Psychosocial Stress and Attitudes Toward Substance Use Among College Students: An Exploratory Study

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ABSTRACT. Substance use occurs on college campuses nationwide and is among the top threats to college-student health. The present study aimed to explore the impact of stress on substance use attitudes. The independent variable was acute psychosocial stress, induced using the Trier Social Stress Test. We measured chronic stress using the Adverse Childhood Experiences questionnaire. The Alcohol Purchase Task (i.e., alcohol demand, alcohol breakpoint, alcohol expenditure) and the Cognitive Appraisal of Risky Events-Revised questionnaire (i.e., expected involvement with substances and expected benefits and consequences of using substances) were the dependent variables. We predicted that participants who completed the acute stress task would report greater attitudes toward substance use behaviors and this would be more pronounced for those with higher levels of chronic stress. Acute stress did not affect willingness to pay for alcohol, $F(3, 85) = 0.55, p = .65, \eta^2_p = 0.02$, or expected positive or negative consequences from engaging in substance use, $F(3, 85) = 0.44, p = .73, \eta^2_p = 0.02$. There was a small positive association between chronic stress, as measured by adverse childhood experiences, and expected use, $\rho(89) = .22, p = .04$. In exploratory analyses, we found expected positive benefits of substance use to be significantly associated with expected future involvement, whereas expected negative consequences of substance use was associated with expected future involvement. Our results imply that acute and chronic stress were not significant in predicting substance use behaviors. Rather, those who expect benefits are more likely to use substances.

Keywords: acute stress, chronic stress, substance use, alcohol, risky decision-making

College students nationwide engage in substance use (Schulenberg et al., 2017). For example, 58% of 18–22-year-old students reported alcohol use in 2015 and more than 37% reported binge drinking (Substance Abuse and Mental Health Services Administration, 2019). Alcohol and other drug use are among the top threats to college-student health in the United States (Shillington & Clapp, 2006). In addition, more than 65% of college students reported experiencing moderate to high levels of stress over the past year (American College Health Association, 2020), and stress exposure is linked to alcohol use disorders (Stephens & Wand, 2012). The purpose
of the present study was to examine the relationship between acute and chronic stress and substance use attitudes among college students.

Understanding the relationship between stress and substance use among college students is important because substance use is a high-risk activity. Substance use is related to health problems, unsafe sexual behavior, and poor academic performance. Specifically, college students who are heavy drinkers are less likely to use protection during sex (Porter & Pryor, 2007). Moreover, alcohol use is negatively related to GPA and graduating with honors, and heavy drinkers are more likely to miss classes and fall behind in schoolwork (Porter & Pryor, 2007).

Stress may be a modifiable lifestyle factor that, if alleviated, could reduce risky substance use behaviors. Stress can be either acute or chronic and may influence decisions to use substances. Acute stress is sudden, novel, intense, lasts a relatively short time, disrupts behavior that is goal-oriented, and requires an immediate response (Ellis, 2006). A chronic stressor can be an ongoing difficulty stemming from a particular event or point in time, such as losing a job, or it can be an ongoing issue not related to a particular event, such as feeling unsure about future goals (Towbes & Cohen, 1996). Both acute and chronic stress activate the hypothalamic-pituitary adrenal (HPA) axis. The HPA axis is a system in the body that produces cortisol and is involved in responding to stressful events and returning the body back to homeostasis. A normal stress response elicits a quick rise in cortisol levels followed by a rapid decline after the stressful event is over.

When an individual experiences chronic stress, cortisol levels increase and do not return the body back to normal because of ongoing stress, which can cause damage to the individual and can lead to health problems. Sustained levels of stress releases high levels of stress hormones (e.g., cortisol) into the body, which has been shown to be damaging to the brain (Sapolsky, 1996, 2003). Such dysfunction in the HPA axis is a risk factor in developing alcohol use disorders and associated with alcohol abuse (Stephens & Wand, 2012). Cortisol also interacts with the brain’s reward system to reinforce the effects of alcohol, which contributes to substance abuse (Stephens & Wand, 2012). Substance users may have altered reward pathways (Grant et al., 2006), such that typically rewarding behaviors (e.g., eating) become less rewarding.

Previous research has shown that stress impacts decision-making, specifically decisions regarding risk taking. University students who were exposed to a stressful task (i.e., giving a speech) had a greater increase in cortisol levels and chose a riskier option more frequently during a decision-making task (Starcke et al., 2008). Furthermore, when studying the relationship between stress (i.e., Trier Social Stress Test, TSST) and financial risks, college students were more likely to take financial risks when under stress (Buckert et al., 2014). These results support the idea that acute stress may lead individuals to engage in risky behaviors.

Chronic stress, such as that experienced due to adverse childhood experiences (ACEs) may also be associated with substance use. Adverse childhood experiences are adverse events, such as abuse, witnessing violence between parents, or having a family member using illegal drugs, that a person might experience from birth to age 18 years. Previous researchers have found that ACEs were related to negative health problems and behaviors including substance use. ACEs accounted for one-half to two-thirds of individuals who have serious problems with drug use (Dube et al., 2003), and the prevalence of substance use increases with higher ACEs scores (Felitti et al., 1998). Dube and colleagues (2003) also found that each additional ACE was associated with an increase in the likelihood of using illicit drugs by the age of 14 and an increase in the risk of continued use into adulthood. Dube and colleagues (2003) explained that substance use may serve as an escape from the emotional pain, anxiety, and anger that accompanies these adverse experiences. Overall, previous research has suggested that individuals who have experienced more adversity in their childhood are more likely to use substances.

The perception and appraisal of stress is an important factor in determining the effects that stressors have on an individual. Perceived stress is defined as a subjective experience; therefore, there is variability in who perceives an event or experience as stressful (Lazarus, 1990; Liston et al., 2009). Appraisal modifies one’s perceptions of stress and considers the demands of the environment one is in and the personal beliefs of an individual (Lazarus, 1993). For example, college students who were in more rigorous programs (e.g., pre-medicine) experienced greater perceived stress than those in less rigorous programs.

Perceived stress is also influenced by coping strategies, which suggests that effective coping strategies may prevent the consequences of stress in college students (Neveu et al., 2012). When faced with a psychosocial stressor, individuals assess its significance. This higher order processing of a stimulus and the
perception of the stimulus as stressful is thought to activate the HPA axis and the stress response (Liston et al., 2009). Therefore, the perception of a stimulus as being stressful ultimately makes one feel stressed. Individual differences including abuse, major life events, and stressful environments affect one’s perception of threat (Juster et al., 2010), which may be why individuals handle stress differently.

**Hypotheses**

Limited research has simultaneously examined both acute and chronic stress in empirical studies of risky choice and decision-making. Thus, the goal of the present research was to examine the link between stress and attitudes toward substance use. We hypothesized that individuals under acute stress (i.e., induced by the TSST) would make riskier substance use-related choices on the Alcohol Purchase Task (MacKillop & Murphy, 2007) and report greater expected involvement in, positive benefit from, and lower negative consequences of substance use behavior. We predicted that the above effects would be more pronounced for individuals with higher levels of chronic stress, as measured by the ACE questionnaire.

**Method**

**Participants**

We conducted a power analysis in G*Power (3.1.9.2) for a multivariate analysis of variance (MANOVA) with a small-medium effect size, $\alpha = .05$, power = .80, number of groups = 6, number of predictors = 2, and response variables = 3. This power analysis indicated a sample size of $N = 80$. To account for the possibility of a smaller than expected effect size and feasibility based on time, money, and personnel, we aimed to achieve a sample size of $N = 100$. Participants who were recruited through a class were compensated with extra credit as seen fit by their professors. Participants who were recruited via posters hung around the university were compensated with $15 gift cards to Amazon ($n = 41$ participants were compensated with gift cards). Data collection occurred in classrooms on the University of Wisconsin Platteville’s campus. In-person participants were randomly assigned to either the stress condition or the control condition by using a randomizer on Excel to determine which participants were in each condition. However, due to personnel constraints, if there were not two researchers available, some cases were conducted as the control condition rather than the stress condition.

A total of 108 individuals started this research study. After excluding 16 participants who completed between 2% and 74% of the study, and three participants who were outliers (three standard deviations above the mean) on one of the dependent variables, our final sample included 89 participants. The participants’ average age was 20 years ($SD = 2.12$ years). Notably, the average age of participants was under the legal alcohol purchase and consumption age. Of these, 75.3% were women, 24.7% were men, demographics reflected those of the university.

Twenty-eight participants were included in the stress condition and 61 participants completed the control condition. Twenty-seven of the 61 control participants completed the control task in the laboratory. Due to lack of personnel required to run the stress condition and the presence of time constraints (i.e., schedule differences of researchers), 34 participants completed the control condition online, which deviates from our original preregistration. In-person control participants ($M_{age} = 20.52$, $SD = 1.42$) and experimental participants ($M_{age} = 20.50$ years, $SD = 3.04$ years) were older than the online control participants ($M_{age} = 19.18$, $SD = 1.31$), $F(2, 86) = 4.47$, $p = .01$. Initial analyses were conducted with all control participants grouped together; follow up analyses were conducted to control for age and excluding the online control participants; however, results did not differ and are therefore not reported in detail.

**Design**

We originally planned to use a $2 \times 3$ between-participant factorial design with acute psychosocial stress (i.e., stressed and unstressed) as our main independent variable and adverse childhood experiences as a participant variable, as reported in our preregistration. The psychosocial stress was induced using the TSST. ACEs were a participant variable, and we planned to use three levels—no ACEs, 1–2 ACEs, and 3+ ACEs. However, we did not have enough power to detect an interaction effect. Therefore, we report the results from a between-participant design with acute psychosocial stress as our independent variable. We used ACEs as a continuous predictor variable in a separate analysis.

We measured six dependent variables: alcohol demand, alcohol breakpoint, alcohol highest expenditure, expected involvement with drugs/alcohol, expected gains of using drugs/alcohol, and expected costs of using drugs/alcohol.
Alcohol demand was measured by how many drinks a participant purchased at $0.00 in the Alcohol Purchase Task (described more below). Alcohol breakpoint was the price at which participants were no longer willing to purchase a drink in the Alcohol Purchase Task. Alcohol highest expenditure was the largest amount paid at a price point during the Alcohol Purchase Task. Expected involvement with drugs/alcohol, expected gains of using drugs/alcohol, and expected costs of using drugs/alcohol were all measured by scoring participants’ answers to the Cognitive Appraisal of Risky Events-Revised (CARE-R) questionnaire (Katz et al., 2000).

**Materials**

Except for the TSST, all questionnaires were completed online using Qualtrics. The stress group and in-person control group completed the survey using the computer in the lab. Participants in the online control condition completed the survey using their own devices. Reliability for all relevant measures was computed and is reported below. All scales used have evidence for their validity.

**Demographics**

Participants first completed the demographic questionnaire that collected data on age, gender, year in school, race/ethnicity, area raised in, current housing location, first-generation status, employment status, and academic college. As part of the demographics section, participants also completed the Perceived Stress Scale, Childhood Socioeconomic Status Questionnaire, and the patient health questionnaire. These additional scales were not used in analysis.

**Adverse Childhood Experiences Questionnaire (ACEs)**

The ACEs questionnaire (Felitti et al., 1998) consisted of 10 items and measures participants’ history of abuse and household dysfunction from birth through the age of 18. The categories of abuse included psychological, physical, and sexual abuse. The categories of household dysfunction included substance use, mental illness, violence toward a parent/caregiver, and criminal behavior. For example, an item on the ACEs questionnaire asked participants if they lived with someone who was a problem drinker or alcoholic. Answering yes to an item gave participants a score of 1 and answering no gave participants a score of 0. Higher scores indicated experiencing more adverse events in childhood (α = .80).

**The Cognitive Appraisal of Risky Events Revised (CARE-R)**

For the CARE-R (Katz et al., 2000), participants answered questions on a 7-point Likert-type scale regarding their views on drugs and alcohol. The questions used in this study were taken from the drugs/alcohol items from the original questionnaire, which has established reliability and validity (Katz et al., 2000). We included the following sections from the CARE-R in our study: Number of Times in the Past 6 Months (α = .83), Expected Involvement (α = .84), Likelihood of Positive Consequences (α = .89), and Likelihood of Negative Consequences (α = .97). The first section asked participants how many times in the past 6 months they tried/used drugs other than alcohol, drove after drinking, and how much and often they drank. This section was given to participants in the demographics section of the questionnaire to determine their typical drinking behavior. The section on expected involvement contained items that were used to determine the likelihood they would exhibit similar behaviors in the future compared to those asked about in the past 6 months. The items contained in the positive and negative consequences sections were used to determine if participants thought using substances would result in positive or negative outcomes (e.g., feeling good, spending time with friends, becoming sick, losing money).

**Emotion Visual Analog Scale**

For the visual analog scales (Kelly et al., 2008), participants indicated their level of calm, fear, happiness, and irritability using a visual analog scale. These scales range from 0 (not at all) to 100 (most ever). The emotion word scale was used throughout the experiment (i.e., beginning of study, before stress manipulation, after stress manipulation, end of study) as a manipulation check to see if the stress manipulation had an effect on participants’ emotions. Participants in the control condition completed the scale at the same time points throughout the study as a comparison.

**Primary Appraisal and Secondary Appraisal**

The Primary Appraisal and Secondary Appraisal scales (Gaab et al., 2005) were made up of 16 items to assess primary and secondary stress appraisal directly related to the stress manipulation. Participants ranked how relevant each item is to themselves on a 6-point Likert-type scale ranging from 1 (strongly disagree) to 6 (strongly agree). The
Primary Appraisal portion of the scale assessed how challenging (4 items; $\alpha = .51$) and threatening (4 items; $\alpha = .90$) the situation is. The Secondary Appraisal portion of the scales assessed how the situation affects participants’ self-concept (4 items; $\alpha = .71$) and their ability to control the situation (4 items; $\alpha = .65$). The primary appraisals gauged participants’ perception of the situation, whereas the secondary appraisal scales gauged participants’ perceived coping resources. We had good reliability for the Threat scale, adequate reliability for the Self-Concept scale, and poor or questionable reliability for the Challenge and Control facets; therefore, neither Challenge nor Control were included in subsequent analyses.

**Trier Social Stress Test (TSST)**
The TSST (Payne et al., 1993) required participants to prepare and present a speech in a short amount of time and to respond verbally to a challenging arithmetic problem in front of evaluators. This task is a well-validated standardized protocol for studies of stress and capable of inducing a reliable stress response (see protocol below).

**Alcohol Purchase Task**
The Alcohol Purchase Task (MacKillop et al., 2010) asked participants to estimate how many drinks they would typically consume at different prices. The drinks used in this task were domestic beer (12 oz.), wine (5 oz.), shots of hard liquor (1.5 oz.), or mixed drinks containing one shot of liquor. The Alcohol Purchase Task used 16 prices, ranging from $0 per drink to $1,120 per drink. A meta-analysis of the alcohol purchase task demonstrated that it showed good construct validity (Kiselica et al., 2016).

**Procedure**
After gaining approval from the Institutional Review Board at the University of Wisconsin Platteville, we preregistered this study’s materials and analyses at [https://osf.io/6stkm](https://osf.io/6stkm) on the Open Science Framework.

The female primary investigator welcomed participants to the lab space and seated them at a desk. The same researcher gave the participants a consent form to review and went over informed consent with the participants. Participants were informed that their participation was voluntary, and they could stop at any point if they no longer wished to continue. Participants who agreed to participate were instructed to use the computer to complete the survey. The visual analog scales were completed by participants at the beginning of the study, before the stress manipulation, after the stress manipulation, and at the end of the study. After the first visual analog scale was completed, all participants completed the demographic survey, the Perceived Stress Scale, the ACEs survey, the Childhood Socioeconomic Status Survey, and the Patient Health Questionnaire-4. Then, participants completed the Number of Times in the Past 6 Months section from the CARE-R questionnaire.

After completing the CARE-R questions, participants in the control condition completed the filler task of reading a magazine (in print) for the same duration of the experimental condition (approximately 15 minutes). After 5 minutes, the control participants completed the Primary Appraisal and Secondary Appraisal scales; they then continued the filler task for the remainder of the time. Participants in the online control condition did not have a filler task to complete because they were not in-person to monitor a task.

Participants in the experimental condition were instructed to prepare a speech on why they would be the best applicant for a job. They were given four jobs to choose from: advertising, banking, manufacturing, and personal caregiver (Oda & Kikuchi, 2013). The procedure for the TSST followed the procedure explained in Payne and colleagues (2002) and Kirschbaum and colleagues (1993). Participants gave the speech in front of a one-way mirror and were told that evaluators would be scoring them on the other side. There was also a camera and monitor in the room with participants under the impression that they might be recorded (but they were not; Payne et al., 2002).

Participants were given 5 minutes to prepare an outline for their speech. After 5 minutes, their notes were taken from them and they were told that they had to give their speech from memory. At this time, participants completed the Primary Appraisal and Secondary Appraisal scales. Participants were given 5 minutes to present their speech. If participants stopped before the 5 minutes were up, evaluators prompted them to continue going. For the first time stopping, an evaluator said, “You still have time remaining.” For the second time stopping, an evaluator was quiet for 20 seconds to see if the participants continued on their own. If the participants did not continue, an evaluator prompted them with “You still have time remaining” (Kirschbaum et al., 1993). Most participants continued after being prompted, but some did not have anything else to say so they stood there waiting for the 5 minutes to be up.
No participants chose to leave the study due to the manipulation. After the speech portion of the TSST, participants completed the math portion of the test, which also took 5 minutes to complete. Participants were instructed to serially subtract 13 from the starting number of 1,022. If a participant got a number incorrect, they were prompted to start over from the number 1,022 with an evaluator saying, “Stop. Please start again at 1,022” (Kirschbaum et al., 1993).

After the TSST or filler, participants were then instructed to complete the Alcohol Purchase Task, as if they were in a typical drinking situation. After the Alcohol Purchase Task was completed, participants completed the Expected Involvement, Likelihood of Positive Consequences, and Likelihood of Negative Consequences of the CARE-R questionnaire. Following the completion of the study, participants were debriefed orally and given a copy of our debriefing form. The online control participants received an electronic copy of the debriefing form. The debriefing form included information for the university’s counseling services in the event that participants experienced any distress from participating in the study (e.g., ACEs questionnaire, stress manipulation, substance use).

Results

Descriptive Statistics

Descriptive statistics are presented in Table 1. Several of our dependent variables were positively skewed. Therefore, we conducted nonparametric tests, which are also reported in Table 1.

First, we checked for any baseline differences between the in-person control and online control group. In-person control participants had a lower maximum expenditure on the Alcohol Purchase Task, $t(59) = -2.0$, $p = .05$. At Time Point 3, the in-person control participants had slightly higher levels of irritability, $t(59) = 2.11$, $p = .04$, and lower levels of calmness, $t(59) = 2.25$, $p = .03$, relative to the online control participants. Otherwise the in-person control participants did not differ from the online control participants. We also checked for differences based on participants’ gender. Female and male participants were similar on scores of the Alcohol Purchase Task and the CARE-R, all $t(87) < 1.60$, all $p s > .10$, all Hedge’s $g s < 0.40$. Note that degrees of freedom differ due to missing data for one participant.

We examined the number of participants who had engaged in various activities related to alcohol or substance use in the past 6 months (see Table 2). Then we examined participants’ expected negative consequences and expected positive benefits from alcohol and substance use activities. Participants reported higher expected negative consequences compared to positive benefits from

<table>
<thead>
<tr>
<th>TABLE 1</th>
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<tr>
<td><strong>Descriptive Statistics and Effect Sizes for the Experimental and Control Groups</strong></td>
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<td>Demographic</td>
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<td>N</td>
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<td>Perceived stress</td>
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<td>ACEs</td>
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<td>Past involvement†</td>
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<td></td>
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<tr>
<td>Dependent Variables</td>
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<tr>
<td>CARE-R positive</td>
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<td>CARE-R negative</td>
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<td>CARE-R expected</td>
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<tr>
<td>Alcohol demand</td>
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<td>Alcohol breakpoint</td>
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<td>Max expenditure</td>
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Note. SES = Socioeconomic Status; ACEs = Adverse Childhood Experiences; CARE-R = Cognitive Appraisal of Risky Events-Revised Questionnaire.  
†n = 87 (two missing scores from control condition)
engaging in substance use behaviors (see Figure 1). We conducted a paired-samples t test to compare participants’ expected negative consequences to their expected positive benefits. For example, participants expected more negative consequences than positive benefits if they consumed more than five alcoholic beverages in one sitting, t(88) = -4.02, p < .001, d = 0.43. There was not a difference between expected positive benefits compared to expected negative consequences as a result of playing drinking games, t(88) = 1.23, p = .22, d = 0.13.

**FIGURE 1**
Expected Outcome of Engaging in Various Substance Use Behaviors

Note. 0 indicates positive/negative outcome is not at all likely and 6 indicates a positive/negative outcome is extremely likely.

**FIGURE 2**
Self-Reported Calmness for the Control and Experimental Groups

Note. TSST = Trier Social Stress Test.

**FIGURE 3**
Self-Reported Irritability for the Control and Experimental Groups

Note. TSST = Trier Social Stress Test.

**Manipulation Check**

We conducted four mixed ANOVAs using the data collected from the visual analog scales with time (i.e., beginning of experiment, before TSST or filler, after TSST or filler, end of experiment) as a repeated measure and condition (i.e., stressed and control) as a between participant factor. We observed a condition by time interaction for each of the four emotions. We examined the simple effects at Time Point 3 (i.e., post TSST or post filler). Participants in the stress condition felt more irritable, t(37.65) = -2.08, p = .04, Hedges’ g = 0.56 (see Figure 2), less calm, t(43.81) = 3.23, p = .002, g = 0.80 (see Figure 3), and less happy, t(87) = 2.57, p = .01, g = 0.59, following the TSST compared to the control condition. Participants did not differ in fear, t(40.00) = -1.57, p = .12, g = 0.40. Many of the above tests did not meet Levene’s test for equality of variances, meaning we did not meet the homogeneity of variance assumption. In these cases, we did not assume equal variances and used the corrected values based on adjusted degrees of freedom to account for unequal variances.

**Hypothesis 1: Acute Psychosocial Stress Will Increase Substance Use Behaviors**

We first conducted our planned analyses outlined in our preregistration. We conducted two MANOVAs to test for the effect of acute stress (i.e., induced by the TSST) on substance use attitudes. Participants in the stress condition did not differ from the participants in the control condition on the Alcohol Purchase Task (i.e., alcohol demand, breakpoint, or max expenditure), F(3,85) = 0.55, p = .65, η² = 0.02. Participants in the stress condition did not differ from participants in the control condition on the CARE-R, F(3,85) = 0.44, p = .73, η² = 0.02. Because our data were skewed, we conducted unplanned nonparametric tests and, again, did not find an effect of stress on substance use behaviors (see Table 1 for p values from a Mann-Whitney U test).

**Hypothesis 2: ACEs Will Be Associated With Substance Use Behaviors**

We did not have enough power to detect whether there was an interaction between childhood adversity (ACEs) and the TSST on substance use behaviors, which was planned in our preregistration. Instead, we tested whether there was a relationship between childhood adversity and substance use behavior. We conducted simple bivariate Spearman’s ρ correlations. We did not find a relationship between ACEs and alcohol demand, alcohol breakpoint, alcohol maximum expenditure,
CARE-R positive, or CARE-R negative, $p$s $>.07$. There was a small positive association between ACEs and CARE-R expected use, $\rho(89) = .22$, $p = .04$.

**Planned Exploratory Analyses**

In our preregistration, we planned to examine simple bivariate correlations among our dependent variables. These exploratory analyses may inform future research. We used Spearman $\rho$ correlations to examine bivariate relationships because many of our measures were not normally distributed.

There were positive correlations between expected positive benefits from substance use and past use, $\rho(87) = .67$, $p < .001$, expected use, $\rho(89) = .76$, $p < .001$ (see Figure 4), alcohol demand, $\rho(89) = .38$, $p < .001$, alcohol breakpoint, $\rho(89) = .37$, $p < .001$, and alcohol maximum expenditure, $\rho(89) = .46$, $p < .001$. Expected negative consequences were negatively associated with expected use, $\rho(89) = -.24$, $p = .03$, and not associated with alcohol demand, breakpoint, or maximum expenditure (all $p$s $>.09$).

**Unplanned Analysis**

We conducted an unplanned multiple regression with expected positive benefits, expected negative consequences, past involvement, and age as predictors and expected future use as the outcome, $F(4,82) = 63.17$, $p < .001$, $R^2 = .76$. Past involvement and positive benefits both significantly predicted anticipated future use (see Table 3).

**Discussion**

In the present study, we aimed to examine the impact of stress on substance use attitudes. We predicted that acute stress (i.e., induced by the TSST) would lead to higher anticipated use of and more positive attitudes toward substance use, as measured by the Alcohol Purchase Task and CARE-R. However, we did not find support for our hypothesis. Similarly, our prediction that the effects of stress on substance use attitudes would be greater in individuals who have experienced higher levels of chronic stress, as measured by the ACEs questionnaire, was also not supported.

Our results are inconsistent with previous research that has found both acute and chronic stress to predict substance use. For example, stress exposure is a risk factor in developing alcohol use disorders (Stephens & Wand, 2012). The American College Health Association (2020) reported that 65% of college students experienced moderate to high levels of stress over the past year. Because the induced acute stressor was known to be an experimental manipulation, and not something directly affecting the lives of participants outside of the experiment, it is likely that the TSST was just a very short-term stressor. It may be that introducing a new acute stress (i.e., the TSST) did not lead to a substantive enough increase in relative stress to impact substance use attitudes. In other words, chronic stress, such as that induced by ACEs, may be a more important predictor of substance use attitudes or behaviors.

We did find a small positive association between ACEs and expected future use, which is consistent with research showing that the presence of even one ACE increases the likelihood of alcohol use during adolescence (Dube et al., 2006). Chronic stress leads to the secretion of the stress hormone cortisol, which can impair normal functioning of the prefrontal cortex and affect decision-making, which relates to risky

![FIGURE 4](image-url)

**Association Between Expected Positive Benefits From Substance Use and Expected Involvement**

![TABLE 3](image-url)

**Significant Predictors of Anticipated Future Use of Substances**

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<th>$B(\text{SE})$</th>
<th>$\delta$</th>
<th>$t$</th>
<th>$p$</th>
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<tbody>
<tr>
<td>Constant</td>
<td>$-9.04 (6.88)$</td>
<td>N/A</td>
<td>$-1.32$</td>
<td>.19</td>
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<tr>
<td>Age</td>
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<td>$0.07$</td>
<td>$1.18$</td>
<td>.24</td>
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<tr>
<td>Past involvement</td>
<td>$0.96 (0.10)$</td>
<td>$0.71$</td>
<td>$9.89$</td>
<td>&lt;.001</td>
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<tr>
<td>Positive benefits</td>
<td>$0.19 (0.06)$</td>
<td>$0.21$</td>
<td>$3.02$</td>
<td>.003</td>
</tr>
<tr>
<td>Negative Consequences</td>
<td>$0.03 (0.03)$</td>
<td>$0.02$</td>
<td>$0.42$</td>
<td>.68</td>
</tr>
</tbody>
</table>
decisions such as using substances (Balleine, 2007; Liston et al., 2009; Starcke & Brand, 2016; Stephens & Wand, 2012). We did not find a relationship between ACEs and any other measures of substance use, though, such as on the Alcohol Purchase Task or expected positive benefits or negative consequences. This may indicate that ACEs predict different levels of expected substance use, regardless of the benefits or consequences. Similarly, it may mean that ACEs predict expected substance use but not the amount of money participants are willing to spend on alcohol or the quantity of alcohol participants intend to consume, as measured by the Alcohol Purchase Task. In fact, third variables such as financial disparities or constraints related to being an undergraduate student may be an important future area to explore related to substance use.

Our results are not in line with previous research that has found both acute and chronic stress to be related to one’s tendency to use substances. For example, stress exposure is a risk factor in developing alcohol use disorders (Stephens & Wand, 2012). Secretion of cortisol due to chronic stress can impair normal functioning of the prefrontal cortex and decision-making, and has been shown to lead to risky decisions such as using substances (Balleine, 2007; Liston et al., 2009; Starcke & Brand, 2016; Stephens & Wand, 2012). In fact, some research has indicated that the presence of even one ACE increases the likelihood of alcohol use during adolescence (Dube et al., 2006).

Another possible explanation for our results not aligning with previous literature could be explained by a third variable. For example, stress may not play a role in substance use if an individual has healthy coping methods. For example, inverse relationships between coping and substance use have occurred at high levels of stress, which indicates that good coping skills can reduce the likelihood of substance use behaviors (Wills, 1986). Certain personality traits may also provide insight into individual differences that may predict substance use behaviors. For example, greater use of illicit substances and smoking are related to negative affect, which suggests that individuals who have more negative affect may use substances to reduce negative emotional states. In comparison, individuals who are more conscientious, self-disciplined, and less impulsive report less alcohol and tobacco use. Individuals with these traits are also less likely to use illicit substances (Kashdan et al., 2005).

Limitations
Our results might be due to the limitations of our study. Our main limitation is a smaller sample size than we were aiming for (goal N = 100). We were only able to collect a subset of the data in-person for the stress and control conditions, which adds noise to the data. There was also substantial within-group variability in substance use attitudes; therefore, we might have been underpowered to detect small effects. However, means were in the opposite direction than hypothesized (i.e., participants in the stressed condition generally had lower scores on the Alcohol Purchase Task and CARE-R), which suggests that, if there was an undetected effect of psychosocial stress on substance use that it is small, and there may be other, more important factors that influence substance use behaviors among college students.

Future Directions
Although neither of our hypotheses were supported, our exploratory analyses offer several avenues for future research. First, we found that college students tended to put more value on the benefits as compared to consequences of using substances, such as being able to spend time with friends and socialize. This finding is supported by previous research showing that many students continued to drink regardless of the occurrence of negative consequences and that students’ perceptions of certain experiences with alcohol, including facilitating social interactions, may be a factor in future drinking behaviors (Lee et al., 2011).

Because positive benefits seem to hold more value to students than the negative consequences, future intervention research should focus on reducing the appeal of positive benefits. Current interventions suggest emotional support and open communication influences adolescents’ self-control, competence, peer association, and builds resilience in the face of adversity (Wills & Yaeger, 2003), which may buffer the potential benefits of using substances.

One positive benefit related to substance use, socialization, can serve as both a risk factor leading to an increased risk of substance use, or it can be a protective factor leading to a decreased risk of substance use depending on the tendency of use in the peer group (Andrews et al., 2002). Substance use similarities among young adult peers were found in cigarette use, binge drinking, and marijuana use (Andrews et al., 2002), which suggests that peer use influences one’s substance use behaviors.
Furthermore, future research should reexamine the relationship between stress and substance use attitudes with a larger sample. Future research should also focus on how the expectation of positive benefits relate to substance use behaviors in college students. These results may inform future substance use interventions by providing insight into students’ attributions of substance use and their perceptions on benefits and consequences. Future interventions should consider social support, peer influence, and other protective factors to help prevent problematic substance use attitudes and behaviors.

Conclusion
In summary, we examined the relationship between psychosocial stress and substance use. We did not find evidence for a relationship between acute stress and substance use attitudes, and we only found a small association between chronic stress and expected future use in an exploratory analysis. We found that expected positive benefits were the strongest predictor of expected future substances. Understanding factors that predict college students’ substance use attitudes is important because substance use is common on college campuses and leads to negative health outcomes. Future research should focus on methods to reduce college students’ expected positive benefits from substance use and whether this subsequently could reduce substance use on college campuses.

References
Stress and Substance Use


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This research was supported by the Summer Undergraduate Scholars Program (SUSP) and Undergraduate Research, Scholarly, and Creative Activities Award to D. K. and a New Faculty Professional Development Award to K. H. from the Office of Research and Sponsored Programs (ORSP) at UW-Platteville.

We would like to thank members of the Platteville Emotion and Decision-Making Lab, including Dana Mueller, Bailey Kerkel, Madison Schony, and Haley Daniels for assistance with data collection and moral support and participants in the SUSP program for moral support. We would also like to extend thanks to the UW-Platteville ORSP for providing time, resources, workshops, and support, including opportunities to share and receive feedback on earlier parts of this research.

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