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Weeding Through College Drinking: The Moderating Role of Marijuana

Use on Alcohol Use, Protective Behavioral Strategies, and Negative

Consequences

by

Mallorie Gayle Carroll

A Dissertation
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 Doctor of Philosophy

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ABSTRACT

Rates of alcohol (60% monthly) and marijuana (20% monthly) use among college students remain a concern given students experience a wide range of negative consequences related to their use, especially hazardous use. Research supports the theory that protective behavioral strategies are effective strategies that one can use while engaging in alcohol and marijuana use to minimize the experience of negative consequences. However, research regarding protective behavioral strategies for marijuana is fairly new and the findings are inconsistent. Given the limited research regarding alcohol-use behaviors among college students who report alcohol and marijuana use, the purpose of this study was to examine the moderating effect of hazardous marijuana use on the relationship between hazardous alcohol consumption and alcohol-related negative consequences and on the relationship between the types of protective behavioral strategies for alcohol (e.g., manner of drinking, serious harm reduction, stopping limiting drinking) and alcohol-related negative consequences. In addition, the current study examined the moderating relationship protective behavioral strategies for marijuana has on the relationships between typical marijuana consumption and hazardous marijuana use with marijuana-related negative consequences. Participants were a national sample of 410 traditional aged college students who completed measures of alcohol consumption, protective behavioral strategies for alcohol and marijuana, marijuana consumption, alcohol-related negative consequences, and marijuana-related negative consequences. Only hazardous marijuana use and manner of drinking emerged as significant double moderators of the association between hazardous alcohol consumption and alcohol-related negative consequences. Clinical and research implications are discussed.

ACKNOWLEDGMENTS

DEDICATION

The author would like to dedicate this dissertation to her family, in particular her partner Richard Klinger, her parents Gail and Ernie Patrick, aunts and uncles Michelle and Michael Sayner and Sharon and Ronnie Peden, and many beloved friends (especially Sarah Ehlke, Lucas Mirabito, Malory Stacy, Courtney Perry, and Erin Consuegra) who have stood by the author's side throughout the many years of school and have been a constant and invaluable source of support and encouragement.

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CHAPTER I - INTRODUCTION

Alcohol and marijuana are two of the most commonly used substances by college students, often being used at higher rates than their non-college peers (Johnston, O'Malley, Bachman, Schulenberg, & Miech, 2016). While rates of alcohol consumption in college students have generally declined over the last 30 years (e.g., decrease of 12% since 1987; Johnston et al., 2016; White & Hingson, 2013), alcohol consumption remains a large part of the college culture with roughly 79% of students reporting annual alcohol consumption. Marijuana use is on the rise, with around 38% of college students reporting marijuana use in 2016, compared to 31.8 % in 2007 (Johnson et al., 2016). Following alcohol and cigarette use, marijuana use has become the most widely used drug among persons aged 18-25 (Johnston et al., 2016). Alcohol and marijuana use is a large part of the college experience for many college students and often have a negative and sometimes lasting impact on a number of students. According to 2009 substance abuse treatment admission data from the Substance Abuse and Mental Health Services Administration (SAMHSA, 2012), 12,000 persons aged 18 to 24 who were admitted for substance use treatment were college students or postsecondary students. Furthermore, 46% of those admits reported alcohol as their primary drug of abuse and 31% reported marijuana use as their primary drug of abuse (SAMHSA, 2012).

College Student Alcohol Use and Alcohol-Related Negative Consequences

Approximately 63% of college students report monthly alcohol use and about 33% of the annual drinkers report hazardous drinking behaviors (Johnston et al., 2016, National Institute on Alcohol Abuse and Alcoholism; NIAAA, 2015). Hazardous drinking consists of a number of different drinking behaviors, with one of the most

prevalent being binge drinking (i.e., 5 drinks or more for males/4 drinks or more for females within 2 hours on at least 1 day in the past month; SAMSHA, 2016). White and Hingson (2013) stated that reports of college student drinking over the last 20 years indicate that while the percentage of binge drinkers (as classified by definition above) has remained stable, the percentage of frequent binge drinkers (e.g., two-three episodes a week) has increased. Johnston and colleagues (2016) also reported a significant number of students are drinking at rates well above the regarded threshold considered hazardous such as consuming at least 10 drinks (13%) or at least 15 drinks (5%) in a row in the previous two weeks. Thus, data suggest frequent alcohol consumption, including hazardous use, is common among college students. In fact, alcohol is one of the few substances in which college students' use is greater than their non-college peers and they continue to have the highest rate of binge drinking (Dawson, Grant, Stinson, & Chou, 2004; Johnston et al., 2016). Gender differences in alcohol consumption also appear to be unique to the college atmosphere (Byrd, 2016) such that men report engaging in more hazardous drinking and being drunk more often than women (Johnston et al., 2016). Although there is some research to support the gender gap in college student drinking is decreasing, the difference remains significant (Fuggitt, Ham, & Bridges, 2017; Johnston et al., 2016). The high prevalence rate of alcohol use among college students, especially the rates of hazardous drinking, remains a concern of college administrators, parents, and society at large particularly because of alcohol-related negative consequences .

Alcohol-related negative consequences range from more minor consequences, such as saying something one later regretted or experiencing a hangover, to more serious consequences such as assault, legal trouble, academic difficulties, or death (Everett,

Lowry, Cohen, & Dellinger, 1999; Hingson, Zha, & Weitzman, 2009; Martinez, Sher, & Wood, 2008; Martinez, Sher, & Wood, 2014; NIAAA, 2017; Perkins, 2002). Greater weekly alcohol consumption and hazardous drinking are consistently associated with greater alcohol-related negative consequences (Corbin et al., 2014; Ebersole, Noble, & Madson, 2012; Ham & Hope, 2003; Hingson et al., 2009; Madson, Moorer, Zeigler-Hill, Bonnell, & Villarosa, 2013; Wechsler, Kuo, Lee, & Dowdall, 2000). Frequent hazardous drinkers were 25 times more likely to report experiencing more negative consequences than non-hazardous drinkers (Wechsler, Davenport, Dowdall, Moeykens, & Castillo, 1994) and a variety of consequences ranging in severity (e.g., feeling sick after drinking to unwanted sexual experience) were found to be consistently related to frequent heavy alcohol consumption (Martinez et al., 2014).

More globally, the NIAAA (2015) reports 1,825 college students die each year from unintentional injuries related to alcohol consumption, 696,000 students are assaulted by someone who has been drinking, 97,000 students are victims of alcohol-related sexual assault or rape, 590,000 students experience some type of alcohol-related unintentional injury, 25% of students report academic difficulties, and 150,000 students report a health problem because of drinking. In addition, around one percent of college students try to commit suicide because of drinking or drug use (Hingson et al., 2009) and alcohol use is the greatest contributor to college student morbidity and mortality (Borsari, Murphy, & Barnett, 2007). Thus, although alcohol consumption among college students is often considered a benign rite of passage, it is clear that college students' alcohol consumption can result in high rates of alcohol-related negative consequences, some being extremely severe and fatal (Lee, Gesiner, Patrick, & Neighbors, 2010). Not only does alcohol

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consumption result in negative consequences for the student, but it can also have an impact on the community (e.g., residence halls, campus administration) and economy (NIAAA, 2017; Perkins, 2002).

Given the consistently high rates of alcohol consumption and alcohol-related negative consequences witnessed among college students, it is important for researchers to continue to expand understanding regarding the experience of alcohol-related negative consequences and to identify college student subpopulations that may be at an even greater risk for experiencing these consequences. One such subpopulation is college students who use alcohol and marijuana. Given that marijuana use is on the rise by college students, it is beneficial to explore the impact marijuana use may be having on students who are also using alcohol.

<div align="center">College Student Marijuana Use</div>

College student annual marijuana use is at the highest rate since the 1980's, and it appears that monthly (20%) and daily (5.1%) reports have seen the most significant increase within the last 30 years (Johnston et al., 2016; Pearson, Liese, Dvorak, & Marijuana Outcomes Study Team, 2017; Pedersen, Hummer, Rinker, Traylor, & Neighbors, 2016). The substantial increase in marijuana use may be due to several factors including (a) the view that marijuana use is relatively low risk with low impact consequences (Kilmer, Hunt, Lee, & Neighbors, 2007; LaBrie, Hummer, Kenney, Lac, & Pedersen, 2011; Pearson et al., 2017; Pedersen et al., 2016), (b) the evolution of laws regarding the legality of marijuana use, and (c) geographic and socio-cultural factors (Johnston et al., 2016). To date, eight states (Washington, Alaska, Oregon, California, Colorado, Nevada, Maine, Massachusetts) and the District of Columbia have legalized

marijuana for recreational purposes. Further, 30 states and the District of Columbia have legalized marijuana for non-FDA approved medicinal purposes, 16 states have cannabidiol (CBD, one of the chemical components of marijuana) specific medicinal laws, and a number of other states have decriminalized it (American Society of Addiction Medicine, 2018). Thus, it is likely that over the next decade the country will see even more changes to the legalization of marijuana and a subsequent increase in the percentage of college students reporting marijuana use. Given the current level of use and expectation of greater future use, researchers and clinicians will likely start to look more at college student marijuana use, including hazardous marijuana use. Similar to alcohol use, research shows that men report more marijuana use than women (Allen & Holder 2014; Weiss & Dilks, 2015) in annual (40% vs. 37%) and daily (6.7% vs. 3.4%) use frequency (Johnston et al., 2016). However, female annual and daily use increased from 2013 to 2015 (Johnston et al., 2016). Therefore, it appears that marijuana use, including hazardous use, is becoming a normative component of the college experience for many college students, illustrating the importance of examining its impact and the development of evidence-based harm reduction strategies for marijuana use.

Although young adults may consider marijuana use to be low risk, negative consequences are associated with more frequent marijuana use. Specifically, more frequent marijuana use is associated with a number of unsafe behaviors and negative consequences such as driving while under the influence, risky sexual behaviors, cigarette use, and increased alcohol consumption (Bell, Wechsler, & Johnston, 1997; Buckner, Eckner, & Cohen, 2010; Caldeira, Arria, O'Grady, Vincent, & Wish, 2008; Kilmer et al., 2007; Pedersen et al., 2016), as well as academic difficulties (Arria, Caldeira, Bugbee,

Vincent, & O'Grady, 2015). Allen and Holder (2014) and Keith, Hart, McNeil, Silver, and Goodwin (2015) found a link between the frequency of marijuana use and increased negative consequences, with Allen and Holder (2014) highlighting that marijuana was the best predictor of negative consequences for those using multiple substances (i.e. hallucinogens, cocaine, ecstasy, MDMA, ketamine, Oxycontin, and stimulants).

<p align="center">Marijuana and Alcohol Use</p>

Large majorities of students who report marijuana use also report alcohol use, and the frequency of marijuana use has been significantly associated with frequency of binge drinking (Keith et al., 2015; Yurasek, Aston, & Metrick, 2017). Further, studies found frequent marijuana users engaged in more frequent alcohol use (2-3 times per week) compared to less frequent marijuana use (Buckner et al., 2010) and tend to be "higher risk partiers" and more likely to try other drugs (Weiss & Dilks, 2015). Keith and colleagues (2015) found 36% of frequent marijuana users reported hazardous drinking on at least three occasions in the previous two weeks (vs 23.2% of occasional marijuana users and 6.4% of non-marijuana users). Thus, the majority of students who are using marijuana are also reporting alcohol use, and those who are reporting more frequent marijuana use are reporting more hazardous alcohol consumption. Given the rate of alcohol and marijuana use among college students, and the substantial body of evidence to support the link between increased use of each substance independently and negative consequences, it behooves researchers and clinicians alike to develop a greater understanding of the relationship and potential impact on the experience of negative consequences the substances may be having in combination. There is also growing

concern over the impact of their combined use, especially as efforts to legalize marijuana increase (Keith et al., 2015; Pearson et al., 2017).

Although limited, the current body of literature suggests that students who use marijuana and consume alcohol experience greater consequences than students who only consume alcohol (Collins, Bradizza, & Vincent, 2007; Harrington et al., 2012; Stein, Caviness, & Anderson, 2014; Yurasek et al., 2017). Collins and colleagues (2007) found that young adults who drank regularly (i.e. > 40oz/week) and used marijuana in combination experienced more alcohol-related problems as compared to individuals who did not use substances together. 97.9% of combined alcohol and marijuana users reported at least one negative consequence in the past 30 days, compared to 41.4% of alcohol-only users who reported at least one negative consequence in the past 30 days (Shillington & Clapp, 2001). There are also some findings on gender differences such that, even though men use more marijuana and alcohol than women do, women are more likely to experience more negative consequences (Weiss & Dilks, 2015).

Overall, it appears individuals commonly use both marijuana and alcohol, which is putting them at greater risk for experiencing negative consequences. Thus, these findings illustrate the importance of continuing research to further explore this relationship and that addressing students' use of marijuana and alcohol may be a vital component of interventions. Although there is a body of literature examining the combination of marijuana and alcohol use on experienced negative consequences (Harrington et al., 2012; Keith et al., 2015; Yurasek et al., 2017), less is known about the combined use of marijuana and alcohol on other alcohol-related behaviors, including harm reduction approaches such as protective behavioral strategies (PBS).

Protective Behavioral Strategies

Over the past two decades, there have been increased efforts by researchers and clinicians to develop, modify, and implement effective prevention and intervention programs in an attempt to reduce the experience of alcohol-related negative consequences among college students. One of the major components of these programs is protective behavioral strategies for alcohol (PBSA). PBSA are strategies individuals can engage in, such as setting a drinking limit, having a designated driver, or avoiding shots of liquor, to minimize the experience of alcohol-related negative consequences (Madson, Arnau, & Lambert, 2013; Martens et al., 2004; Pearson, Kite, & Henson, 2012; Pearson, Kite, & Henson, 2013). A large body of research supports the theory that increased PBSA use, both directly and as a moderator, is associated with decreased alcohol consumption and alcohol-related negative consequences (Delva, et al., 2004; Kenney & LaBrie 2013; LaBrie, Kenney, Lac, Garcia, & Ferraiolo, 2009; Madson, et al., 2013a; Pearson, 2013; Villarosa, Madson, Zeigler-Hill, Noble, & Mohn, 2014; Villarosa, Moorer, Madson, Zeigler-Hill, & Noble, 2014). For instance, higher PBSA use has been associated with less alcohol consumption and reported negative consequences (Patrick, Lee, & Larimer, 2011). Further, less PBSA use has been related to a greater experience of alcohol-related negative consequences even when accounting for gender and alcohol consumption (Martens et al., 2004), and alcohol-related problems have been found to be strongest for binge drinkers who reported low PBSA use (Benton et al., 2004; Borden et al., 2011). This inverse relationship has also stood when examining PBSA longitudinally (Martens, Martin, Littlefield, Murphy, & Cimini, 2011).

Further understanding of PBSA strategies can be gained by dismantling them into specific types such as stopping/limiting drinking (SLD), serious harm reduction (SHR), and manner of drinking (MOD) (Martens, Pedersen, LaBrie, Ferrier, & Cimini, 2007). Research on the types of PBSA have found that increased PBS MOD tends to be more consistently inversely related with alcohol consumption, increased SHR tends to be inversely related to alcohol-related negative consequences, and SLD tends to be unrelated (DeMartini et al., 2013; Frank, Thake, & Davis, 2012; Madson, et al., 2013a; Madson and Zeigler-Hill, 2013; Martens et al., 2005, 2008, 2011; Moorer, Madson, Mohn, & Nicholson, 2013; Napper, Kenney, Lac, Lewis, & LaBrie, 2014; Pearson et al., 2012; 2013; Villarosa, et al., 2014a, 2014b; Villarosa, Kison, Madson & Zeigler-Hill, 2016). These findings lend support to the utility of PBSA, highlighting the importance of continuing to examine its role among additional relationships, particularly through the examination of PBSA at subtype levels.

However, additional research has identified a variety of factors that can impact the effectiveness of PBSA such as mental health, race, and gender (Delva et al., 2004; Frank et al., 2012; LaBrie et al., 2009; LaBrie, Kenney, & Lac, 2010; Landry, Moorer, Madson, & Zeigler-Hill, 2014; Madson et al., 2013b; Madson & Zeigler-Hill, 2013; Martens et al., 2008). For instance, some studies have found the inverse relationship between PBSA and alcohol-related outcomes to only be significant among females (Delva et al., 2004; Madson et al., 2013b), while others studies have found race to moderate the benefits of PBSA (Kenney & LaBrie, 2013; Landry et al., 2014; Madson & Zeigler-Hill, 2013). The impact of other factors on the relationship between PBSA and alcohol-related outcomes indicates that the relationship does not occur in isolation and

highlights the importance of continued research to identify other unexamined variables that may affect PBSA (Pearson, 2013).

While the majority of current research regarding PBS has focused on strategies for alcohol, research has recently begun to examine PBS with marijuana (PBSM; Pedersen et al., 2016). While some of the strategies closely match the established PBSA, others differ. For instance, similar strategies include using a designated driver and setting a consumption limit, while differences exist with marijuana strategies such as avoiding using marijuana in public places and keeping track of your costs of use. Pedersen and colleagues (2016) found significant negative correlations existed between PBSM use scores and frequency of marijuana use, marijuana consequences, and hazardous marijuana use. Pedersen, Huang, Dvorak, Prince, and Hummer (2017) also found a shortened form of the PBSM to be strongly and negatively associated with past month marijuana use and marijuana-related negative consequences. In addition, Bravo, Anthenien, Prince, Pearson, and the Marijuana Outcomes Study Team (2017) found that greater PBSM use was associated with decreased marijuana consumption and marijuana-related consequences. Furthermore, researchers found among those with high PBSM use, gender differences were minimized, while for those with average PBSM use, being male and coping motives were associated with greater consequences (Bravo et al., 2017a). Surprisingly, the researchers also found the relationship between marijuana consumption and consequences was strengthened by greater PBSM use (Bravo et al., 2017a). Although PBSM research is still in the early stages, the findings suggest protective strategies are effective for both alcohol and marijuana. However, far less is known about the value of marijuana protective strategies and whether increased PBSM use is consistently

associated with a decrease in marijuana use and marijuana-related negative

consequences. Thus, Pearson and colleagues (2017) note the importance of continuing to

develop understanding and implementation of safe strategies for marijuana use given the

increased legal availability of marijuana.

Advancing research in the area of PBS can be accomplished through multiple

avenues. First, while the direct relationship between PBSA and alcohol-related outcomes

is fairly stable, there is a body of research to support a number of factors that may impact

this relationship. However, the research regarding these factors is emerging and indicates

the need to identify more intervening variables such as marijuana use. In addition,

examining PBSA at the subtype level in combination with other factors can provide a

deeper level of understanding of these relationships. Lastly, expanding knowledge of the

utility of PBS beyond alcohol, such as with marijuana, will expand upon the current body

of literature, particularly around interventions aimed at reducing harm from substance use

among at-risk populations such as college students.

<center>Present Study</center>

Alcohol and marijuana use is a large part of the college experience for many

students, which is concerning given the link between increased use of both substances,

especially hazardous use and a range of negative consequences. The combined use of

alcohol and marijuana results in even greater negative consequences than one substance

alone. Evidence supports PBSA as an effective strategy to minimize alcohol-related

negative consequences. However, to date, the understanding of how marijuana use may

attenuate the effects of PBSA use in students who use alcohol and marijuana is needed,

especially among students who are using at hazardous rates, as they are at the greatest

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risk for experiencing alcohol-related negative consequences. The purpose of this study was to examine the moderating role of hazardous marijuana use on the relationship between hazardous alcohol consumption and alcohol-related negative consequences and on the relationship between the types of PBSA and alcohol-related negative consequences. Furthermore, given the early findings related to PBSM and marijuana use, the current study examined the relationship of PBSM with typical marijuana consumption, hazardous marijuana use, and marijuana-related negative consequences. As mentioned throughout, when considering college student substance use behaviors and the related outcomes, one of the variables to account for is gender. Research has supported the theory that men consistently use alcohol and marijuana more frequently and in greater quantities than women and use PBSA at lower rates. With the present study's purposes in mind, the current study examined the following questions and subsequent hypotheses:

Question 1: To what degree does hazardous marijuana use moderate the relationship between hazardous alcohol consumption and alcohol-related negative consequences?

Hypothesis 1: Hazardous marijuana use will moderate the relationship between hazardous alcohol consumption and alcohol-related negative consequences, such that for students who report greater hazardous marijuana use, the relationship between hazardous alcohol consumption and alcohol-related negative consequences will be strongest.

Question 2: To what degree does hazardous marijuana use moderate the relationship between each type of PBS-A (MOD, SHR, SLD) and alcohol-related negative consequences?

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Hypothesis 2a: Hazardous marijuana use will moderate the relationship between Manner of Drinking and alcohol-related negative consequences, such that for students who report greater hazardous marijuana use, the inverse relationship between fewer MOD use and greater alcohol-related negative consequences will be strongest.

Hypothesis 2b: Hazardous marijuana use will moderate the relationship between Stopping/Limiting Drinking and alcohol-related negative consequences, such that for students who report greater hazardous marijuana use, the inverse relationship between fewer SLD use and greater alcohol-related negative consequences will be strongest.

Hypothesis 2c: Hazardous marijuana use will moderate the relationship between Serious Harm Reduction and alcohol-related negative consequences, such that for students who report greater hazardous marijuana use, the inverse relationship between fewer SHR use and greater alcohol-related negative consequences will be strongest.

Question 3: To what extent does each type of PBS-A and hazardous marijuana use moderate the relationship between hazardous alcohol consumption and alcohol-related negative consequences?

Hypothesis 3a: Manner of Drinking and hazardous marijuana use will moderate the relationship between hazardous alcohol consumption and alcohol-related negative consequences, such that for students who report greater hazardous marijuana use and less MOD use, the relationship between hazardous alcohol consumption and alcohol-related negative consequences will be the strongest.

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Hypothesis 3b: Stopping/limiting Drinking and hazardous marijuana use will moderate the relationship between hazardous alcohol consumption and alcohol-related negative consequences, such that for students who report greater hazardous marijuana use and less SLD use, the relationship between hazardous alcohol consumption and alcohol-related negative consequences will be the strongest.

Hypothesis 3c: Serious Harm Reduction and hazardous marijuana use will moderate the relationship between alcohol consumption and alcohol-related negative consequences, such that students who report greater hazardous marijuana use and less SHR use, the relationship between hazardous alcohol consumption and alcohol-related negative consequences will be the strongest.

Question 4: To what degree does typical weekly marijuana consumption predict marijuana-related negative consequences?

Hypothesis 4: Greater typical marijuana consumption will predict greater marijuana-related negative consequences.

Question 5: To what degree does PBSM use moderate the relationship between typical weekly consumption and marijuana-related negative consequences?

Hypothesis 5: PBSM use will moderate the relationship between typical marijuana consumption and marijuana-related negative consequences, such that for students with lower PBSM use, the relationship between typical marijuana consumption and marijuana-related negative consequences will be the strongest.

Question 6: To what degree does hazardous marijuana use predict marijuana-related negative consequences?

Hypothesis 6: Greater hazardous marijuana use will predict greater marijuana-related negative consequences.

Questions 7: To what degree does PBSM use moderate the relationship between hazardous marijuana use and marijuana-related negative consequences?

Hypothesis 7: PBSM use will moderate the relationship between hazardous marijuana use and marijuana-related negative consequences, such that for students with lower PBSM use, the relationship between hazardous marijuana consumption and marijuana-related negative consequences will be the strongest.

CHAPTER II – METHODS

Participants and Procedures

The present study consisted of a national sample of 443 traditional aged (18-25) college students who were physically attending classes on campus (i.e., not enrolled in an online degree program) at a four-year college or university. Additional eligibility requirements for the study included reporting at least one day of alcohol consumption and one day of marijuana consumption in the past month. Participants were recruited through Amazon's MTurk, which is a worldwide online data collection system. However, the current study was only available to participants living in the United States. MTurk was determined to be a more robust participant pool (versus the traditional university psychology subject pool) for the current study due to the need of a more equal distribution of men and women, as well as participants who reported monthly marijuana use. Furthermore, MTurk research has shown it to be a reliable method of data collection and allowed us to collect participants who met eligibility criteria within a more diverse population (Arditte, Çek, Shaw, & Timpano, 2016; Buhrmester, Kwang, & Gosling, 2011; Paolacci, Chandler, & Ipeirotis, 2010).

Participants were screened for eligibility based on the criteria outlined above. Those who met eligibility requirements were allowed to continue to complete the entire survey. Those who did not meet eligibility requirements were thanked for their time and directed to the end of the survey. Participants who met eligibility requirements, completed at least 75% of the survey, and passed all of the three validity questions (Huang, Curran, Keeney, Poposki, & DeShon, 2012; Meade & Craig, 2012) were paid 25 cents. Procedures were utilized to ensure participants could only complete the survey

once. All survey procedures were approved by the Institutional Review Board (Appendix A).

Once participants indicated interest in participating in the survey through their MTurk profile, they were provided a link to Qualtrics, which is a secured survey administration website. Participants were first directed to an informed consent form (Appendix B). Following agreement, all participants completed the six screening questions (Appendix C) and participants who met eligibility requirements then completed a demographic form followed by measures of alcohol consumption, protective behavioral strategies for alcohol, marijuana consumption, alcohol-related negative consequences, marijuana-related negative consequences and protective behavioral strategies for marijuana. While the demographic questionnaire was always presented first in the survey, the remaining questionnaires were presented in random order in an effort to minimize order effects. In total, the survey took about 15-25 minutes to complete.

Out of the 443 participants who met eligibility criteria and completed the survey, 410 participants were used in the final analyses. A number of participants were excluded for having inconsistent responses regarding marijuana and alcohol use. Specifically, seven participants were excluded for endorsing "no" on the CUDIT question "Have you used marijuana/cannabis over the past six months?" Five participants were excluded for answering "never" on the CUDIT question "How often do you use cannabis?" Fourteen participants were excluded for reporting a total typical marijuana quantity of zero. Three participants were excluded for reporting a total typical alcohol quantity of zero. Finally, four participants were excluded from the analyses for endorsing a gender other than male or female (as this was not a large enough group to use as a separate group).

The final sample consisted of 410 participants aged 18-25 ($M = 21.98$ [SD = 1.92], 50.8% female). The ethnic makeup of the sample included 70.5% white, 8.3% Hispanic, 7.1% Asian, 6.8% Black, 4.4% Multiracial, 1.0% American Indian or Alaska Native, 1.0% Eastern Indian American, 0.5% other, 0.2% Native Hawaiian or Other Pacific Islander, 0.2% Middle Eastern American. The regional distribution of participants was:

1. 21.5% from the South Atlantic (Delaware, Maryland, District of Columbia, Virginia, West Virginia, North Carolina, South Carolina, Georgia, Florida)

2. 18.8% from the Midwest – East North Central (Wisconsin, Michigan, Illinois, Indiana, Ohio)

3. 14.4% from the Northeast – Mid Atlantic (New York, Pennsylvania, New Jersey)

4. 12.2% from West – Pacific (Alaska, Washington, Oregon, California, Hawaii)

5. 8.8% from the Southwest (Oklahoma, Texas, Arkansas, Louisiana)

6. 6.6% from the Southeast (Kentucky, Tennessee, Mississippi, Alabama)

7. 6.3% from the Northeast- New England (Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut)

8. 6.3% from West – Mountain (Idaho, Montana, Wyoming, Nevada, Utah, Colorado, Arizona, New Mexico)

9. 5.1% from the Midwest – West North Central (Missouri, North Dakota, South Dakota, Nebraska, Kansas, Minnesota, Iowa)

Measures

Demographic Questionnaire

A brief demographic questionnaire was administered at the beginning of the survey to gather information on gender identity, racial/ethnic identity, age, college classification, type of college (e.g., private, public, 4 year), region of college location, and GPA. Additional data was gathered for sample descriptive purposes including Greek affiliation (yes/no), student athlete status (yes/no), living arrangements (e.g., dorm, off-campus), and use of illicit drugs other than marijuana and prescription drugs. The demographic form can be found in Appendix D.

Drinking Behavior

Daily Drinking Questionnaire (DDQ). The DDQ was used to assess typical alcohol consumption over the last 30 days (Collins, Parks, & Marlatt, 1985). The questionnaire has participants indicate their typical weekly alcohol consumption, in terms of standard drinks, over the past month. The questionnaire also has participants indicate the typical number of hours spent drinking on drinking days. The DDQ has been shown to be a reliable and valid measure in college students (Collins et al., 1985). Internal consistency for this sample was acceptable ($\alpha = .87$). This measure was used for descriptive purposes only.

Alcohol Use Disorder Identification Test (AUDIT). The AUDIT (US), an updated version of the original AUDIT, is a 10-item measure that can be used to assess alcohol consumption as well as hazardous drinking (Babor, Higgins-Biddle, Saunders, and Montiero, 2001; Center for Disease Control and Prevention [CDC], 2014). For the purpose of this study, the first three items were used to examine participants' hazardous alcohol consumption, also known as the AUDITc. Participants' answered using a scale from 0 to 6 on the first three questions: "How often do you have a drink containing

alcohol (0 (never) to 6 (daily))," "How many drinks containing alcohol do you have on a typical day when you are drinking (0 (1 drink) to 6 (10 or more drinks))," and "How often do you have 5 drinks (male) or 4 drinks (female) or more on one occasion (0 (less than monthly) to 6 (daily))." Total scores ranged from 0 to 18, with higher scores reflecting greater hazardous alcohol consumption. The AUDITc has been supported as a reliable and valid measure of alcohol consumption (Reinart & Allen, 2007; Hays, Merz, & Nicholas, 1995). Internal consistency of the 10 items of the AUDIT for this sample was acceptable ($\alpha = .83$) and the internal consistency of the AUDITc was low ($\alpha = .68$). The total AUDIT score was only used for descriptive purposes.

Rutgers Alcohol Problem Index (RAPI). The RAPI was used to assess negative consequences experienced as a result of alcohol consumption (White & Labouvie, 1989; Earleywine, LaBrie & Pedersen, 2008). The RAPI contains 23 items in which participants are asked to indicate on a 5-point Likert scale from 0 (never) to 4 (more than 10 times) their experience of a variety of alcohol-related consequences in the past month. Sample items include statements such as "went to work or school high or drunk, "suddenly found yourself in a place that you could not remember getting to" and "neglected responsibilities." For the purpose of this study, total scores were used and ranged from 0-92, with higher scores indicating a greater experience of alcohol-related negative consequences. The RAPI total score has been shown to be a reliable and valid measure with college students ($\alpha = .88$; Earleywine et al., 2008). Internal consistency for this sample was acceptable ($\alpha = .95$).

Protective Behavioral Strategies Scale-20 (PBSS-20). The PBSS-20 is a recently revised version of the original Protective Behavioral Strategies Scale (Martens et al.,

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2005). The PBSS-20 is a 20-item measure that assesses the use of protective behavioral

strategies related to alcohol use (Treloar, Martens, & McCarthy, 2015). The original

PBSS is made up of three subscales: serious harm reduction (SHR; know where your

drink has been at all times), manner of drinking (MOD; avoid drinking games), and

stopping/limiting drinking (SLD; drink water while drinking). The purpose of

modifications to the original version in the PBSS-20 included increasing content validity

of the SHR scale, which only included three items, but was identified as the most used

subscale of the PBSS. The PBSS-20 version maintained 14 original PBSS items and

added 6 new items. The PBSS-20 made modifications to the SHR scale (adding five new

items) and the MOD scale (adding one new item).

The PBSS-20 asks participants to indicate the degree to which they have engaged

in specific behaviors to keep themselves safe when using alcohol, on a 6-point Likert

scale from 1(*never*) to 6 (*always*). Higher scores indicate greater PBS use, both total and

for each subscale. The PBSS-20 is still comprised of the three subscales serious harm

reduction (*avoid combining alcohol and marijuana*), manner of drinking (*avoid pre-*

gaming), and stopping/limiting drinking (*drink water while drinking*). Results from

Treloar and colleagues (2015) indicated improved content coverage, internal consistency

(α levels of .81-.88), test-retest reliability, and criterion-related validity from the original

PBSS (Treloar et al., 2015). Internal consistency for this sample was acceptable

including the total score (α= .91), SHR subscale (α = .83), MOD subscale (α = .83), and

SLD subscale (α = .86). The total score was not used in any analyses.

Marijuana Behavior

Typical monthly/weekly marijuana use. Monthly marijuana consumption was

assessed by having participants indicate how many days out of the last 30 they consumed

marijuana and 8 descriptive questions (e.g., money spent on marijuana in past month,

routes of consumption in past month). Frequency and quantity of typical weekly

marijuana consumption over the last 30 days were assessed using a measure modeled

after the DDQ. In particular, each day of the week is broken into 4-hour segments (a total

of 42 segments), and participants are asked to indicate the number of grams of marijuana

consumed during a typical week in the last 30 days for each segment. Participants are

provided with photos of different marijuana quantities as a reference when indicating

grams consumed. From this measure, a weekly frequency score can be calculated by

summing the total number of time blocks for which the participant reported using during

the typical week (ranging from 0-42) and a weekly quantity score can be calculated by

adding the total number of grams reported (Pearson et al., 2017). The present study used

the quantity weekly totals. These procedures have been utilized in a number of other

studies (Bravo et al., 2017a; Dvorak & Day, 2014; Pearson et al., 2017; Williams,

Adams, Stephens, & Roffman, 2000). Furthermore, the measure has shown adequate

reliability and validity ($\alpha = .92$; Dvorak & Day, 2014). Internal consistency for this

sample was acceptable ($\alpha = .93$).

   Cannabis Use Disorder Identification Test-Revised (CUDIT-R). The CUDIT-R

was used to assess hazardous marijuana use (Adamson et al., 2010). The CUDIT-R is an

eight-item measure used to assess both frequency and consequences experienced as a

result of marijuana use in the past six months utilizing a 5-point Likert type scale. Items

one and two assess frequency (0 (never) to 4 (4 or more times a week) and hours of

marijuana use (0 (less than 1) to 4 (7 or more), while items two through eight assess negative consequences. (0 (never) to 6 (daily or almost daily). Higher scores indicate more hazardous marijuana use and a higher chance of developing a cannabis use problem. Total scores can range from 0 to 32, with cut off scores of 8 or more indicating hazardous cannabis use and scores of 12 or more indicating possible Cannabis Use Disorder. In addition, the CUDIT can also be used as a screener for Cannabis Use Disorder. The scale has displayed adequate reliability with young adults (Finch, Ramo, Delucchi, Liu, & Prochaska, 2013; Pedersen et al., 2016 ($\alpha = .83$); Ramo, Liu, & Prochaska, 2012). Internal consistency for this sample was acceptable ($\alpha = .82$).

Brief Marijuana Consequences Questionnaire (B-MACQ). The B-MACQ is a 21-item questionnaire that was used to assess marijuana-related consequences (Simons, Dvorck, Miller, & Read, 2012). The B-MACQ is a shortened version of the original 51-item MACQ. Participants indicate whether or not a consequence has occurred over the past six months as a result of marijuana use by indicating yes or no. Answers of "yes" are scored as one and B-MACQ scores are calculated by adding all the yes answers to create a total score. Total scores can range from 0 to 21, with higher numbers indicating a greater experience of negative consequences as a result of marijuana use. The measure has been shown to have good reliability and validity with alpha levels of .80 (Simons et al., 2012). Internal consistency for this sample was acceptable ($\alpha = .89$).

Protective Behavior Strategies for Marijuana (PBS-M). The PBS-M is a 36-item measure that assesses the use of protective behavioral strategies related to marijuana use (Pedersen et al., 2016). Similar to the PBSS-20, the PBS-M uses a Likert scale ranging from 1 (never) to 6 (always), asking participants to indicate the degree to which they used

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specific protective behaviors related to marijuana/cannabis use. Total scores can range

from 39-216 with higher scores indicating greater use of PBS for marijuana. Pedersen

and colleagues (2016) analyses showed the PBS-M was best described by one factor, thus

only a total score is generated. The PBS-M was shown to have strong internal

consistency (α = .95) and significantly associated with other marijuana-related measures

(e.g. CUDIT and B-MACQ) as well as alcohol-related protective strategies scale

(Pedersen et al., 2016). Internal consistency for this sample was acceptable (α = .96).

Data Analytic Approach

Prior to running the analyses, a series of one-way ANOVAs were conducted to

determine the presence of any gender differences in current study variables. The results

of that ANOVA determined whether it was necessary to examine gender as a covariate. A

series of multiple regressions were conducted to test proposed questions and subsequent

hypotheses. Research supports the use of multiple regression for examining moderating

effects among continuous variables (Field, 2013; Fraizer, Tix, & Barron, 2004).

Significance was determined by examining an F test and coefficients (Field, 2013). Prior

to running statistical analyses, data were screened for outliers and missing data. No

participant had less than 75% of their survey completed. Missing data from variables of

interest ranged from 0-7% and imputation with linear trend in point was utilized to

replace missing values. Skewness was determined by examining the skewness statistics.

Skewness statistics over one indicate potential issues with data (Bulmer, 1979; Hair Jr,

Anderson, Tatham, & Black, 2009) and the following variables had skewness statistics

over one: CUDIT, RAPI, BMACCQ, and Typical Marijuana use. It was determined log

transformations was the most appropriate data transformation procedure to use in the

current sample (Field, 2013). All variables used were continuous variables and were centered prior to analysis. Simple slopes tests were utilized to examine any significant moderating effects, in which variables of the significant interaction are examined at low (-1 SD below the mean) and high (+1 SD above the mean) levels (Cohen, Cohen, West, & Aiken, 2003).

CHAPTER III - RESULTS

A series of one-way ANOVAs were used to determine the presence of gender differences on study variables. Results indicated significant mean differences on the variables used in analyses (i.e., AUDITc, RAPI, MOD, SHR, SLD, PBSM, and B-MACQ) except total marijuana use. As can be seen in Table 1, men reported higher hazardous alcohol consumption (i.e., AUDITc scores), hazardous marijuana use (i.e., CUDIT scores), marijuana-related negative consequences, and alcohol-related negative consequences. Women reported higher PBS use, including PBSA and PBSM. Based on the presence of mean gender differences, gender was used as a covariate in subsequent analyses.

Table 1

Series of One-Way ANOVAs Examining Gender Differences Among Study Variables

	Females		Males					
	Mean	SD	Mean	SD	*df*	*F*	η^2	*p*
AUDITc	7.31	2.76	8.62	3.03	1	21.14	.05	<.001
CUDIT	10.16	5.48	11.53	6.27	1	5.55	.01	.019
Weekly Marijuana	9.35	18.03	11.34	18.46	1	1.22	---	.269
MOD	18.60	6.22	16.40	6.18	1	12.83	.03	<.001
SHR	39.32	6.07	34.57	8.27	1	44.21	.10	<.001
SLD	28.02	7.63	25.67	7.90	1	9.45	.02	.002
B-MACQ	4.36	4.30	5.50	5.21	1	5.91	.01	.016
PBSM	147.58	40.76	137.81	40.12	1	5.97	.01	.015
RAPI	8.90	11.52	11.86	14.49	1	5.27	.01	.022

Note. Alcohol Use Disorder Identification Test (AUDITc) = hazardous alcohol consumption; Cannabis Use Disorder Identification Test – Revised (CUDIT) = hazardous marijuana use; MOD = Manner of Drinking protective behavioral strategies; SHR = Serious Harm Reduction protective behavioral strategies; SLD = Stopping/Limiting Drinking protective behavioral strategies; Rutgers Alcohol Problem Index (RAPI) = alcohol-related negative consequences; Brief Marijuana Consequences Questionnaire (B-MACQ) = marijuana-related negative consequences; Protective Behavioral Strategies for Marijuana (PBSM)

Bivariate correlations for all variables of interest are presented in Table 2. All correlations were in the expected directions.

Table 2

Intercorrelations of Measures

	1	2	3	4	5	6	7	8
1. AUDITc	--							
2. CUDIT	.11*	--						
3. Weekly Marij	.05	.35***	--					
4. MOD	-.43***	-.15**	-.05	--				
5. SHR	-.34***	-.36***	-.22***	.51***	--			
6. SLD	-.34***	-.22***	-.16**	.66***	.64***	--		
7. B-MACQ	.16**	.62***	.25***	-.16**	-.33***	-.18***	--	
8. PBSM	-.16**	-.55***	-.39***	.35***	.54***	.40***	-.34***	--
9. RAPI	.29***	.45***	.28***	-.15**	-.35***	-.14**	.44***	-.23***

Note. Alcohol Use Disorder Identification Test (AUDITc) = hazardous alcohol consumption; Cannabis Use Disorder Identification Test – Revised (CUDIT) = hazardous marijuana use; MOD = Manner of Drinking protective behavioral strategies; SHR = Serious Harm Reduction protective behavioral strategies; SLD = Stopping/Limiting Drinking protective behavioral strategies; Rutgers Alcohol Problem Index (RAPI) = alcohol-related negative consequences; Brief Marijuana Consequences Questionnaire (B-MACQ) = marijuana-related negative consequences; Protective Behavioral Strategies for Marijuana (PBSM)

* = p < .05, ** = p < .01, *** = p < .001.

On average, participants reported 16.50 standard drinks (SD = 14.21) per week and 8.29 grams of marijuana (SD = 11.55) used in a typical week. The average total AUDIT score was 12.56 (SD = 6.86) and the average CUDIT score was 10.83 (SD = 5.91). Thus, the sample consisted of mostly hazardous drinkers and marijuana users as the mean scores were well over the AUDIT cutoff score of 8 as indicative of hazardous alcohol use (Hagman, 2016) and the CUDIT cutoff of 8 as indicative of hazardous marijuana use (Adamson et al., 2010; Annaheim, 2013; Thake & Davis, 2011). Additional descriptive information regarding marijuana use is presented in Table 3.

Table 3

Descriptive Information Related to Marijuana Use

Descriptive Variable	N	%
Mean % of time using alcohol without using marijuana (max = 100%)	413	62.6
On a typical day of using marijuana, mean % of time also using alcohol (max = 100%)	408	29.5
Mean % of combined use of the following:	____	____
Alcohol and Plant (i.e., bud, flower)	399	51.7
Alcohol and Edibles (i.e., brownie, chocolate)	312	19.8
Alcohol and Concentrates (i.e. hash, dabs)	275	13.7
Other	193	13.8
Mean % of use of marijuana types:		___
Plant (i.e., bud, flower)	399	77.0
Edibles (i.e., brownie, chocolate)	289	23.5
Concentrates (i.e., hash, dabs)	240	12.5
Other	173	5.0
Marijuana legal for recreational use in state of residence	414	___
No	___	78.0
Yes	___	22.0
Marijuana legal for medicinal use in state of residence	414	___
No	___	39.4
Yes	___	60.6

Results from Table 3 indicate the majority of the sample did not use marijuana and alcohol at the same time, the majority used marijuana through plant form, and the majority did not live a state when it was legal for recreational use. Three outliers were removed for the mean monthly amount of money spent on marijuana. Mean amount of money spent on marijuana monthly was $111. 90 (SD = 170.7, n = 407).

To test hypotheses one through three, a hierarchal multiple regression analysis was run that examined hazardous alcohol consumption, PBSA types, hazardous marijuana use, and alcohol-related negative consequences. Hypothesis one posited that hazardous marijuana use would moderate the relationship between hazardous alcohol consumption and alcohol-related negative consequences. Hypothesis two posited that hazardous marijuana use would moderate the relationship between each PBSA subscale and alcohol-related negative consequences. Hypothesis three posited that hazardous marijuana use and each PBSA subscale would moderate the relationship between hazardous alcohol consumption and alcohol-related negative consequences. See Table 4 for the results of the regression analyses

Table 4

Regressions of ARNC on AUDITc, CUDIT, and PBSA (MOD, SHR, SLD)

Predictor Variable	R^2	ΔR^2	B	SE	β
			Alcohol Related-Related Negative Consequences		
Step 1	.29***	.29***			
Gender			-.06	.04	-.06
AUDITc			.05	.01	.28***
CUDIT			.63	.09	.31***
MOD			-.01	.005	-.10
SHR			-.01	.004	-.18**
SLD			.01	.004	.11
Step 2	.31***	.02			
AUDITc x CUDIT			.03	.03	.05
AUDITc x MOD			.003	.002	.14
AUDITc x SHR			.000	.001	.02
AUDITc x SLD			-.002	.001	-.08
MOD x CUDIT			.03	.02	.08
SHR x CUDIT			-.02	.02	-.07
SLD x CUDIT			.02	.02	.07
Step 3	.33***	.02**			
AUDITc x CUDIT x MOD			.08	.01	.18*
AUDITc x CUDIT x SHR			-.001	.01	-.01
AUDITc x CUDIT x SLD			-.001	.005	-.02

Note. Note. Alcohol Use Disorder Identification Test (AUDITc) = hazardous alcohol consumption; Cannabis Use Disorder Identification Test – Revised (CUDIT) = hazardous marijuana use; MOD = Manner of Drinking protective behavioral strategies; SHR = Serious Harm Reduction protective behavioral strategies; SLD = Stopping/Limiting Drinking protective behavioral strategies;.
* = p < .05, ** = p < .01, *** = p < .001.

Step one included gender, AUDITc, MOD, SHR, SLD, and CUDIT on alcohol-related negative consequences. The overall model accounted for 28% of the variance (F [6, 403] = 26.81, p < .001). Main effects emerged for hazardous alcohol consumption as

measured by AUDITc ($\beta = .28$, t = 5.84, p < .001), hazardous marijuana use as measured by CUDIT ($\beta = .31$, t = 6.84, p < .001), and PBS SHR use ($\beta = -.18$, t = -3.01, p = .003), such that more alcohol-related negative consequences was associated with higher AUDITc scores, higher CUDIT scores, and lower SHR use.

Step two, which tested hypotheses one and two and the moderating effects of PBSA, contained seven 2-way interactions (i.e., AUDITc x SHR; CUDIT x SHR; AUDITcx MOD; CUDIT x MOD; AUDITc x SLD; CUDIT x SLD; AUDITc x CUDIT) on alcohol-related negative consequences. The second model did not account for significantly more variance ($\Delta R^2 = .02$, $R^2 = .31$, $p = .078$) than model one, thus none of the interactions terms were interpreted (F (13, 396) = 13.54, $p <. 001$) and simple slopes were not conducted. Furthermore, hypotheses one and two were not supported.

Step three, the final step, tested hypothesis three and included three 3-way interactions between AUDITc, PBSA subscales, and CUDIT (i.e., AUDITc x SHR x CUDIT; AUDITc x MOD x CUDIT; AUDITc x SLD x CUDIT) on alcohol-related negative consequences. The third model accounted for significantly additional variance ($\Delta R^2 = .02$, $R^2 = .33$, $p = .007$) (F (16, 393) = 12.04, $p <. 001$). Hypothesis three was partially supported such that the three-way interaction of AUDITc, MOD, and CUDIT emerged ($\beta = .18$, $t = 2.60$, $p = .01$). These results suggest that MOD and hazardous marijuana use moderated the relationship between hazardous alcohol consumption and alcohol-related negative consequences.

In order to determine the significance of the three-way interaction, it was examined whether the two-way interaction of CUDIT and MOD was significant for those reporting high levels of AUDITc and low levels of AUDITc (Cohen et al., 2003). This

revealed the two-way interaction of CUDITxMOD was significant at high levels of

AUDITc (β = .24, t = 2.71, p = .007) but not at low levels of AUDITc (β = -.06, t = -

0.73, p = .467). These interactions are presented in Figure 1. Simple slope tests were then

conducted for AUDITc high that found the slope of the line representing CUDIT and

alcohol-related negative consequences was significant for those with high levels of MOD

use (β = .69, t = 5.47, p < .001) but not significant for those with low levels of MOD use

(β = .94, t = 1.90, p = .058). Additionally, simple slopes that examined the relationship

between MOD and alcohol-related negative consequences was significant for those with

high CUDIT scores (β = .30, t = 2.25, p = .025) but not significant for those with low

CUDIT scores (β = -.20, t = -1.63, p = .103). Taken together, these results suggest for

individuals who reported high levels of AUDITc, low MOD use was associated with less

alcohol-related negative consequences regardless of CUDT, whereas high MOD use was

significantly associated with more alcohol-related negative consequences at high rates of

CUDIT. Further, among individuals who reported high levels of AUDITc, lower CUDIT

was not significantly associated with alcohol-related negative consequences between low

and high levels of MOD use, whereas greater CUDIT was associated with significantly

more alcohol-related negative consequences at high levels of MOD use.
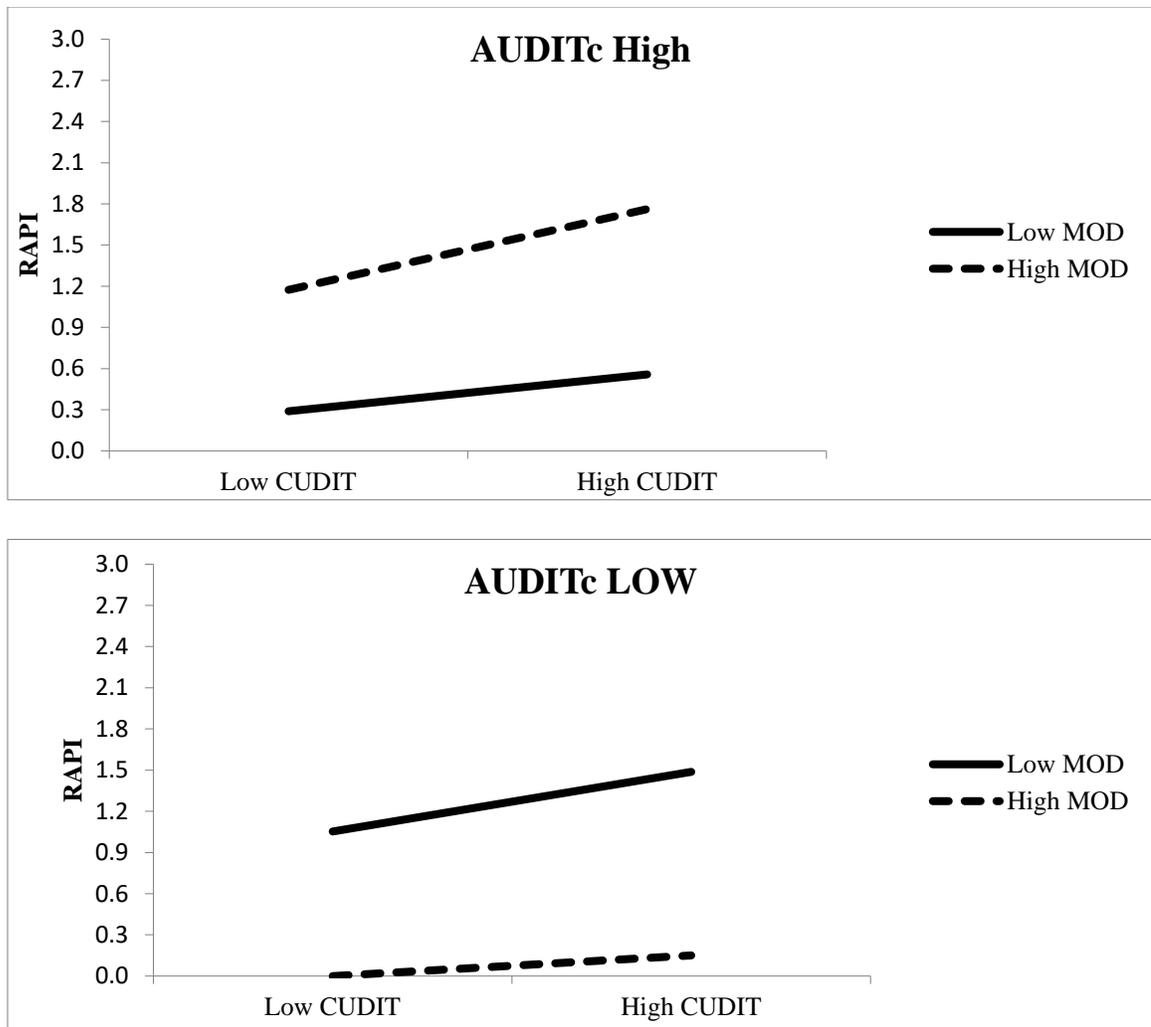
Figure 1. Simple Slope Analysis for the three-way interaction: AUDITc x CUDIT x

MOD.

Panel A (top graph) shows the simple slope analysis of CUDITxMOD when AUDITc is high, and Panel B (bottom graph) show the

simple slope analysis for CUDITxMOD when AUDITc is low.

    To test hypotheses four and five, a hierarchical multiple regression was run that

examined typical marijuana use, PBSM, and marijuana-related negative consequences.

Hypothesis four posited that greater typical marijuana consumption would predict greater

marijuana-related negative consequences. Hypothesis five posited that PBSM would

moderate the relationship between typical marijuana consumption and marijuana-related

negative consequences. The overall model accounted for 16% of the variance and was statistically significant (F (3, 406) = 26.62, p < .001). Step one, which tested hypothesis four, included gender, typical weekly marijuana consumption, and PBSM. Hypothesis four was supported and main effects for typical marijuana consumption (β =.15, t = 2.73, p = .007) and PBSM (β = -0.30, t = -5.49, p < .001) emerged. Step two, which tested hypothesis five, included one interaction term, typical marijuana consumption measure x PBSM. The interaction was not significant (β = .05, t = 1.03, p = .30), indicating hypothesis five was not supported and simple slopes were not conducted. Taken together, results indicated that greater typical marijuana use was associated with greater marijuana-related negative consequences and fewer PBSM use was associated with greater marijuana-related negative consequences, however, PBSM did not moderate the relationship between typical marijuana use and marijuana-related negative consequences. Results of the regression analysis are displayed in Table 5.

Table 5

Regressions of Marijuana-Related Negative Consequences on Typical Weekly Marijuana Consumption and PBSM

Predictor Variable	Marijuana-Related Negative Consequences				
	R^2	ΔR^2	B	SE	β
Step 1	.16***	.16***			
Gender			.02	.04	.02
Typical Marijuana			.10	.04	.15**
PBSM			-.003	.001	-.30***
Step 2	.17***	.002			
Typ Marij x PBSM			.001	.001	.05

Note. Protective Behavioral Strategies for Marijuana (PBSM); Typ Marij = typical weekly marijuana; *** p < .001, ** p < ,01.

The third hierarchical regression tested hypotheses six and seven and examined hazardous marijuana use, PBSM, and marijuana-related negative consequences. Hypothesis six posited that greater CUDIT scores would predict greater marijuana-related negative consequences. Hypothesis seven posited that PBSM would moderate the relationship between CUDIT and marijuana-related negative consequences. Results of the regression analysis are displayed in Table 6.

Table 6

Regressions of Marijuana-Related Negative Consequences on CUDIT And PBSM

Predictor Variable	Marijuana-Related Negative Consequences				
	R^2	ΔR^2	B	SE	β
Step 1	.36***	.360***			
Gender			.01	.03	.01
CUDIT			.92	.08	.57***
PBSM			.000	.000	-.05
Step 2	.36***	.002			
CUDIT x PBSM			.002	.002	.05

Note: Cannabis Use Disorder Identification Test Revised (CUDIT) = marijuana related negative consequences; Protective Behavioral Strategies for Marijuana (PBSM); *** p < .001.

The overall model accounted for 36% of the variance and was statistically significant (F (3, 406) = 76.23, p < .001). Step one, which tested hypothesis six, included gender, hazardous marijuana use, and PBSM. Hypothesis six was supported and significant main effects of CUDIT (β = .57, t = 11.58, p < .001) emerged. Step two, which tested hypotheses seven, included one interaction term, CUDIT x PBSM. Again, the interaction was not significant (β = .05, t = 1.26, p = .21), indicating hypothesis seven was not supported and simple slopes of regression were not conducted. Taken

together, results indicated greater hazardous marijuana use was associated with higher

marijuana-related negative consequences, but that PBSM did not moderate that

relationship.

CHAPTER IV – DISCUSSION

Given the high rates of alcohol and marijuana use among college students and the link between increased substance use with negative consequences (Corbin et al., 2013; Johnston et al., 2016; Pedersen et al., 2016), the purpose of this study was to expand our understanding of alcohol-related behaviors among college students who reported both alcohol and marijuana use. In particular, the present study sought to examine the moderating role of hazardous marijuana use on the relationship between hazardous alcohol consumption and alcohol-related negative consequences and on the relationship between protective behavioral strategies (PBSA) for alcohol use (i.e., Manner of Drinking, Serious Harm Reduction, Stopping/Limiting Drinking) and alcohol-related negative consequences. The present study also sought to examine the moderating role of PBS for marijuana (PBSM) on the relationship between typical marijuana consumption and marijuana-related negative consequences and the relationship between hazardous marijuana use and marijuana-related negative consequences.

When examining the direct relationships between alcohol use behaviors and marijuana use with alcohol-related negative consequences, the present study found significant direct associations for hazardous alcohol consumption, SHR strategies, and hazardous marijuana consumption on alcohol-related negative consequences in the expected directions. In particular, greater hazardous alcohol consumption and greater hazardous marijuana use were associated with greater alcohol-related negative consequences, supporting the theory that college students who are using alcohol and marijuana at higher levels, especially hazardous rates, are at an increased risk for experiencing a range of alcohol-related negative consequences (Corbin et al, 2014;

Madson et al., 2013b; Pedersen et al., 2016). In addition, lower SHR use was associated with greater alcohol-related negative consequences, supporting the link between the use of SHR strategies and college students' experience of alcohol-related negative consequences (DeMartini et al., 2013; Frank, Thake, & Davis, 2012; Madson, et al., 2013a; Madson and Zeigler-Hill, 2013; Martens et al., 2005, 2008, 2011). The present study's findings are in line with current literature such that it has consistently been supported that greater alcohol use, less SHR use, and greater marijuana use are associated with greater alcohol-related negative consequences (Corbin et al., 2014; Ebersole et al., 2012; Ham & Hope, 2003; Hingson et al., 2009; Madson et al., 2013b; Wechsler et al., 2000). In addition, results did not indicate a significant association between SLD strategies and alcohol-related negative consequences, which is consistent with previous studies that have examined this relationship (Martens et al., 2011; Napper et al., 2014). Results from the present study continue to emphasize the direct connection between hazardous alcohol and marijuana use and alcohol-related negative consequences, and the potential protective value of serious harm reduction strategies.

The present study also had a number of non-significant findings that were in contrast to what was predicted on the basis of previous research (Benton et al., 2004; Borden et al., 2011; Collins et al., 2007; D'Lima, Pearson, & Kelly, 2012; Frank et al., 2012; LaBrie et al., 2009, 2010; Landry et al., 2014; Madson & Zeigler-Hill, 2013; Shillington & Clapp, 2001; Stein et al., 2014; Weaver, Martens, & Smith, 2012). In particular, the present study did not find a significant direct association between MOD strategies and alcohol-related negative consequences, the association between hazardous alcohol consumption and alcohol-related negative consequences was not impacted by the

use of any of the PBSA types or hazardous marijuana use (hypotheses one), and the

association between PBSA use and alcohol-related negative consequences was not

impacted by hazardous marijuana use (hypothesis two) . Additionally, the present study

tested hypotheses that examined the double moderating role of each type of PBSA and

hazardous marijuana use on the relationship between hazardous alcohol consumption and

alcohol-related negative consequences (hypothesis 3: a,b,c). In partial support of these

hypotheses, results indicated that MOD use and hazardous marijuana use moderated the

association between hazardous alcohol consumption and alcohol-related negative

consequences (hypothesis 3a); however, this moderating effect did not occur in the

expected direction. Specifically, results indicated that the greatest number of reported

alcohol-related consequences was associated with those who reported high hazardous

alcohol use, high hazardous marijuana use, and high MOD use. In addition, lower use of

MOD strategies was associated with lower alcohol-related negative consequences among

students who reported high levels of hazardous alcohol consumption regardless of

hazardous marijuana use levels (e.g., high vs low).

   Given these surprising findings, it is important to consider the results in the

context that the present study is the only study to date to specifically examine PBSA

among college students who reported using multiple substances. Thus, it is possible that

the predicted relationships perform differently than previous studies when exploring them

among a group of explicit alcohol and marijuana users. For example, it is possible that

the value of PBSA is diminished or effective strategies may be different altogether

among users of multiple substances. In addition, although a large body of research

suggest that overall higher PBSA use is consistently associated with lower consequences

(Delva, et al., 2004; Kenney & LaBrie 2013; LaBrie et al., 2009; Madson et al., 2013a; Pearson, 2013; Villarosa et al., 2014a, 2014b), research that has examined MOD strategies among alcohol users has produced mixed results. Specifically, some studies found greater MOD use to be associated the less alcohol consumption and less alcohol-related negative consequences (Frank et al., 2012; Weaver et al., 2012), while others found that MOD strategies did not have a significant relationship with alcohol-related negative consequences (Martens et al., 2011; Pearson et al., 2013). MOD strategies appeared to have unique associations in the present study, such that despite not engaging in chugging drinks or taking shots, participants still reported drinking heavily. It is possible that when students are choosing to utilize MOD strategies to minimize negative consequences, they engage in fewer strategies of other types (e.g., SHR and SLD) because it may feel unnecessary; however, the latter may actually be the bigger contributor to their experience of alcohol-related negative consequences. In addition, perhaps MOD use plays a different role among alcohol and marijuana users and is linked to greater consequences.

Participants in the present study reported using alcohol and marijuana at the same time around 30% of the time. Although these result suggest concurrent use is not occurring the majority of times when using marijuana, another possible factor that may be at play is the concept of synergism, which posits that when two drugs are used concurrently, they may produce an exaggerated effect than even the sum of the two together (Tallarida, 2001). Given the possibility of synergistic effects, people using multiple substances may have an altered perception and they may be unaware of their actual level of substance use, which could result in inaccurately reporting consumption

levels. It is also possible that participants may not have interpreted the question to mean using the two substances within the same using period and the 30% is an underrepresentation of concurrent use. Additionally, the present study did not tease apart whether the reported negative consequences were evaluated as occurring due to their alcohol or marijuana use separately or combined, information which may be important to consider when examining these relationships among students who use alcohol and marijuana. Moreover, examining additional substance use related variables such as the context in which the individuals are using and motivations for using may be important to examine among multiple substance users, as these have been found to be linked to PBSA use (Braitman, Linden-Carmichael, & Henson, 2017; Linden, Kite, Braitman, & Henson, 2014). Therefore, given the complex nature of all these different variables, it might be valuable to examine them using more sophisticated statistics methods such as Mplus where researchers can examine variables in all one model (D'Lima, et al., 2012; Ebersole et al., 2012; Madson et al., 2013b; Madson, Villarosa, Moorer, & Zeigler-Hill, 2015; Martens et al., 2008; Martens, Ferrier, & Cimini, 2007; Palmer, Corbin, & Cronce, 2010). These procedures were not utilized in the present study due to the need for establishing foundational information regarding the individual relationships. Overall, the present study highlights the potential importance of looking at multiple substance users and the need to intentionally look at substance use behaviors in this population further. Given evidence that college students are commonly using multiple substances, looking at these substance use behaviors collectively may yield different results than previous findings.

The present study also tested hypotheses that predicted increased typical marijuana consumption (hypothesis four) and increased hazardous marijuana use

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(hypothesis six) would be associated with greater marijuana-related negative

consequences. These hypotheses were supported and contribute to the current literature

base regarding the impact of marijuana use (Buckner et al., 2010; Caldeira et al., 2008;

Kilmer et al., 2007; Pedersen et al., 2016; Sewell, Poling, & Sofuoglu, 2009). Further, it

illustrates the importance of implementing protective strategies for those students at

greater risk for negative consequences related to marijuana use. However, the present

study also attempted to expand understanding around the role of PBSM, such that it

tested the hypotheses that the relationship between greater typical marijuana consumption

and greater marijuana-related negative consequences would be strongest for those who

reported less PBSM use (hypothesis five) and that PBSM would moderate in the same

way on the relationship between greater hazardous marijuana use and greater marijuana-

related negative consequences (hypothesis seven).

　　　　Contrary to hypotheses five and seven, the present study's results indicated PBSM

did not emerge as a significant moderator of either of the relationships, indicating PBSM

did not impact these relationships. To our knowledge, this study was the first to examine

the moderating role of PBSM on the relationship between hazardous marijuana use and

marijuana-related negative consequences and the second to examine the moderating role

of PBSM on typical use and marijuana-related negative consequences (Bravo et al.,

2017a). Despite non-significant findings, the intercorrelations were in the expected

direction (e.g., inverse relationship between PBSM and marijuana-related negative

consequences). There are a number of potential reasons why the proposed hypotheses

were not supported. Firstly, the role of PBSM has yet to be consistently established. In

particular, Bravo and colleagues (2017a) found greater PBSM to be associated with more

marijuana-related negative consequences, while Bravo, Prince, and Person (2017c) found

PBSM to significantly mediate a number of variables (e.g., sex, premeditation,

perseverance, motives) on marijuana use frequency and marijuana-related consequences.

Thus, the present study's result highlights the importance of the need for more research in

this area to establish a greater understanding of PBSM's role among marijuana-related

variables. Second, the evaluation of protective strategies for marijuana is still in the early

stages and the current measure may not be capturing all the important aspects of

protective strategies related to marijuana use. In particular, safe use may be different

among marijuana users than alcohol, given the number of nuances between marijuana

and alcohol use and effects (e.g., tolerance, routes of administration, different absorption

rates; Levinthal, 2010; Sewell et al., 2009). Furthermore, Caffrey, Wright, and Maarhuis

(2018) recently found support for a four-factor structure of the PBS-M measure. Thus, it

is possible that similar to PBSA, more information can be gathered about the value of

PBSM by examining different types. Lastly, research supports that individuals often view

marijuana use as relatively low risk (Kilmer et al., 2007; LaBrie et al., 2011; Pearson et

al., 2017; Pedersen et al., 2016) and thus it is possible students who use marijuana may

feel less of a need to use protective strategies when engaging in marijuana use. Taken

together, much more research in this area and construct is needed to improve our

understanding of the function and utility of PBSM.

The current study has several implications for applied considerations. School

administrators and clinicians are encouraged to continue to implement prevention and

intervention methods aimed at reducing negative consequences resulting from substance

use, especially students using at hazardous rates. This may also be particularly important

for men as they continue to report the highest rates of alcohol and marijuana use and lowest rates of PBS use. Further, one of the issues that the present study highlighted was the need to address the use of alcohol and marijuana in prevention and intervention efforts, especially as traditional alcohol interventions, such as Brief Alcohol Screening and Intervention for College Students (Dimeff, Baer, Kivlahan, & Marlatt, 1999), may not include a component for assessing marijuana use as well as the use of other drugs. Examination of the use of multiple substance use as well as concurrent use, may be a vital component to harm reduction approaches in order to target risky substance use behaviors (e.g., synergism) and effective use of PBS. In addition, encouraging the use of serious harm reduction strategies and examining the role of manner of drinking strategies may be particularly important among college students who report hazardous alcohol and marijuana use, as the latter may actually be serving as a risk factor for experiencing negative consequences. Further, given the common misconception that marijuana use is relatively low risk, it may behoove those conducting harm reduction programs to provide psychoeducational information regarding the risks associated with marijuana use and ways to engage in effective protective strategies related to marijuana use.

It is also important to acknowledge some of the present study's limitations. First, the data from this study is cross-sectional and therefore it is not possible to draw any conclusions regarding causality among the variables of interest. Second, assessing marijuana use, especially typical marijuana consumption, is still in the early stages. Although the present study used a measure of typical marijuana consumption that was based on previous research (Bravo et al., 2017a; Dvorak & Day, 2014; Pearson et al., 2017, Williams et al., 2000), the measure's psychometric properties are still being

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assessed, and a published version was not available at the time of this study. As research examining marijuana use advances, it is likely that published measures will become available and aid in the validity of findings. However, there has been some evidence to suggest that overall, individuals may have a poor ability to estimate their actual marijuana use (Adrian Bravo, Ph.D, personal communication, July 28, 2017) and given all the broad range of variations that can be present among marijuana, standardization is proving to be a more difficult task. Unlike alcohol, which has a form of standardization (e.g., standard drinks) that is fairly consistent across different types of alcoholic beverages (e.g., beer, wine, liquor), the same type of measurement standardization has yet to be established among marijuana. Third, there is a broad spectrum of alcohol use behaviors that can be assessed, and the present study attempted to examine only a set of these behaviors among only one group of co-morbid users. Replication of this study may find different results among a different group of co-morbid users as well as individuals who report specific concurrent use. Fourthly, the sample consisted of majority white participants and given the role race/ethnicity may play in substance use behaviors (Kenney & LaBrie, 2013; Landry et al., 2014; Madson & Zeigler-Hill, 2013), studies that utilize a more diverse racial sample may find different results. Fifth, the internal consistency of the AUDITc in the present study ($\alpha = .68$) was just below the generally accepted cutoff of .70 (Field, 2013), indicating our measurement of hazardous alcohol consumption may not have measured this construct as well as hoped.

This study also uncovered future areas of investigation regarding college student alcohol and marijuana use. Given the results of the current study found greater MOD was associated with the most negative consequences for students who reported high levels of

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hazardous alcohol and marijuana use, further studies are needed to examine whether this relationship holds true in other samples. In addition, examining PBSA, PBSM, and marijuana use as mediators instead of moderators may yield important information regarding the functionality of these behaviors. For instance, Pearson, Prince, and Bravo (2017) were unable to replicate and extend findings of three previous studies that identified PBSA as a moderator among alcohol users. In addition, Bravo, Prince, and Pearson (2016) and Bravo, Prince, and Pearson (2017b) discussed considering the total use of PBSA strategies may yield different results than when breaking it down by type. Thus, future research may want to examine total PBSA use, as well as types of PBSA, on the relationships in this study. This study examined college student alcohol and marijuana use and PBS behaviors in a cross-sectional fashion and deeper understanding could be garnered through a diary design study. Not only would this allow for examination of between-group differences but also within-group differences for substance use and use of protective behavioral strategies. Moreover, diary designs may allow researchers to gain a better sense of college students' concurrent substance use and its link to PBS use and variation in the experience of negative consequences. Further, this study only examined the proposed relationships in a sample of college students who reported past 30-day alcohol and marijuana use. Future studies would likely benefit from examining and comparing these relationships among individuals who report alcohol only use, marijuana only use, and combined use as a way to determine group differences. In particular, while the present study did not find an increase in hazardous marijuana strengthened the relationship between hazardous alcohol consumption and alcohol-related negative consequences, it is possible that when comparing college students who report alcohol and

marijuana use to college students who only report alcohol use, there may be a significant difference in the experience of alcohol-related negative consequences. The same idea may also be true when comparing individuals who report only marijuana use as compared to those who report alcohol and marijuana use. In addition, Berge, Håkansson, and Berglund (2014) found that while marijuana users were more likely to report hazardous alcohol use than those who did not use marijuana, among the group of active marijuana users, those who reported frequent cannabis use (e.g., 2-3 time a week or greater), was actually more negatively associated with hazardous alcohol use as compared to those who reported occasional use. While their results were the first to find this negative association, it is possible the association between alcohol use and marijuana may vary on the frequency of use, which could be important when exploring substance use related variables such as PBS. Although the present study examined alcohol and marijuana-related negative consequences separately, future studies could look at substance-related negative consequences as a whole versus just alcohol-related or marijuana-related negative consequences. Furthermore, similar to examining consequences as a whole, it may provide useful to assess PBS in combination for alcohol and marijuana for students who report using marijuana and alcohol, as there may be there are a unique set of strategies that one uses to be protective when engaging in multi-substance use. As mentioned, continued research is needed to establish the effectiveness of protective behavioral strategies for marijuana which should continue to be examined among the relationship between both hazardous use and typical use.

Altogether, the results of the present study contribute to the understanding of the connection between hazardous marijuana use and alcohol use behaviors among college

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students who explicitly reported alcohol and marijuana use. In addition the study contributed to the current literate base exploring the role of PBS for marijuana among college students. Specifically, the present study found hazardous marijuana use did not moderate the relationship between hazardous alcohol use and PBSA on alcohol-related negative consequences, however hazardous marijuana use and the PBSA subscale manner of drinking did serve as moderators to the relationship between hazardous alcohol use and alcohol-related negative consequences. Further, PBSM did not moderate the relationship between typical and hazardous marijuana use and marijuana-related negative consequences. The surprising findings of the current study highlight the importance of continuing research that examines substance use behaviors among explicit alcohol and marijuana using college students, especially as the use of marijuana is expected to continue to increase.

APPENDIX A – IRB Approval Form

THE UNIVERSITY OF SOUTHERN MISSISSIPPI.

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

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: 17041208
PROJECT TITLE: Weeding through college drinking: The moderating role of marijuana use on alcohol use, PBS, and alcohol-related negative consequences
PROJECT TYPE: New Project
RESEARCHER(S): Mallorie Carroll
COLLEGE/DIVISION: College of Education and Psychology
DEPARTMENT: Psychology
FUNDING AGENCY/SPONSOR: N/A
IRB COMMITTEE ACTION: Expedited Review Approval
PERIOD OF APPROVAL: 04/13/2017 to 04/12/2018
Lawrence A. Hosman, Ph.D.
Institutional Review Board

APPENDIX B – Electronic Informed Consent

PURPOSE: The present study is designed to examine the associations between substance use, safe behaviors, and health among college students. Results from this study will aid in greater understanding of college student substance use and contribute to improved intervention strategies.

DESCRIPTION OF STUDY: Participation will consist of completing several questionnaires and demographic information. The questionnaire items will relate to your feelings, attitudes, behaviors, and experiences with substance use as a college student. An internet link to the questionnaire items will be provided through Amazon Mturk's website. Participation will take approximately 15 to 30 minutes to complete. Quality assurance checks will be used to make sure that workers are reading questions carefully and answering thoughtfully. It is not necessary to over-think any item but to fully read and respond thoughtfully to each item. Indication that participation in this survey was not given your full attention may result in being exited from the survey and no compensation.

ALTERNATIVE PROCEDURES: Participation in this study is voluntary. You are free to not answer any question or withdraw at any time. However, if you do not complete the survey measures, you will not be compensated.

BENEFITS: Upon completion of the survey materials, 0.25 cents will be deposited into your MTurk account.

RISKS: The risks associated with participation are minimal, however the survey does ask about illegal behavior including underage alcohol use or marijuana use. Workers are reassured that answers to questions regarding substance use are not associated with identifying information. Thus, you may find that some of the questions are sensitive in nature or difficult to answer. will not be tied to any identifying information. If workers find they are distressed by completing these questionnaires, they should notify the researcher immediately. Additionally, you may become bored or fatigued when completing questions.

CONFIDENTIALITY: The records of this study will be kept private. You will not be asked to provide your name. Your worker ID (i.e. the 14 character sequences of letters and numbers used to identify workers) will be protected and is only collected for the purposes of distributing compensation and will not be associated with survey responses. At the conclusion of data collection for this study, all identifying information will be deleted. 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 and only the researchers involved in this study will have access to the research records. In any sort of report that might be published from this data, no

information will be included that will make it possible to identify you. However, should you wish to contact the requester, your email address will automatically be interested in the message so the requester can reply to you. Amazon.com inserts the worker's name as well. Therefore, it is possible that if you make contact with the requester, that your name and email address will be included.

PARTICIPANT ASSURANCE: 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.

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 workers may withdraw from this study at any time without penalty, prejudice, or loss of benefits.

Questions concerning the research should be directed to the primary researcher Mallorie Carroll (though Mturk website) or the research supervisor, Dr. Michael Madson at (michael.madson@usm.edu). Any questions or concerns about rights as a research participant should be directed to the Chair of the Institutional Review Board at (601) 266-6820.

If you experience distress as a result of your participation in this study, please notify the primary researcher Mallorie Carroll (through Mturk website) or the research supervisor, Dr. Michael Madson (michael.madson@usm.edu). A list of available agencies that may able to provide services for you are provided below:

- SAMHSA's National Helpline - 1-800-662-HELP (4357)
- National Council on Alcoholism and Drug Dependence - 1 (800) NCA-CALL (622-2255)
- National Institute on Drug Abuse (NIDA) - 1 (800) 662-HELP (4357)
- National Crisis Center - 1-800-273-8255

Consent is hereby given to participate in this study

APPENDIX C – Screener Questions

How old are you?

- 18
- 19
- 20
- 21
- 22
- 23
- 24
- 25
- Other

Are you currently enrolled as a college student?

- Yes
- No

Are you currently attending college courses in person (i.e., not online only courses)?

- Yes
- No

What is your current your academic status?

- Freshman
- Sophomore
- Junior
- Senior
- Graduate Student

What type of college are you currently attending?

- Public 4-year college/university
- Private 4-year college/university
- Junior/community college

Have you consumed alcohol within the past 30 days?

- Yes
- No

Have you consumed marijuana within the past 30 days?

- Yes
- No

APPENDIX D – Demographic Form

Instructions: Please answer each question:

1. How do you identify yourself?

   - Male
   - Female
   - Transgender

2. How old are you?

   - Grading scale from 18-25

3. What is your approximate college GPA? If you are a freshman and do not have a college GPA yet, please report your high school GPA.

   - Grading scale from 0-4.0

4. What is your racial/ethnic identity?

   - African American
   - Asian American
   - Eastern Indian American
   - International student
   - Latina/Latino
   - Middle Eastern American
   - Multiracial
   - Native American
   - White (non-Hispanic)
   - Other (specify)

5. What region of the US are you currently attending college?

   - Northeast – New England (Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut)
   - Northeast – Mid Atlantic (New York, Pennsylvania, New Jersey)
   - Southwest (Oklahoma, Texas, Arkansas, Louisiana)
   - Southeast (Kentucky, Tennessee, Mississippi, Alabama)
   - South Atlantic (Delaware, Maryland, District of Columbia, Virginia, West Virginia, North Carolina, South Carolina, Georgia, Florida)
   - Midwest – East North Central (Wisconsin, Michigan, Illinois, Indiana, Ohio)
   - Midwest – West North Central (Missouri, North Dakota, South Dakota, Nebraska, Kansas, Minnesota, Iowa)

- West – Mountain (Idaho, Montana, Wyoming, Nevada, Utah, Colorado, Arizona, New Mexico)
- West – Pacific (Alaska, Washington, Oregon, California, Hawaii)

6. Where do you primarily live while going to school?

- Dorm
- Apartment – on campus
- Apartment – off campus
- Greek House
- With parents

7. Are you a member of a sorority or fraternity?

- YES
- NO

8. Are you a member of a university athletic team?

- YES
- NO

9. Do you use illicit drugs other than marijuana (e.g., cocaine, opiates)?

- YES
- NO

10. Do you take prescription medication?

- YES
- NO

11. Do you take medication not prescribed for you?

- YES
- NO

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