI-PBS-MOD and AI-PBS-SLD) and this is especially the case with women (Moorer et al., 2013). Overall, the consistent theme of AI-PBS subtype function is that AI-PBS-SHR are typically associated with decreased alcohol-related negative consequences but not harmful drinking or alcohol consumption, while AI-PBS-MOD and

AI-PBS-SLD are typically associated with decreased alcohol consumption and harmful drinking but not alcohol-related negative consequences.

The protective elements of PBS use appear to vary in strength, but still exist, across gender, race, extracurricular group membership, and mental health status (LaBrie, Lac, Kenney, & Mirza, 2011; Madson & Zeigler-Hill, 2013; Madson, Villarosa, Moorer, & Zeigler-Hill, 2015; Noble, Madson, Mohn, & Mandracchia, 2013). Evidence consistently supports the additional protective value of AI-PBS use for individuals with greater mental health problems (Kenney & LaBrie, 2013; Villarosa et al., 2014). Further, it appears that increased AI-PBS-SHR tends to be associated with fewer alcohol-related negative consequences (Napper et al., 2014; Pearson et al., 2013; Villarosa et al., 2014) while AI-PBS-MOD and AI-PBS-SLD tend to be associated with decreased alcohol consumption and harmful drinking (Napper et al., 2014; Pearson et al., 2013). Therefore, using AI-PBS appears to be a universally effective technique for college students to reduce the overall harm associated with alcohol use, but it is important to note the different functions of specific types of AI-PBS (Borden et al., 2011; DeMartini et al., 2012; LaBrie et al., 2009; Martens et al., 2004; Pearson, 2013).

#### Mental Health and AI-PBS

While using AI-PBS is generally protective, it has been established that individuals with mental health problems tend to employ fewer AI-PBS, and thus report greater alcohol use and alcohol-related negative consequences (Pearson, 2013; Villarosa et al., 2014; Villarosa, Kison, Madson, & Zeigler-Hill, 2016). However, AI-PBS use has been shown to be effective in reducing the experience of alcohol-related negative consequence when individuals with mental health problems do use AI-PBS (Kenney &

LaBrie, 2013). Furthermore, when examining mental health status broadly, mental health problems tend to moderate the relationship between AI-PBS use and alcohol-related negative consequences, such that those with poorer mental health who used more AI-PBS experienced greater protection from alcohol-related negative consequences than those with better mental health (LaBrie et al., 2009). This supports promoting AI-PBS use in communities with mental health problems because of the additional protective value.

Beyond broad exploration, the associations between AI-PBS use and alcohol-related outcomes have also been studied in the context of specific mental health problems (e.g., Linden-Carmichael, Braitman, & Henson, 2015; Villarosa et al., 2014; Villarosa et al., 2016). For individuals with depression, anxiety, and social anxiety, similar relationships have been found such that those with these specific mental health problems who do not employ AI-PBS experience more significant alcohol-related negative consequences than their peers without these specific mental health problems (Landry, Moorer, Madson, & Zeigler-Hill, 2014; Linden-Carmichael et al., 2015; Villarosa et al., 2014; Villarosa et al., 2016). Specifically, Linden-Carmichael and colleagues (2015) found greater depressive symptoms were indirectly associated with greater alcohol consumption because of using fewer AI-PBS. Additionally, Villarosa and colleagues (2014) found that greater social anxiety symptoms were associated with greater alcohol-related negative consequences. Specifically, AI-PBS-SHR (not AI-PBS-CC) was related, such that individuals with social anxiety symptoms using fewer AI-PBS-SHR experienced greater alcohol-related negative consequences (Villarosa et al., 2014).

Again, this highlights the importance of more thoroughly understanding the relationship between specific mental health problems and AI-PBS use trends. Further

understanding of this relationship can help to more effectively inform prevention and intervention strategies. Including mental health problems as a variable when examining the relationship between PBS and alcohol use in college students can help inform prevention and intervention strategies. Thus, prevention and intervention techniques addressing the interplay of mental health problems and alcohol-related problems on college campuses may benefit from studies examining the impact of mental health problems in the relationship between AI-PBS and alcohol use among college students.

### Present Study

This co-occurrence of traumatic stress symptoms and substance use problems is potent, such that individuals with traumatic stress and substance use problems simultaneously experience greater symptom severity and less treatment and intervention success (Vujanovik et al., 2016). Although symptoms of traumatic stress are associated with alcohol consumption and negative outcomes in college samples, the protective value of AI-PBS in relation to traumatic stress has yet to be identified. Because traumatic stress symptoms are related to anxiety, it is reasonable to predict traumatic stress will interact with AI-PBS subtypes and alcohol use in a similar way to anxiety (e.g., Villarosa et al., 2014). Further, because AI-PBS-MOD and AI-PBS-SLD are often linked to harmful drinking but not alcohol-related negative consequences (e.g., Pearson et al., 2013) while AI-PBS-SHR are often linked to alcohol-related negative consequences but not harmful drinking (e.g., Villarosa et al., 2014), predictions for the present study linked MOD and SLD to harmful drinking and SHR to alcohol-related negative consequences.

Examining the role of AI-PBS subtypes in the link between traumatic stress and alcohol-related outcomes may have important clinical implications. Results from the

present study may help inform interventions for individuals identified as being at-risk for experiencing negative consequences of alcohol use and thus are at higher risk for experiencing a future potentially traumatic event. Additionally, findings may provide further reason to assess for a history of trauma when conducting an alcohol screening in a college setting. This could help identify individuals who may benefit from trainings and workshops specific to individuals experiencing traumatic stress which could promote safe drinking behaviors among this group of college students (Woolman, Becker, & Klanecky, 2015).

Thus, the present study attempted to identify the relationship between traumatic stress and harmful drinking, the relationship between traumatic stress and negative consequences of alcohol use, and the moderating role of traumatic stress on AI-PBS use on these relationships. This will contribute to Pearson's (2013) call to examine specific mental health problems and AI-PBS to further understand these relationships on alcohol use. The present study sought to accomplish these objectives by answering the following:

**Question 1:** To what degree is traumatic stress associated with harmful drinking?

**Hypothesis 1:** Traumatic stress symptoms will be associated with harmful drinking.

**Question 2:** To what degree is traumatic stress associated with alcohol-related negative consequences?

**Hypothesis 2:** Traumatic stress symptoms will be associated with alcohol-related negative consequences.

**Question 3:** To what degree does AI-PBS type moderate the relationship between traumatic stress and harmful drinking?

**Hypothesis 3a:** AI-PBS-SHR use will not moderate the relationship between traumatic stress and harmful drinking.

**Hypothesis 3b:** AI-PBS-MOD use will moderate the relationship between traumatic stress and harmful drinking, such that individuals with more traumatic stress symptoms who employ fewer PBS-MOD strategies will engage in more harmful drinking.

**Hypothesis 3c:** AI-PBS-SLD use will moderate the relationship between traumatic stress and harmful drinking, such that individuals with more traumatic stress symptoms who employ fewer PBS-SLD strategies will engage in more harmful drinking.

**Question 4:** To what degree does AI-PBS type use moderate the relationship between traumatic stress and alcohol-related negative consequences?

**Hypothesis 4a:** AI- PBS-SHR use will moderate the relationship between traumatic stress symptoms and alcohol-related negative consequences, such that individuals with more traumatic stress symptoms who employ fewer PBS-SHR strategies will experience more alcohol-related negative consequences.

**Hypothesis 4b:** AI-PBS-MOD use will not moderate the relationship between traumatic stress and alcohol-related negative consequences.

**Hypothesis 4c:** AI-PBS-SLD use will not moderate the relationship between traumatic stress and alcohol-related negative consequences.

**Question 5:** To what degree are the moderating effects of AI-PBS type on the relationship between traumatic stress and both harmful drinking and alcohol-related negative consequences also moderated by gender?

**Hypothesis 5a:** Gender will not moderate the moderating effects of AI-PBS-SHR on the relationship between traumatic stress and harmful drinking.

**Hypothesis 5b:** The moderating effects of AI-PBS-MOD will also be moderated by gender, such that male individuals with traumatic stress symptoms who employ fewer AI-PBS-MOD strategies will report greater harmful drinking than females with traumatic stress symptoms who employ fewer AI-PBS-MOD strategies.

**Hypothesis 5c:** The moderating effects of AI-PBS-SLD will also be moderated by gender, such that male individuals with traumatic stress symptoms who employ fewer AI-PBS-MOD strategies will report greater harmful drinking than females with traumatic stress symptoms who employ fewer AI-PBS-SLD strategies.

**Hypothesis 5d:** The moderating effects of AI-PBS-SHR will also be moderated by gender, such that female individuals with traumatic stress symptoms who employ fewer AI-PBS-SHR strategies will report experiencing greater alcohol-related negative consequences than males with traumatic stress symptoms who employ fewer AI-PBS-SHR strategies.

**Hypothesis 5e:** Gender will not moderate the moderating effects of AI-PBS-MOD on the relationship between traumatic stress and alcohol-related negative consequences.

**Hypothesis 5f:** Gender will not moderate the moderating effects of AI-PBS-SLD on the relationship between traumatic stress and alcohol-related negative consequences.

## CHAPTER II - METHOD

### Participants and Procedures

The sample initially consisted of 1,153 cases from nine universities reporting an age between 18 and 25 who indicated prior alcohol consumption and completed the Posttraumatic Stress Disorder Checklist (PCL-5). The data were screened to code for extreme values; none necessitated recoding. Cases missing the Alcohol Use Disorders Identification Test–United States–Consumption (AUDIT-C) and Brief Young Adult Alcohol Consequences Questionnaire (BYAACQ) scores were excluded. Additionally, particularly influential cases identified using the studentized residuals (increase of 0.5 or greater from one case to the next) and standardized DFFITS (increase of 67% or greater from one case to the next) diagnostics were excluded from the final sample.

The final sample included 915 participants. The majority of participants identified as female (72.2%) and the mean age of participants was 20.05 ( $SD = 1.67$ ). Most participants were freshmen (37.5%) and sophomores (23.3%), in addition to juniors (20.8%), seniors (18.1%), and graduate students (0.3%). Participants reported racial backgrounds of White (74.8%), Hispanic/Latino/Spanish Origin (16.6%), Black or African American (14.4%), Asian (6.2%), American Indian or Alaskan Native (2.8%), Native Hawaiian or Pacific Islander (1.3%), and Other (7.2%). Individuals could select more than one identifier.

This was a multi-site, multi-investigator project in which each university's Institutional Review Board approved the study. All participants were recruited through psychology subject pools at nine universities that geographically represent the United States (e.g., Alaska, Colorado, Mississippi, New Mexico). At each site, students

completed the survey via Qualtrics, a secure, online survey provider. The same survey was administered at each site to maintain consistency. After providing informed consent, participants first completed demographic information and alcohol use measures followed by a random presentation of the study instruments to reduce testing effects and effects of fatigue.

## Instruments

### *Demographics*

Participants were asked to report their age, academic year in school, race, and gender.

### *Posttraumatic Stress Disorder Checklist (PCL-5)*

The Posttraumatic Stress Disorder Checklist (PCL-5; Weathers et al., 2013) is a 20-item measure that assesses PTSD symptoms according to DSM-5 criteria (Blevins, Weathers, Davis, Witte, & Domino, 2015). Participants indicated the degree to which they were bothered by a symptom in the past month using a Likert-scale ranging from 0 (not at all) to 5 (extremely) (Weathers et al., 2013). Examples of symptoms include ‘repeated, disturbing, or unwanted experiences of the stressful experience’ and ‘blaming yourself or someone else for the stressful experience or what happened after it.’ The standard form of the PCL-5 assesses PTSD symptom clusters B, C, D, and E (e.g., re-experiencing, avoidance, negative thoughts and feelings, hyperarousal) and can produce cluster subscale scores (APA, 2013; Weathers et al., 2013). For the purpose of the present study, only a total score representing overall traumatic stress symptoms were calculated by summing each item. Total scores can range from 0 to 80, with higher scores indicating greater traumatic stress symptoms (Weathers et al., 2013). In a sample of 278 college

students, Blevins and colleagues (2015) found strong internal consistency ( $\alpha = .94$ ). Additionally, the PCL-5 appears to have acceptable test-retest reliability (Blevins et al., 2015; Bovin et al., 2016). The PCL-5 has also been found to show evidence of both convergent and discriminant validity (Blevins et al., 2015; Bovin et al., 2016). Internal consistency for the PCL-5 in the current study was excellent ( $\alpha = .96$ ).

#### *Protective Behavioral Strategies Scale-20 (PBSS-20)*

The PBSS-20 is a 20-item measure evaluating use of AI-PBS (Treloar et al., 2015). Participants indicated the degree to which they use each AI-PBS using a Likert-type scale ranging from 1 (never) to 6 (always). Total scores are obtained by summing all 20 items for a score ranging from 20 to 120, with higher scores indicating greater use of AI-PBS. The PBSS-20 consists of three subscales, AI-PBS-SHR (eight items), AI-PBS-SLD (seven items), and AI-PBS-MOD (five items). Examples of items include ‘use a designated driver’ (AI-PBS-SHR), ‘determine not to exceed a set number of drinks’ (AI-PBS-SLD), and ‘avoid drinking games’ (AI-PBS-MOD). Subscale scores are obtained by summing the items unique to that subscale. There are eight AI-PBS-SHR items with scores ranging from 8 to 48, with higher scores indicating greater use of AI-PBS-SHR. There are seven PBS-SLD items with scores ranging from 7 to 42, with higher scores indicating greater use of AI-PBS-SLD. There are five AI-PBS-MOD items with scores ranging from 5 to 30, with higher scores indicating greater use of AI-PBS-MOD.

Internal consistency for each of the three subscales is adequate, with  $\alpha = .86$  for PBS-SHR,  $\alpha = .83$  for PBS-MOD (Treloar et al., 2015), and  $\alpha = .82$  for PBS-SLD (Martens, Pederson, LaBrie, Ferrier, & Cimini, 2007). Scores appear to be consistent over time with adequate test-retest reliability (Treloar et al., 2015). Finally, evidence of

criterion-related validity exists for the PBSS-20 subscales (Treloar et al., 2015). Internal consistency for the PBSS-R subscales were as follows: the PBS-SHR subscale was good ( $\alpha = .86$ ), the PBS-MOD subscale was acceptable ( $\alpha = .80$ ), and the PBS-SLD subscale was good ( $\alpha = .84$ ).

*Alcohol Use Disorders Identification Test-United States-C (AUDIT-US-C)*

The three-item AUDIT-US-C was used to assess harmful alcohol use (Centers for Disease Control and Prevention [CDC], 2014). The AUDIT-US-C consists of the first three items of the AUDIT-US. The AUDIT-US is a revised version of the AUDIT (Saunders, Aasland, Babor, De La Fuente, & Grant, 1993) that edited the response items for the AUDIT-C and question three per Babor, Higgins-Biddle, Saunders, and Montiero's (2001) recommendation to use gender-specific and United States-specific binge drinking criteria in the question material. Example items include 'how often do you have a drink containing alcohol?' and 'how often do you have five or more drinks for males or four or more drinks for females on one occasion.' Two of the three items are scored on a five-point scale ranging from 'never' to 'daily or almost daily' and the remaining item is scored on a seven-point scale ranging from '1 drink' to '10 or more drinks' when assessing typical daily drinking. AUDIT-US-C scores are the sum of the first three items. Scores on the AUDIT-US-C can range from 0 to 18, with higher scores indicating greater levels of hazardous drinking.

Internal consistency appears to be strong, with researchers regularly finding coefficient alpha values around 0.80 in the original AUDIT (Fleming, Barry, & MacDonald, 1991; Kokotailo et al., 2004). Test developers intended the AUDIT to have evidence of face validity to increase understanding in healthcare settings (Saunders et al.,

1993). Evidence of construct validity (specifically, concurrent validity) has been supported (Bohn, Babor, & Kranzler, 1995). Internal consistency for the AUDIT-C in the current study was acceptable ( $\alpha = .80$ ).

*Brief Young Adult Alcohol Consequences Questionnaire (BYAACQ)*

The BYAACQ is a 24-item measure that assesses alcohol-related problems experienced by college students (Kahler, Strong, & Read, 2005). Participants responded to items either no (0) or yes (1) to indicate whether they experienced a consequence or not. Example items include ‘while drinking, I have said or done embarrassing things’ and ‘my drinking has gotten me into sexual situations I later regretted.’ Item responses are summed to produce a total score ranging from 0 to 24 with higher scores indicating greater experience of alcohol-related problems.

Internal consistency of the BYAACQ is strong ( $\alpha = .83$ ; Kahler et al., 2005). Additionally, the BYAACQ has evidence of concurrent validity with the Rutgers Alcohol Problem Index (RAPI), another measure of alcohol-related consequences ( $r = .78$ ). This provides evidence for using the BYAACQ to appropriately assess alcohol-related consequences in college students. Internal consistency for the BYAACQ in the current study was good ( $\alpha = .90$ ).

### CHAPTER III - RESULTS

Means, standard deviations, and intercorrelations of all measures are presented for the overall sample in Table 1 and for males and females in Table 2. On average, participants reported drinking 4.23 ( $SD = 4.70$ ) times in the last 30 days. Using an AUDIT-C score of 4 (Madson et al., n.d), 80.63% of male participants and 72.62% of female participants exceeded the cutoff for hazardous drinking (Madson et al., n.d). Additionally, 18.99% of participants met the clinical cutoff score of 33 on the PCL-5. Intercorrelations of all measures are in the expected direction for each relationship, such that traumatic stress symptoms have a significant positive association with hazardous drinking and alcohol-related negative consequences (e.g., Berenz et al., 2016; Kaysen et al., 2013; Tripp et al., 2015). AI-PBS use for all subtypes have a significant negative association with hazardous drinking and alcohol-related negative consequences (e.g., Pearson, 2013).

Table 1 *Overall Means, Standard Deviations, and Intercorrelations*

Scale	1	2	3	4	5	6
1. PBS-SHR	-	-	-	-	-	-
2. PBS-SLD	.45***	-	-	-	-	-
3. PBS-MOD	.39***	.58***	-	-	-	-
4. PCL-5	-.21***	-.02	-.05	-	-	-
5. AUDIT-US-C	-.23***	-.34***	-.46***	.07*	-	-
6. BYAACQ	-.33***	-.25***	-.38***	.30***	.46***	-
Mean Overall	41.51	24.11	17.50	15.96	5.96	5.87
SD Overall	7.19	8.28	5.97	16.68	3.47	5.38

Note. \* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$ .

Table 2 *Male and Female Means, Standard Deviations, and Intercorrelations*

Scale	1	2	3	4	5	6
1. PBS-SHR	-	.41***	.34***	-.24***	-.17***	-.36***
2. PBS-SLD	.49***	-	.55***	-.03	-.31***	-.24***
3. PBS-MOD	.44***	.61***	-	-.05	-.46***	-.41***
4. PCL-5	-.22***	-.03	-.08	-		.29***
					.08**	
5. AUDIT-US-C	-.24***	-.36***	-.41***	.05	-	.47***
6. BYAACQ	-.28***	-.27***	-.32***	.33***	.45***	-
Mean Male	38.68	22.21	16.04	15.15	6.74	6.06
SD Male	8.53	8.43	6.11	16.71	3.72	5.87
Mean Female	42.56	24.08	18.03	16.19	5.67	5.78
SD Female	6.32	8.12	5.83	16.61	3.33	5.19

Note. Correlations for females above the diagonal line and correlations for males below the diagonal line.

\* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$ .

### Hazardous Drinking

A hierarchical multiple regression was conducted to test the moderating effects of AI-PBS subtypes on the relationship between traumatic stress symptoms and hazardous alcohol use. All continuous interval variables (i.e. traumatic stress symptoms, AI-PBS-SHR, AI-PBS-SLD, and AI-PBS-MOD) were centered. Traumatic stress symptoms, AI-PBS-SHR, AI-PBS-SLD, AI-PBS-MOD, and gender (male = 1, female = 0) were entered on step 1. The two-way interactions (AI-PBS-SHR x traumatic stress, AI-PBS-SLD x traumatic stress, and AI-PBS-MOD x traumatic stress) were entered on step 2. The three-way interactions (AI-PBS-SHR x traumatic stress x gender, AI-PBS-SLD x traumatic stress x gender, and AI-PBS-MOD x traumatic stress x gender) were entered on step 3. There was a main effect for traumatic stress symptoms ( $\beta = .07, t = 2.48, p = .013$ ), such that traumatic stress symptoms and hazardous drinking were positively associated which supports hypothesis one. As seen in Table 3, there were no statistically significant two-

way interactions. This supports hypothesis 3a; however, hypotheses 3b and 3c were not supported.

Table 3 *Regressions of Alcohol-Related Outcomes on Traumatic Stress, Protective Behavioral Strategy Subtypes, and Sex*

	Hazardous Drinking <sup>1</sup>			Alcohol-Related Negative Consequences <sup>2</sup>		
	<i>R</i> <sup>2</sup>	$\Delta R^2$	$\beta$	<i>R</i> <sup>2</sup>	$\Delta R^2$	$\beta$
<i>Step 1</i>	.24***			.50***	.25***	
PCL-5			.07**			.25***
PBS-SLD			-.11**			-.01
PBS-MOD			-.38***			-.31***
PBS-SHR			.003			-.17***
Sex			.11***			-.06*
<i>Step 2</i>	.24	.006		.51**	.01**	
PCL-5 × PBS-SLD			-.003			-.07
PCL-5 × PBS-MOD			.06			.04
PCL-5 × PBS-SHR			-.08*			-.08*
<i>Step 3</i>	.25**	.01		.51	.003	
PCL-5 × PBS-SLD × Sex			-.16**			-.06
PCL-5 × PBS-MOD × Sex			.11*			.002
PCL-5 × PBS-SHR × Sex			-.05			.09

Note. PCL-5 = Posttraumatic Stress Disorder Checklist, PBS-SLD = Protective Behavioral Strategies-Stopping/Limiting Drinking, PBS-MOD = Protective Behavioral Strategies-Manner of Drinking, PBS-SHR = Protective Behavioral Strategies-Serious Harm Reduction; 1 = Alcohol Use Disorder Identification Test-Consumption; 2 = Brief Young Adult Alcohol Questionnaire.

\**p* < .05; \*\**p* < .01; \*\*\**p* < .001.

As seen in Table 3, there were significant three-way interaction effects for AI-PBS-SLD, traumatic stress, and gender ( $\beta = -.16, t = -3.02, p = .003$ ) and AI-PBS-MOD, traumatic stress, and gender ( $\beta = .11, t = 2.05, p = .04$ ) on hazardous drinking but not for AI-PBS-SHR ( $\beta = -.05, t = -.95, p = .34$ ). Thus, the sample was split by gender and hierarchical regressions were conducted for each gender separately. As seen in Table 4, there was a main effect of AI-PBS-MOD on hazardous drinking ( $\beta = -.42, t = -10.16, p <$

.001), but no main effects for AI-PBS-SLD ( $\beta = -.08, t = -1.88, p = .06$ ), AI-PBS-SHR ( $\beta = .02, t = .41, p = .68$ ), or traumatic stress symptoms ( $\beta = .06, t = 1.63, p = .10$ ) for females. There were no significant two-way interactions for females (see Table 4 for regression coefficients and Figures 2 and 4). For males, there was a main effect of AI-PBS-SLD ( $\beta = -.24, t = -3.18, p = .002$ ) and AI-PBS-MOD ( $\beta = -.26, t = -3.50, p = .001$ ) on hazardous drinking, but no main effects for AI-PBS-SHR ( $\beta = -.02, t = -.31, p = .759$ ) or traumatic stress symptoms ( $\beta = .07, t = 1.06, p = .291$ ) on hazardous drinking. These significant main effects were qualified by the two-way interaction of AI-PBS-SLD x traumatic stress ( $\beta = -.28, t = -3.04, p = .003$ ) and AI-PBS-MOD x traumatic stress ( $\beta = .27, t = 2.95, p = .003$ ) on hazardous drinking for males but not for AI-PBS-SHR ( $\beta = -.12, t = -1.57, p = .117$ ), which supports hypothesis 5a. See Table 4 for regression coefficients.

Table 4 *Regressions of Hazardous Drinking on Traumatic Stress and Protective Behavioral Strategy Subtypes Split by Gender*

	Males:			Females:		
	Hazardous Drinking <sup>1</sup>			Hazardous Drinking <sup>1</sup>		
	<i>R</i> <sup>2</sup>	$\Delta R^2$	$\beta$	<i>R</i> <sup>2</sup>	$\Delta R^2$	$\beta$
<i>Step 1</i>	.21***			.22***		
PCL-5			.13*			.06
PBS-SLD			-.19*			-.08
PBS-MOD			-.27***			-.42***
PBS-SHR			-.02			.02
<i>Step 2</i>	.26**	.05**		.23	.01	
PCL-5 × PBS-SLD			-.28**			.05
PCL-5 × PBS-MOD			.27**			.05
PCL-5 × PBS-SHR			-.12			-.05

Note: PCL-5 = Posttraumatic Stress Disorder Checklist, PBS-SLD = Protective Behavioral Strategies-Stopping/Limiting Drinking, PBS-MOD = Protective Behavioral Strategies-Manner of Drinking, PBS-SHR = Protective Behavioral Strategies-Serious Harm Reduction; 1 = Alcohol Use Disorder Identification Test-Consumption.

\* < .05\*\* *p* < .01; \*\*\* *p* < .001.

Simple slopes tests were run to further probe the interaction (Frazier et al., 2004). Simple slopes tests found that the slope of the line representing the association between AI-PBS-SLD use and hazardous drinking was significant for those with high levels of traumatic stress symptoms ( $\beta = -.11$ ,  $t = -2.12$ ,  $p = .035$ ) but that the association was not significant for those with low levels of traumatic stress symptoms ( $\beta = -.10$ ,  $t = -1.94$ ,  $p = .053$ ), although this relationship was approaching significant. These results show that individuals reporting high levels of traumatic stress symptoms who report using fewer AI-PBS-SLD report the highest levels of hazardous drinking. However, there may be a low association between AI-PBS-SLD use and hazardous drinking for those with low traumatic stress symptoms given the statistical *p*-values approaching the standard cutoff. Overall, the interaction between AI-PBS-SLD and traumatic stress supports hypothesis 5c and showed that the relationship between traumatic stress symptoms and hazardous

drinking was significantly weakened for those with high traumatic stress when using more AI-PBS-SLD (Figure 1).

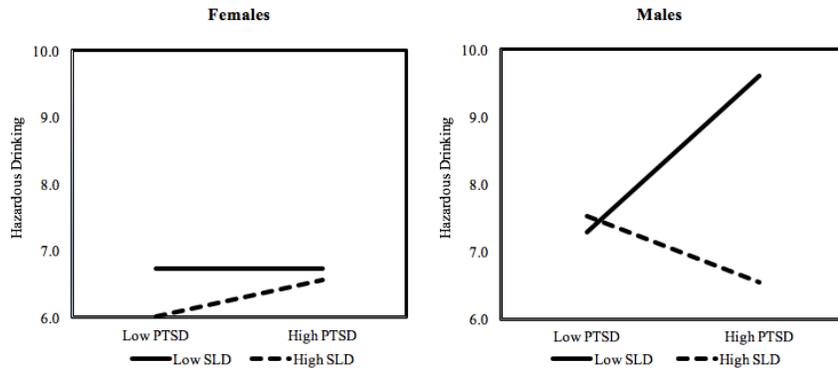


Figure 1. AI-PBS-SLD and Traumatic Stress interaction on AUDIT-US-C.

Simple slopes tests found that the slope of the line representing the association between AI-PBS-MOD use and hazardous drinking was significant for those with high levels of traumatic stress symptoms ( $\beta = -.35$ ,  $t = -7.48$ ,  $p < .001$ ) and low levels of traumatic stress symptoms ( $\beta = -.46$ ,  $t = -8.60$ ,  $p < .001$ ). These results show that individuals reporting both high and low levels of traumatic stress symptoms who do not implement AI-PBS-MOD report the highest levels of hazardous drinking. Overall, the interaction between AI-PBS-MOD and traumatic stress supports hypothesis 5b and showed that the relationship between traumatic stress symptoms and hazardous drinking was significantly weakened for those using more AI-PBS-MOD regardless of traumatic stress symptom level (Figure 2).

Overall, the prediction that traumatic stress and hazardous drinking would be positively associated was supported. There was not support for the hypothesis that the AI-PBS-MOD x traumatic stress and AI-PBS-SLD x traumatic stress interactions would be significant. However, the results support the prediction that gender would further qualify

the moderating impact of AI-PBS-MOD and AI-PBS-SLD on the relationship between traumatic stress symptoms and hazardous drinking, but this only emerged for males.

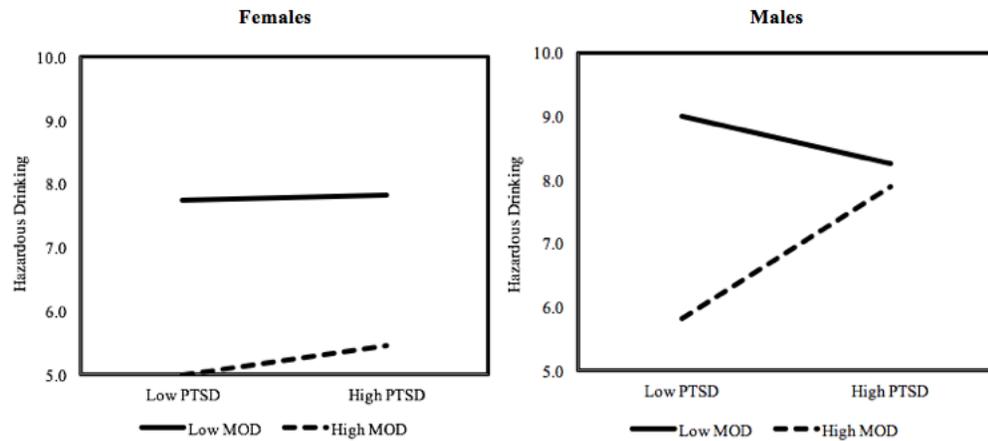


Figure 2. AI-PBS-MOD and Traumatic Stress interaction on AUDIT-C for females and males.

#### Alcohol-Related Negative Consequences

A hierarchical multiple regression was conducted to explore how AI-PBS subtypes moderate the relationship between traumatic stress symptoms and alcohol-related negative consequences. All interval variables (i.e. traumatic stress symptoms, AI-PBS-SHR, AI-PBS-SLD, and AI-PBS-MOD) were centered. Traumatic stress symptoms, AI-PBS-SHR, AI-PBS-SLD, AI-PBS-MOD, and gender were entered on step 1. The two-way interactions (AI-PBS-SHR x traumatic stress, AI-PBS-SLD x traumatic stress, and AI-PBS-MOD x traumatic stress) were entered on step 2. The three-way interactions (AI-PBS-SHR x traumatic stress x gender, AI-PBS-SLD x traumatic stress x gender, and AI-PBS-MOD x traumatic stress x gender) were entered on step 3.

As seen in Table 3, there was a main effect of traumatic stress symptoms ( $\beta = .25$ ,  $t = 8.29$ ,  $p < .001$ ), such that traumatic stress symptoms and alcohol-related negative consequences were positively associated, supporting hypothesis two. This main effect

was qualified by the two-way interaction of AI-PBS-SHR x traumatic stress ( $\beta = -.08, t = -2.13, p = .034$ ) on alcohol-related negative consequences, supporting hypotheses 4a, 4b, and 4c. Because step 3 was not significant, no three-way interactions were interpreted. Given the absence of a three-way interaction, hypothesis 5d was not supported, but hypothesis 5e and 5f were supported.

Simple slopes tests were run to further probe the interaction of traumatic stress and AI-PBS-SHR (Frazier et al., 2004) and revealed that the slope of the line representing the association between AI-PBS-SHR use and alcohol-related negative consequences was significant for those with high levels of traumatic stress symptoms ( $\beta = -.22, t = -5.31, p < .001$ ) and low levels of traumatic stress symptoms ( $\beta = -.10, t = -1.98, p = .048$ ). These results show that individuals reporting both high and low levels of traumatic stress symptoms who reported implementing fewer AI-PBS-SHR reported the highest levels of alcohol-related negative consequences. As seen in Figure 3, the interaction between AI-PBS-SHR and traumatic stress symptoms showed that the positive relationship between traumatic stress and alcohol-related negative consequences was significantly weakened for those using more AI-PBS-SHR regardless of traumatic stress symptom level, supporting hypothesis 4a.

Overall, the finding that traumatic stress symptoms and alcohol-related negative consequences would be positively associated was supported. Furthermore, AI-PBS-SHR did significantly moderate the relationship between traumatic stress symptoms and alcohol-related negative consequences, supporting this two-way interaction hypothesis. However, the prediction that gender would further qualify the AI-PBS-SHR x traumatic

stress moderation on alcohol-related negative consequences was not supported as there was not a significant three-way interaction.

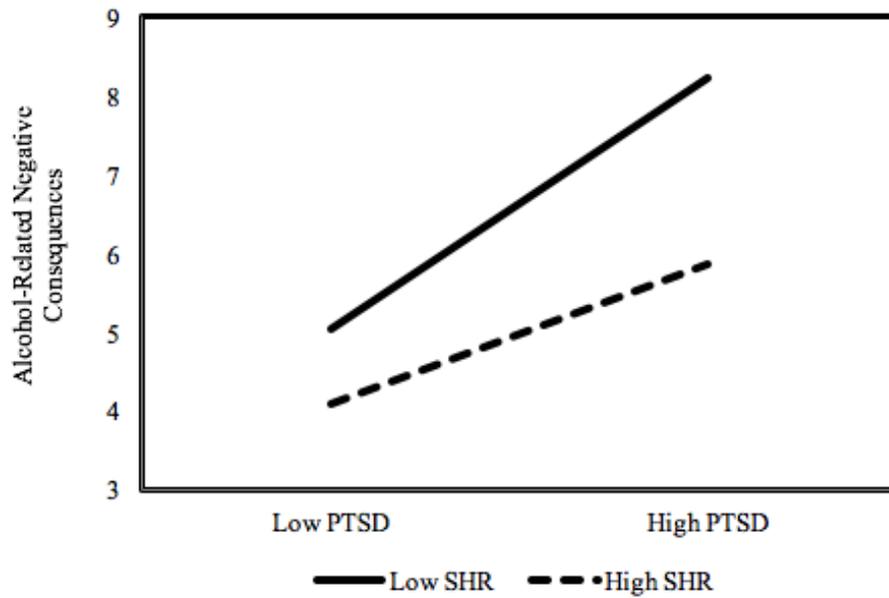


Figure 3. AI-PBS-SHR and Traumatic Stress interaction on BYAACQ.

## CHAPTER IV – DISCUSSION

The purpose of the study was to evaluate the moderating role of AI-PBS subtypes on the relationships between traumatic stress and hazardous drinking and alcohol-related negative consequences. Additionally, this study sought to examine the moderating effect of gender on any existing AI-PBS subtype moderations.

Higher levels of traumatic stress symptoms were associated with greater hazardous drinking, supporting hypothesis one. This is consistent with findings that greater traumatic stress symptoms predict future alcohol use patterns (Read et al., 2012). One potential explanation for these results is the Self-Medication Theory (SMT), which proposes that using substances (i.e. alcohol) to cope with traumatic stress symptoms may be negatively reinforcing and perpetuate the pattern of drinking to cope (e.g., Haller & Chassin, 2014). This is because consuming alcohol can be a form of avoidance through the removal of distressing symptoms experienced with traumatic stress. For the overall sample, AI-PBS subtypes did not moderate the relationship between traumatic stress and hazardous drinking, supporting the hypothesis that AI-PBS-SHR would not moderate the relationship (hypothesis 3a). However, these findings are inconsistent with the hypotheses that predicted AI-PBS-MOD and AI-PBS-SLD would moderate the relationship between traumatic stress symptoms and hazardous drinking (hypotheses 3b & 3c).

Despite the absence of a significant AI-PBS subtype moderation, gender significantly moderated the impact of all AI-PBS subtypes on the relationship between traumatic stress symptoms and hazardous drinking. When the two-way interactions were explored by gender, no AI-PBS subtypes moderated the relationship between traumatic

stress symptoms and hazardous drinking for females. However, AI-PBS-SLD and AI-PBS-MOD, but not AI-PBS-SHR, emerged as significantly moderating the relationship for males which supports hypotheses 5a, 5b, and 5c. Specifically, males with greater traumatic stress symptoms who used more AI-PBS-MOD or AI-PBS-SLD reported less hazardous drinking than when those with high traumatic stress symptoms who reported less PBS use. This implies a potential gender difference in the relationship, and indicates the potential added benefit of both AI-PBS-MOD and AI-PBS-SLD for males compared to females when examining hazardous drinking levels as related to traumatic stress symptoms. Because females appear to use more AI-PBS than males (e.g., Madson et al., 2013b), perhaps these findings signify that AI-PBS-MOD and AI-PBS-SLD are even more protective when males with higher levels of traumatic stress incorporate them into drinking experiences. Given the established gender differences in the traumatic stress and alcohol use literature, these results provide evidence for and highlight the need to continue exploring these relationships for males and not just females (Berenz et al., 2016).

Results of this study also showed that higher levels of traumatic stress symptoms were associated with more alcohol-related negative consequences, supporting hypothesis two. This finding supports evidence of a link between traumatic stress and consequences (Grayson & Nolen-Hoeksema, 2005; Read et al., 2012; Tripp et al., 2015). Alcohol-related negative consequences are concerning on their own because they include physical and mental health impacts as well as safety impacts (Barnett et al., 2014; White & Hingson, 2014). However, alcohol-related consequences may be especially concerning for those experiencing traumatic stress symptoms because the nature of certain

consequences (e.g., sexual assault, physical injury) could put these individuals at greater risk for maintaining existing or developing new traumatic stress symptoms (Borsari et al., 2008). Evidence showing the link between traumatic stress symptoms and alcohol-related negative consequences (e.g., Tripp et al., 2015) further signals the need to identify protective factors that weaken the relationship to prevent or reduce the maintenance of symptoms.

As predicted in hypothesis 4a, AI-PBS-SHR moderated the relationship between traumatic stress and alcohol-related negative consequences, such that the relationship between traumatic stress symptoms and alcohol-related negative consequences was weakened for those reporting higher levels of symptoms and using more AI-PBS-SHR. Essentially, for individuals with greater traumatic stress symptoms, using more AI-PBS-SHR strategies was associated with a decrease in alcohol-related negative consequences when compared to those individuals with high traumatic stress symptoms but using low AI-PBS-SHR strategies. As predicted, AI-PBS-MOD and AI-PBS-SLD did not moderate the relationship when consequences were the outcome, supporting hypotheses 4b and 4c. This is consistent with literature showing that indirect, but not direct, AI-PBS strategies are usually related to consequences (e.g., Villarosa et al., 2014) as well as literature demonstrating that greater AI-PBS-SHR use explains in part the relationship between increased mental health difficulties (i.e. depression) and alcohol-related negative consequences (Villarosa, Messer, Madson, & Zeigler-Hill, in press). Essentially, AI-PBS-SHR may be particularly important for those with increased mental health problems, likely because of the implied harm reduction nature of these strategies.

Contrary to hypothesis 5d, gender did not serve as an additional moderator on the moderating impact of AI-PBS-SHR on traumatic stress symptoms and alcohol-related negative consequences. This could suggest that male and female college students with increased traumatic stress symptoms are not using AI-PBS-SHR strategies differently. Additionally, this rationale could be further supported by the finding that gender moderated the impact of AI-PBS-MOD and AI-PBS-SLD, but not AI-PBS-SHR, on the relationship between traumatic stress and hazardous alcohol use. Perhaps men and women are using AI-PBS-SHR in similar ways and experiencing similar impacts on both their rates of hazardous drinking and experience of alcohol-related negative consequences. Alternately, both male and female college students with higher traumatic stress symptoms may be more prone to vigilantly protecting themselves from harm through approaches such as AI-PBS-SHR. Given the cyclical nature of trauma and alcohol use, male and female individuals with traumatic stress may be thinking more proactively about how to reduce harm in their environments to prevent a future trauma from occurring (Borsari et al., 2008). Perhaps similar levels of vigilance or awareness of potential harm across genders contributed to gender not further moderating the relationship between traumatic stress and alcohol-related negative consequences.

These findings could be useful for prevention and intervention strategies on college campuses. While AI-PBS-MOD and AI-PBS-SLD appear to be additionally useful for males with higher traumatic stress symptoms than females in terms of lower hazardous drinking, AI-PBS-SHR strategies appear to be universally associated with fewer alcohol-related negative consequences for both male and female college students reporting traumatic stress symptoms. Because of the potentially severe impact of alcohol-

related negative consequences (e.g., White & Hingson, 2014), prevention and intervention strategies including AI-PBS-SHR education may be a cost-effective and reliable way to increase safety on college campuses for individuals reporting traumatic stress symptoms and alcohol use consequences. Additionally, education about AI-PBS-MOD and AI-PBS-SLD may have additional clinical utility for intervention purposes with male college students presenting with traumatic stress symptoms and hazardous alcohol use behaviors.

Furthermore, there is evidence college students are more interested in seeking treatment for emotional problems than alcohol-related problems (Capron, Bauer, Madson, & Schmidt, in press). Given the emotional nature of traumatic stress symptoms, students may present to treatment primarily to target traumatic stress, so these results suggest that mental health professionals working with college students could improve their practice through including screening and assessment of alcohol use problems. Conversely, mental health professionals providing alcohol-specific interventions to college students could incorporate screening and assessment measures for traumatic stress and other mental health problems; these symptoms could then be added as a target in interventions or addressed through a referral to other mental health services.

Future research should explore additional factors, such as peer or social influence, that may influence gender differences in AI-PBS use, specifically AI-PBS-MOD and AI-PBS-SLD use when it comes to hazardous drinking. Incorporating drinking context, such as high-risk and low-risk environments, may provide useful information as to why certain AI-PBS subtypes have emerged as protective for individuals with traumatic stress when measuring hazardous use and experienced negative consequences. For example, if

individuals with high traumatic stress are drinking in less-risky environments (e.g., drinking alone at home rather than at a college party), the relevance of AI-PBS-SHR may be reduced, but the protective utility of AI-PBS-MOD and AI-PBS-SLD may be increased. Moreover, assessing the relationship between traumatic stress symptoms and typical daily drinking (instead of hazardous drinking) along with drinking motives may better reflect how typically (i.e. frequency) and why (i.e. motives) individuals with greater traumatic stress symptoms are using alcohol. Drinking could function as a coping mechanism to reduce some of the physical and mental symptoms of traumatic stress that are associated with hyperarousal, negative affect, and avoidance (Kaysen et al., 2014). A daily diary design capturing fluctuations in traumatic stress symptoms, drinking motives, drinking context, use of AI-PBS, and both positive and negative consequences may lend useful insight into what initiates, maintains, and results from alcohol consumption for those experiencing traumatic stress symptoms.

There are several limitations to the present study. First, the cross-sectional design of the study limits the causal inferences that can be made from the results as temporal precedence cannot be established. Furthermore, using a self-report screening measure limits the inferences that can be made around diagnostic criteria, as individuals may under-report symptoms and because the self-report is not sufficient for a diagnosis (McDonald, Brown, Benesek, & Calhoun, 2015). Using a semi-structured interview, such as the PTSD Symptom Scale Interview for DSM-5 (PSSI-5), may provide a more reliable measure of traumatic stress symptomology (Foa et al., 2016a). While the PCL-5 asks respondents to think about the most stressful event they have experienced (Weathers et al., 2013), it does not explicitly assess for the Criterion A trauma necessary to establish a

diagnosis of PTSD per DSM-5 diagnostic guidelines (APA, 2013). Additionally, traumatic stress symptomology can fluctuate (APA, 2013) and this study assessed symptoms at one point in time. Future studies could enhance the assessment validity of traumatic stress symptomology through daily design studies to evaluate fluctuations in symptomology and how this relates to drinking behaviors. Future research could also explicitly screen for the presence of Criterion A trauma to more distinctly measure PTSD rather than traumatic stress symptoms, and could implement either a semi-structured interview or more rigorous self-report measure of Criterion A trauma and traumatic stress symptoms such as the PTSD Diagnostic Scale (PDS-5; Foa et al., 2016a, Foa et al., 2016b). Finally, assessing hazardous alcohol use may not capture the frequency with which individuals experiencing traumatic stress may be drinking. If individuals are consuming alcohol in manners consistent with SMT, they may be engaging in more consistent, daily drinking to manage regularly occurring traumatic stress symptoms.

Despite limitations, the present study has strengths. The multi-site nature of the national sample increases the generalizability of the results and helps mitigate regional differences that can emerge in the college student drinking literature (e.g., less heavy drinking in the southern United States). Additionally, no studies to our knowledge have evaluated the role of AI-PBS subtypes in the context of traumatic stress symptoms and alcohol use behaviors. The prevalence of trauma exposure and traumatic stress symptoms in college students (Read et al., 2011), along with the high rates of college student drinking (e.g., Johnston et al., 2016), make this an important area of study in the interest of safety and public health. Finally, the inclusion of gender provides useful information about where gender differences may emerge in the relationships between traumatic stress

symptoms, AI-PBS subtype use, and alcohol-related variables. Overall, this study contributes important information to a gap in the literature in further understanding how harm reduction strategies and gender are related to alcohol behaviors and outcomes for individuals experiencing traumatic stress symptoms.

## APPENDIX A – Electronic Informed Consent

Consent is hereby given to participate in the study titled: PSST

**PURPOSE:** The present study is designated to examine the association between thoughts and college student health and harmful substance use behaviors. Results will be used to guide later research on promoting healthy behaviors.

**DESCRIPTION OF STUDY:** Participation will consist of completing several brief questionnaires via an on-line secure website. The completion of these initial questionnaires should take approximately 60 minutes and participants will receive 1 credit. Questionnaires completed via the Internet will concern your feelings, attitudes, behaviors, and experiences. You will only receive credit for completing the survey and answering honestly.

**BENEFITS:** Participants are not expected to directly benefit from your participation. However, it is hoped that this study will contribute to our understanding of personality. You will also receive 1 SONA credit for completing the surveys completely and honestly.

**RISKS:** No foreseeable risks, beyond those present in routine daily life, are anticipated in this study. If you find that are distressed by completing these questionnaires, you should visit the campus counseling center or notify the researcher immediately. The survey asks some personal questions about personal behavior including illegal behavior (i.e., drug use). You can skip questions or discontinue from further participation in the study at any time without any consequence. You will be able to contact the principal investigator, Michael B. Madson, Ph.D., at any time throughout the study. You should visit your campus counseling services if you feel distressed although this need is not anticipated.

**CONFIDENTIALITY:** This study uses automatic crediting so it is anonymous and you will not need to provide your name. The on-line survey has security measures to protect your responses and there are no hard copies of your responses. Findings will be presented in aggregate form with no identifying information to ensure confidentiality and will be stored on a password protected computer.

**PARTICIPANT ASSURANCE:** Whereas no assurance can be made concerning results that may be obtained (since results from investigational studies cannot be predicted) the researcher will take every precaution consistent with the best scientific practice. Participation in this project is completely voluntary, and participants may withdraw from this study at any time without penalty, prejudice, or loss of benefits. Questions concerning the research should be directed to Dr. Michael Madson at (601) 266-4546 (or e-mail at michael.madson@usm.edu). This project and this consent form have been reviewed by the Institutional Review Board, which ensures that research projects involving human participants follow federal regulations. Any questions or concerns about

rights as a research participant should be directed to the Chair of the Institutional Review Board, The University of Southern Mississippi, Box 5147, Hattiesburg, MS 39406, (601) 266-6820. A copy of this form will be given to the participant.

If you become distressed as a result of your participation in this study, then you should contact an agency on-campus or in the surrounding community that may be able to provide services for you. A partial list of available resources is provided below:

University of Southern Mississippi Counseling Center (601) 266-4829

Community Counseling & Assessment Clinic (601) 266-4601

Pine Belt Mental Healthcare (601) 544-4641

Pine Grove Recovery Center (800) 821-7399

Forrest General Psychology Services (601) 288-4900

Lifeway Counseling Service Incorporated (601) 268-3159

Behavioral Health Center (601) 268-5026 Hope Center (601) 264-0890

If you experience distress as a result of your participation in this study, please notify Hallie Jordan ([hallie.jordan@usm.edu](mailto:hallie.jordan@usm.edu)) or Dr. Michael Madson ([michael.madson@usm.edu](mailto:michael.madson@usm.edu)).



## APPENDIX C Posttraumatic Stress Disorder Checklist (PCL-5)

Below is a list of problems that people sometimes have in response to a very stressful experience. Please read each problem carefully and then circle one of the numbers to the right to indicate how much you have been bothered by that problem in the past month.  
In the past month, how much were you bothered by:

Not at all  
A little bit  
Moderately  
Quite a bit  
Extremely

1. Repeated, disturbing, and unwanted memories of the stressful experience?
2. Repeated, disturbing dreams of the stressful experience?
3. Suddenly feeling or acting as if the stressful experience were actually happening again (as if you were actually back there reliving it)?
4. Feeling very upset when something reminded you of the stressful experience?
5. Having strong physical reactions when something reminded you of the stressful experience (for example, heart pounding, trouble breathing, sweating)?
6. Avoiding memories, thoughts, or feelings related to the stressful experience?
7. Avoiding external reminders of the stressful experience (for example, people, places, conversations, activities, objects, or situations)?
8. Trouble remembering important parts of the stressful experience?
9. Having strong negative beliefs about yourself, other people, or the world (for example, having thoughts such as: I am bad, there is something seriously wrong with me, no one can be trusted, the world is completely dangerous)?
10. Blaming yourself or someone else for the stressful experience or what happened after it?
11. Having strong negative feelings such as fear, horror, anger, guilt, or shame?
12. Loss of interest in activities that you used to enjoy.
13. Feeling distant or cut off from other people?
14. Trouble experiencing positive feelings (for example, being unable to feel happiness or have loving feelings for people close to you)?
15. Irritable behavior, angry outbursts, or acting aggressively?
16. Taking too many risks or doing things that could cause you harm?
17. Being “superalert” or watchful or on guard?
18. Feeling jumpy or easily startled?
19. Having difficulty concentrating?
20. Trouble falling or staying asleep?

APPENDIX D Protective Behavioral Strategies Scale – 20 (PBSS-20)

For the following set of items, think about your behavior in the past 30 days. How often do you use the following behaviors when using alcohol or 'partying'?

{Choose one}

- (1) Never
- (2) Rarely
- (3) Occasionally
- (4) Sometimes
- (5) Usually
- (6) Always

1. Determine not to exceed a set number of drinks
2. Alternate alcoholic and nonalcoholic drinks
3. Have a friend let you know when you've had enough
4. Leave the bar/party at a predetermined time
5. Stop drinking at a predetermined time
6. Drink water while drinking alcohol
7. Put extra ice in your drink
8. Avoid drinking games
9. Avoid mixing different types of alcohol
10. Drink slowly, rather than gulp or chug
11. Avoid trying to "keep up" or out-drink others
12. Avoid "pregaming" (i.e., drinking before going out)
13. Use a designated driver
14. Make sure that you go home with a friend
15. Know where your drink has been at all times
16. Refuse to ride in a car with someone who has been drinking
17. Only go out with people you know and trust
18. Avoid combining alcohol with marijuana
19. Make sure you drink with people who can take care of you if you drink too much
20. Eat before or during drinking

APPENDIX E Alcohol Use Disorders Identification Test – United States – Consumption

(AUDIT-US-C)

Please answer the following questions regarding your alcohol use and consequences.

Questions	0	1	2	3	4	5	6
1. How often do you have a drink containing alcohol?	Never	Less than Monthly	Monthly	Weekly	2-3 times a week	4-6 times a week	Daily
2. How many drinks containing alcohol do you have on a typical day when you are drinking?	1 drink	2 drinks	3 drinks	4 drinks	5-6 drinks	7-9 drinks	10 or more drinks
3. How often do you have six or more drinks on one occasion?	Never	Less than Monthly	Monthly	Weekly	2-3 times a week	4-6 times a week	Daily

APPENDIX F Brief Young Adult Alcohol Consequences Questionnaire (BYAACQ)

{Choose all that apply}

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

## APPENDIX G – IRB Approval Letter



**INSTITUTIONAL REVIEW BOARD**  
118 College Drive #5147 | Hattiesburg, MS 39406-0001  
Phone: 601.266.5997 | Fax: 601.266.4377 | [www.usm.edu/research/institutional.review.board](http://www.usm.edu/research/institutional.review.board)

### NOTICE OF COMMITTEE ACTION

The project has been reviewed by The University of Southern Mississippi Institutional Review Board in accordance with Federal Drug Administration regulations (21 CFR 26, 111), Department of Health and Human Services (45 CFR Part 46), and university guidelines to ensure adherence to the following criteria:

- The risks to subjects are minimized.
- The risks to subjects are reasonable in relation to the anticipated benefits.
- The selection of subjects is equitable.
- Informed consent is adequate and appropriately documented.
- Where appropriate, the research plan makes adequate provisions for monitoring the data collected to ensure the safety of the subjects.
- Where appropriate, there are adequate provisions to protect the privacy of subjects and to maintain the confidentiality of all data.
- Appropriate additional safeguards have been included to protect vulnerable subjects.
- Any unanticipated, serious, or continuing problems encountered regarding risks to subjects must be reported immediately, but not later than 10 days following the event. This should be reported to the IRB Office via the "Adverse Effect Report Form".
- If approved, the maximum period of approval is limited to twelve months.  
Projects that exceed this period must submit an application for renewal or continuation.

PROTOCOL NUMBER: 16120704  
PROJECT TITLE: PSST  
PROJECT TYPE: New Project  
RESEARCHER(S): Michael Madson, Ph.D.  
COLLEGE/DIVISION: College of Education and Psychology  
DEPARTMENT: Psychology  
FUNDING AGENCY/SPONSOR: N/A  
IRB COMMITTEE ACTION: Expedited Review Approval  
PERIOD OF APPROVAL: 01/04/2017 to 01/03/2018

**Lawrence A. Hosman, Ph.D.**  
**Institutional Review Board**

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