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**ENVIRONMENTAL CONTEXT AND EXPECTANCY OF ALCOHOL
USE ON CHANGES IN REFLECTION-IMPULSIVITY AND CRAVING**

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ENVIRONMENTAL CONTEXT AND EXPECTANCY OF ALCOHOL USE ON
CHANGES IN REFLECTION-IMPULSIVITY AND CRAVING

BY

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A DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT OF THE
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DOCTOR OF PHILOSOPHY DISSERTATION

OF

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ABSTRACT

The present study primarily aimed to (a) determine the effects of environmental context and the expectancy of alcohol consumption on changes in reflection-impulsivity (R-I), a state behavioral aspect of impulsivity and (b) test R-I as a mediator of the association between environment, expectancy of alcohol consumption, and subjective craving for alcohol in a sample of college-aged heavy drinkers. Participants were 81 (76.5% female) college students between the ages of 21 and 29 ($M = 21.86$, $SD = 1.87$) who were classified as heavy drinkers. Participants first completed measures of alcohol use, trait impulsivity, behavioral R-I, and subjective craving for alcohol in a neutral location prior to being randomized into one of four conditions: (1) a neutral environment without the expectancy of alcohol consumption, (2) a neutral environment with the expectancy of alcohol consumption, (3) a simulated bar without the expectancy of alcohol consumption, and (4) a simulated bar with the expectancy of alcohol consumption. Participants completed post-condition exposure assessments of R-I and subjective craving. Post hoc analyses determined that statistical tests for both aims were underpowered. As such, significant findings may not have been detected due to a high probability of Type II error and thus, null findings should be considered with caution. Findings revealed that environment nor expectancy of alcohol consumption elicited changes in R-I or subjective craving. There was a significant effect of time on R-I, whereby R-I improved over time. Such improvement may suggest the potential presence of a testing effect. Further, the association between condition and subjective craving for alcohol was not mediated by R-I. Trait impulsivity was found to positively associate with subjective craving at baseline and post-condition exposure. Thus, alcohol-related cues in one's environment and the

priming of future alcohol consumption were not found to elicit changes in R-I or subsequent increases in subjective craving for alcohol. Future research may benefit from replication, as the COVID-19 pandemic may impacted the internal and external validity of this study.

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DEDICATION

To my grandmother, Iva.

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CHAPTER 1

REVIEW OF LITERATURE

Hazardous alcohol use (SAMHSA, 2019) and alcohol-related consequences (e.g., academic issues, unintentional injury, motor-vehicle accidents, sexual assault, and death) are prevalent among young adults (White & Hingson, 2013). Although significant efforts have been made to reduce drinking among young adults, current rates suggest that approximately 10% of young adults attending college meet the criteria for alcohol use disorder (SAMHSA, 2017). One factor that may contribute to these heightened levels of alcohol use and consequences is reflection-impulsivity (R-I), a term used to describe the amount of information a person gathers prior to making a decision (Kagan, 1966). Although R-I has been linked to greater alcohol use (Banca et al., 2016, Lawrence et al., 2009; Townshend et al., 2014) and alcohol craving (Joos et al., 2013), less research has focused on specific contexts that may influence this relationship. Through the lens of incentive sensitization theory, it may be that alcohol-related contexts (e.g., bars) increase impulsive decision making, and in turn, influence subsequent craving for alcohol. Further, expectation of alcohol consumption may exacerbate the effects of an alcohol-related context on R-I and craving. Consequently, the purpose of this study is to: (1) experimentally investigate the relationship between contextual (simulated bar environment) and cognitive (alcohol expectancy) factors on R-I among young adults, and (2) consider R-I as a mechanism explaining the association between environmental context and motivation to drink alcohol. Information from this study would add to extant literature on cognitions surrounding alcohol use and further the development of

prevention and intervention efforts aimed at reducing alcohol-related risks for young adult drinkers.

Impulsivity and Alcohol Use

Impulsivity is a well-established risk factor for alcohol use (Coskunpinar et al., 2013; Dick et al., 2010; Shin et al., 2012). Impulsivity is an umbrella term, composed of both *trait* (e.g., sensation seeking, urgency) and *state* (e.g., inhibitory control, delay discounting, R-I) dimensions, used to describe an individual's tendency to make hasty decisions with little consideration for potential negative outcomes (Enticott & Ogloff, 2006; Herman & Duka, 2020). *Trait* impulsivity describes an individual's tendency to act impulsively in everyday situations (Herman & Duka, 2020). Greater *trait* impulsivity has been linked to greater alcohol use in previous research (see Stamatēs & Lau-Barraco for review, 2017b). *State* impulsivity is measured with self-report and behavioral instruments, whereby performance on these tasks has been linked to problematic alcohol use and alcohol use disorder (Bernhardt et al., 2017; Lawrence et al., 2009; Morris et al., 2016; Townshend et al., 2014). One important aspect of *state* impulsivity is R-I (Kagan, 1966). Individuals with poorer R-I, or those who do not gather enough information prior to making a decision, are considered to be poorly reflective and tend to act more impulsively (Kagan, 1966). R-I is typically measured using either the Information Sampling Task (IST; Clark et al., 2006) or the Jumping to Conclusions Beads Task (JTC; Phillips & Edwards, 1966), both of which assess the amount of information an individual gathers prior to making a decision. Scant research has examined R-I in the context of alcohol use among young adults, which may inform research on decision-making while drinking.

Although limited, the research that has examined R-I and alcohol use suggests a negative association, such that impaired R-I is associated with greater alcohol use, binge drinking, and alcohol-related problems (Banca et al., 2016, Bø et al., 2017; Lawrence et al., 2009; Townshend et al., 2014). One study observed that, when controlling for other aspects of impulsivity, R-I was most predictive of heavy drinking frequency (Wardell, et al., 2016). Further, impaired R-I has been observed among heavy drinking samples when compared to controls (Banca et al., 2016; Lawrence et al., 2009) and is related to alcohol-related consequences (e.g., unplanned sexual encounters; Townshend et al., 2014). Specifically, Banca et al. (2016) found that individuals who binge drink demonstrated impaired R-I, as compared to a non-binge control group. In another study, individuals with alcohol use disorder demonstrated poorer R-I compared to healthy controls (Lawrence et al., 2009). In addition, prospective studies have indicated that R-I is predictive of binge drinking among college students (Bø et al., 2017).

A primary limitation of the prior research on R-I and alcohol use is that R-I was assessed at one timepoint in each of these studies, despite theoretical assertions that R-I is a *state* variable (Herman & Duka, 2020). Specifically, prior theories on R-I indicate that R-I may be a malleable behavior (Kagan, 1966) that is influenced by external factors (Solowij et al., 2011) and can be improved with training (Messer, 1976). The influence of state-level changes of impulsivity on alcohol use behaviors has been examined in prior work (Stamates & Lau-Barraco, 2020), but this research has not been extended to R-I. Thus, it is unknown whether changes in R-I are subsequently associated with changes in alcohol use behaviors.

Alcohol-related Environment and R-I

Environments (e.g., bars) with alcohol-related cues, as compared to environments with no alcohol cues (i.e., neutral), are associated with elevated rates of alcohol use (Field & Jones, 2017; Jones et al., 2013) and may influence R-I. According to the incentive-sensitization theory of addiction (Robinson & Berridge, 1993, 2003), environmental stimuli associated with a drug attainment acquire conditioned incentive attributes, otherwise known as ‘incentive salience.’ As such, these stimuli become conditioned to be more attractive and evoke heightened approach responses. These cues are associated with cognitive biases as well as heightened subjective craving and substance-seeking behavior (Field et al., 2005). Thus, particularly for individuals with more drinking experience, the selective attention to cues in one’s environment may reduce one’s capacity to consider the consequences of their behavior, leading to increased alcohol consumption. The lack of forethought of potential consequences could be described as poor R-I. That is, when in the presence of an alcohol-related environment, one may reflect less on the consequences of their behavior and make hasty decisions. Although the extant literature has examined R-I from a between-person perspective, less research has focused on within-person changes and how these might be affected by environmental context. Thus, how alcohol-related cues in one’s context may lead to impairments in R-I have not yet been explored.

Associations with Subjective Alcohol Craving

Previous research indicates that alcohol cues in one’s environment and deficits in R-I are independent predictors of approach behaviors, such as alcohol craving. Craving is defined as a psychological (e.g., urge, desire) and physiological (e.g., salivation, arousal; Flannery et al., 2001) conditioned response to alcohol-related context and stimuli (Tiffany & Conklin, 2000), and is a precursor to alcohol-seeking behavior. The presence

of alcohol-related cues in a person's environment may elevate their craving for alcohol. Previous research has suggested that alcohol environments increase alcohol craving (Jones et al., 2013; Stamatēs & Lau-Barraco, 2017a). Specifically, Jones and colleagues (2013) investigated the effect of alcohol-related cues in one's environment on disinhibition and subjective craving for alcohol and found that alcohol-related cues were associated with increased subjective craving. These findings were replicated in a second study, where participants tested in a simulated bar had greater subjective craving for alcohol than those tested in a neutral environment (Stamatēs & Lau-Barraco, 2017a). To the best knowledge, only one study has examined R-I in the context of alcohol craving; impaired R-I was found to be associated with greater subjective craving for alcohol (Joos et al., 2013). However, Joos et al. (2013) used a sample of abstinent individuals with alcohol use disorder, and thus, generalization to young adult drinking behavior is limited. It is unknown whether associations between R-I and craving are present among young adult drinkers who do not yet meet criteria for an alcohol use disorder. This information would inform whether R-I may potentially serve as a risk factor in the etiology of alcohol use disorder.

Although aspects of context, R-I, and craving have been examined independently, no studies have examined how these may integrate. Consistent with incentive sensitization theory, exposure to an alcohol-related environment may reduce heavy drinkers' capacity to consider their behavior, and thus, lead to increased subjective craving. Only two studies have examined the influence of an alcohol-related environment on impulsivity (Jones et al., 2013; Stamatēs & Lau-Barraco, 2017a), however both studies only examined one aspect of state impulsivity (i.e., inhibitory control). To date,

no study has investigated how exposure to alcohol-related contexts impacts R-I as it relates to alcohol craving. Such an investigation would offer additional insight into how state impulsivity underlies associations between context and motivation to consume alcohol. Specifically, if the simulated bar environment is associated with impaired reflection (heightened impulsivity), heavy drinkers may have a reduced capacity to make sound decisions concerning their alcohol use when exposed to specific contexts. Such findings would demonstrate the role of R-I within the incentive-sensitization theory's framework.

Role of Expectancy of Alcohol Consumption

Expectation of alcohol consumption may influence the relationship between environment, R-I, and craving. Previous research has found that verbally priming participants with the expectancy of alcohol consumption is associated with elevated alcohol consumption (Stein et al., 2000). Specifically, Stein and colleagues (2000) observed that men who were instructed that they would receive alcohol during testing drank significantly more than men who were not primed. In line with the incentive-sensitization theory of addiction, the added expectancy of alcohol consumption on environment may further reduce one's capacity to weigh the costs of their actions leading them to become more impulsive. Thus, the anticipation of alcohol consumption may enhance the influence of cues in the environment, strengthening the relationship, and further leading to more impulsive, less reflective decisions. In turn, impaired decision making, as a result of these cues, may lead to heightened subjective craving for alcohol. Further, although prior studies have observed that alcohol-related cues in simulated bar environments are associated with heightened craving for alcohol (Field & Jones, 2013;

Stamates & Lau-Barraco, 2017a), research has not yet explored whether the cues themselves illicit this change in craving, or whether craving is determined by the expectancy of drinking in the simulated bar. These findings may differentiate important pathways of risk associated with alcohol-seeking behavior.

The purpose of this study was to investigate whether environmental context (alcohol vs. neutral) affects within-person changes in R-I among heavy drinkers and whether this relationship is exacerbated when drinkers have the expectancy of alcohol consumption. Specifically, this study experimentally tested a 2 (Environmental Context: Alcohol vs. Neutral) x 2 (Expectancy: No Expectancy of Alcohol Consumption vs. Expectancy of Alcohol Consumption) factorial design to investigate the interaction between environmental context and expectancy of alcohol consumption on changes in R-I. In addition, R-I was also investigated as a mediator between environmental context, expectancy of alcohol consumption, and subjective alcohol craving.

Hypotheses

Aim 1: Environment and Expectancy of Alcohol Consumption on Reflection-Impulsivity

H1: Exposure to an alcohol-related environment (simulated bar) will be associated with reduced reflection (greater impulsivity).

H2: The expectancy of receiving alcohol will be associated with reduced reflection (greater impulsivity).

H3: Exposure to an alcohol-related environment (simulated bar) with the expectancy of receiving alcohol will be associated with reduced reflection (greater impulsivity).

Aim 2: Reflection-Impulsivity as a Mediator among Environment, Expectancy of Alcohol

Consumption, and Subjective Craving for Alcohol

H4: Those who expect to receive alcohol in an alcohol-related environment (simulated bar) will become more impulsive (less reflective), which will lead to greater subjective alcohol craving.

CHAPTER 2

METHODOLOGY

The primary goal of this dissertation was to examine the effects of environmental context and expectancy of alcohol consumption on changes in reflection-impulsivity and craving for alcohol. This study primarily examined: (1) the effect of environmental context, expectancy of alcohol consumption, and their interaction on R-I, and (2) whether R-I mediates the relationship between environmental context, expectancy of alcohol consumption, and subjective alcohol craving. This study followed ethical guidelines set by the American Psychological Association and was approved by the University of Rhode Island Institutional Review Board on Human Subjects (American Psychological Association, 2017).

Participants.

Participants were 84 college students (76.5% female) between the ages of 21 and 29 years ($M = 21.85$, $SD = 1.87$) who were recruited through the University of Rhode Island. In terms of racial background, 81.5% ($n = 66$) self-identified as white, 6.2% ($n = 5$) as African American/Black, 3.7% ($n = 3$) as Asian/Pacific Islander, 3.7% ($n = 3$) as multiple races, and 4.9% ($n = 4$) preferred not to say. A total of seven (8.6%) participants identified as Hispanic/Latinx. Regarding sexuality, 82.7% ($n = 66$) self-identified as heterosexual, 12.3% ($n = 10$) as bisexual, 3.8% ($n = 3$) as lesbian/gay, and 1.3% ($n = 1$) as “another sexuality not listed.” Most participants were employed at least part-time ($n = 55$; 67.9%). Further, 12.3% ($n = 10$) of participants identified as a member of a Greek organization. Participants reported consuming an average of 10.52 ($SD = 5.39$) alcoholic

drinks per week. In addition, 16.0% ($n = 13$) of participants reported that their drinking had lessened during COVID-19, 45.7% ($n = 37$) of participants reported that their drinking had remained the same during COVID-19, and 38.3% ($n = 31$) of participants reported that their drinking had increased during COVID-19. Three participants were excluded from the final analyses for reporting an average of 0 alcoholic drinks in a typical week. See Table 1 for full demographic information.

Participants were recruited through announcements that were made in courses university-wide as well as through flyers posted across the college campus and via university-associated listservs (see Appendix A for flyer). Inclusion criteria for the study included: (a) being between the ages of 21 and 29 years old (e.g., this age range was selected to better ensure that participants were young adults who had sufficient previous exposure to alcohol-related cues in their lifetime and students under 21 may not have believed the expectation about receiving alcohol on a university campus), and (b) having engaged in at least one heavy episodic drinking episode (4+/5+ for women/men) in the past 30 days (e.g., this characterization has been used to operationalize heavy or problematic drinking in multiple research contexts). Participants who met the criteria for an alcohol use disorder, as determined by a score of 15 or higher on the Alcohol Use Disorder Identification Test (AUDIT; see Appendix B), or who reported having sought treatment for alcohol use problems, were excluded from the study. For compensation, participants were given the option to receive either a \$10 online gift card or course credit from a participating faculty member in the psychology department. In addition, all participants were entered into a raffle where they could win one of four \$50 online gift cards.

Procedure.

Potential participants were first screened online through a Qualtrics link provided on advertisements. Participants were asked to provide their age and details concerning their recent engagement in heavy alcohol use. In order to screen for alcohol use disorder, participants were asked to complete the AUDIT. Eligible participants were then contacted by either the researcher or an undergraduate research assistant for scheduling an in-person session. Those who agreed to participate in-person were told that the study's aim was to investigate alcohol behaviors and cognitions among college students. In-person sessions were held Mondays through Fridays on campus from 2pm to 7pm. All participants were tested individually, meaning that they were not tested in the presence of other participants or confederates. Upon arriving to their in-person session, participants were asked to provide informed consent. All participants completed a baseline assessment in a neutral laboratory space. Specifically, participants completed a 15-minute survey measuring trait-impulsivity, typical alcohol use, baseline subjective craving, in addition to a computerized 15-minute behavioral task measuring baseline R-I. Participants were then randomized and brought to one of four exposure conditions: (1) Neutral Environment without Expectancy, (2) Neutral Environment with Expectancy, (3) Alcohol Environment without Expectancy, and (4) Alcohol Environment with Expectancy. A simulated bar located in URI's Chafee Hall was used for the alcohol environment conditions. The simulated bar resembles a typical bar, including a bar with stools, alcohol advertising signs, and shelves with bottles of liquor displayed. To replicate the scent of a typical bar, nonalcoholic beer was applied to surfaces. Those in expectancy conditions were told after baseline assessment that they would be served alcohol later in

the session; however, alcohol was not provided as the study aimed to focus on expectation, not actual use. Participants were asked to sit in the assigned condition for approximately 10 minutes. This allowed sufficient time for participants' environmental exposure to have the anticipated effects (Christiansen et al., 2016). Participants were then asked to complete the 15-minute behavioral task measuring R-I and subjective alcohol craving for post ratings. At the conclusion of the session, participants were debriefed (see Appendix I for debriefing sheet) and were asked to complete a manipulation check questionnaire. Those in the expectancy conditions were told of the deception and that they would not be receiving an alcoholic beverage. Specifically, participants in these conditions were informed that we were interested in how the sheer expectation of drinking affects their behavior. See Figure 1 for a flow chart on procedures.

Measures.

Demographics. Demographics assessed included age, gender (i.e., female, male, non-binary/third gender, prefer to self-describe, prefer not to say), race (i.e., white, Black, Asian, Native Hawaiian/Other Pacific Islander, American Indian/Alaskan Native), ethnicity (Hispanic, Non-Hispanic), class standing, GPA, employment, and personal income. See Appendix B for the complete demographic questionnaire.

Short UPPS-P Impulsive Behavior Scale (SUPPS-P). The Short UPPS-P (SUPPS-P; Cyders et al., 2014) is a validated (Cyders et al., 2014) 20-item scale that assesses five domains of trait impulsivity: negative urgency (e.g. "When I am upset I often act without thinking"), positive urgency (e.g. "I tend to act without thinking when I am really excited"), lack of premeditation (e.g. "My thinking is usually careful and purposeful"), lack of perseverance (e.g. "I generally like to see things through to the

end”), and sensation seeking (e.g. “I quite enjoy taking risks”). Participants rated their responses on a scale from 1 (Agree Strongly) to 4 (Disagree Strongly). A summed score for the SUPPS-P was used as a covariate in study analyses, with higher scores indicating greater impulsivity. Cronbach’s alpha for the present study was $\alpha = .83$. See Appendix C for the full 20-item SUPPS-P scale.

Jumping to Conclusion (JTC) Beads Task. The Jumping to Conclusion (JTC) Beads Task (Garety et al., 1991; Phillips & Edwards, 1966) is a computerized behavioral measure of R-I. During this task, participants are presented with two jars on a computer screen. The jars contain opposite ratios (e.g. 85:15) of red and blue beads (See Appendix D for visualization of this task). Participants are informed of the bead ratio and are told that beads from one of the jars will be presented. The participants’ goal is to infer whether beads are drawn from Jar 1 or Jar 2. Participants are free to sample as many beads as they choose up to a maximum of 20 before making their decision about which jar the beads came from. There is no time limit to this task. The primary outcome is the number of beads drawn prior to making a decision. Participants who select fewer beads prior to making a decision are considered to be more impulsive, and less reflective, as they engage in less data gathering prior to making a determination.

Daily Drinking Questionnaire (DDQ). The Daily Drinking Questionnaire (DDQ; Collins et al. 1985; Kivlahan et al., 1990) is a validated (Borsari et al., 2001) instrument used to assess typical drinking behavior. Participants are asked to report the typical amount of alcohol consumed and the typical number of hours spent consuming alcohol for each day of the week over the past three months. See Appendix E for the full DDQ.

Alcohol Use Disorder Identification Test (AUDIT). The Alcohol Use Disorder Identification Test (AUDIT) is a validated (Allen et al., 1997; Kokotailo et al., 2004) 10-item screening tool used to assess alcohol consumption, drinking behaviors, and alcohol related-problems (e.g. “How often do you have a drink containing alcohol?”). The AUDIT was used to screen out individuals who indicate severity (scores above 15). See Appendix F for the full AUDIT.

Alcohol Craving Questionnaire (ACQ-SF-R). The Alcohol Craving Questionnaire-Short Form-Revised (Singleton et al., 1994) is a validated (Raabe et al., 2005) 12-item self-report measure which uses a 7-point Likert response format. Questions on the ACQ-SF-R assess multidimensional aspects of craving for alcohol: compulsivity (e.g. “I want to drink so bad I can almost taste it”), expectancy (e.g. “Drinking would put me in a better mood”), purposefulness (e.g. “Drinking would not be very satisfying”), and emotionality (e.g. “If I used alcohol, I would feel less tense”). A general craving score was calculated by averaging the 12 items, with greater scores indicating greater craving. Craving was assessed pre- and post-condition exposure. Cronbach’s alpha for the present study was $\alpha = .73$ for pre-exposure and $\alpha = .77$ for post-exposure. See Appendix G for the full ACQ-SF-R.

Manipulation Check. In order to test whether participants were cognizant of the environment or the anticipated effects of the environment to which they were randomized, participants were asked to complete a brief credibility check at the completion of the study. Participants were asked to report any thoughts they may have about the purpose of the experiment. Questioning was completed via face-to-face interviews by the experimenter to maximize the likelihood of participants’ disclosure of

all suspicions they have about the experiment. See Appendix H.

Data Analysis Plan.

Power. In order to achieve sufficient power (.80) for Aim I, analyses indicated a minimum of 128 participants would be needed to detect a medium effect size ($f = .25$) with an alpha level of .05. A medium effect size was determined by previous research (Ham et al., 2013; Wall et al., 2000). However, in order to test the mediation model proposed for Aim 2, a sample size of 140 would be required. According to Kline (2015), a suggested $N:k$ ratio of 20 participants per parameter were needed. The proposed model contains seven parameters including: two main effects (environment, expectancy), one mediator (change in R-I), one outcome (change in subjective craving), and two covariates (typical alcohol use, trait impulsivity). As the current study's sample contained 81 participants, associations in the present study may be underpowered.

Data Cleaning. Prior to analyses, assumptions of normality and homoscedasticity were tested using IBM SPSS 27.0. Extreme outliers outside the three interquartile ranges were Winsorized (Barnett, 1994) to match the next highest data point. Although participants were randomized, individual-level factors assessed at baseline were examined to ensure that no differences between groups were present on typical alcohol use, trait impulsivity, R-I, and subjective craving for alcohol. Groups did not differ with regard to typical alcohol use, $F(3, 77) = 2.278, p = .086$, trait impulsivity, $F(3, 77) = .340, p = .797$, R-I, $F(3, 77) = .371, p = .774$, and subjective craving for alcohol, $F(3, 77) = .713, p = .547$. Descriptive statistics and correlations across the overall sample can be found in Table 2. Descriptive statistics for each condition can be found in Table 3.

Aim 1. To test Aim 1, a two-way repeated measures analysis of variance (ANOVA) test was conducted to investigate the main effects of environmental context (Neutral vs. Alcohol Environment) and expectancy of alcohol consumption (No Expectancy vs. Expectancy), and their interaction, on pre- and post-R-I. This allows for both within- and between-person effects to be assessed. The assumption of sphericity was tested prior to the interpretation of analyses and was found to be met.

Aim 2. To address Aim 2, a path analysis was used to assess change in R-I as a mediator between condition and change in subjective alcohol craving. Analyses were conducted using the PROCESS macro for SPSS (Hayes & Preacher, 2014). Specifically, change in R-I was assessed as a mediator between the independent variables of condition and the dependent variable change in subjective craving for alcohol. Typical alcohol use and trait impulsivity were included as covariates. Three of the four condition groups were first dummy coded, with the first group (Neutral Environment without Expectancy) being treated as the reference group. Three coefficients represented each pairwise comparisons between each group and the reference group: a_1 (Neutral Environment without Expectancy vs. Neutral Environment with Expectancy), a_2 (Neutral Environment without Expectancy vs. Alcohol Environment without Expectancy), and a_3 (Neutral Environment without Expectancy vs. Alcohol Condition with Expectancy). In order to compare all conditions, follow-up analyses were conducted with different reference groups. Specifically, an additional three coefficients represented each remaining pairwise comparison: a_4 (Neutral Environment with Expectancy vs. Alcohol Environment without Expectancy), a_5 (Neutral Environment with Expectancy vs. Alcohol Environment with Expectancy), and a_6 (Alcohol Environment without Expectancy, Alcohol Environment

with Expectancy). Thus, each of a_{1-6} denoted an a path in the model. There was one b path in the model (R-I to craving) and six c' paths (i.e., a_1xb , a_2xb , a_3xb , a_4xb , a_5xb , a_6xb). Significance of pathways were assessed using 95% bias-corrected (BC) confidence intervals from 5,000 generated bootstrapped samples (Preacher & Hayes, 2004). Each parameter estimate was considered to be significant if its BC confidence interval did not contain zero.

CHAPTER 3

FINDINGS

Descriptives and Correlations.

Of the entire sample, participants reported consuming an average of 10.52 ($SD = 5.39$) alcoholic drinks per week. Bivariate correlations among study variables for the overall sample revealed that trait impulsivity was associated with typical alcohol use, $r(79) = .268, p = .015$, subjective alcohol craving at baseline, $r(79) = .344, p = .002$, and alcohol craving at Time 2, $r(79) = .326, p = .003$. Typical alcohol use was further associated with subjective alcohol craving at Time 2, $r(79) = .222, p = .047$, but not at baseline, $r(79) = .086, p = .446$. Reflection-impulsivity at baseline and at Time 2 were positively related, $r(79) = .593, p < .001$. Further, subjective alcohol craving at baseline and Time 2 were also positively related, $r(79) = .726, p < .001$ (see Table 3).

Primary Analyses.

To test Aim I, a two-way repeated measures ANOVA was used to investigate the effect of environment, expectancy of alcohol consumption, and their interaction on within-person changes in R-I. Findings indicated that there was a significant main effect of R-I, $F(1, 77) = 9.683, p = .003, \eta_p^2 = .112$, indicating that there were significant within-person changes in R-I from pre- to post- exposure assessments (see Figure 2). There was no significant main effect of environment on changes in R-I, $F(1, 77) = .022, p = .883, \eta_p^2 < .001$). In addition, there was no significant main effect of expectancy of alcohol consumption on changes in R-I, $F(1, 77) = 2.793, p = .099, \eta_p^2 = .035$). There was not a significant interaction between environment and expectancy of alcohol consumption on

changes in R-I, $F(1, 77) = 0.020, p = .887, \eta_p^2 < .001$ (see Figure 3).

An additional two-way repeated measures ANOVA was conducted to investigate the effect of environment, expectancy of alcohol consumption, and their interaction on within-person changes in subjective craving for alcohol, while controlling for typical alcohol use. Findings indicated that there was not a significant main effect of craving, $F(1, 76) = .193, p = .662, \eta_p^2 = .003$, indicating that there were no significant within-person changes in craving from pre- to post- exposure assessments. There was not a significant main effect of environment on changes in craving, $F(1, 76) = 1.832, p = .180, \eta_p^2 = .024$). In addition, there was not a significant main effect of expectancy of alcohol consumption on changes in craving, $F(1, 76) = 0.004, p = .950, \eta_p^2 < .001$. Further, there was not a significant interaction between environment and expectancy of alcohol consumption on changes in craving, $F(1, 76) = 0.065, p = .800, \eta_p^2 = .001$ (see Figure 4).

To test Aim II, a multicategorical mediation model was conducted to investigate whether the relationship between condition and change in subjective alcohol craving (Time 2 – Time 1) was mediated by change in R-I (Time 2 – Time 1). All paths controlled for trait impulsivity and typical alcohol use as covariates. Findings revealed that the indirect path containing the following comparisons were not significant: a neutral environment without the expectancy of alcohol consumption and a neutral environment with the expectancy of alcohol consumption, $B = -0.00$ with 95% BC CI [-0.87, 0.08], a neutral environment without the expectancy of alcohol consumption and an alcohol environment without the expectancy of alcohol consumption, $B = 0.00$ with 95% BC CI [-0.08, 0.06], a neutral environment without the expectancy of alcohol consumption and an alcohol environment with the expectancy of alcohol consumption, $B = -0.00$ with 95%

BC CI [-0.50, 0.44]. Further, the indirect paths containing the comparisons between a neutral environment with the expectancy of alcohol consumption and an alcohol environment without the expectancy of alcohol consumption, $B = -.00$ with 95% BC CI [-0.12, 0.09], and a neutral environment with the expectancy of alcohol consumption and an alcohol environment with the expectancy of alcohol consumption, $B = 0.00$ with 95% BC CI [-0.06, 0.05] were not found to be significant. Lastly, the indirect path containing the comparison between an alcohol environment without the expectancy of alcohol consumption and an alcohol environment with the expectancy of alcohol consumption, $B = -0.01$ with 95% BC CI [-0.08, 0.09] were not found to be nonsignificant. The results of the full mediation model are presented in Table 4 and Figure 5.

CHAPTER 4

CONCLUSION

The purpose of the current study was two-fold. First, this study aimed to investigate whether environmental context (alcohol vs. neutral) affects within-person changes in R-I among heavy drinkers and to determine whether this relationship is exacerbated when drinkers are primed with the expectancy of alcohol consumption. It was hypothesized that individuals exposed to an alcohol-related environment would demonstrate heightened R-I (reduced reflection, heightened impulsivity). In addition, it was hypothesized that individuals primed with the expectancy of alcohol consumption would demonstrate heightened R-I.

Prior to discussion of this study's main conclusions, it is imperative to consider that findings may be nonsignificant due to low power. Although a sample of 140 participants was anticipated, a total of 81 eligible participants were recruited. As such, post hoc power analyses revealed that between-person effects for Aim 1 were underpowered (power = .39). Thus, it is likely that significant effects for Aim 1 may not have been found if they had indeed existed as there may have been an inflation of Type II error (i.e., incorrectly retaining a false null hypothesis). More specifically, a power of .39 would indicate that if a significant effect were indeed present, the statistical tests conducted would miss this effect approximately 61% of the time. As analyses for Aim 2 were more advanced, it may be suggested that the power for these tests would be even lower. Thus, with a sample of 81 participants for this study, null findings should be considered with caution as low sample size may have incurred because of Type II error.

Counter to study hypotheses, neither environment nor expectancy of alcohol consumption was found to significantly elevate R-I. It should be mentioned, however, that although the expectancy of alcohol consumption was not found to elicit significant changes in R-I, this effect trended toward significance as sample size increased. Specifically, analyses indicated that as sample size increased over the duration of data collection, the significance level for the main effect of expectancy of alcohol consumption on R-I appeared to approach a p -value of .05. Thus, it might be suggested that this null finding is attributed to inadequate power. Lastly, it was hypothesized that individuals exposed to an alcohol-related environment who were also primed with the expectation of alcohol consumption would demonstrate heightened R-I. Counter to this hypothesis, interactive effects were null.

Interestingly, there was a significant main effect of R-I from baseline to the post-exposure assessment. This indicates that participants demonstrated within-person changes in R-I between the two timepoints. More specifically, participants, when compared to their assessment at baseline, were found to have sampled more beads on the beads task during their post-exposure assessment. This finding indicates that, irrespective of the condition, participants were demonstrating greater reflection in their decision making. It may be, however, that these findings are consistent with a testing effect. That is, performance on the beads task at baseline enhanced task performance during the post-condition exposure assessment. If a testing effect had indeed occurred, it may then be that the time between assessments at baseline and at post-condition exposure was too brief (McLean et al., 2018). In addition, this insufficient break in time between testing could lend itself as an explanation as to why a main effect of environment on R-I was not

observed. Specifically, it may be that length of exposure to alcohol stimuli in the simulated bars was not ample to heighten R-I. Future research should consider the possibility of these effects and allocate sufficient timing between assessments in future study designs.

The second aim of this study was to investigate R-I as a mediator in the association between environmental context, expectancy of alcohol consumption and subjective craving for alcohol. It was hypothesized that individuals who were primed with the expectancy of alcohol consumption whilst exposed to an alcohol-related environment would become more impulsive (less reflective) which would lead to greater subjective alcohol craving. Counter to this hypothesis, R-I was not found to mediate this association. Indeed, all indirect effects containing pairwise comparisons between each context were nonsignificant. This finding, however, is consistent with previous research which investigated whether inhibitory control, an alternate facet of behavioral impulsivity, mediated the relationship between environmental context (bar context vs. neutral context) and subjective craving for alcohol (Jones et al., 2013; Stamatou and Lau-Barraco, 2017a). Both studies found that although participants in the bar contexts demonstrated higher craving for alcohol, inhibitory control did not mediate the relationship. Thus, although the present study was underpowered, findings are in line with previous research that bar contexts may not impact these specific behavioral facets of impulsivity. Alternatively, it may be that participants in these samples are not drinking in public bars and thus have not developed conditioned responses to alcohol-related cues in these particular environments. It should also be considered that the presence of a testing effect, or inadequate exposure to the randomized condition yielded negligible

findings. Future research should aim for replication to reinforce these findings.

Additional analyses were conducted to investigate the main effects of environment and expectancy of alcohol consumption on changes in subjective alcohol craving. Interestingly, neither environment nor expectancy were found to associate with changes in craving. This is counter to previous research which has found that, when compared to a neutral environment, exposure to an environment with alcohol-related cues is associated with greater subjective craving for alcohol (Bordnick et al., 2008; Jones et al., 2013; Stamatēs & Lau-Barraco, 2017a). There are potential reasons for this finding. For instance, the average age of participants in this sample was just above 21 years. It may be that participants did not have sufficient prior drinking experience in bar environments, and as such, were less perceptible to alcohol cues in their environment. Lack of exposure to bar environments may have been further exacerbated by the COVID-19 pandemic, which limited access to public bars. It would also be pertinent to consider the drinking characteristics of the current study's sample. Specifically, the current study's sample demonstrated lesser alcohol use severity when compared to prior research that had found a main effect of environment on subjective craving (Jones et al. 2013). Specifically, Jones et al. identified an effect of an alcohol-related environment on craving among a sample of heavy social drinkers who endorsed an average score of 13.88 on the AUDIT, while the current study sample endorsed an average score of 6.97 on the AUDIT. As previous research has determined that drinking levels are directly associated with alcohol cue susceptibility (Papachristou et al., 2012), it is possible that alcohol cues in the simulated bar were not salient enough to elicit elevations in craving among these less severe drinkers. With consideration to the incentive salience theory of addiction

(Robinson & Berridge, 1993, 2003), it is posited that environmental stimuli associated with drug attainment (e.g., alcohol-related cues) elicit conditioned cognitive biases in addition to heightened approach responses, such as craving. If participants in the current sample had not yet attained conditioned responses to alcohol related-cues, then this may offer explanation as to why subjective craving was not found to increase when alcohol-related cues were present in the environment.

Bivariate correlations revealed that there were significant associations between trait impulsivity and subjective alcohol craving at both baseline and post-condition exposure assessments. That is, higher levels of trait impulsivity were associated with greater craving at both timepoints. Reports of heightened trait impulsivity were also found to associate with greater self-reports of typical alcohol consumption, which is consistent with previous literature (for a review, see Herman & Duka, 2020). As such, trait impulsivity appears to be an important determinant of one's typical alcohol consumption as well their urges to drink. Although trait impulsivity was not found to associate with R-I at either baseline or post-condition exposure assessments, this is consistent with previous literature that has found null to small correlations among self-report and behavioral measures of impulsivity (for a review, see Dick et al., 2010). This finding further provides evidence of impulsivity as a heterogeneous construct and lends support to research that aims to differentiate trait and state impulsivity as individual predictors of alcohol related outcomes.

Limitations and Future Research.

Although this study offers contributions to the literature regarding environmental influences on impulsive behaviors among heavy drinkers, there are several limitations

worth mentioning. First, the sample size was not adequate. Post-hoc power analyses conducted for Aim 1 revealed that despite the study being powered for within-person fluctuations in R-I (.87), sufficient power was not met to distinguish significant main effects for environment (.38) or expectancy (.05), or a significant interaction of the two predictors (.05). Thus, it may be that findings were null for both aims due to limited sample size. Second, the sample was homogeneous in nature (76.5% female, 81.5% white, 8.6% Hispanic). Moreover, participants were recruited from mainly undergraduate psychology courses. This may reduce our ability to generalize our findings to other populations (e.g., other age groups, noncollege students, other racial groups or ethnicities). Third, the drinking characteristics of the sample might suggest that participants had not developed conditioned responses to alcohol-related cues. Specifically, across the overall sample, the average score on the AUDIT (6.97) was indicative of less severe drinking tendencies. Future research may consider implementing this study with individuals who meet the criteria for alcohol use disorder. Individuals with alcohol use disorder are considered to have stronger conditioned responses to alcohol-related cues (Papachristou et al., 2012; 2014), and as such, may be more sensitive to alcohol stimuli in their environment. Thus, individuals with alcohol use disorder may have limited capacity to consider the decisions they make when in the presence of alcohol-related cues. Replication of this study with a sample of individuals with alcohol use disorder may then be useful in understanding how environmental influences affect R-I and subsequent drinking behavior among such a vulnerable population. Fourth, participants were not asked about their prior experiences in bar environments. If participants did not have sufficient prior exposure to such alcohol-related environments,

it may then be that conditioned responses to alcohol-related cues had not yet developed. Future replication studies should thus assess heavy drinkers' history of drinking in bar environments in order to account for this potential limitation.

A main limitation could be the current COVID-19 pandemic, which may have posed a risk to both the internal and external validity of this study. First, it is likely that the majority of participants in the current study experienced both virtual learning and stringent social distancing protocol in their first years of college. As such, it may be that participants have not had adequate past exposure to alcohol-related environments (i.e., bars) prior to participating, and thus, may not have developed conditioned responses to alcohol-related stimuli. Second, due to the pandemic, alterations to the design of the current study were deemed necessary. For instance, in order to reduce the risk of exposure to the virus, participants were tested individually, and the use of confederates was not permitted. As such, this study lacked social influences that may be necessary for changes in R-I and subjective craving. Indeed, previous literature that has observed environmental influences on subjective craving had implemented confederates in their studies (Jones et al., 2013; Stamatēs & Lau-Barraco, 2017a). Such social influences may have been a key factor in participants' decision making abilities when in the presence of an alcohol-related environment. Future research should thus aim to investigate whether social influences may enhance reductions in R-I when in the presence of an alcohol-related environment. Third, throughout their testing session, participants were required to wear a mask. This may have impeded their ability to detect olfactory cues in their environment. Previous literature has found that exposure to olfactory alcohol-related cues contribute to altered cognitive responses, including impaired response inhibition (Monk

et al., 2016) and alcohol craving (Litt & Cooney, 1999). Thus, the absence of olfactory cues may have lessened conditioned responses, which, in turn, may help to explain null findings regarding the effect of environment on both R-I and subjective craving. Fourth, we did not administer alcohol, and subjective alcohol craving served as a proxy for measuring alcohol consumption. Future research should aim to investigate whether exposure to alcohol-related cues might instead be related to actual alcohol consumption rather than reported craving.

Although this lab-based experiment allowed for causal inferences to be made, future research should look to investigate these relationships as they occur in real-time. That is, it would be useful to implement ecological momentary assessment (EMA) design to further explore these associations. Such methodology would offer insight into the specific environments in which young adults are choosing to drink in (e.g., bar, dorm, at home) as well as who these young adults are drinking with (e.g., friends, family) in real time. Moreover, this type of research design would permit the investigation of drinking behaviors beyond subjective craving, such as actual consumption, intentions to drink that day, expectations of drinking that day, and experiences of alcohol-related problems. The use of EMA would also permit assessment of day-to-day fluctuations in impulsivity and how these within-person changes associate with drinking behavior that same day (Stamates & Lau-Barraco, 2020). Further, when compared to a lab-based design, EMA may yield a more fine-grained assessment of impulsivity, as it would allow researchers to identify more proximal influences of impulsivity in a participant's natural environment.

The present study examined one type of behavioral impulsivity and one overall score of self-reported trait impulsivity, which may have limitations given that there are

different models of impulsive behavior (Dick et al., 2010). Given that trait impulsivity was found to associate with subjective alcohol craving at both baseline and post-condition exposure assessments, it may be that the effects of environment and expectancy on alcohol craving are heightened for individuals who demonstrate greater trait impulsivity. Moreover, this study utilized an overall score of trait impulsivity using the SUPPS-P, and as such, individual facets of trait impulsivity were not explored. Previous research has found that dimensions of trait impulsivity differentially associate with drinking behaviors (for a review, see Stamatēs & Lau-Barraco, 2017b). Follow up analyses will thus be conducted to investigate whether individual facets of impulsivity, as measured on the SUPPS-P moderate the relationship between environment, expectancy of alcohol consumption, and subjective alcohol craving.

Conclusions.

The results of the present study help to increase our understanding of contextual influences on risky alcohol use among college students. Our findings suggest that exposure to an alcohol-related environment was not associated with heightened R-I. Further, the expectancy of alcohol consumption was not found to exacerbate the association between environment and reflection-impulsivity. In addition, reflection-impulsivity was not found to mediate the relationship between environment, expectancy of alcohol consumption, and subjective craving for alcohol. Although findings were negligible, it is important to consider the limitations of this study. Specifically, restrictions placed by the COVID-19 pandemic may have instilled threats to the internal and external validity of this study. Future research may look to investigate these relationships as they exist among heavy drinkers outside the context of the pandemic.

TABLES

Table 1.

<i>Demographic Information Across Conditions</i>					
<i>Variable</i>	Neutral, No Expectancy (<i>n</i> = 19)	Neutral, Expectancy (<i>n</i> = 18)	Bar, No Expectancy (<i>n</i> = 22)	Bar, Expectancy (<i>n</i> = 22)	Total (<i>n</i> = 81)
Age					
<i>M (SD)</i>	21.16 (.37)	22.5 (2.55)	21.82 (1.84)	21.96 (1.94)	21.86 (1.87)
<i>Range</i>	21 – 22	21 – 29	21 – 29	21 – 28	21 – 29
Gender					
Female	17 (89.4%)	12 (66.7%)	16 (72.7%)	17 (77.3%)	62 (76.5%)
Male	1 (5.3%)	6 (33.3%)	4 (18.2%)	5 (23.7%)	16 (19.8%)
Third Gender	1 (5.3%)	0	1 (4.5%)	0	2 (2.5%)
Prefer Not to Say	0	0	1 (4.5%)	0	1 (1.3%)
Race					
White	16 (84.2%)	14 (77.8%)	17 (77.3%)	19 (86.4%)	66 (81.5%)
African American/Black	0	1 (5.6%)	3 (13.6%)	1 (4.6%)	5 (6.2%)
Asian/Pacific Islander	2 (10.5%)	1 (5.6%)	0	0	3 (3.7%)
Mixed-Race	1 (5.3%)	2 (11.1%)	0	0	3 (3.7%)
Prefer Not to Say	0	0	2 (9.1%)	2 (9.1%)	4 (4.9%)
Ethnicity					
Hispanic	1 (5.3%)	1 (5.6%)	5 (23.7%)	0	7 (8.6%)
Sexual Orientation					
Heterosexual	12 (63.2%)	17 (94.4%)	20 (90.9%)	18 (81.8%)	67 (82.7%)
Lesbian	0	1 (5.6%)	1 (4.6%)	0	2 (2.5%)
Gay	0	0	0	1 (4.6%)	1 (1.3%)
Bisexual	7 (36.8%)	0	1 (4.6%)	2 (9.1%)	10 (12.3%)
Other not listed	0	0	0	1 (4.6%)	1 (1.3%)
Employed					
Yes, part-time	13 (68.4%)	13 (72.2%)	9 (40.9%)	14 (63.6%)	49 (60.5%)
Yes, full-time	1 (5.3%)	1 (5.6%)	2 (9.1%)	2 (9.1%)	6 (7.4%)
Not Employed	5 (26.3%)	4 (22.2%)	11 (50.0%)	6 (27.3%)	26 (32.1%)
Live on Campus					
Yes	2 (10.5%)	2 (11.1%)	4 (18.2%)	3 (13.6%)	11 (13.6%)
Member of Greek Organization					

Yes	3 (15.8%)	3 (16.7%)	2 (9.1%)	2 (9.1%)	10 (12.3%)
COVID Drinking					
Lessened	2 (10.5%)	4 (22.2%)	2 (9.1%)	5 (23.7%)	13 (16.0%)
Stayed the Same	5 (26.3%)	8 (44.4%)	14 (63.6%)	10 (45.5%)	37 (45.7%)
Increased	12 (63.2%)	6 (33.3%)	6 (27.3%)	7 (31.8%)	31 (38.3%)

Note. Demographics do not include 3 participants who were removed from total sample for having reported an average of 0 drinks on the Daily Drinking Questionnaire.

Table 2.

Means, Standard Deviations, and Correlations among Variables of Interest for Overall Sample

	1	2	3	4	5	6	M	SD
1. Trait Impulsivity	-						39.24	7.33
2. Typical Alcohol Use	.268*	-					10.52	5.39
2. Beads Drawn <i>T1</i>	-.010	-.054	-				4.27	3.68
3. Beads Drawn <i>T2</i>	-.037	-.004	.593**	-			5.75	5.09
4. Alcohol Craving <i>T1</i>	.344**	.086	-.003	-.080	-		31.05	9.40
5. Alcohol Craving <i>T2</i>	.326**	.222*	-.045	-.045	.726**	-	32.60	10.23

Note. $p < .05$, $p < .01$, $p < .001$; *T1* = baseline (pre-exposure) assessment; *T2* = post-exposure assessment

Table 3.

Means and Standard Deviations of Measures per Group Condition

Measure	Neutral, No Expectancy (<i>n</i> = 19) <i>M</i> (<i>SD</i>)	Neutral, Expectancy (<i>n</i> = 18) <i>M</i> (<i>SD</i>)	Bar, No Expectancy (<i>n</i> = 22) <i>M</i> (<i>SD</i>)	Bar, Expectancy (<i>n</i> = 22) <i>M</i> (<i>SD</i>)
Typical Alcohol Use	11.32 (5.02)	9.44 (5.44)	8.73 (4.00)	12.5 (6.35)
Trait Impulsivity	40.26 (7.02)	39.98 (6.08)	38.27 (8.11)	38.73 (8.00)
AUDIT	8.32 (2.79)	6.78 (3.06)	6.64 (2.75)	7.00 (3.07)
Beads Drawn <i>T1</i>	4.95 (2.90)	4.17 (5.27)	4.32 (3.63)	3.73 (2.83)
Beads Drawn <i>T2</i>	6.79 (5.36)	4.39 (5.17)	6.91 (5.69)	4.82 (3.90)
Alcohol Craving <i>T1</i>	33.26 (7.75)	32.00 (7.35)	29.91 (10.81)	29.5 (10.73)
Alcohol Craving <i>T2</i>	34.47 (9.79)	33.37 (8.96)	29.82 (11.39)	33.14 (10.46)

Note. *T1* = baseline (pre-exposure) assessment; *T2* = post-exposure assessment

Table 4.

Indirect Effects of Condition on Subjective Craving through R-I

Indirect Effects	<i>B</i>	<i>SE</i>	Lower	Upper
NeNoExp v NeExp → R-I → Craving (<i>a_{1b}</i>)	-.001	.039	-.87	.08
NeNoExp v AlNoExp → R-I → Craving (<i>a_{2b}</i>)	.000	.032	-.08	.06
NeNoExp v AlExp → R-I → Craving (<i>a_{3b}</i>)	-.002	.030	-.50	.44
NeExp v AlNoExp → R-I → Craving (<i>a_{4b}</i>)	.001	.050	-.12	.09
NeExp v AlExp → R-I → Craving (<i>a_{5b}</i>)	.000	.024	-.06	.05
AlNoExp v AlExp → R-I → Craving (<i>a_{6b}</i>)	-.005	.038	-.08	.09

Note. Partially standardized regression coefficients reported due to multicategorical predictor. Bootstrap sample size was 5000.

NeNoExp = Neutral Environment, No Expectancy; NeExp = Neutral Environment, Expectancy; AlNoExp = Alcohol Environment, No Expectancy; AlExp = Alcohol Environment, Expectancy; R-I = Reflection-Impulsivity; Lower and Upper represent 95% confidence intervals for indirect effect. Typical alcohol use and trait impulsivity added as controls. *All paths were nonsignificant.*

FIGURES

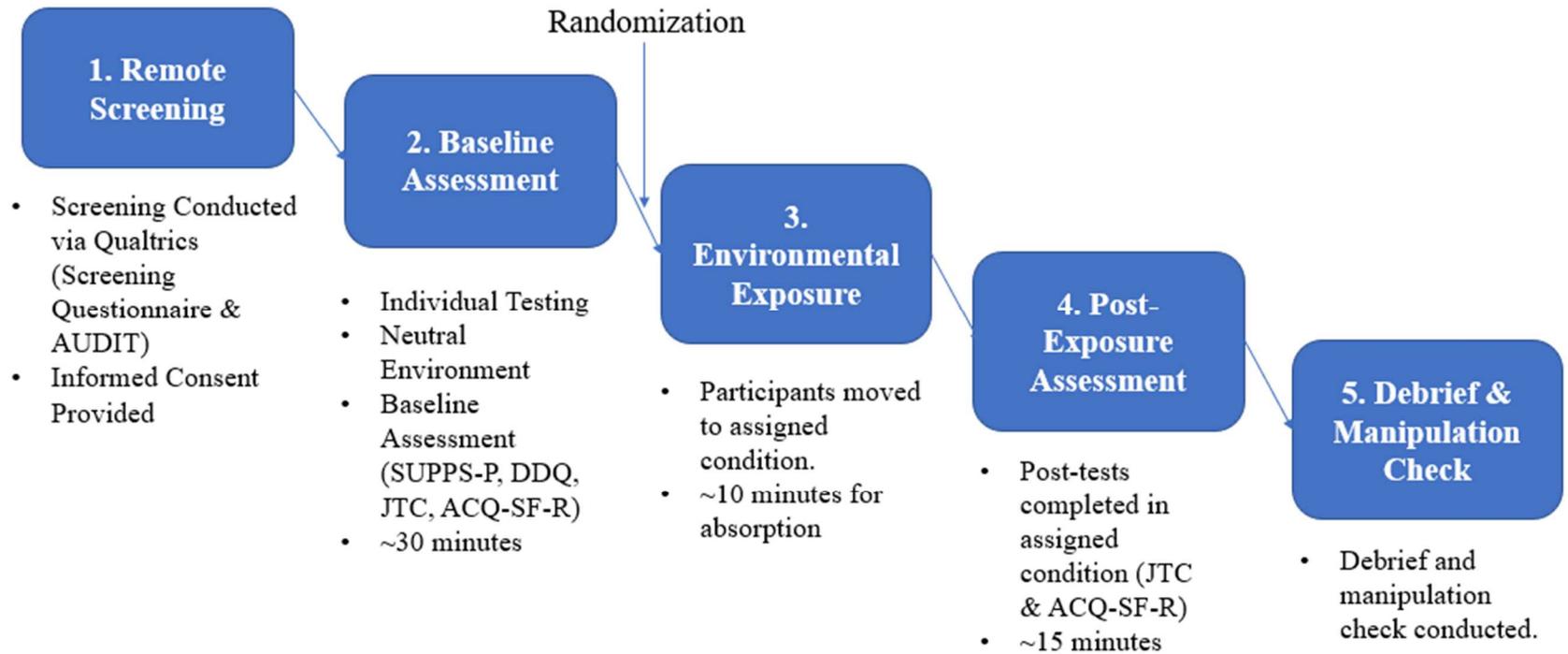


Figure 1. Flow chart detailing experimental procedures

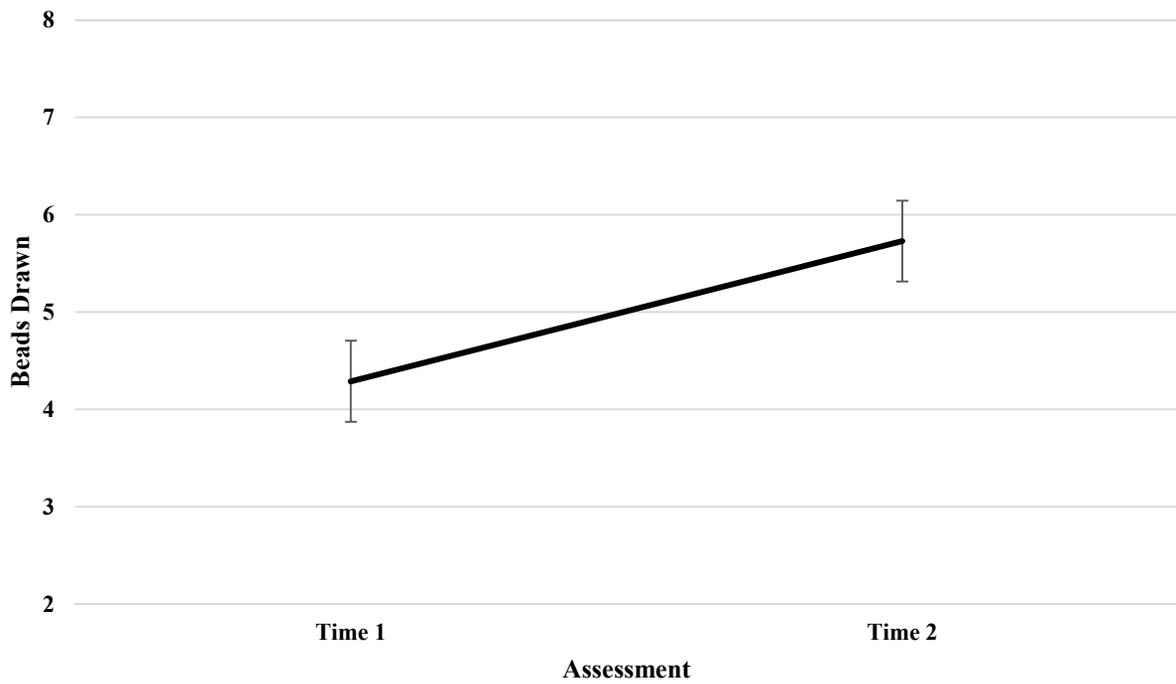


Figure 2. Mean differences in number of beads drawn from baseline (Time 1) to post-environment exposure (Time 2). The fewer beads selected, the less reflective, and more impulsive an individual is perceived to be.

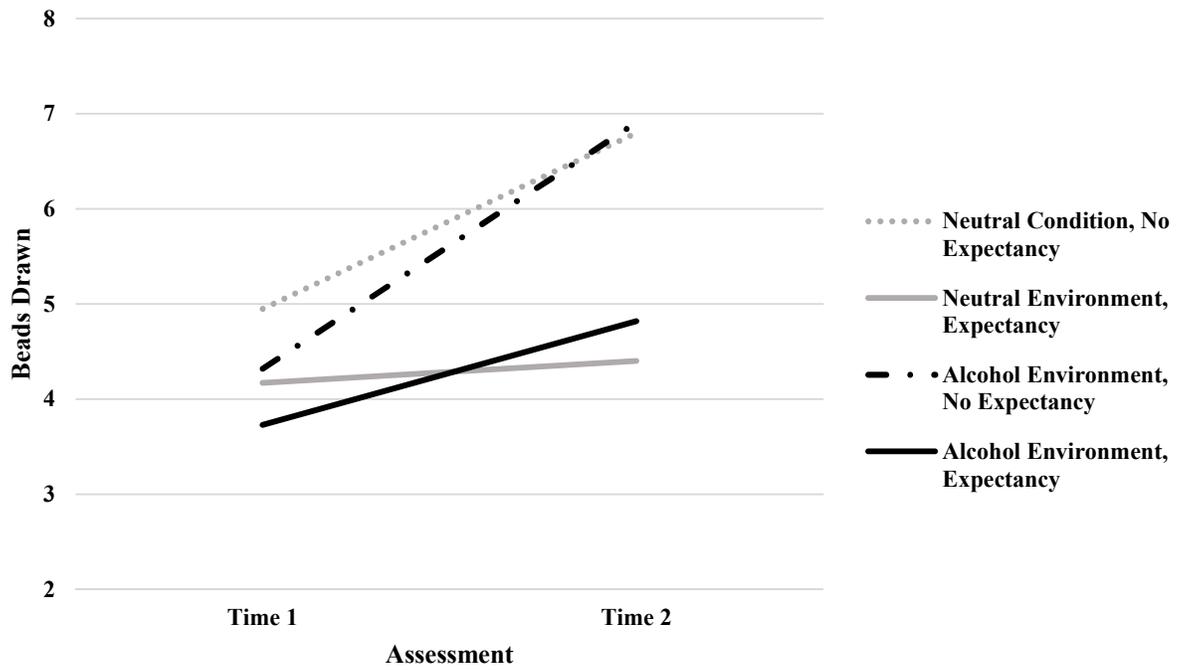


Figure 3. Mean differences in number of beads drawn from baseline (Time 1) to post-environment exposure (Time 2) across all conditions. The fewer beads selected, the less reflective, and more impulsive an individual is perceived to be.

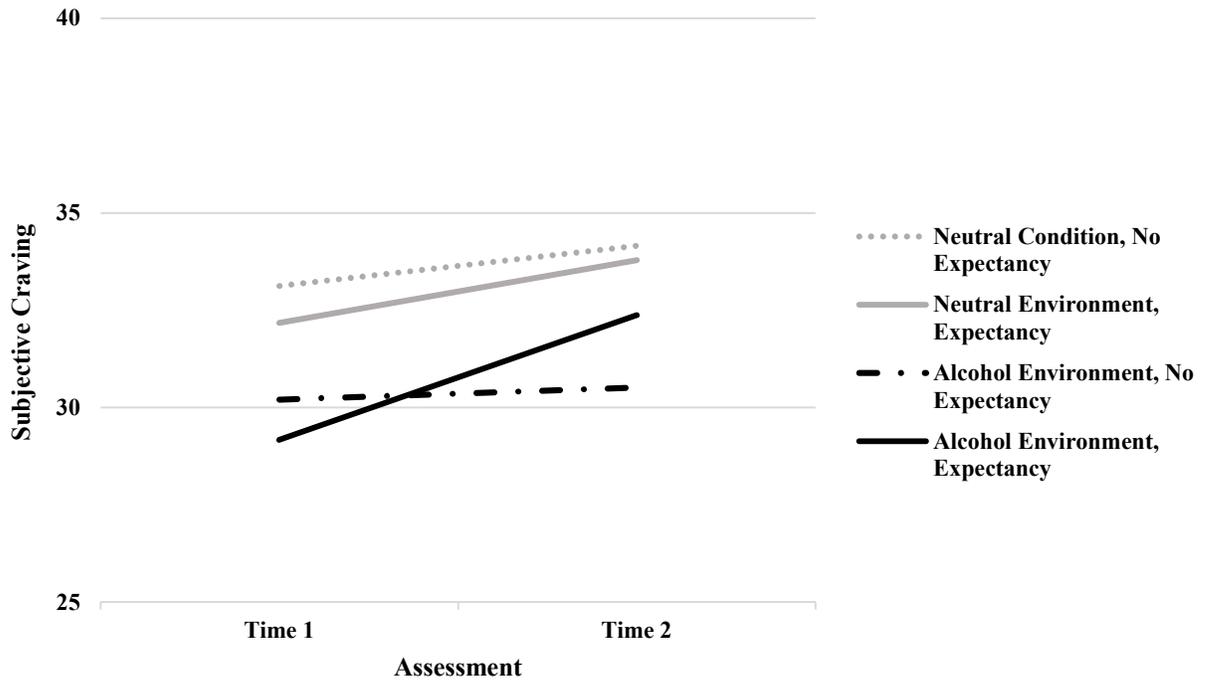


Figure 4. Mean differences in subjective alcohol craving from baseline (Time 1) to post-environment exposure (Time 2) across all conditions. Typical alcohol consumption controlled for as a covariate.

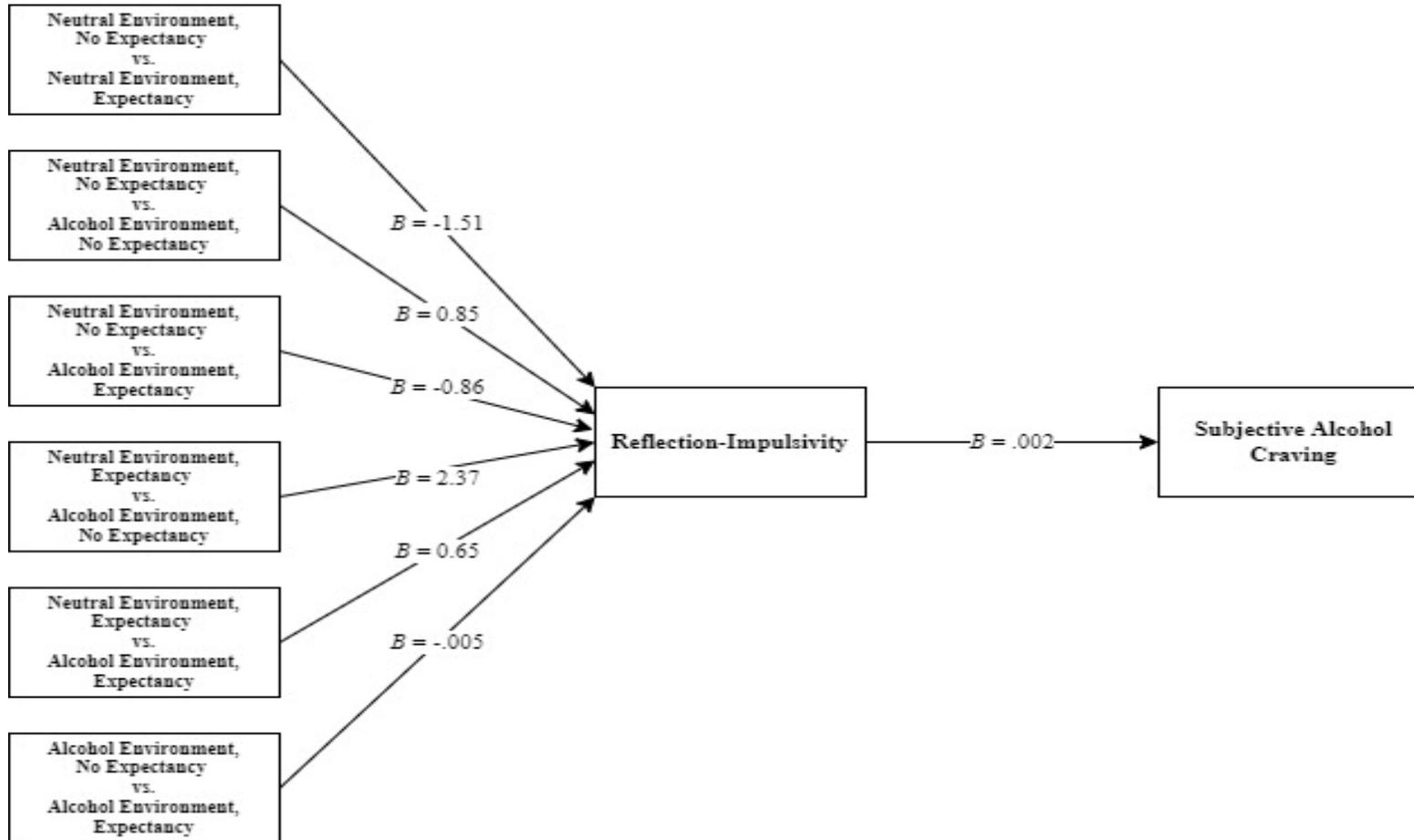


Figure 9. Multicategorical mediation model for the effect of experimental condition on subjective alcohol craving through reflection-impulsivity. The model controls for typical drinking consumption and trait impulsivity. No effects were significant.

APPENDICES

APPENDIX A – STUDY FLYER



If you have any questions, email:
Amy Stamates (P.I.) at
astamates@uri.edu
or Christina Schulz at
ctschulz@uri.edu

WE'RE LOOKING FOR PARTICIPANTS!

What is this study for?

Our lab is investigating the way young adults think about alcohol use.

What will I have to do?

- Join us for a brief, **1-hour in-person** lab visit.
- Fill out a few surveys and play cognitive games!

What will I get if I participate?

- Be a part of a one-of-a-kind study
- Receive a **\$10 gift card** for your time, or course credit, if eligible!
- Be entered into a raffle to win **1 of 4 \$50 Gift Cards!**

Am I eligible? You must:

- Be between the ages of 21 and 29
- Have consumed at least one alcoholic beverage in the past 30 days.

To see if you're eligible,
scan QR code:



This research has been approved by the University of Rhode Island Institutional Review Board

APPENDIX B – DEMOGRAPHIC QUESTIONNAIRE

DIRECTIONS: It is important to know something about our participants as a whole, so we request some demographic information. Only grouped data will be used, and you will never be identified.

1. Your Sex:

- Male Female Non-Binary/Third Gender
 Prefer to Self-Describe _____ Prefer not to say

2. Your Age: _____

3. What is your racial background?

- Caucasian/White African American/Black Asian/Pacific
American
 American Indian/Alaskan Native Other (please
specify): _____

4. What is your ethnic background? Hispanic or Latino Not Hispanic or Latino

5. What is your sexual orientation?

- Heterosexual Lesbian Gay Bisexual Other: ____

6. What is your current class standing?

- College Freshman College Sophomore College Junior College
Senior
 Graduate Student Other

7. Do you live on campus?

- YES NO

8. Are you affiliated with a Greek organization on campus? YES NO

9. What is your GPA? _____

10. Are you employed now? YES, part-time only YES, full-time only NO

11. What is your yearly total individual income: (drop-down)

- \$0,000 \$1-\$5,000 \$5,001-\$10,000 \$10,001 - \$15,000 \$15,001-20,000
 \$20,001-\$25,000 \$25,001-\$30,000 \$30,001-\$35,000 \$35,001-\$40,000
 \$40,001-\$45,000 \$45,001-\$50,000 Over \$50,000

12. Complete the following statement: Since the beginning of COVID-19, my drinking has:

- lessened stayed the same increased

13. Do you smoke cigarettes/e-cigarettes?

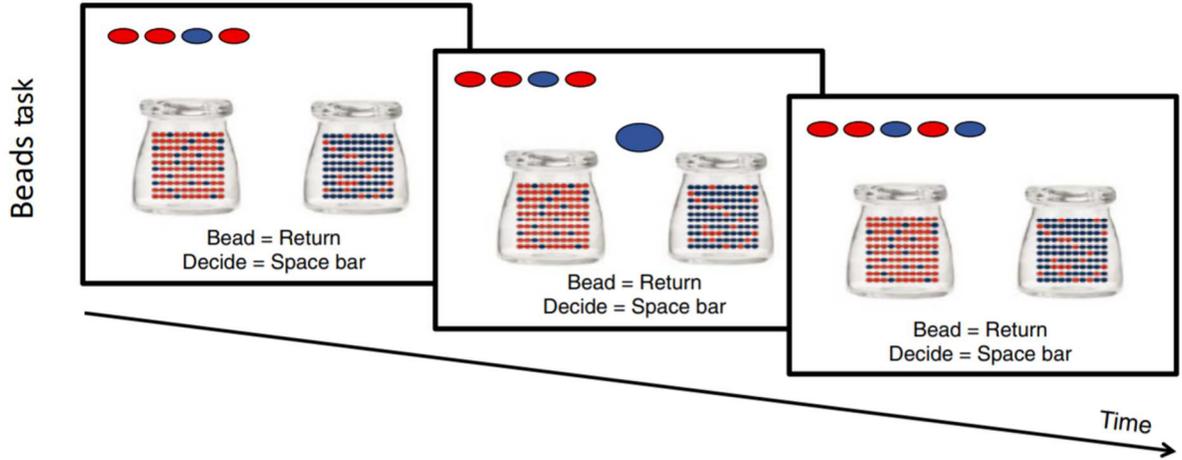
- YES NO

APPENDIX C – SUPPS-P

Below are a number of statements that describe ways in which people act and think. For each statement, please indicate how much you agree or disagree with the statement. If you **Agree Strongly** circle **1**, if you **Agree Somewhat** circle **2**, if you **Disagree somewhat** circle **3**, and if you **Disagree Strongly** circle **4**. Be sure to indicate your agreement or disagreement for every statement below.

	Agr ee Stron gly	Agr ee Some	Disagree Some	Disagree Strongly
1. I generally like to see things through to the end.	1	2	3	4
2. My thinking is usually careful and purposeful.	1	2	3	4
3. When I am in great mood, I tend to get into situations that could cause me problems.	1	2	3	4
4. Unfinished tasks really bother me.	1	2	3	4
5. I like to stop and think things over before I do them.	1	2	3	4
6. When I feel bad, I will often do things I later regret in order to make myself feel better now.	1	2	3	4
7. Once I get going on something I hate to stop.	1	2	3	4
8. Sometimes when I feel bad, I can't seem to stop what I am doing even though it is making me feel worse.	1	2	3	4
9. I quite enjoy taking risks.	1	2	3	4
10. I tend to lose control when I am in a great mood.	1	2	3	4
11. I finish what I start.	1	2	3	4
12. I tend to value and follow a rational, "sensible" approach to things.	1	2	3	4
13. When I am upset I often act without thinking.	1	2	3	4
14. I welcome new and exciting experiences and sensations, even if they are a little frightening and unconventional.	1	2	3	4
15. When I feel rejected, I will often say things that I later regret.	1	2	3	4
16. I would like to learn to fly an airplane.	1	2	3	4
17. Others are shocked or worried about the things I do when I am feeling very excited.	1	2	3	4
18. I would enjoy the sensation of skiing very fast down a high mountain slope.	1	2	3	4
19. I usually think carefully before doing anything.	1	2	3	4
20. I tend to act without thinking when I am really excited.	1	2	3	4

APPENDIX D – JUMPING TO CONCLUSIONS BEADS TASK



APPENDIX E – DAILY DRINKING QUESTIONNAIRE

DIRECTIONS: Please think about your typical drinking over the **PAST 3 MONTHS**. On a typical day, how many drinks would you have and over how many hours would you have them?

12 fl oz of regular beer	=	8–9 fl oz of malt liquor (shown in a 12 oz glass)	=	5 fl oz of table wine	=	1.5 fl oz shot of 80-proof spirits ("hard liquor"— whiskey, gin, rum, vodka, tequila, etc.)
						
about 5% alcohol		about 7% alcohol		about 12% alcohol		about 40% alcohol
The percent of "pure" alcohol, expressed here as alcohol by volume (alc/vol), varies by beverage.						

Over the PAST 3 MONTHS , on a....	# of drinks	# of hours
Typical Monday		
Typical Tuesday		
Typical Wednesday		
Typical Thursday		
Typical Friday		
Typical Saturday		
Typical Sunday		

APPENDIX F – AUDIT

<p>DIRECTIONS: Because alcohol use can affect your health and can interfere with certain medications and treatments, it is important that we ask some questions about your use of alcohol. Your answers will remain confidential so please be honest. Place an X in one box that best describes your answer to each question.</p>						
Questions	0	1	2	3	4	
1. How often do you have a drink containing alcohol?	Never	Monthly or less	2-4 times a month	2-3 times a week	4 or more times a week	
2. How many drinks containing alcohol do you have on a typical day when you are drinking?	1 or 2	3 or 4	5 or 6	7 to 9	10 or more	
3. How often do you have six or more drinks on one occasion?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily	
4. How often during the last year have you found that you were not able to stop drinking once you had started?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily	
5. How often during the last year have you failed to do what was normally expected of you because of drinking?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily	
6. How often during the last year have you needed a first drink in the morning to get yourself going after a heavy drinking session?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily	
7. How often during the last year have you had a feeling of guilt or remorse after drinking?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily	
8. How often during the last year have you been unable to remember what happened the night before because of your drinking?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily	
9. Have you or someone else been injured because of your drinking?	No		Yes, but not in the last year		Yes, during the last year	
10. Has a relative, friend, doctor, or other health care worker been concerned about your drinking or suggested you cut down?	No		Yes, but not in the last year		Yes, during the last year	
					Total	

APPENDIX G – ACQ-SF-R

INSTRUCTIONS: Please indicate how much you agree or disagree with each of the following statements by placing a single checkmark between STRONGLY DISAGREE and STRONGLY AGREE. The closer you place your checkmark to one end or the other indicates the strength of your disagreement or agreement. We are interested in how you are thinking or feeling *right now* as you are filling out this questionnaire. Please complete every item.

- 1. If I had some alcohol, I would probably drink it.
STRONGLY DISAGREE _____ STRONGLY AGREE
- 2. I miss drinking.
STRONGLY DISAGREE _____ STRONGLY AGREE
- 3. I am *not* making any plans to drink.
STRONGLY DISAGREE _____ STRONGLY AGREE
- 4. I could *not* stop myself from drinking if I had some alcohol here.
STRONGLY DISAGREE _____ STRONGLY AGREE
- 5. I want to drink so bad I can almost taste it.
STRONGLY DISAGREE _____ STRONGLY AGREE
- 6. I would feel less irritable if I used alcohol now.
STRONGLY DISAGREE _____ STRONGLY AGREE
- 7. If I used alcohol, I would feel less tense.
STRONGLY DISAGREE _____ STRONGLY AGREE
- 8. Drinking would not be very satisfying.
STRONGLY DISAGREE _____ STRONGLY AGREE
- 9. I would feel less restless if I drank alcohol.
STRONGLY DISAGREE _____ STRONGLY AGREE
- 10. If I were using alcohol, I would feel less nervous.
STRONGLY DISAGREE _____ STRONGLY AGREE
- 11. It would be easy to pass up the chance to use alcohol.
STRONGLY DISAGREE _____ STRONGLY AGREE
- 12. Drinking would put me in a better mood.
STRONGLY DISAGREE _____ STRONGLY AGREE

APPENDIX H – MANIPULATION CHECK

Please answer the following question as honestly as you can:

1. What do you believe was the purpose of today's study?

APPENDIX I – DEBRIEF

THE
UNIVERSITY
OF RHODE ISLAND

Project ACAD Debrief

Amy L. Stamates, Ph.D.
Department of Psychology
Project Alcohol Context and Decisions
1/31/21

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Thank you for your participation in this experiment. The goal of this study was to determine how one's environment may influence decision making and subsequent craving for alcohol. In this experiment, you were asked to complete a questionnaire concerning alcohol craving in addition to a computerized task that assessed decision making, twice. The first time you completed these, you were in a neutral environment. The second time you completed these, you were either in a neutral environment again, or in an environment with alcohol-related cues. We were interested in whether your process of decision making and craving for alcohol changed as you moved from one environment to the next.

Your participation is not only greatly appreciated by the researchers involved, but the data collected could possibly inform researchers on how to better preventive and interventive methods aimed at reducing drinking among young adults. Depending on the condition to which you were assigned, an additional goal of the study required minor deception on our part; for instance, you may also have been instructed that you would be receiving alcohol during this study. An additional goal of this experiment was to see how expectancy of consuming alcohol influenced decision making processes and craving for alcohol as well. Although you did not receive alcohol, our goal was to investigate how the expectancy that you would be receiving alcohol, not the actual consumption of alcohol, may impair your cognition and craving.

If you have any questions about this study, please contact us:
Christina Schulz, Graduate Researcher: ctschulz@uri.edu
Amy Stamates, PhD, Faculty Advisor: astamates@uri.edu
University of Rhode Island IRB: researchintegrity@etal.uri.edu

Finally, we urge you not to discuss this study with anyone else who is currently participating or might participate at future point in time. As you can understand, we will not be able to properly examine our research questions when participants know about the true purpose of the project beforehand.
Thank you!

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