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The Moderating Effects of College Stress on the Relationship between Protective Behavioral Strategies and Alcohol Outcomes

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Abstract

Background: Protective behavioral strategies (PBS) are harm reduction strategies used to lessen the negative effects of alcohol consumption. PBS controlled consumption (e.g., avoiding shots) center on managing alcohol consumption and tend to be negatively correlated with hazardous drinking whereas PBS serious harm reduction (e.g., having a designated driver) have a negative association with alcohol-related negative consequences. These relationships are often attenuated by factors such as mental health. Stress is linked with hazardous drinking and is experienced by most individuals. However, there are unique aspects of alcohol use and stressors associated with being in college (e.g., adjustment, academics) that require further investigation.

Objectives: The purpose of this study was to explore how college stress – specific stressors related to the college experience – moderated the relationships PBS types had with hazardous drinking and alcohol-related negative consequences while accounting for gender.

Methods: Participants were 550 college students ages 18 to 24 who drank alcohol within 30 days of completing measures of PBS use, college stress, hazardous drinking, and alcohol-related negative consequences.

Results: A negative association was found between PBS controlled consumption and hazardous drinking while a positive association was found between PBS serious harm reduction and hazardous drinking, but neither relationships were significantly moderated by college stress. A negative relationship was found between PBS serious harm reduction and alcohol-related negative consequences, which was strengthened for those with high levels of college stress.

Conclusion: These findings highlight the importance of further investigating the role of college stress in relation to safe and hazardous drinking and provide evidence for the protective role of PBS for college students experiencing stress and consuming alcohol.

Keywords

Hazardous alcohol use; alcohol-related negative consequences; protective behavioral strategies; college stress

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Disclosure statement

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The college environment appears to be a distinct context that fosters hazardous drinking. Specifically, 58% of college students consumed alcohol in the past month compared to 48% of non-college same age peers (Johnston, O'Malley, Bachman, Schulenberg, & Miech, 2016) and 38% of those students reported heavy episodic (binge) drinking compared to 33% of noncollege peers (National Institute on Alcohol Abuse and Alcoholism; NIAAA, 2015). Hazardous drinking at these levels places students at risk for a plethora of alcohol-related negative consequences or developing an alcohol use disorder. For instance, White and Hingson (2013) found that 1,800 deaths, 599,000 injuries, 646,000 physical assaults, 97,000 sexual assaults, and 150,000 reported health problems were related to alcohol use annually. Because of the far-reaching effects of hazardous drinking, researchers and university communities seek to better understand the factors related to increased and decreased alcohol use. Protective behavioral strategies (PBS) are one approach to harm reduction for college students engaging in alcohol use (Pearson, Kite, & Henson, 2013).

PBS are cognitive and behavioral strategies students can implement when drinking alcohol to protect themselves from increased alcohol use and alcohol-related negative consequences and thus reduce the harm associated with alcohol misuse (Martens et al., 2004). PBS have been linked with less hazardous drinking and fewer reported alcohol-related negative consequences (Pearson et al., 2013). However, differential effects appear to exist when dismantling PBS into their subtypes (DeMartini et al., 2013; Madson, Arnau, & Lambert, 2013). PBS controlled consumption (PBS-CC; e.g., avoiding drinking games, alternating alcoholic and nonalcoholic drinks) tend to be associated with decreased hazardous drinking while PBS serious harm reduction (PBS-SHR; e.g., having a designated driver, leaving the bar or party with friends) tend to be associated with reduced alcohol-related negative consequences (DeMartini et al., 2013; Madson et al., 2013).

Evidence is emerging that the experience of mental health problems may affect the relationships between PBS and alcohol outcomes. The general trend suggests that PBS use is particularly valuable for reducing hazardous drinking and alcohol-related negative consequences when used by those experiencing mental health problems (Kenney & LaBrie, 2013; LaBrie, Kenney, & Lac, 2010; LaBrie, Kenney, Lac, Garcia, & Ferraiolo, 2009). Further, support is mounting to emphasize the value of PBS with specific mental health problems such as anxiety (Linden, Lau-Barraco, & Milletich, 2013) and depression (Martens et al., 2008). However, differential effects of PBS are found when dismantling them into their subtypes in relation to psychological distress. Villarosa, Moorer, Madson, Zeigler-Hill, and Noble (2014) found that increased PBS-CC was associated with reduced alcohol consumption but not with alcohol-related negative consequences among students experiencing elevated social anxiety symptoms. Moreover, increased PBS-SHR tend to be associated with decreased alcohol-related negative consequences but not decreased alcohol consumption for those with increased symptoms of depression who drank to cope with depression (Villarosa, Messer, Madson, & Zeigler-Hill, 2018). Mental health problems clearly appear to play a role in the value of PBS for college student drinkers. However, college students may experience psychological distress not related to mental health problems that may relate to their hazardous drinking. The experience of stress in college is common to most students and may influence students' drinking behavior, including PBS use. These findings may be best explained through the self-medication theory in which substance use is

a coping strategy to manage negative affect (Maisto, Bishop, & Hart, 2012). Additionally, drinking alcohol to self-medicate may deter an individual from engaging in PBS, as PBS use may interfere with one's goals of experiencing emotional relief through alcohol use.

College stress

Stress is a common human experience that can make it difficult to meet the demands of life (Cosby, 2012). Increased exposure to stressors is associated with greater likelihood of developing a substance use problem (Dawson, Grant, & Ruan, 2005; Sinha, 2008). The college experience includes unique stressors such as finances, academics, adjustment, socialization, and loneliness (Gold, 2016). Furthermore, the first year of college is a transitional period that can be stressful and increases risk for hazardous drinking (Borsari, Murphy, & Barnett, 2007).

According to the self-medication and tension-reduction hypotheses, students may use alcohol to cope with stress given the perceived stress reducing effects of alcohol use (Gold, 2016). Armeli and colleagues (2014) demonstrated that alcohol consumption and alcohol-related negative consequences were associated with drinking-related problems specifically for students who reported drinking to cope. Essentially, when pressed with copious amounts of stress, college students may drink to help mitigate pressures they feel due to stressors (Dermody, Cheong, & Manuck, 2013; Woolman, Becker, & Klanecky, 2015). In other words, alcohol use may be viewed by college students as a socially approved form of stress management.

The relationships that PBS have with hazardous alcohol consumption and alcohol-related negative consequences have been well established (Pearson et al., 2013). Further, there is growing evidence that psychological distress and mental health factors affect these relationships. One factor that has yet to be explored is stress specifically related to college, as it might be a factor in student hazardous drinking. Additionally, gender differences have been established for alcohol consumption, alcohol-related negative consequences, and PBS use (Madson & Zeigler-Hill, 2013). Thus, the purpose of this study was to explore the degree to which college stress moderates the relationships PBS subtypes (i.e. PBS-CC and PBS-SHR) have with hazardous alcohol use and alcohol-related negative consequences while accounting for the impact of gender. It was predicted that increased PBS-CC would be associated with reduced hazardous drinking (Villarosa et al., 2014) and this relationship would be the strongest for those reporting greater stress. We also predicted that greater use of PBS-SHR would be associated with decreased alcohol-related negative consequences (Villarosa et al., 2014) and this relationship would be the strongest for those reporting greater stress.

Methods

Participants and procedure

Participants were 550 traditional age (18–25; $M = 20.41$, $SD = 1.62$) undergraduate college students attending a university in the Southeastern region of the United States. To be eligible, participants had to have reported drinking alcohol within the 30 days prior to

participation. Participants classified themselves as freshman (41.4%), sophomore (22.6%), junior (20.2%), or senior (15.8%) and identified as White Non-Hispanic (57.7%), African American (35.9%), Hispanic (0.7%), American Indian or Alaskan Native (0.7%), Asian (1.7%), Native Hawaiian or Other Pacific Islander (0.5%), and others (1.7%). The majority of participants identified as female (59.9%).

Two methods were used to recruit participants. First, participants signed up through the School of Psychology research participation website and completed the survey for partial fulfillment of a research requirement. Second, an email that advertised the study with a link to the research website was sent through the university student announcements. Once participants clicked on the study link, they were sent to a University Institutional Review Board informed consent page. After providing informed consent, participants completed the demographic form followed by the study measures presented randomly in an effort to minimize order effects.

Measures

Protective Behavioral Strategies Scale-revised (PBSS-r).—The 18-item PBSS-r was used to assess PBS use (Madson et al., 2013). Participants indicated the degree to which they engaged in specific behaviors such as alternating alcoholic and nonalcoholic drinks and avoiding shots (PBS-CC; 12-items) and knowing where your drink is at all times and using a designated driver (PBS-SHR; 6-items) while drinking or partying using a 6-point scale ranging from 1 (*never*) to 6 (*always*). Scores ranged from 6 to 36 on the PBS-SHR subscale and from 12 to 72 on the PBS-CC subscale, with higher scores indicating more PBS use. The PBSS-r has been shown to be reliable and valid specifically with undergraduate college students with internal consistencies ranging from good to excellent (Madson et al., 2013). The internal consistency was strong in the present sample (PBS-CC $\alpha=.94$; PBS-SHR $\alpha=.92$).

College Student Stress Scale (CSSS).—The 11-item CSSS was used to assess the degree to which participants experienced unique stressors related to the college experience (Feldt, 2008). Participants rated the degree to which they felt anxious or distressed during the semester in relation to items such as personal relationships, academic matters, or being away from home using a 5-point scale ranging from 1 (*never*) to 5 (*very often*; Pintrich, Smith, Garcia, & McKeachie, 1993). Scores ranged from 11 to 55 with higher scores indicating experiencing more stress. The CSSS has evidence of good reliability and validity (Feldt & Koch, 2011). The internal consistency of the CSSS in this sample was strong ($\alpha=.92$).

Alcohol Use Disorders Identification Test-C (AUDIT-C).—Hazardous drinking was measured using the 3-item AUDIT-C (Saunders, Aasland, Babor, De La Fuente, & Grant, 1993). Participants responded to items using a scale ranging from 0 (*never*) to 4 (*daily*). Items include “How often do you have a drink containing alcohol?” and “How often do you have six or more drinks on one occasion?” AUDIT-C scores ranged from 0 to 12 with higher scores indicating more hazardous drinking. The internal consistency of the AUDIT-C in this sample was adequate ($\alpha=.82$).

Rutgers Alcohol Problem Index (RAPI).—The 23-item RAPI was used to assess alcohol-related negative consequences (Earleywine, LaBrie, & Pederson, 2008). Participants indicated how often they experienced a negative consequence, such as neglected your responsibilities, using a 5-point scale which ranged from 0 (*never*) to 4 (*more than 10 times*). Scores ranged from 0 to 92 with higher scores indicating more alcohol-related negative consequences experienced. The RAPI is considered a reliable and valid measure for showing experienced alcohol-related negative consequences among undergraduate college students ($\alpha=.88$; Earleywine et al., 2008). The internal consistency of the RAPI in this sample was excellent ($\alpha=.97$).

Data analysis

A series of hierarchical multiple regression analyses were conducted in SPSS to examine the degree to which college stress moderated the associations PBS subtypes (PBS-CC & PBS-SHR) had with hazardous alcohol use and alcohol-related negative consequences while accounting for gender (coded as 0, female and 1, male). The main effects of PBS and college stress were entered on Step 1 and the two-way interaction of these main effect terms were entered on Step 2. Additionally, the three-way interaction of PBS type, college stress, and gender were entered on Step 3. All continuous predictor variables were centered for the purpose of testing interactions (Darlington & Hayes, 2017; Frazier, Tix, & Barron, 2004). Significant two-way interactions were further examined using the PROCESS v3.0 macro for SPSS (Hayes, 2017) to evaluate the moderating impact of college stress on the relationships between PBS use and alcohol outcomes at low (1 *SD* below the mean), average (mean), and high (1 *SD* above the mean) levels of college stress.

Results

Means, standard deviations, and intercorrelations are reported in Table 1. College student stress was not correlated with hazardous drinking ($r=.01$, ns), PBS-CC ($r=.04$, ns), and PBS-SHR ($r=.03$, ns); however, it was positively associated with alcohol-related negative consequences ($r=.24$, $p<.001$). PBS-CC was negatively associated with hazardous drinking ($r=-.37$, $p<.001$) but not alcohol-related negative consequences ($r=-.21$, ns). Further, PBS-SHR was negatively associated with alcohol-related negative consequences ($r=-.35$, $p<.001$) but not hazardous drinking ($r=-.10$, ns). All main effects and interaction effects for both hazardous drinking and alcohol-related negative consequence analyses are presented in Table 2.

Hazardous drinking.

There was a significant main effect of PBS-CC ($\beta=-.45$, $t=-6.07$, $p<.001$), PBS-SHR ($\beta=.28$, $t=3.91$, $p<.001$), and gender ($\beta=.32$, $t=5.24$, $p<.001$) but not college stress ($\beta=.07$, $t=1.24$, $p=.22$) on hazardous drinking. Further, there was a significant interaction between college stress and PBS-CC ($\beta=.23$, $t=2.75$, $p=.006$) as well as between college stress and PBS-SHR ($\beta=-.27$, $t=-3.21$, $p=.002$) and hazardous drinking. However, conditional effects tests in PROCESS indicate the relationships between college stress and hazardous drinking are not significant at low (1 *SD* below the mean), average, and high (1 *SD* above the mean) levels of the moderators, suggesting PBS-CC and PBS-SHR do not significantly moderate

the relationship between college stress and hazardous drinking. Further, the model containing three-way interaction terms was not significant ($R^2=.30$, $R^2=.02$, $p=.057$) and thus specific interaction terms were not evaluated.

Alcohol-related negative consequences.

There were significant main effects of PBS-SHR ($\beta = -.37$, $t = -4.69$, $p < .001$) and college student stress ($\beta = .25$, $t = 4.10$, $p < .001$) but not PBS-CC ($\beta = .03$, $t = .34$, $p = .73$) or gender ($\beta = .04$, $t = .68$, $p = .50$) on alcohol-related negative consequences. Further, there was a significant interaction such that college stress moderated the relationship between PBS-SHR and alcohol-related negative consequences ($\beta = -.31$, $t = 3.64$, $p < .001$). Results of the conditional effects test (Figure 1) indicate the significant negative association between PBS-SHR use and alcohol-related negative consequences was strengthened at all levels of college stress: low level of college stress (1 SD below the mean, $\beta = -.38$, 95% CI [-.70, -.06]), average level of college stress ($\beta = -.84$, 95% CI [-1.13, -.55]), high level of college stress ($\beta = -1.31$, 95% CI [-1.68, -.94]); and the relationship was strongest at high levels of college stress.

Discussion

The purpose of this study was to explore the degree to which college stress moderated the relationships that PBS subtypes had with hazardous alcohol use and alcohol-related negative consequences while accounting for gender. Our hypotheses were partially supported, as PBS-CC was negatively associated with hazardous drinking; however, this relationship was not moderated by college stress levels when accounting for the effects of gender. Importantly, college stress was not associated with hazardous drinking. From these results, it appears that elevated levels of college stress do not appear alongside significant hazardous drinking behavior, which contrasts with studies linking college stress and hazardous drinking (Borsari et al., 2007). One contributing factor could be that students who experience high levels of stress may be consuming alcohol, but not at levels meeting hazardous drinking criteria (e.g., engaging in heavy episodic drinking). Thus, students with high stress could be consuming alcohol at a high rate (e.g., typical drinking throughout the week vs. binge drinking) or in manners leading to increased experience of alcohol-related negative consequences (e.g., before driving), but not high enough to meet the hazardous drinking standards. Other studies have found that mental health variables have differential relationships with typical weekly drinking and hazardous drinking (Villarosa et al., 2014, 2018). Perhaps exploring the relationship between typical weekly drinking and stress may lead to different results.

Increased use of PBS-SHR was associated with more hazardous drinking, which is inconsistent with our hypothesis but supported by other recent findings (Jordan, Villarosa-Hurlocker, Ashley, & Madson, 2018; Villarosa et al., 2018). Although PBS-CC is typically negatively associated with hazardous drinking, the positive association between PBS-SHR and hazardous drinking may speak to the types of behaviors assessed when examining PBS-SHR. Specifically, PBS-SHR strategies do not focus on alcohol consumption, but rather on strategies such as having a designated driver, knowing what is in your drink, and leaving a

party or bar with friends (Madson et al., 2013). Subsequently, students who use more PBS-SHR may believe they can consume more alcohol while still staying safe due to their implementation of PBS-SHR. Thus, these students may be simultaneously employing more PBS-SHR strategies and consuming more alcohol, yet experiencing fewer alcohol-related negative consequences due to the PBS-SHR. Consistent with hypotheses, there was not a significant interaction between college stress and PBS-SHR use when evaluating hazardous drinking. This finding could perhaps be due to differences in stress-related drinking behaviors; for example, students experiencing lower stress may drink more frequently or drink in more social situations, while students experiencing higher stress may only drink to cope with stress in more isolated environments, which call for less PBS-SHR to be used. However, this needs to be investigated further.

As expected, we found that increased use of PBS-SHR was related to decreased alcohol-related negative consequences and this was significantly moderated by college stress. Specifically, the negative association between PBS-SHR and alcohol-related negative consequences was the strongest when college stress was high. This finding supports previous research that PBS, especially PBS-SHR, are particularly important in reducing alcohol-related negative consequences for those experiencing mental health problems and psychological distress (Kenney & LaBrie, 2013; LaBrie et al., 2009; Villarosa et al., 2014, 2018). Similar to the protective value of PBS use for students experiencing psychological distress or other mental health problems, this study further supports the protective value of PBS use, particularly PBS-SHR, with alcohol-related negative consequences for college students experiencing college-related stress. Thus, PBS-SHR is likely valuable for reducing alcohol-related negative consequences for most students, but particularly those experiencing higher levels of stress.

Implications

These results have several implications for prevention and intervention efforts on college campuses. First, given that most students experience stress related to being in college to some extent, it is important that educational efforts discuss the connection between stress and alcohol-related negative consequences as well as the potential protective value of PBS use. Further, screening events for college stress experiences, such as “stress less week,” could also assess for alcohol use and subsequently provide feedback about the links between stress and alcohol-related negative consequences. Finally, brief motivational interventions for alcohol use on college campuses could assess for college-related stress and integrate this feedback when discussing overall alcohol use and alcohol-related outcomes, such as negative consequences. This feedback could inform discussions about how stress, alcohol use, and alcohol-related negative consequences may be related. These discussions could uncover students’ motives for drinking, such as coping with stress, or expectations, such as tension reduction, and how they may relate to safer drinking decisions. Ultimately, information gained through screenings and feedback could lead to discussions on how to manage stress more effectively in a healthy manner, even when alcohol is being consumed (Park, Armeli, & Tennen, 2004).

Limitations

Although these results are promising, they should be interpreted within the study limitations. One limitation is the cross-sectional design. Stress fluctuates over time, such that stress at the beginning of the semester may be different from stress occurring during midterms or finals, and this study only captured stress at one point in the year. Another limitation is general psychopathology symptoms were not assessed. Mood disorders and alcohol use often co-occur in college populations (Blanco et al., 2008) and may have influenced these results. A final limitation is this study focuses on general college stress and not specific stressors within the college context. The specific stressors experienced may differentially affect how stressors relate to students' drinking behaviors. In addition to addressing these limitations, future research should examine the relationship between PBS use and specific stressors on hazardous drinking and alcohol-related negative consequences to expand upon these findings related to general college stress. Some specific stressors could include stress related to academics, socialization and peer influence, minority status, sexual orientation, ethnicity and race, and finances. For example, examining the links between alcohol outcomes, PBS, and stressors such as racial and gender discrimination among specific groups may help inform culturally congruent prevention and intervention approaches (Cottonham, 2018; Cottonham, Madson, Nicholson, & Mohn, 2018). Similarly, it might be beneficial to further examine the within and between group differences in the associations between stress and alcohol outcomes based on demographic variables such as race, Greek Letter Organization affiliation, or athletic status, as these factors have been shown to influence alcohol outcomes yet were not addressed in this study (Cottonham et al., 2018). Because of the likelihood that students with higher stress may drink alcohol to cope, it would be advantageous to explore the role of drinking motives and outcome expectancies as related to stress and alcohol outcomes (Ham, Zamboanga, Bacon, & Garcia, 2009). Additionally, given the comorbidity between mood disorders and alcohol use in college student populations (Blanco et al., 2008), it may be helpful to examine the relationships between stress, PBS use, and alcohol outcomes while accounting for the presence of more significant psychopathology. Finally, because stress fluctuates throughout the course of an academic year, use of diary designs may be valuable to capture the temporal, causal relationships between stress, PBS, and alcohol-related outcomes.

In conclusion, these findings extend the PBS literature by providing further evidence for the value of PBS subtypes in relation to hazardous drinking and alcohol-related negative consequences. Additionally, this study provided evidence as to how college student stress might attenuate these relationships. Thus, these findings highlight the importance of further investigating the role of college stress in relation to safe and hazardous drinking and provide evidence for the protective role of PBS for college students experiencing stress and consuming alcohol.

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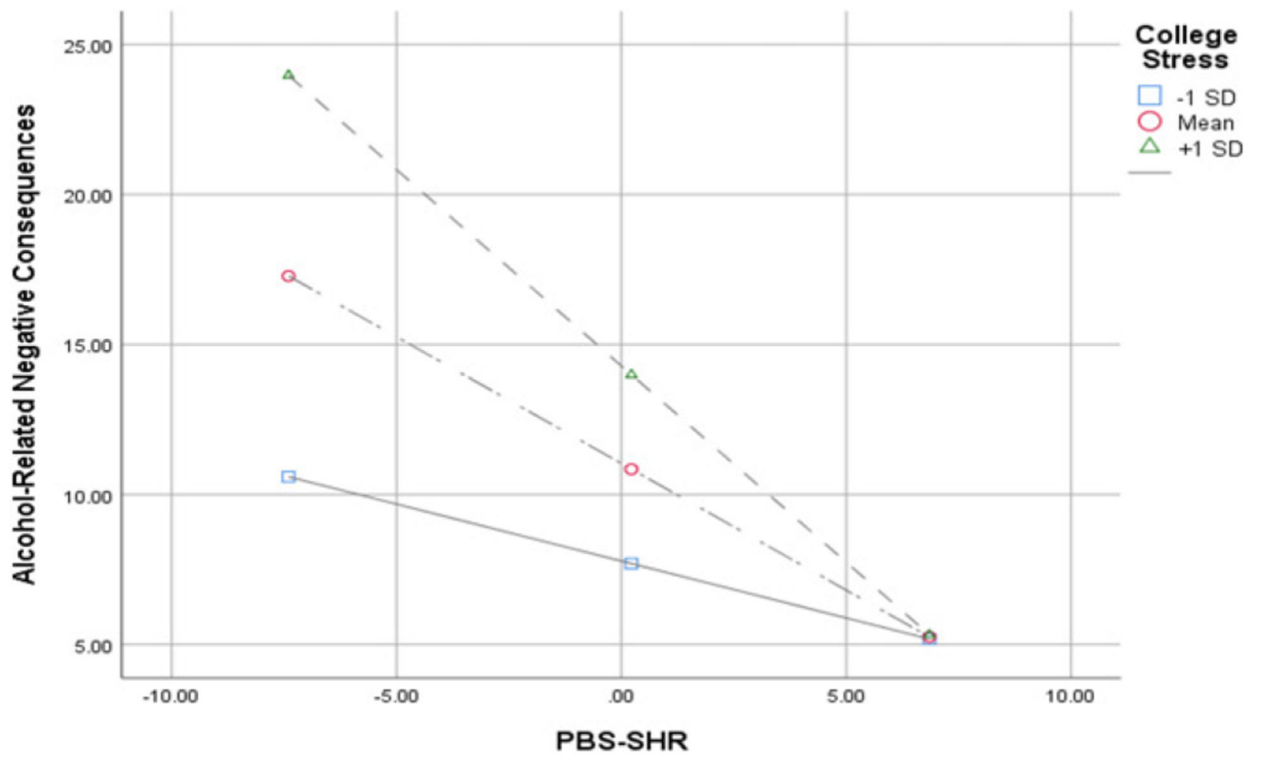


Figure 1. Predicted values for alcohol-related negative consequences given the interaction of college student stress and serious harm reduction while accounting for gender. Note: PBS-SHR = Protective Behavioral Strategies-Serious Harm Reduction.

Table 1.

Means, standard deviations, and correlations of study measures.

	1	2	3	4	5
1. CC	–				
2. SHR	–.63***	–			
3. CSS	–.04	–.03	–		
4. AUDIT-C	–.37***	–.10	–.01	–	
5. RAPI	–.21	–.35***	–.24***	–.37**	–
Means	46.2	29.1	28.3	4.1	11.1
SD	15.9	7.6	9.98	2.6	15.7

Note . PBS-CC = Protective Behavioral Strategies-Controlled Consumption; PBS-SHR = Protective Behavioral Strategies-Serious Harm Reduction; CSS = college stress; AUDIT-C = Alcohol Use Disorder Identification Test-Consumption; RAPI = Rutgers Alcohol Problem Index

* $p < .05$;

** $p < .01$;

*** $p < .001$.

Regressions of alcohol-related outcomes on college stress and protective behavioral strategies accounting for gender.

Table 2.

	Hazardous drinking		Alcohol-related negative consequences	
	R ²	β	R ²	β
<i>Step 1</i>	.25***		.18***	
CSS		-.07		-.25***
PBS-CC		-.45***		-.03
PBS-SHR		-.28***		-.37***
Gender		-.32***		.04
<i>Step 2</i>	.28**		.26***	
CSS × PBS-CC		-.23**	.08***	-.02
CSS × PBS-SHR		-.27**		-.31***

Note. CSS =college stress; PBS-CC = Protective Behavioral Strategies-Controlled Consumption; PBS-SHR = Protective Behavioral Strategies-Serious Harm Reduction.

* $p < .05$;

** $p < .01$;

*** $p < .001$.