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Official Study Title: Acute Use of Alcohol and Attentional Bias Towards Suicide: An Experimental Test of the Attention-Allocation Model

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Statistical Design and Power

Statistical Design

Data from Qualtrics (Session 1 baseline data), excel (paper data entered from Session 1 and 2), and DirectRT software will be exported into IBM SPSS statistical software, Version 25. Standard data quality checks and cleaning procedures will be completed. Most notably, any participants voicing awareness of the study aims or not responding adequately to the mood induction will be removed from the initial analyses. Second, manipulation checks will be performed by comparing the participants in the mood conditions on self-reported mood post-manipulation. We expect that negative mood participants will have greater mean scores on the guilt and sadness subscales and lower mean scores on the joviality subscale compared to the positive mood participants.

Study variables for the entire sample will be examined using descriptive statistics such as frequencies and percentages (for categorical variables) and means, standard deviations, and ranges (for continuous variables) to ensure values are reasonable. Prior to conducting analyses related to the hypotheses of the study, individual distributions of continuous variables will be examined visually with histograms to confirm that all assumptions for the analyses are reasonably met. Methods robust to distributional assumptions will be used as appropriate.

Prior to analysis, Suicide Stroop scores will be evaluated for outliers. We will exclude: trials with incorrect responses, trials with response latencies ±2 SD from each participant's mean response latency, participants with a mean response latency ±2 SD from the overall sample's mean, participants whose error rate was +2 SD above the error rate for all participants. We will also examine the reliability, factor structure, and concurrent validity for the suicide-related alcohol expectancies measure (created for this study) prior to its use for Hypothesis 3. We will use exploratory factor analysis (with parallel analysis), Cronbach's alpha, and examine associations with AUDIT total scores and past suicidal ideation severity. Finally, we will confirm there were no pre-existing relevant differences in mood states between our mood and alcohol conditions by estimating measures of association (i.e., R^2) between condition assignment and pre-manipulation sad, guilty, and joviality mood states.

Pre-Pilot tests: To finalize study procedures, for the 10 pre-pilot subjects, we will examine prevalence of mood induction effectiveness. If >50% fail the mood induction, we will replace it with another effective mood induction (imaginative film). We will also run frequencies to examine percentage of participants who are successfully deceived, expecting these percentages to be high (>90%). We will use these results to adjust the protocol in order to improve success of our mood manipulation and deception.

Specific Aim 1, Hypothesis 1a: To test the feasibility our experiment, we will first quantify the number of individuals who contact our lab about the study and the percentage who are eligible and participate. We will run descriptive statistics to quantify 1) prevalence of successful mood induction (expecting at least 75%), 2) distress ratings after the study session (expecting average ratings to be low), and 3) number of adverse events (expecting less than 1% of pilot subjects). **Objective 1b:** Using measures of effect size (i.e., Cohen's d, Cramer's V) and t-tests and Chi square analyses, we will examine sociodemographic differences (gender, age, race/ethnicity, income, and alcohol use history) in these feasibility factors.

Specific Aim 2, Hypothesis 2: Examine sociodemographic differences in suicide-related attentional bias. Suicide-related attentional bias will be higher among women, individuals with lower income, individuals ages 21-34, and individuals with heavier alcohol use than their comparators. Although racial differences are not observed in suicide attempts, we will explore racial differences in suicide-related attentional bias.

Analysis: Using measures of effect size and *t*-tests and Chi Square analyses where appropriate, we will examine potential these sociodemographic differences in suicide-related attentional bias scores.

Specific Aim 3, Hypothesis 3: Examine the conditional effect of AUA on suicide-related attentional bias by mood states. Individuals in the alcoholic beverage-negative mood condition will exhibit the greatest suicide-related attentional bias, followed by individuals in the placebo beverage-negative mood condition, placebo beverage-positive mood condition, and alcoholic beverage-positive mood condition.

Analysis: The interactive effect of mood and alcohol (Alcohol X Mood Induction) on attentional bias towards suicide-related cues (Stroop interference score, calculated by subtracting the response latencies for neutral words from the latencies for suicide-related words) will be estimated using a general linear model of the form $\hat{Y} = \beta_0 + \beta_1 Alcohol + \beta_2 Mood + \beta_3 Alcohol \times Mood$, where $\hat{Y}$ is the average Stroop interference score, $Alcohol$ is a binary indicator (1=yes, 0=no) of assignment to alcoholic beverage intake, and $Mood$ is a binary indicator of assignment to the positive vs. negative mood induction (1 vs. 0). Among the positive mood induction group, the average effect of alcohol intake on Stroop interference scores is estimated by the sum of coefficients $\beta_1 + \beta_3$, while the average effect of alcohol intake in the negative mood induction group is estimated by the coefficient β_1. Therefore, the coefficient β_3 estimates the differential effect of alcohol intake conditional on mood induction. We will use model-predicted means to estimate mean Stroop interference scores by each of the 4 condition combinations, and expect to find higher Stroop interference scores among the negative mood-alcohol condition participants compared with negative mood-placebo, positive mood-placebo, and positive mood-alcohol participants. Measures of effect size (e.g. R^2, partial eta^2, Cohen's d) will be used to aid in interpretation. Inferences will be conducted using confidence intervals for the comparisons of interest, as statistical significance testing is not the primary goal of the study.

Specific Aim 4, Hypothesis 4: Explore the conditional effect of AUA on suicide-related attentional bias by alcohol expectancies. The relation of suicide-related alcohol expectancies with suicide-related attentional bias will be stronger among those in the AUA condition compared to those in the placebo condition.

Analysis: The interactive effect of expectancies and alcohol (Alcohol X Expectancies) on attentional bias towards suicide-related cues (Stroop interference score, calculated by subtracting the response latencies for neutral words from the latencies for suicide-related words) will be estimated using a general linear model of the form $\hat{Y} = \beta_0 + \beta_1 Alcohol + \beta_2 Expectancies + \beta_3 Alcohol \times Expectancies$, where $\hat{Y}$ is the average Stroop interference score, $Alcohol$ is a binary indicator (1=yes, 0=no) of assignment to alcoholic beverage intake, and $Expectancies$ is a continuous score of alcohol expectancies (higher scores indicate higher expectancies). The coefficient β_3 estimates the differential effect of expectancies conditional on alcohol intake. With the model, we will estimate Stroop inference scores by alcohol conditions at the mean expectancy and ±1SD away from the mean, expecting that in the alcohol condition, expectancies will have a stronger association with attentional bias towards suicide scores. Measures of effect size (e.g. R^2, partial eta^2, Cohen's r) will be used to aid in interpretation. Inferences will be conducted using confidence intervals for the comparisons of interest.

Power and Sample Size Considerations

For this training grant, as a compromise between feasibility and precision of estimates, I propose to recruit *10 pre-pilot subjects and 150 subjects (approximately 38 per condition combination)* over a 2.5-year period. Assuming that 25% of subjects may be excluded due to mood induction failure, we will have 30 subjects per condition. Rather than traditional significance testing, the goal of the project is to examine feasibility and tolerability of procedures and explore observed effect sizes. Inference will be conducted primarily by estimation of 68% confidence intervals to be used as reasonable ranges for *observed effect sizes*. Following the proposed analysis of Hypothesis 3, it can be shown using variance algebra that the standard error of the effect of alcohol intake on Stroop interference scores within each of the mood induction groups (positive or negative) is $SE_{Alco.Eff} = \sigma\sqrt{2/n}$, where σ is the standard deviation of the Stroop interference scores and n is the sample size per condition combination. Thus, the standard error of the differential effect of alcohol intake conditional on mood induction (i.e. the interaction term) is $SE_{Diff.Alco.Eff} = 2\sigma/\sqrt{n}$. With $n = 30$ and standardizing the Stroop interference scores (i.e. $\sigma = 1$) to express the confidence interval in terms of an effect size (Cohen's d), the half width of a 68% confidence interval for the standardized effect of alcohol intake within each of the mood induction groups is .26 and the half width of a 68% confidence interval for the standardized differential effect of alcohol intake conditional on mood induction is .36, which provide reasonable and tolerable uncertainty ranges.

For completeness, in terms of null hypothesis significance testing (not a primary goal of this study), at a significance level of .05 the sample size provides 80% power to detect a standardized effect of alcohol intake

within each of the mood induction groups of .72, and standardized differential effect of alcohol intake conditional on mood induction of 1.

Individually Randomized Group-Treatment Trial Consideration: Note that this is an experimental design that randomizes participants to groups (alcohol or placebo and negative mood or positive mood induction). Participants will experience these manipulations independently (i.e., participants will not be interacting with one another). Nonetheless, the same research personnel will likely carry out the mood induction and alcohol administration manipulations with several different participants. Thus, some may designate this research as an "Individually Randomized Group-Treatment Trial," given the potential for nested data within research personnel. Because the mood induction and alcohol administration procedures are significantly standardized, we do not expect the effectiveness of these manipulations to vary across research personnel. However, we will collect data on who administers these protocols and examine differences across personnel to validate this assumption. If significant variation is discovered, we will *employ fixed effects* to account for these issues.