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Changes in Likely Activation Patterns of Alcohol Expectancies After Exposure to the Expectancy Challenge Alcohol Literacy Curriculum (ECALC)

Jessica Flori
University of Central Florida

CHANGES IN LIKELY ACTIVATION PATTERNS OF ALCOHOL EXPECTANCIES AFTER EXPOSURE TO THE EXPECTANCY CHALLENGE ALCOHOL LITERACY CURRICULUM (ECALC)

By

JESSICA N. FLORI
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Major Professor: Michael E. Dunn

ABSTRACT

Alcohol is the most commonly used substance by adolescents in the United States with underage alcohol use being associated with a variety of harms. The Expectancy Challenge Alcohol Literacy Curriculum (ECALC) is a 45-minute interactive expectancy challenge intervention that has been found to be effective in reducing alcohol use. Although ECALC is thought to produce reductions in drinking by changing expectancies, the nature of these expectancy changes has yet to be explored. The purpose of the present study was to link ECALC outcome studies with a memory model approach to understanding the mechanism by which expectancies influence behavior. Participants (n =131) were college students who reported one binge drinking episode in the past month. Students were randomly assigned to receive ECALC or an alcohol education presentation. Alcohol expectancies were assessed before and after the presentation with a Memory Model-Based Expectancy Questionnaire (MMBEQ) and the Comprehensive Effectiveness of Alcohol Scale (CEOA). Participants were grouped based on experimental condition, time, and sex. Expectancies were mapped into memory network format using Individual Differences Scaling (INDSCAL), and consistent with previous studies, a two dimension solution was optimal (stress = .28, R^2 = .81 MMBEQ; stress = .272, R^2 = .683 CEOA; stress = .228, R^2 = .806 combined analyses). PREFMAP vectors modeling paths of likely expectancy activation suggested a greater likelihood of activating negative and sedating expectancies after completion of the ECALC program. This has been the first study to connect effects of the ECALC to the memory model approach to understanding how expectancies influence drinking behavior. Duration of effects of ECALC have yet to be established, but developing methods to enhance and maintain ECALC effects on expectancy activation patterns is likely to promote lasting reductions in drinking and associated harms.

For my father. It's not a play, but it's close.

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CHAPTER 1: COLLEGE DRINKING

Alcohol is the most commonly used substance by youth in the United States with 8.7 million individuals between the ages of 12 to 20 reporting alcohol consumption in the past month, representing a startling 22.8% of underage people (Center for Behavioral Health Statistics and Quality, 2015). Of underage drinkers, more than half engage in binge drinking, where individuals consume four or more drinks on one occasion for women or five or more for men. Among these binge drinkers, 1 in 7 are heavy alcohol users, participating in more than five drinking episodes in the past month (Center for Behavioral Health Statistics and Quality, 2015). With this alarming rate of alcohol use by American youth, it is no surprise that college students are at particularly high risk for episodic heavy and binge drinking, a continuing public health concern (Hingson et al., 2009; Hingson et al., 2017; Perkins, 2002). According to the National Survey on Drug Use and Health, 58% of full time college students between the ages of 18 and 22 years old reported drinking alcohol in the past month, with 37.9% reporting binge drinking and 12.5% reporting heavy drinking during the past month (Center for Behavioral Health Statistics and Quality, 2015).

The high rate of alcohol consumption among college students puts them at risk for a series of adverse events related to alcohol use, including alcohol-related assault, unintentional injury, sexual assault, and death (Hingson et al., 2009; Hingson et al., 2017; White & Hingson, 2013). Students who drink are also at risk for experiencing other consequences including health problems, academic problems, unsafe sex, development of alcohol use disorder, alcohol related legal violations, drunk driving, and suicide attempts (Hingson et al., 2002; Hingson et al. 2009, White & Hingson, 2013). While excessive alcohol consumption puts individuals of any age at

risk for negative consequences, college students are particularly susceptible to these risks because key areas of executive functioning are still developing in the adolescent and emerging adult brain. These areas control decision-making, learning, and impulse control, and deficits in executive functioning are associated with increased engagement in risky behaviors including underage drinking (Squeglia et al., 2015; Feinstein et al., 2012). This is particularly problematic as young adults at risk for hazardous alcohol consumption are infrequently asked about drinking behaviors, perpetuating a lack of awareness of the risks and consequences associated with problematic drinking (Hingson et al., 2012).

The National Institute on Alcohol Abuse and Alcoholism (NIAAA) created a task force to address college alcohol use in an effort to inform and advise college administrators on effective program implementation and evaluation based on relevant empirically supported interventions (Malloy et al., 2002). Prevention and intervention methods were evaluated based on appropriateness for college students and the degree to which the method was empirically supported. Only three strategies were identified as being empirically supported specifically for use with college students, with expectancy challenge (EC) as the only method validated for group administration (Malloy et al., 2002). A meta-analytic review provided additional support in finding that EC interventions are effective in changing expectancies and reducing drinking behaviors among college students (Scott-Sheldon et al., 2012). EC also has been found to be effective in reducing alcohol consumption on specific occasions for heavy drinkers and members of fraternities and sororities, providing further support for the efficacy of the use of alcohol EC in brief interventions for college students, especially for those who are heavy drinkers (Scott-Sheldon et al., 2016).

CHAPTER 2: ALCOHOL EXPECTANCIES

Alcohol expectancies are learned information stored in memory about anticipated effects of alcohol consumption and may be a causal variable in determining alcohol use (Goldman, 1999). Expectancies vary by the individual person, as well as by context, meaning an individual's expected effects of alcohol consumption may vary across different settings (Connors et al., 1992). Expectancies form in childhood prior to experience with alcohol (Dunn & Goldman, 1996, 1998, 2000; Miller et al., 1990; Zucker et al., 1996), and can predict drinking initiation and patterns of alcohol use (e.g. Christiansen & Goldman, 1983; Christiansen et al., 1989; Smith et al., 1986; Stacy, 1997). Expectancies have also been found to mediate the influence of other antecedents on later drinking behaviors (Stacy et al., 1991). Finally, expectancies are changeable with predictable changes drinking (Darkes & Goldman, 1993, 1998; Dunn et al., 2000).

In order to explore the mechanism by which expectancies influence drinking, research has been conducted investigating how alcohol expectancies are stored in memory. Expectancies have been conceptualized as related concepts or nodes of meaning within a figurative network memory model (Dunn & Goldman, 1996, 1998, 2000; Goldman & Rather, 1993; Rather & Goldman, 1994; Rather et al., 1992). This approach suggests that concepts are connected based on intrinsic meaning and learned information, which leads to predictable activation patterns between concepts. For example, those who have learned to associate alcohol with positive concepts (e.g., being more sociable, having an enjoyable time), will activate those expectancies in memory when thinking about drinking or when given the opportunity to drink. Concepts that are understood as being similar in meaning will be more likely to be stored and activated together, whereas concepts that are understood to have dissimilar meanings will be stored more

distally and be less likely to activate together. If alcohol has been associated with positive effects, positive expectancies develop and are likely to be activated in memory when thinking about alcohol use or when given the opportunity to drink. Conversely, if alcohol has been associated with negative effects, negative expectancies are more likely to be activated. These activation patterns may be the mechanism by which expectancies influence patterns of alcohol use or non-use (Dunn & Goldman, 1996, 1998, 2000; Rather & Goldman, 1994).

Multidimensional Scaling (MDS) has been used to test the expectancy memory model because it can be applied to human judgements about the frequency or likelihood of the various effects of alcohol to create a graphic model of the organization of this information in memory, as has been previously demonstrated in experimental tests of memory function (Smith & Medin, 1981). MDS plots expectancy items on bipolar dimensions that represent organizational concepts. Although any number of dimensions can be chosen, a series of studies focused on alcohol expectancies have concluded that two-dimensional solutions best represent the likely organization of expectancies in memory for children and adults (Dunn & Goldman 1996, 1998; Rather et al., 1992). Empirical dimension naming methods applied to data from children found that the two expectancy dimensions represent positive-negative alcohol effects and arousal-sedation effects (Dunn & Goldman 1996, 1998). The organization of expectancies changes somewhat by young adulthood such that the positive-negative dimension incorporates prosocial and antisocial effects (Rather et al., 1992). Function of expectancy networks has been modeled with Preference mapping (PREFMAP, Carroll, 1972), a regression method used to locate lines of best fit for groups of individuals that represent paths of likely activation within expectancy networks (Dunn & Goldman, 1996, 1998, Rather et al., 1992).

MDS techniques have been used for modeling expectancy networks in adults and children (Dunn & Goldman, 1996, 1998; Rather & Goldman, 1994; Rather et al., 1992), and validated with other methods for tapping memory contents (Dunn & Goldman, 2000). Among adults, likely paths of activation varied based on alcohol use with heavier drinkers being more likely to activate positive and arousing expectancies in memory while lighter drinkers and abstainers were more likely to activate negative and sedating expectancies (Rather et al., 1992; Rather & Goldman, 1994). Similar results were found with children. Third graders were similar to abstaining adults, primarily activating negative and sedating expectancies (Dunn & Goldman, 1996, 1998). When expectancy activation patterns of children in 3rd, 6th, 9th, and 12th grades were modeled, a developmental progression was apparent. Across grades, children begin to understand the complexity of potential effects of alcohol and recognize that effects can include positive, negative, arousing, and sedating outcomes. Within grades, children in each age group who had more experience with alcohol were more like children who were three years older and were progressing toward being more likely to activate positive and arousing expectancies (Dunn & Goldman, 1998, 2000).

A series of studies have validated the theoretical memory model by modeling changes in expectancy activation patterns after exposure to material that could cause changes in expectancies. Children in fourth and fifth grades were exposed to five beer commercials or five soft drink commercials (Dunn & Yniguez, 1999). Memory modeling analyses indicated that children exposed to beer commercials were more likely to activate positive and arousing alcohol expectancies compared to those who viewed soft drink commercials. This study was the first to demonstrate that alcohol advertising influences children in ways that encourage underage alcohol use. In relation to the memory model, results demonstrated that expectancy activation patterns

could be changed. In an effort to change the progression of expectancy development in children to prevent early alcohol use, an expectancy education program was developed and delivered to children in fourth grade (Cruz & Dunn, 2003). Memory modeling analyses were conducted comparing children who received expectancy education with those who received traditional alcohol education and an assessment only control group. Likely paths of activation were unchanged among children who received traditional alcohol education or who only completed assessments. Children who received expectancy education, however, became more likely to activate negative and sedating expectancies, presumably reducing risk for early alcohol use.

Among adults, exposure to EC programs designed to change expectancies was found to change likely activation patterns in men, and these changes corresponded to changes in subsequent alcohol use. For women, however, activation patterns did not change, nor did subsequent drinking (Dunn et al., 2000). In an experimental demonstration of the memory model, college students were exposed to alcohol-related stimuli or neutral stimuli and expectancy activation was measured with an implicit association task (Lau-Barraco & Dunn, 2009). The implicit task consisted of a list of words that could be associated with alcohol use or with other beverages or activities (e.g., “mug” which could be associated with beer or coffee). Exposure to alcohol-related stimuli produced significantly more alcohol-related associations indicating activation of alcohol expectancies in memory. In a subsequent taste-rating task, activation of alcohol expectancies predicted increased alcohol consumption. In sum, expectancy activation patterns vary predictably in relation to alcohol use for children and adults (Dunn & Goldman, 1996, 1998, 2000; Rather & Goldman, 1994). Activation of expectancies leads to immediate increases in alcohol consumption in adults, and exposure to EC leads to changes in likely activation patterns that predict subsequent reductions in alcohol use (Dunn et al, 2000).

CHAPTER 3: EXPECTANCY CHALLENGE (EC)

Expectancy Challenge (EC) refers to methods of aligning individuals' expectancies with the pharmacology of alcohol to reduce future consumption (Goldman et al., 1999). People who drink greater quantities of alcohol typically over-emphasize effects experienced on the ascending limb of blood alcohol concentration (BAC) and under-emphasize those experienced on the descending limb (Dunn & Earleywine, 2001). EC methods focus on correcting these misperceptions about the effects of alcohol to reduce risky and underage drinking. The first successful EC approach was developed by Darkes and Goldman (1993, 1998) through use of a bar lab and alcohol administration to demonstrate how alcohol expectancies influence the effects of alcohol consumption. This approach is conducted in a simulated bar environment, wherein heavy drinking college students are given beverages that either contain actual alcohol or are non-alcoholic placebos. Students consume about two drinks while playing games that facilitate social interaction and are then informed that beverages may or may not contain alcohol. Finally, they are asked to identify who in the group received an alcoholic beverage and who received a placebo, including discerning whether the participant themselves had consumed alcohol. Participants are typically unable to identify who had consumed alcohol beyond chance, and this exercise is used to explain expectancy effects and distinguish them from pharmacological effects of alcohol. As a result, positive expectancies decreased and subsequent alcohol consumption was significantly reduced.

The original EC bar lab studies were conducted exclusively with moderate to heavy drinking male college students and demonstrated decreases in positive expectancies and decreases in drinking behavior at two-week follow up in comparison to control participants (Darkes & Goldman 1993; 1998). Dunn et al. (2000) delivered the bar lab EC to females and

males and applied memory modeling methods (MDS) to explore the mechanism by which expectancy changes influence changes in alcohol use. Likely paths of expectancy activation changed among males and predicted a subsequent reduction in drinking. For females, however, there was very little change in activation patterns and no significant change in alcohol use. The correspondence between activation patterns and subsequent drinking further validated the memory model and use of MDS to understand how EC changes expectancy processes leading to changes in alcohol use. Based on the results of a study conducted to better understand women's expectancies (Borjesson & Dunn, 2001), the Darkes and Goldman protocol was modified and applied to female and male college students (Lau-Barraco & Dunn, 2008). This study was the first to effectively change expectancy processes in college students with a single session EC intervention, and the first to demonstrate the efficacy of EC intervention for women. Despite the obvious scientific gains in demonstrating the effectiveness of EC interventions for women, this protocol still necessitated the use of alcohol administration in a bar lab to produce positive results.

Although the bar lab EC approaches have been demonstrated to be effective, other EC methods have demonstrated the effectiveness of EC without alcohol administration through the use of presentations of information rather than first-hand learning (Cruz & Dunn, 2003; Fried & Dunn, 2012). Meta-analyses reviewing both bar lab and non-experiential EC approaches have found that EC programs reduce positive expectancies, alcohol consumption, and heavy drinking in college student populations (Carey et al., 2016; Scott-Sheldon et al., 2012).

CHAPTER 4: EVOLUTION OF THE EXPECTANCY CHALLENGE ALCOHOL LITERACY CURRICULUM (ECALC)

The ECALC is the only non-experiential EC that has been successful in reducing alcohol use, and the likely reason for its success is that it was developed based on a series of studies designed to explore the mechanism by which expectancies influence behavior (Dunn & Goldman, 1996, 1998, 2000; Rather & Goldman, 1994; Rather et al., 1992). The first version of the single-session classroom based ECALC was successfully implemented with elementary school children (Cruz & Dunn, 2003). Results demonstrated changes in likely expectancy activation patterns such that participants were more likely to associate alcohol consumption with sedation and impairment. In light of previous findings that charted the development of expectancy activation patterns from second grade to adulthood (Dunn & Goldman, 1996, 1998, 2000), the changes produced by the first classroom based EC are consistent with lowered risk of early alcohol use among children. The ECALC was then modified to be suitable for adolescents and was administered to high school students. Results demonstrated success in reducing positive expectancies among heavier drinking males, as well as subsequent reductions in alcohol use (Cruz, 2007). However, this protocol was not successful for lighter drinking males or female participants.

To address the lack of effectiveness in reducing drinking among women, the ECALC was modified to include components of media literacy (Fried & Dunn, 2012). Media literacy programs have been found to change perceptions of social norms involving smoking, weight concern, violence, eating disorders, nutrition, sexual behavior, and body image, and have been found to be more effective than general health programs (as cited by Hindmarsh et al., 2015). Similarly, media literacy programs involving alcohol have been found to have positive effects on

outcome variables, such as skills, knowledge, behavior, and attitudes surrounding alcohol, with media literacy programs demonstrating more success for females than males (Hindmarsh et al., 2015).

In its current iteration, the ECALC is a 45 minute web-based interactive program appropriate for both group and individual administration. It is designed to change likely activation patterns of expectancies, making positive, arousing effects less likely to be activated and negative, sedating effects more likely to activate, reducing the likelihood of underage drinking and decreasing risky drinking among those who already drink.

The web-based ECALC was first validated with first year college students by delivering the program to students in introductory success skills courses composed of up to 30 students (Sivasithamparam, 2008). Findings from this implementation revealed significant reductions in drinking at one-month post-intervention for both male and female first year college students. Subsequently, the ECALC was utilized with large groups of one hundred or more students by including the ECALC intervention into existing college level Psychology and English classes. Results demonstrated significant changes in both positive and negative alcohol expectancies among males and females with no significant changes in alcohol consumption or alcohol related harms at 30 day follow up (Schreiner, 2010). In a subsequent study focused on high school students (Sivasithamparam, 2011), the ECALC produced significant changes in alcohol expectancies and reductions in alcohol use at one month follow up for 11^{th} and 12^{th} graders. These findings were consistent for both male and female participants. This study was the first to employ mean-based and MDS analyses to data collected using the Comprehensive Effects of Alcohol questionnaire (CEOA: Fromme et al., 1993), demonstrating the utility of MDS for

capturing expectancy activation patterns across time using a factor model-based measure rather than a memory model-based measure like the MMBEQ (Dunn & Goldman, 1996; 1998; 2000).

In an effort to demonstrate the effectiveness of the ECALC with high risk college students, the ECALC was implemented in group format for sorority and fraternity members (Fried, 2010). Results demonstrated significant reductions in positive alcohol expectancies and alcohol use, including quantity, frequency, and heavy episodic drinking (Fried, 2010). For fraternity members, findings also demonstrated significant reductions in mean and peak BAC at one month follow up (Fried & Dunn, 2012). In another study, the ECALC was modified for individual administration and delivered to mandated college students, another high risk heavy drinking population (Dunn et al.,2019). Participants were randomly assigned to receive either the ECALC or a well-validated brief intervention known as BASICS (Brief Alcohol Screening and Intervention for College Students ; Dimeff et al., 1999). BASICS is only suitable for use with individuals and requires trained clinicians who complete a workshop on program implementation, making it expensive for widespread use. In comparison, the web-based ECALC can be delivered to individuals or groups by presenters with relatively little training. Results indicated that the ECALC produced significant reductions on all four positive expectancy subscales of the CEOA. Both programs were associated with significant reductions on all alcohol use variables and harms. The expectancies of Sociability, Liquid Courage, and Sexuality significantly mediated the intervention to outcome relationship in the ECALC condition. No significant sex differences were found. Two one-sided equivalence test (TOST) indicated superior effects for ECALC in comparison to BASICS on four alcohol use variables (mean blood alcohol concentration, peak blood alcohol concentration, peak drinks per sitting, & drinking days per month), and non-inferior to BASICS in reducing others (mean drinks per sitting, mean drinks per

week, & binge drinking; Dunn et al., 2019). In sum, the relatively inexpensive ECALC was found to be superior in reducing alcohol use compared to BASICS. Because these two programs use different methods to reduce alcohol use (EC vs. personalized normative feedback), they may have additive effects when used in tandem.

CHAPTER 5: PRESENT STUDY

The present study served to add to the validation literature of the ECALC and to demonstrate this intervention as an effective means of changing alcohol expectancy activation patterns. Additionally, this was the first ECALC study to target general population risky drinking college students. Thus far, the ECALC has been found to be effective for reducing risky drinking in fraternity and sorority members, as well as mandated college students. The ECALC has also shown promising effects for first year college students; however, many students included in that study were low risk drinkers or abstainers. This was the first ECALC study specifically targeting risky drinking college students, a population that included students from Greek letter organizations, a population that is at high risk for alcohol-related problems and risky drinking behaviors. This study was also the first ECALC study to utilize an alcohol control condition. The present study was the first to utilize MDS techniques to model likely expectancy activation patterns in memory over time utilizing both the CEOA and the Memory Model-Based Expectancy Questionnaire (MMBEQ; Dunn, 2017). This type of analysis has not been previously used to analyze expectancy activation patterns for college students receiving the ECALC, and will link ECALC research with the memory model approach to understanding the mechanism by which expectancies influence alcohol use.

CHAPTER 6: HYPOTHESES

1. Individual Differences Scaling (INDSCAL), a variant of MDS, will be applied to responses to the CEOA and MMBEQ individually and in combination. Two-dimensional solutions will be optimal for both measures with dimensions representing positive-negative effects and arousal-sedation effects.
2. Compared to control participants, students who receive the ECALC will demonstrate changes in INDSCAL subject weights that reflect a decrease in emphasis on the arousal-sedation dimension and an increase in emphasis on the positive-negative dimension.
3. Compared to control participants, PREFMAP analyses will show that participants who receive the ECALC will demonstrate changes in likely expectancy activation patterns consistent with a decrease in activation of positive and arousing expectancies and an increase in activation of negative and sedating expectancies.

CHAPTER 7: METHOD

Participants

Participants were recruited through Psychology Department undergraduate classes via the SONA research system at the University of Central Florida. Additionally, participants were recruited through Greek Letter Organizations. Of the 1,225 participants screened for eligibility, 354 met criteria (one binge drinking episode in the past 30 days) and were invited to participate in the study. Eligible individuals had a mean age of 19.68 (*SD* = 2.97) and ranged from 18 to 43 years of age. The sample of eligible individuals were predominantly female (64.7%), slightly more than the 55% female majority in the general undergraduate population at the University of Central Florida. Eligible individuals predominantly identified as non-Hispanic (69.5%), Caucasian (82.8%). The individuals eligible for the study identified as 30.5% Hispanic/Latino/Latinx, 9.6% Black/African American, 4.5% Asian, 0.8% American Indian/Alaskan Native, and 0.4% Native Hawaiian/Pacific Islander, as well as 7.3% endorsed "other." Of individuals eligible for the study, 51.1% were freshman, 17.8% were sophomores, 18.4% were juniors, and 12.1% were seniors. Due to the anonymous in data collection for the in-person portion of the study, statistical analyses were not conducted comparing data of those eligible versus those who participated.

Of the 354 eligible participants, 62 completed a one-time alcohol intervention. Additionally, participants were recruited through the Greek system at the University of Central Florida (*n* = 92). In total, 154 participants completed the one time intervention study. Twenty one cases were omitted due to incomplete data (e.g., more than 50% of data missing) and two cases were omitted due to incomplete data on biological sex necessary for analyses. The final sample included 131 participants, 36 male and 95 female.

The sample distribution in the ECALC and alcohol control conditions were 44 (26 male, 18 female) and 87 (10 male, and 77 female), respectively. Of the individuals included, 77 participants reported belonging to a fraternity or sorority. The sample was predominantly female (72.5%), due to the participation of two large sororities. Participants in the analysis sample had a mean age of 19.41 (*SD* = 1.67) and ranged from 18 to 27 years of age. The sample predominantly identified as non-Hispanic, Caucasian (56.5%). Participants included in analyses identified as 26.8% Hispanic/Latino, 10.7% Asian, and 4.6% Black/African-American participants, as well as 2.3% of participants who endorsed "other." Of participants included in analyses, 41.2% were freshman, 26.7% were sophomores, 22.9% were juniors, and 12.2% were seniors.

Inclusion and exclusion criteria based on screening. To be eligible for inclusion in analyses, students screened through Sona had to endorse participating in at least one episode of binge drinking in the previous four weeks and be at least 18 years of age (see Appendix A for screening measure). Binge drinking is defined as four drinks on one occasion for women and five drinks on one occasion for men (National Institute on Alcohol Abuse and Alcoholism, 2004). For individuals recruited through Greek Letter organizations, no screening was required due to the greater occurrence of risky drinking and consequences among fraternity and sorority members in comparison to general population students (O'Brien et al., 2014; Sheppard et al., 2016).

Procedure

Students were invited to participate in an initial online screening survey containing questions about demographic information as well as a single question regarding binge drinking (an episode of 4 drinks for women/ 5 drinks for men) in the previous month. All individuals who responded affirmatively to this single screening question were be invited to participate in the

study. As required by the UCF IRB, select individuals who did not endorse binge drinking in the past month were be invited to participate, as well to protect the identities of those who endorsed risky drinking behaviors when involved in the next stage of the study. Individuals who did not endorse binge drinking were invited to participate at random and were not included in final analyses.

Participants who were eligible to participate were contacted directly via email. Students who agreed to participate were scheduled for a one-time group presentation that consisted of the ECALC or Alcohol Control Presentation. Randomization to group assignment was conducted via block randomization, such that if one group was randomized to the control condition, the next group scheduled was randomized to the intervention condition. Groups were held on various days of the week in order to accommodate various student schedules with randomization procedures occurring prior to the start of each group. A total of 15 groups were conducted during Fall Semester, 2019, seven ECALC and eight Control. Each group contained a minimum of two participants. Students were awarded SONA points to receive either extra credit in psychology classes or course requirements for Intro to Psychology. These credits were dispersed in accordance to the amount of time spent participating in the study. Additionally, three groups were conducted at three Greek Letter Organizations during Fall Semester, 2019, two ECALC groups and one Alcohol Control. Prior to the intervention, participants provided informed consent (see Appendix B and Appendix C) and complete baseline measures (see Appendices D-J). After the intervention, participants repeated expectancy measures from the baseline protocol.

Measures

Demographic information was collected from all participants including sex, year in school, race, ethnicity, and participation in Greek life. (Appendix E).

Daily Drinking Questionnaire (DDQ). The DDQ was utilized to assess alcohol use over the past 30 days. This measure has been validated for use with undergraduate college students (Collins et al., 1985). The DDQ assesses typical drinks per week, assessing both number of drinks consumed per day, as well as duration of the drinking episode. Additionally, the DDQ assesses drinking habits during a peak drinking week. Drinker weight will also be collected as part of this measure. It has been found to be consistent with longer drinking measures (Collins et al., 1985). Included in Appendix H.

Comprehensive Effects of Alcohol Questionnaire (CEOA). Alcohol expectancies were assessed using the CEOA (Fromme et al.,1993). This measure has been previously used in evaluations of the ECALC and has been validated for use with college students. Items are totaled to compile four positive subscales (Sociability, Tension Reduction, Liquid Courage, and Sexuality) and three negative subscales (Cognitive and Behavioral Impairment, Risk and Aggression, and Self-Perception). This measure utilizes a 4-point rating scale. The CEOA has demonstrated good internal consistency, temporal stability, and construct validity (range of r = 0.53-0.81 for the various factors; Fromme et al., 1993) with college students. For the purposes of these analyses, CEOA scores were calculated to compare pre- and post-intervention means. Included in Appendix G.

The Brief Young Adult Alcohol Consequences Questionnaire (BYAACQ). The BYAACQ utilizes 24 items to assess the consequences of alcohol consumption for the previous 30 days (Kahler et al., 2005). Consequences are endorsed via dichotomous yes/no for each individual item. The number of items endorsed is totaled to reflect the total number of consequences experienced in the past 30 days. This measure was validated for use with college students in its advent, with this measure having as high internal consistency (Cronbach's alpha =

0.89), and test-retest reliability (r = 0.86), minimal redundancy of items, and covers a range of problems relevant to college students (Kahler et al., 2005; Kahler et al., 2008). Included in Appendix I.

Memory Model-Based Expectancy Questionnaire (MMBEQ). The MMBEQ consists of 41 expectancy words or phrases that can be mapped into a network format utilizing multidimensional scaling techniques and has been used to differentiate between heavier and lighter drinking patterns in both children and college students(Dunn et al., 2000; Dunn & Goldman, 1998). Individuals are presented with a list of words to complete the phrase "Drinking alcohol makes me_____." Participants are then instructed to circle the response that reflects how often the individual thinks this effect happens or could happen after drinking several drinks of alcohol, using the responses, "never," "sometimes," "usually," or "always." Items collectively are not scored, but rather are analyzed utilizing MDS techniques to map expectancy activation into a theoretical memory network. For this study, items were scored from 1-4.

With college student participants, this measure has demonstrated changes in likely activation patterns of expectancies in memory after exposure to an expectancy challenge intervention (Dunn et al., 2000). In contrast to a typical factor model-based measure, the MMBEQ was designed to retain all useful items, rather than discarding items that did not load sufficiently on a unitary construct. Therefore, the measure was not designed to contain subscales measuring common expectancy constructs. However, a factor analysis was conducted on the MMBEQ to relate content to common factor-model expectancy measures. Results indicated that MMBEQ items loosely loaded on 4 factors that could be used to create subscales. The four factors/subscales of the measure appeared to represent Positive-Social effects (correlation with alcohol use *r* = 0.38, internal consistency alpha = .92), Negative Arousal (*r* = -0.13, alpha =

0.85), Sedated/Impaired (r = -0.14, alpha = 0.82), and Wild and Crazy (r = 0.16, alpha = 0.84; Dunn, 2017). The r listed for these subscales represents the correlation of these subscales with drinking behaviors. These factors were totaled and used for comparisons of pre- and post-intervention expectancy means. Included in Appendix F.

Intervention

ECALC. The ECALC is a 45-minute web-based interactive program designed to change alcohol expectancy processes, prevent underage drinking, and decrease the frequency of alcohol use among individuals who already drink. The ECALC presents scientific information about the pharmacological effects of alcohol and teaches media literacy to help participants deconstruct alcohol advertisements and distinguish between pharmacological effects of alcohol and the non-pharmacological effects typically portrayed in the media. Key concepts of the program are delivered through automated narration that accompanies each screen within the web-based program. A trained facilitator, Jessica Flori, helped navigate the presentation and answer any questions participants may have.

The ECALC starts with two exercises on defining a standard drink based on different beverages and various sized containers. Subsequently, common myths associated with alcohol consumption are deconstructed in a game show format. Next, alcohol expectancies are defined and the role they play in drinking behaviors are described. Additionally, a review of research focused on discerning pharmacological versus expectancy effects of alcohol is summarized. Following this module, advertisements for alcohol are presented and participants are asked to identify various types of expectancies depicted in each ad. After this exercise advertisements are deconstructed to highlight the disparity between positive expectancies portrayed in media and pharmacological effects of alcohol. Lastly, the ECALC provides several interactive exercises to

reinforce participants' understanding of alcohol expectancies and their knowledge about expectancy effects versus pharmacological effects of alcohol.

Alcohol Control. Participants randomized to the control group received a presentation involving information about consequences related to alcohol consumption. This alcohol control was designed using Greek Letter organization Standards of Excellence curriculum as a guideline for information included. The control group presentation was also 45 minutes in length to match the length of the ECALC.

Power Analysis

Utilizing the effect size data from a study conducted by Dunn et al. (2019), in which mandated college students were exposed to the ECALC (*dw*= .62), an *a-priori* power analysis was conducted. For mean-based analyses, a minimum of 84 participants are recommended with 42 participants in each group to have 80% power for detecting a medium sized effect when employing .05 criterion of statistical significance. For MDS analyses, there are no tests of statistical significance. Results are evaluated based on fit with theory-based hypotheses, consistency with previous findings, variance accounted for, and stability of proximity matrices. MDS is based on analysis of proximity matrices consisting of a measure of similarity or dissimilarity of each possible pair of items in the analysis. Proximity matrices are typically considered to be "stable" when based on at least 15 observations, and "very stable" when based on at least 25 observations.

Data Analysis

Statistical analyses were conducted using IBM SPSS Statistics (Version 26) and NewMDSX. Analyses were conducted to demonstrate comparability between experimental and control within each sex due to previous varied outcomes between sex in previous ECALC studies

and other EC interventions. Analyses were conducted between groups to rule out significant differences based on demographic variables, baseline drinking behavior, and baseline drinking-related harms utilizing Chi-square and univariate analysis of variance techniques.

Alcohol Expectancies. Between group differences in alcohol expectancies at post-intervention were assessed using a series of 2 x 2 (Condition x Sex) analyses of covariance (ANCOVA) with pre-test expectancy values included as covariances. This technique was utilized with the subscale scores of the CEOA and the factors of the MMBEQ.

Individual differences scaling (INDSCAL) is a variation of MDS that was utilized to model the organization of expectancies in memory. INDSCAL can be applied to multiple groups or individuals simultaneously, and provides dimension weights for each group (sometimes referred to as subject weights or group weights) as a measure of differences in organization of information in memory (Rather & Goldman, 1994). INDSCAL has been used previously and found to be an effective method for mapping alcohol expectancy networks in memory (Cruz & Dunn, 2003; Dunn et al., 2000; Dunn & Goldman, 1996, 1998, 2000). In the present study, INDSCAL will be applied to responses on the CEOA and the MMBEQ individually, as well as combined.

Two-dimensional solutions are expected to be optimal for both measures with dimensions representing positive-negative effects and arousal-sedation effects. Subsequent dimensional solutions will be iteratively tested to ensure a two-dimensional solution is optimal and provides the most variance accounted for by the model. Subject weights were evaluated to assess whether participants who receive the ECALC demonstrate decreased emphasis on the arousal-sedation dimension and increased emphasis on the positive-negative dimension in comparison to participants in the control condition. PREFMAP analyses were conducted to demonstrate

changes in likely expectancy activation patterns. In comparison to students in the control condition, ECALC participants were expected to exhibit changes in likely paths of activation that reflect a decrease in activation of positive and arousing expectancies.

CHAPTER 8: RESULTS

Participants

Of the 354 individuals invited to participate through SONA screening, 62 completed consent processes and participated in a one-time alcohol intervention, of either a control group or the ECALC. The sample was predominantly female (72.5%), due to the participation of two large sororities. Participants in the analysis sample had a mean age of 19.41 (*SD* = 1.67) and ranged from 18 to 27 years of age. The sample predominantly identified as non-Hispanic, Caucasian (56.5%), 26.8% Hispanic/Latino, 10.7% Asian, and 4.6% Black/African-American participants, as well as 2.3% of participants who endorsed "other." Of participants included in analyses, 41.2% were freshman, 26.7% were sophomores, 22.9% were juniors, and 12.2% were seniors (see Table 1). Additionally, 92 participants were recruited through Greek letter organizations at the University of Central Florida and participated in this one time study. Of the 154 participants who completed the in person measures for the study, 21 cases were omitted due to incomplete data (e.g., more than 50% of data was incomplete) and two cases were omitted due to incomplete information on provided about biological sex. Analyses were conducted to investigate significant differences between those included in the analyses and those who were omitted, as well as between Greek and non-Greek participants and group differences. (See Figure 1).

Completers/Non-Completers. Analyses were conducted on individuals who did not provide complete data during baseline and post-intervention. A univariate analysis of variance was conducted comparing age differences between completers and non-completers revealed no significant difference between groups, F (1, 152) = 1.029, p = .312. Comparisons of class standing revealed no significant difference between completers and non-completers, X^2 (3 N =

154) = 1.839, p = .606. Additionally, comparisons of race and ethnicity revealed no significant differences between completers and non-completers, X^2 (5 N = 154) = 9.794 p = .081. An additional univariate analysis of variance was conducted comparing drinking behaviors revealed no significant differences between completers and non-completers, utilizing the variable peak drinks per sitting derived from the DDQ, F (1, 148) = 0.199, p = .656. Additionally, an univariate analysis of variance utilizing reported alcohol related harms from the BYAACQ revealed no significant difference between completers and non-completers, F (1, 152) = .238, p = .626 Chi square comparisons revealed significant differences between completers and non-completers in relation to experimental/control group membership, X^2 (1 N = 154) = 6.202, p = .013, such that 9.3% of the control group were non-completers and 24% of experimental group were non-completers. Chi square comparisons revealed significant differences between completers and non-completers in relation to biological sex, X^2 (3 N = 154) = 16.295, p = .001, such that 2.7% of males and 17.4% of females had incomplete data for analyses. These significant differences can potentially be attributed to the larger portion of females (87.8%) included in analyses versus the number of males (28.2%). This difference will be further addressed in study limitations. Additionally, chi square comparisons between completers and non-completers revealed significant differences in relation to Greek Life involvement, X^2 (1, N = 154) = 8.945, p = .003, such that 87.5% of individuals in the non-completers group endorsed being involved in Greek Life, whereas only 8.3% of non-completers did not endorse Greek Life involvement. These significant differences can be attributed to the number of individuals recruited through Greek Life organizations. These differences will be further addressed in study limitations.

Greek/Non-Greek. Due to the inclusion of both Greek life individuals, as well as eligible participants screened through SONA, chi-square analyses were conducted to see if there were significant differences between groups, revealing several significant group differences. A univariate analysis of variance revealed significant differences between ages reported by individuals in Greek Life organizations in comparison to those who were not, F (1, 129) = 6.929, p = .010. In this sample, there were more 18 year old participants who did not endorse Greek involvement, and more individuals who endorsed Greek involvement who reported being 19 and 20 years of age. Chi square analyses revealed significant differences in regard to experimental/control group membership, X^2 (1, N = 131) = 13.739, p < .001, such that 70% of the control group was comprised of Greek life members and 36% of the experimental group was comprised of Greek life members. Chi square analyses revealed differences approaching statistical difference comparing race and ethnicity of Greek and non-Greek students, X^2 (5, N = 131) = 11.075, p = .050. This difference can be attributed to the inclusion of a fraternity consisting of individuals who predominantly identified as Asian (85.7%), versus those who identified as Asian with no Greek life involvement (14.3%). Additional comparisons revealed significant differences in class standing among Greek and non- Greek students, X^2 (3, N = 131) = 21.603, p < .001. These differences can be attributed to there being a greater proportion of freshman being in the non-Greek group. The inflated number of freshmen participants in the non-Greek sample can be attributed to the use of SONA for recruitment and the requirement of SONA participation for introductory psychology classes, a class primarily taken by first year students.

Chi square analyses of sex differences between Greeks and non-Greeks revealed statistically significant differences between groups, X^2 (1, N = 131) = 5.999, p = .014. Participation of two sororities led to there being more females in the Greek group versus non-Greek group.

Additional analyses revealed significant differences of baseline drinking behaviors between Greek and non-Greek students using the variable peak drinks per sitting derived from the DDQ, F (1, 126) = 25.945, $p < .001$, such that those reporting involvement in a fraternity or sorority reported fewer average peak drinks per sitting than those recruited to the study through SONA screening. This difference can be potentially be attributed to the lack of screening criteria utilized for the inclusion of Greek life students in this study. Although there was a difference between peak drinks per sitting between Greek and non-Greek students, analyses did not reveal a significant effect of group membership on the number of reported alcohol related harms utilizing the total score of harms reported from the BYAACQ, F (1, 129) = 0.234, $p = .629$, suggesting that although Greek students reported fewer drinking behaviors, they reported similar levels of consequences related to their drinking. These differences will be further discussed in study limitations as potential confounding variables in the results.

Experimental/Control Baseline differences. The utilization of randomized group necessitates the comparison of potential baseline differences between experimental (n = 44) and control (n = 87) groups that may confound results of this study. Chi square analyses revealed no significant differences of class standing between conditions, X^2 (3, N = 131) = 6.562, $p = .087$. Chi square analyses revealed significant differences between conditions across biological sex, X^2 (1, N = 131) = 33.218, $p < .001$, and racial identification, X^2 (5, N = 131) = 39.781, $p < .001$. There was a disproportion number of women in the control group (81.1% of female participants), which can be attributed to the inclusion of a large sorority that was randomized to the control condition. Additionally, individuals identifying as White/non-Hispanic and White-Hispanic individuals were overrepresented in the control condition (82.4%, 64.7%, respectively), while individuals identifying as Asian were overrepresented in the experimental condition (100%). Sex and

ethnicity differences between conditions will be further addressed in the limitations of the study. Univariate analyses revealed statistically significant differences between mean age for the control (M = 19.138) and experimental (M = 19.955) groups, F (1, 129) = 7.302, p = .008. Additionally, univariate analyses were conducted to investigate group differences on drinking variables of peak drinks per sitting and total harms reported. Analyses revealed no significant differences of peak drinks per sitting between groups, F (1, 126) = 1.872, p = .174, or total harms reported, F (1, 129) = 0.005 p = .942 (see Table 1). Differences between conditions will be further addressed in the limitations of this study, and will be carefully considered in the interpretation of the results.

Expectancies

MMBEQ. A series of 2 x 2 (Condition x Sex) analyses of covariance (ANCOVA) were used to investigate between-group differences in alcohol expectancies with pre-test expectancy values included as covariates. Dependent variables included the four factors of the MMBEQ (Positive-Social, Negative-Arousal, Sedated/Impaired, Wild and Crazy). Results from the MMBEQ revealed significant effects effect for group on the Positive Social factor, F (1, 126) = 15.56, $p < .001$ and the Sedated Impairment factor, F (1, 126) = 5.98, p = .016. Participants in the ECALC condition reported significantly lower mean scores on these two factors of the MMBEQ compared to those in the control condition. Findings suggest that there was no significant modification of expectancies for the Negative-Arousal and Wild and Crazy factors. Additionally, there were no significant group x sex interactions, indicating the ECALC was equally effective for males and females in modifying prosocial and pharmacological expectancies. Means and standard deviations of changes in alcohol expectancies for the MMBEQ are provided in Table 2.

INDSCAL was used to map alcohol expectancies into memory network format. Eight proximity matrices based on participant responses to the MMBEQ were used as input for INDSCAL analysis (i.e., one proximity matrix for each condition, pre- and post-intervention for each sex). A two-dimensional solution (see Figure 2) was considered to be optimal (stress = .28, R^2 = .81). In multidimensional scaling analyses, stress and R^2 are used to evaluate fit of the solution to the data with low stress and high R^2 values being indicators of good fit (Davison, 1992). R^2 is the preferred measure of fit in INDSCAL analyses because stress values are artificially inflated as the number of input matrices increases. In order to ensure a two-dimension model was optimal for interpretation, additional iterations of dimensional fit were tested. Three-dimensional and four-dimensional solutions were tested for dimensional fit and offered a minimal increase in variance accounted for by the model, 4% and 7.1%, respectively. Due to the minimal increase in variance accounted for by three- and four-dimensional solutions, a two-dimensional solution was used for interpretation. Consistent with previous MDS analyses focused on adults (Rather et al., 1992), the horizontal dimension appears to represent social/positive vs. antisocial/negative effects, and the vertical dimension appears to represent arousing vs. sedating effects.

INDSCAL provided a measure of dimensional emphasis for each of the eight participant groups (referred to as "subject" weights, but in this context, "group" weights). Higher group weights on an individual dimension reflect increased emphasis on that dimension. The plot of group weights (see Figure 3) demonstrated decreased emphasis on the prosocial/positive-antisocial/negative and increased emphasis on the arousal-sedation dimension among ECALC males post intervention, relative to their pre-intervention expectancy reports and controls.

ECALC females did not demonstrate change in emphasis on dimensions relative to their own scores or the control groups.

The change in group weights for ECALC males is not consistent with a-priori hypotheses. The hypothesis for this analysis was based on analyses of a sample that included children in 3rd, 6th, 9th, and 12th grades in addition to college students (Dunn & Goldman, 1998). Inclusion of children in that analysis caused the prosocial expectancies to be located near the top of the vertical dimension. In the current analysis, prosocial expectancies are located near the positive end of the horizontal dimension. As a result, group weights in the present analysis reflect much more emphasis on the horizontal dimension because it includes the prosocial expectancies. The change in group weights among ECALC males is logical because it reflects decreased emphasis on prosocial expectancies and increased emphasis on sedation, and both of these concepts figure prominently in ECALC content.

PREFMAP was used to plot likely paths of expectancy activation based on group assignment (experimental/control) and time (pre-/post-intervention) (see Figure 4). Input for PREFMAP consisted of the INDSCAL stimulus configuration and mean frequency of occurrence of each expectancy item on the MMBEQ for each group in the INDSCAL analysis (males and females before and after exposure to the intervention or control condition). PREFMAP computes a vector (line of best fit) through the stimulus configuration for each group. These PREFMAP vectors represent paths or patterns of likely activation of expectancies, and these PREFMAP-derived activation patterns have been validated using other methods to model expectancy activation (e.g., first associates; Dunn & Goldman, 2000). Vectors for male and female participants in the control condition, and for females in the ECALC condition, demonstrated little to no rotation from pre-test to post-intervention. For males in the ECALC

condition, however, there was a notable change in the orientation of the vector through the stimulus configuration. Exposure to the ECALC was associated with rotation of likely path of activation toward negative/sedating expectancies and away from arousing/positive expectancies after the intervention. These results replicate the findings of Dunn et al. (2000), a study that utilized the MMBEQ to model activation changes of expectancies in memory following an experiential expectancy challenge intervention (a multi-session protocol in a barlab that included alcohol administration). Similarly, the findings of this previous study only exhibited changes for males in the experimental condition and not females.

CEOA. A series of 2 x 2 (Condition x Gender) analyses of covariance (ANCOVA) were used to investigate between-group differences in alcohol expectancies at post-intervention with pre-test expectancy values included as covariates. Dependent variables consisted of subscale scores on each of the seven subscales of the CEOA (Sociability, Tension Reduction, Liquid Courage, Sexuality, Cognitive Behavioral Impairment, Risk & Aggression, Self Perception) subscales. Results from the CEOA revealed significant effects effect for group on the Sociability, F (1, 126) = 20.94, $p < .001$, Tension Reduction, F (1, 126) = 9.71, $p = .002$, Liquid Courage, F (1, 126) = 19.23, $p < .001$, Sexuality, F (1, 126) = 7.93, $p = .006$, and Cognitive Behavioral Impairment, F (1, 126) = 4.13, $p = .044$, subscales of the CEOA. Additionally, results revealed a significant condition by gender interaction on the Tension Reduction subscale of the CEOA, F(1, 126) = 4.10, $p = .045$. Participants in the ECALC condition reported significantly lower mean scores on these subscales of the CEOA compared to those in the control condition. These findings indicate that the ECALC was equally effective for males and females in modifying expectancies related to sociability, sexuality, liquid courage, and cognitive behavioral impairment, but not equally effective for both sexes in modifying expectancies of relaxation and

stress reduction. No other significant effects of group or sex were found in the remaining three subscales of the CEOA. Means and standard deviations of changes in alcohol expectancies on the CEOA are provided in Table 3.

The same INDSCAL analysis strategy applied to the MMBEQ was also used for the CEOA. Eight proximity matrices based on participant responses to the CEOA were used as input for the analysis (i.e., one proximity for condition from pre-test to post-intervention for each sex). A two-dimensional solution (see Figure 4) was considered to be optimal (stress = .272, R^2 = .683). In order to ensure a two-dimension model was optimal for interpretation, additional iterations of dimensional fit were tested to the data. Three-dimensional and four-dimensional solutions were tested for dimensional fit. A three-dimensional offered reduction in variance accounted for by the model, -0.001%, while a four-dimensional solution offered an increase in variance account for by the model, 4.95%. Due to the minimal increase in variance accounted for by a four-dimensional solution, a two-dimensional solution was used for interpretation.

INDSCAL analyses provided a measure of dimension emphasis for each of the eight participant groups (group weights). The plot of group weights (see Figure 5) demonstrated decreased emphasis on the social/positive-antisocial/negative dimension and increased emphasis on the arousal sedation dimension among ECALC males post intervention, relative to their pre-intervention expectancy reports and controls. Unlike in the analysis of the MMBEQ, females randomized to the ECALC condition demonstrated a change in emphasis on dimensions relative to their own scores and the control groups. Similar to males, females demonstrated decreased emphasis on the social/positive-antisocial/negative dimension and increased on the arousal-sedation dimension.

A potential discrepancy between the results on the CEOA versus the MMBEQ for women could be due to the manner in which items utilized for stimuli were presented to participants. Due to the CEOA utilizing a sentence structure to measure expectancies, rather than individual words as in the MMBEQ, there could be a difference in interpretation of items accounting for differences on these two questionnaires measuring the same construct (e.g., "I would be humorous" from the CEOA versus "drinking alcohol makes me funny" from the MMBEQ). Additional items that focus on sexuality were included in the CEOA, but were not included in the MMBEQ These items include: "It would be easier to act out my fantasies," "I would enjoy sex more," "I would be a better lover." When mapped in the stimulus configuration, they are present at the arousal extremity of the configuration. Both males and females demonstrated changes in dimension emphasis, but these changes were more robust for males than females. As previously noted, these changes are consistent with a reduced likelihood of future drinking (Dunn & Goldman, 1998; Dunn et al., 2000; Dunn et al., 2019).

PREFMAP was utilized to plot potential paths of expectancy activation based on group (experimental/control) and time (pre-/post-intervention) utilizing the CEOA. Results were consistent with group weights derived from INDSCAL analyses (see Figure 6). Vectors demonstrating paths of activation for male and female participants in the post-intervention control condition show little to no rotation from their pre-test locations. Unlike the previous analyses on the MMBEQ, females in the ECALC condition demonstrated a notable change in orientation of vector through the stimulus configuration, such that the orientation moved more toward antisocial/negative and sedating alcohol expectancies following exposure to the intervention. It should be noted that this shift may appear to be attenuated due to the expectancies of females in the pre-ECALC group being rotated more toward desirable-

social/positive expectancies (being near parallel with the positive-negative dimension) than males in the same condition. Similarly, males in the ECALC condition demonstrated the same change in orientation with more robust rotation.

CEOA and MMBEQ Combined. Finally, INDSCAL was used to map alcohol expectancies into memory network format using both the CEOA and MMBEQ. Eight proximity matrices based on participant responses to the CEOA and MMBEQ were used as input for INDSCAL analysis (i.e., one proximity for condition from baseline to post-intervention for each sex). A two-dimensional solution (see Figure 6) was considered optimal (stress = .228, R^2 = .806). A three-dimensional solution offered a reduction in variance accounted for by the model, -6.1%, while a four-dimensional solution additionally offered a decrease in variance account for by the model, -0.2%. Due to the decrease in variance accounted for by three- and four-dimensional solutions, a two-dimensional solution was retained.

INDSCAL analyses provided a measure of dimension emphasis for each of the eight participant groups (group weights). The plot of group weights (see Figure 7) indicated decreased emphasis on the social/positive-antisocial/negative dimension and increased emphasis on the arousal-sedation dimension among ECALC males post intervention relative to their pre-intervention reports and controls. Similar to the MMBEQ analysis, ECALC females did not demonstrate change in emphasis on dimensions relative to their own scores or the control groups. For this analysis, items that would be presumed to be activated together (e.g., “My body will be relaxed”- from the CEOA; and “drinking alcohol makes me relaxed”- from the MMBEQ) were mapped more distally when combining these measures, such that one falls in the sedating/positive quadrant of the model and the other falls in the arousing/positive quadrant of the model (see figure 6). This difference could be attributed to a sense of bodily relaxation versus

a cognitive relaxation that may have more arousing properties. These differences can also be seen in consideration of the item outgoing (e.g., "I would be outgoing" versus "Drinking alcohol makes me outgoing") with these items similarly stored distally with one being mapped in the positive-arousal quadrant of the configuration and the other mapped in the positive-sedation quadrant of the configuration. A similar situation was observed with several other concepts. For example, the item "I would be sociable" on the CEOA was mapped further from "talkative," "outgoing," and "friendly" for both measures. This could be evidence that the manner in which items are activated in memory may also be determined by the manner in which they are retrieved (e.g., via a single word association, as in the MMBEQ, or a sentence that requires additional activation). A single word association combined with the concept of alcohol may activate different information than that of the entire semantic meaning of the items in the CEOA. This could offer an explanation as to why some items that are seemingly similar were not near each other.

PREFMAP was utilized to plot likely paths of expectancy activation based on group (experimental/control) and time (pre-/post-intervention) utilizing the CEOA. Vector locations were consistent with INDSCAL group weights (see Figure 6). Vectors for male and female participants in the post-test control condition, and females in the ECALC condition, demonstrate little to no rotation from their pre-test positions. Similar to previous analyses, males in the ECALC demonstrated the most notable change in orientation having moved toward negative and sedating alcohol expectancies following exposure to the intervention.

CHAPTER 9: DISCUSSION

The present study aimed to provide additional evidence of the effectiveness of the ECALC for use with risky drinking college students, and to link factor model-based expectancy research with memory model-based findings. The latter was accomplished using MDS techniques to model likely expectancy organization and activation patterns in memory over time utilizing both the factor model-based CEOA and the memory model-based MMBEQ. Finally, the mechanism by which the ECALC influences drinking behavior was modeled for the first time by using INDSCAL and PREFMAP to evaluate changes in dimension emphasis and likely activation patterns.

A primary aim of this study was to connect the ECALC, a didactic expectancy challenge curriculum that has demonstrated effectiveness in altering expectancies and reducing alcohol consumption, to the memory model literature on expectancies to explore the mechanism by which these changes in drinking occur. Previous studies on the ECALC have reported expectancy changes and subsequent drinking reductions (Dunn et al., 2019; Fried & Dunn, 2012); however, the mechanism by which these changes occur has not been examined. Results from this study suggest that not only are expectancies altered through the receipt of the ECALC, but these expectancies are altered such that the likely path of activation of these concepts in memory is changed. Specifically, greater emphasis is placed on negative and sedating experiences, more in line with the pharmacological effects of alcohol. Such changes in likely activation have been demonstrated to be consistent with subsequent changes in drinking patterns (Dunn et al., 2000).

Memory modeling of the MMBEQ with this sample replicates findings of Dunn et al. (2000) that utilized memory modeling techniques to investigate changes after an experiential

expectancy challenge intervention. In both studies, only males in the experimental condition demonstrated changes following intervention. This finding demonstrates that not only are scores on a scale being changed through the receipt of an intervention, but the likely activation of concepts are being altered in memory. Prior to this study, the mechanism by which the ECALC was effective for reducing alcohol consumption had not been demonstrated. Future studies should utilize similar analysis techniques to understand the mechanism by which other interventions that utilize expectancy challenge concepts alter the figurative memory network of expectancies to influence drinking behaviors. Additionally, future studies should use memory modeling techniques to understand what aspects of the ECALC are causal in these activation changes.

An additional finding was the effectiveness of the ECALC in changing activation patterns of expectancies for women after exposure to the ECALC, a finding that has not been demonstrated through previous memory modeling analyses. Specifically, females in the ECALC group only demonstrated changes in expectancy activation when measured with the CEOA, a measure that anchors items in full statements. One potential reason for this difference is the inclusion of items focusing on sexuality in the CEOA that are not included in the MMBEQ. Positive alcohol expectancies related to sexual behavior influence heavy drinking behaviors (Cable & Sacker, 2008; Strano et al., 2004), with women tending to associate alcohol use with social enhancement expectancies (Read et al., 2004). Additionally, these findings could suggest the semantic meaning of the expectancy statements in the CEOA offer activation of concepts that are quantifiably different than those activated by the single word expectancies in the MMBEQ. These findings suggest the importance of the inclusion of multiple expectancy measures in order to capture various elements of alcohol expectancy activation that may not be captured by the use

a single measure to understand a concept. Future studies should use additional expectancy measures to understand how various expectancy challenge measures capture different aspects of alcohol expectancies stored in memory.

Finally, exploratory analyses of the CEOA and MMBEQ combined revealed that similar items from these different measures appear to address different aspects of expectancies as they were mapped distally rather than being clustered together in the memory model. One potential explanation of this is how the measures were constructed. The MMBEQ was developed specifically for memory modeling analyses (Dunn, 2017), whereas the CEOA was created through factor analytic procedures (Fromme et al., 1993). These differences in scale construction may account for differences in their combined analysis as the CEOA was not intended for INDSCAL analyses. Additionally, the way each item is constructed may have influenced stimulus configuration location, as the CEOA utilizes complete sentences to capture expectancy concepts, while the MMBEQ utilizes single words. The semantic construction of the CEOA items may have led them to be linked to concepts in memory different from the single word items of the MMBEQ. Additional analyses should be conducted to develop a better understanding of the relationship of the CEOA and MMBEQ and how seemingly similar items measure different aspects of expectancies.

There are a number of limitations of the current study. First, the limitations of the characteristics of the sample should be noted. Specifically, the disparity between the control and ECALC groups such that the control group differed on several variables including number of participants, age, biological sex, and race identification. Fortunately, group size has no differential impact on INDSCAL analyses (a group of 2 participants has the same influence as a group of 100 because analyses are based on proximity matrices computed from each group).

Although potential sex differences were accounted for in analyses, the other group differences should be noted. Additionally, the predominance of the sample identifying as white, non-Hispanic (n = 61) may affect the generalizability of the findings of this study. Differences between Greek and non-Greek participants should be noted, such that there were significant differences between these groups on multiple demographic variables, as well drinking behaviors. These differences could influence the findings of the study and should be considered in future analyses to ensure inclusion of both Greek and non-Greek students to better account for any differences between the groups. Future studies should seek to garner a larger and more diverse sample to ensure the generalizability of findings.

A secondary limitation of note is that although this study investigated activation changes of alcohol expectancies that can predict changes in alcohol use, follow up alcohol use behaviors were not investigated. Although changes in expectancy activation patterns demonstrated through this study are consistent with a reduced likelihood of future drinking (Dunn & Goldman, 1998; Dunn et al., 2000; Dunn et al., 2019), without additional follow up we are unable to make predictive claims of the findings of this study on subsequent drinking behaviors. Future studies should focus on investigating the long-term implications of the ECALC on drinking behaviors and expectancy activation patterns, in order to fully examine the lasting impact of the ECALC over an extended period of time.

In summary, the current study was the first to implement and evaluate the ECALC for modifying expectancies of risky drinking college students and connect the ECALC to the memory modeling literature of how expectancy activation patterns are altered in memory following the receipt of this didactic expectancy challenge intervention. These findings represent a critical step forward in understanding the mechanism by which expectancy challenge

interventions alter expectancies and subsequent drinking behaviors. Future studies should seek to utilize the understanding of this mechanism to better inform how expectancy challenge interventions can create lasting expectancy changes along with subsequent changes in drinking behaviors.

Table 1: **Demographic Characteristics by Condition**

	Screened (Eligible)	**Control**	**ECALC**		
Variable	*N =364*	*N = 84*	*N =44*	*X² (df)*	*p*
Sex					
Male	125 (35.3%)	10 (11.5%)	26 (59.1%)	33.2 (1)	<.001
Female	229 (64.7%)	77 (88.5%)	18 (40.9%)		
Class Standing					
Freshman	183 (51.7%)	35 (40.2%)	19 (43.2%)	6.5 (3)	.087
Sophomore	63 (17.8%)	25 (28.7%)	6 (13.6%)		
Junior	65 (18.4%)	20 (23.0%)	10 (22.7%)		
Senior	43 (12.1%)	7 (8.0%)	9 (20.5%)		
Greek Affiliation	N/A	61 (70.1%)	16 (36.4%)	13.74 (1)	<.001
Race/Ethnicity					
White/Non-Hispanic	206(58.2%)	61 (70.1%)	13 (29.5%)	39.78 (5)	<.001
White/Hispanic	87 (24.5%)	22 (25.3%)	12 (27.3%)		
Asian	16 (4.5%)	0 (0%)	14 (31.8%)		
Black/Hispanic	5 (1.4%)	0 (0%)	1 (2.3%)		
Black/Non-Hispanic	29 (8.2%)	2 (2.3%)	3 (6.8%)		
Native Hawaiian/Pacific Islander	1 (0.3%)	0 (0%)	0 (0%)		
American Indian/Alaskan Native	3 (0.8%)	0 (0%)	0 (0%)		
Other	26 (7.3%)	2 (2.3%)	1 (2.3%)		
	Mean (*SD*)	Mean (*SD*)	Mean (*SD*)	*F (df)*	*p*
Age	19.68 (2.97)	19.14 (1.23)	19.95 (2.23)	7.30 (1, 129)	<.001
Peak Drinks	N/A	6.75 (4.12)	7.90 (5.17)	1.87 (1, 126)	.174
Average Harms	N/A	6.76 (4.15)	6.82 (4.92)	0.005 (1, 129)	.942

Table 2: **Changes in Memory Model-Based Expectancy Questionnaire (MMBEQ) from pre- to post-intervention**

	Pre-ECALC	**Pre-Control**	**Post ECALC**	**Post Control**	**df**	**Group**	**Sex**	**Group X Sex**
MMBEQ Factors						*F*	*F*	*F*
Positive-Social					1, 126	15.56***	1.19	1.36
Male	47.71 (9.54)	49.8 (6.45)	21.46 (13.31)	31.10 (7.65)				
Female	53.78 (8.41)	47.48 (8.49)	30.57 (9.57)	28.78 (9.65)				
Negative Arousal					1, 126	0.07	0.03	0.07
Male	13.31 (2.77)	12.40 (2.01)	3.92 (13.43)	3.20 (2.57)				
Female	13.17 (3.57)	13.26 (3.10)	4.03 (4.28)	3.34 (3.28)				
Sedated/Impaired					1, 126	5.98*	0.19	0.97
Male	15.62 (3.15)	15.70 (3.06)	10.27 (3.43)	8.30 (2.98)				
Female	14.61 (2.97)	14.73 (3.31)	8.61 (3.85)	7.84 (3.45)				
Wild and Crazy					1, 126	0.32	0.21	1.45
Male	18.85 (3.85)	17.90 (3.14)	13.87 (3.93)	15.00 (2.55)				
Female	20.61 (4.16)	19.48 (3.63)	16.63 (3.29)	14.74 (2.87)				

Note. * $p < .05$, *** $p < .001$

Table 3: **Changes in Comprehensive Effects of Alcohol (CEOA) subscale scores from pre- to post-intervention**

	Pre-ECALC	**Pre-Control**	**Post ECALC**	**Post Control**	***df***	**Group**	**Sex**	**Group X Sex**
CEOA						*F*	*F*	*F*
Sociability								
Male	26.81 (4.79)	28.20 (2.90)	14.35 (7.2)	20.50 (2.37)	1, 126	20.94***	0.08	1.84
Female	30.22 (2.07)	27.64 (3.51)	18.39 (5.19)	19.15 (3.51)				
Tension Reduction					1, 126	9.71**	0.46	4.09*
Male	8.54 (1.98)	9.50 (1.65)	4.62 (1.94)	7.00 (1.25)				
Female	8.56 (2.06)	8.23 (2.03)	5.07 (2.34)	5.22 (1,98)				
Liquid Courage					1, 126	19.23***	0.21	2.00
Male	14.15 (3.54)	13.30 (3.34)	6.88 (3.90)	9.10 (3.14)				
Female	15.33 (3.93)	14.54 (3.51)	8.42 (4.51)	9.25 (3.80)				
Sexuality					1, 126	7.93**	0.47	0.70
Male	9.65 (2.80)	10.60 (2.67)	4.81(3.44)	6.50 (3.31)				
Female	11.09 (3.36)	9.77 (2.76)	5.70 (4.10)	5.72 (3.07)				
CBI					1, 126	4.13*	0.10	0.08
Male	23.6 (3.60)	26.30 (4.34)	15.90 (3.04)	14.40 (3.86)				
Female	26.83 (3.76)	26.35 (4.74)	15.94 (4.93)	14.42 (4.75)				
R&A					1, 126	0.20	0.31	0.19
Male	11.96 (3.12)	12.40 (3.75)	6.38 (3.98)	6.30 (3.43)				
Female	12.33 (3.60)	11.44 (3.31)	6.30 (3.69)	6.45 (3.30)				
Self-Perception					1, 126	2.21	0.04	0.32
Male	7.77 (2.74)	7.20 (1.81)	4.54 (3.08)	3.20 (1.99)				
Female	7.72 (2.56)	7.87 (2.73)	4.34 (2.95)	4.00 (2.57)				

Note. CBI = Cognitive Behavioral Impairment; R&A = Risk & Aggression

* $p < .05$; ** $p < .01$; *** $p < .001$

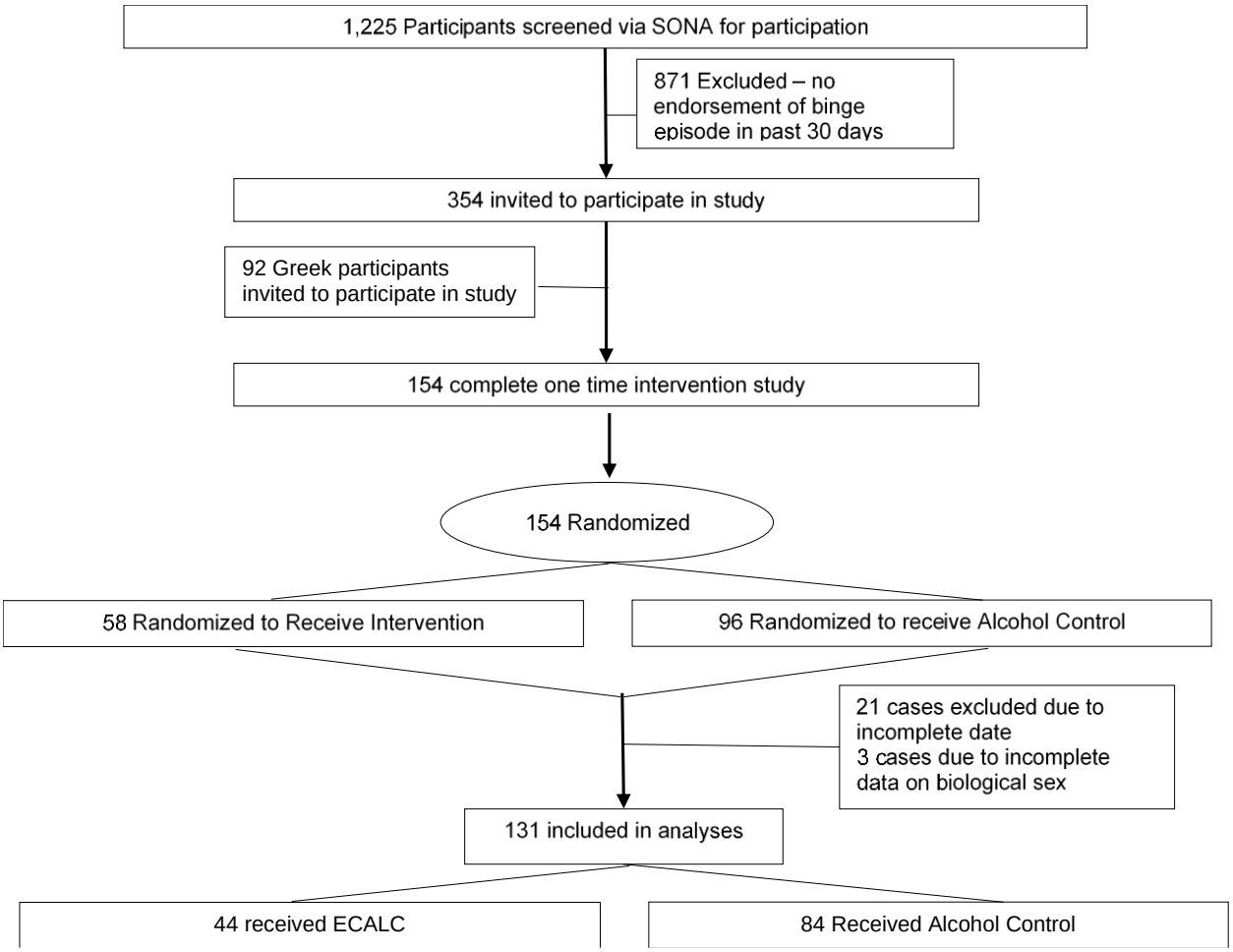

Figure 1. *Consort diagram*

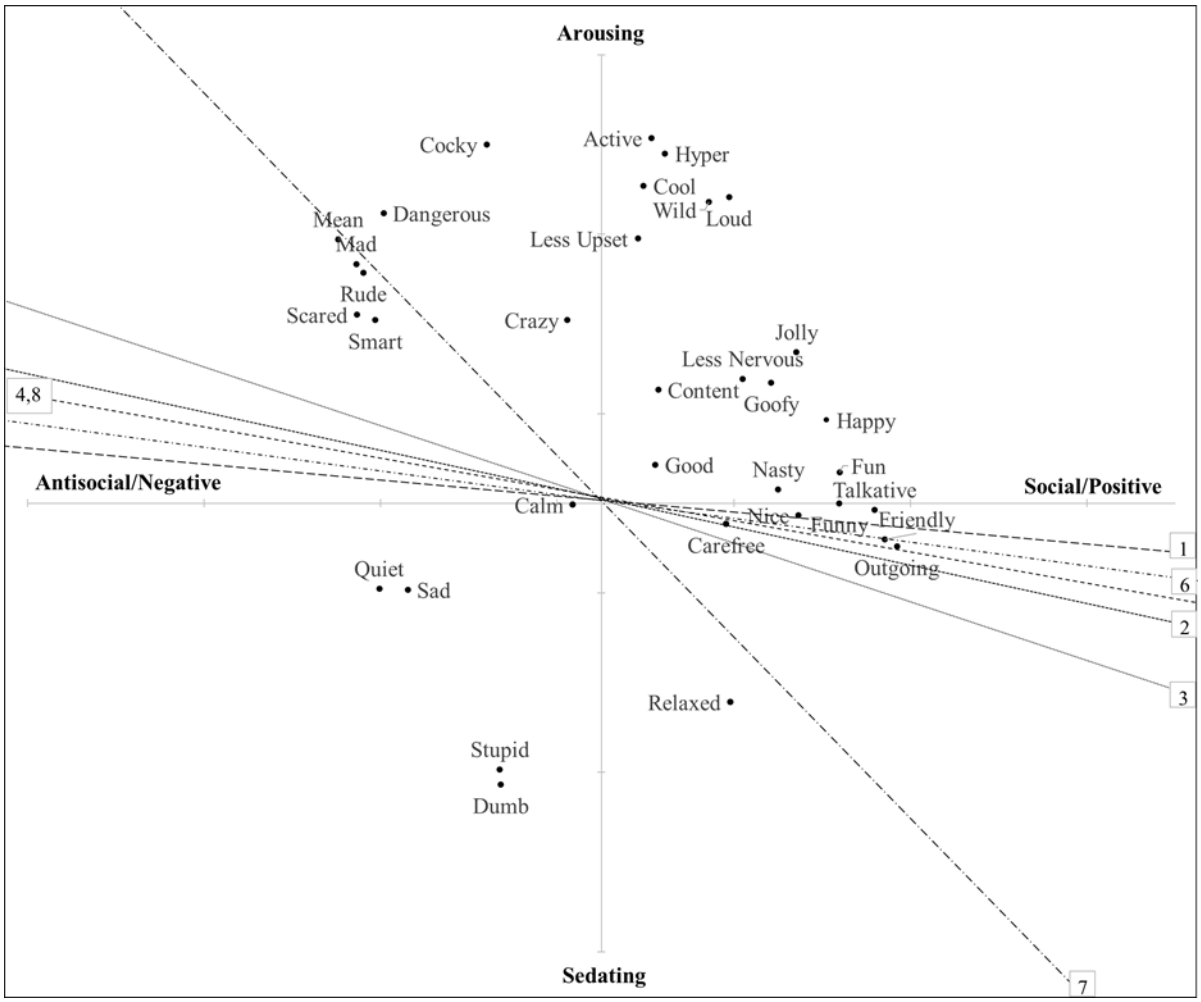

Figure 2. *Individual Differences Scaling (INDSCAL) stimulus configuration with PREFMAP vectors representing possible paths of activation through a memory network pre- and post-intervention/control utilizing the Memory Model-Based Expectancy Questionnaire (MMBEQ).*

Note. 1 = male pre-control; 2 = female pre-control; 3 = male pre-ECALC; 4 = female pre-ECALC; 5 = male post-control; 6 = female post-control; 7 = male post-ECALC; 8 = female post ECALC.

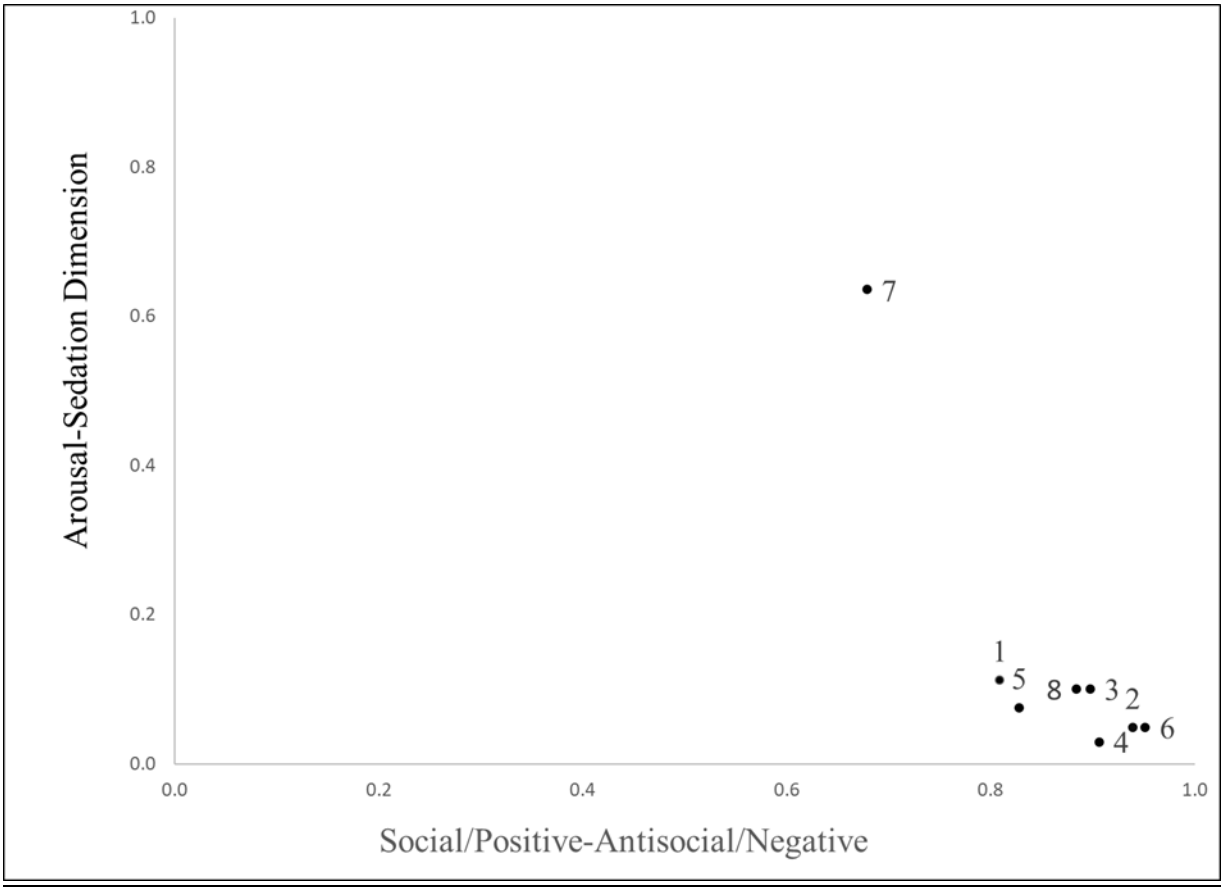

Figure 3. *Individual Differences Scaling (INDSCAL) participant group weights on positive-negative dimensions utilizing the Memory Model-Based Expectancy Questionnaire (MMBEQ).*

Note. 1 = male pre-control; 2 = female pre-control; 3 = male pre-ECALC; 4 = female pre-ECALC; 5 = male post-control; 6 = female post-control; 7 = male post-ECALC; 8 = female post ECALC.

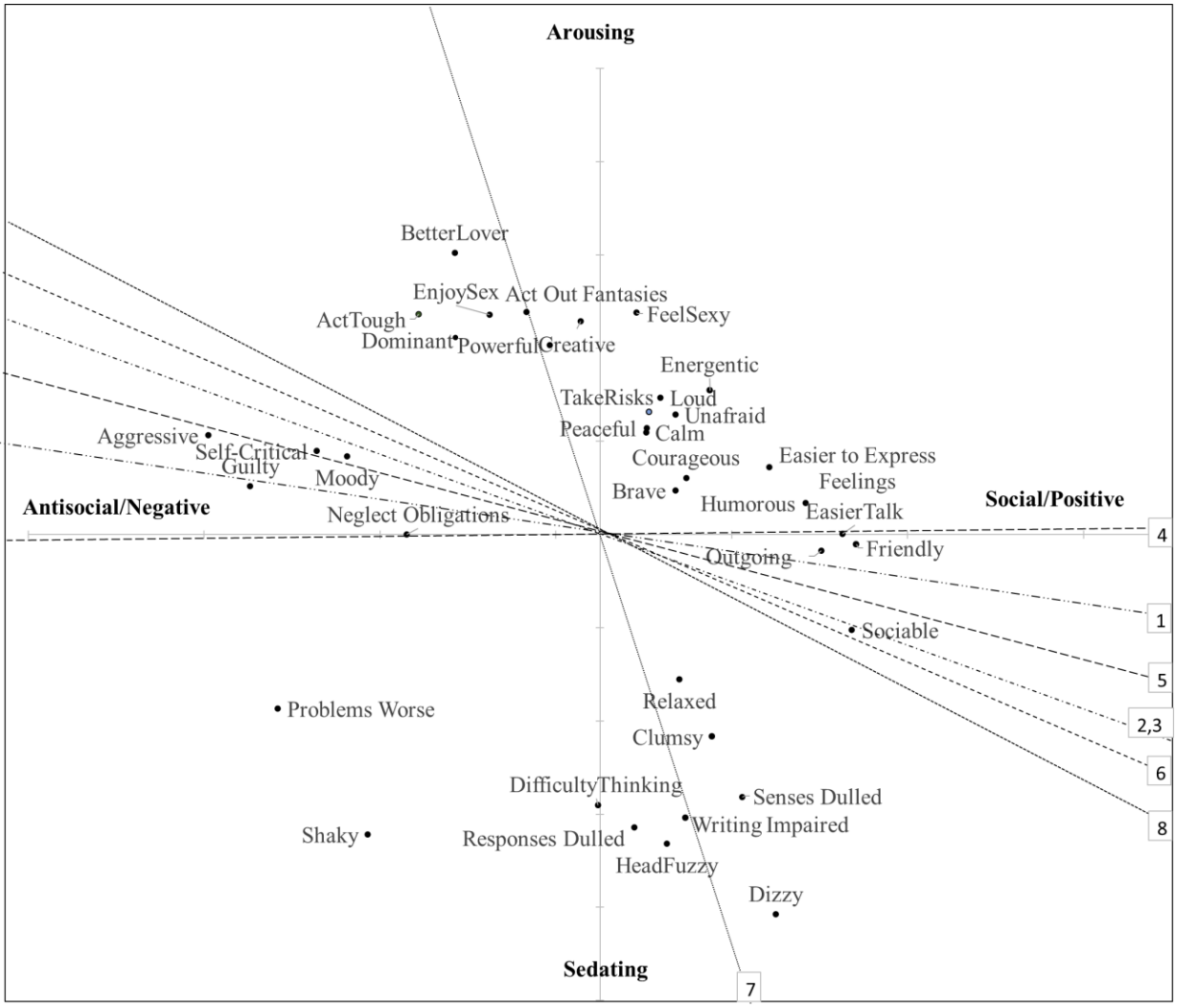

Figure 4. *Individual Differences Scaling (INDSCAL) stimulus configuration with PREFMAP vectors representing possible paths of activation through a memory network pre- and post-intervention/control utilizing the Comprehensive Effects of Alcohol (CEOA).*

Note. 1 = male pre-control; 2 = female pre-control; 3 = male pre-ECALC; 4 = female pre-ECALC; 5 = male post-control; 6 = female post-control; 7 = male post-ECALC; 8 = female post ECALC.

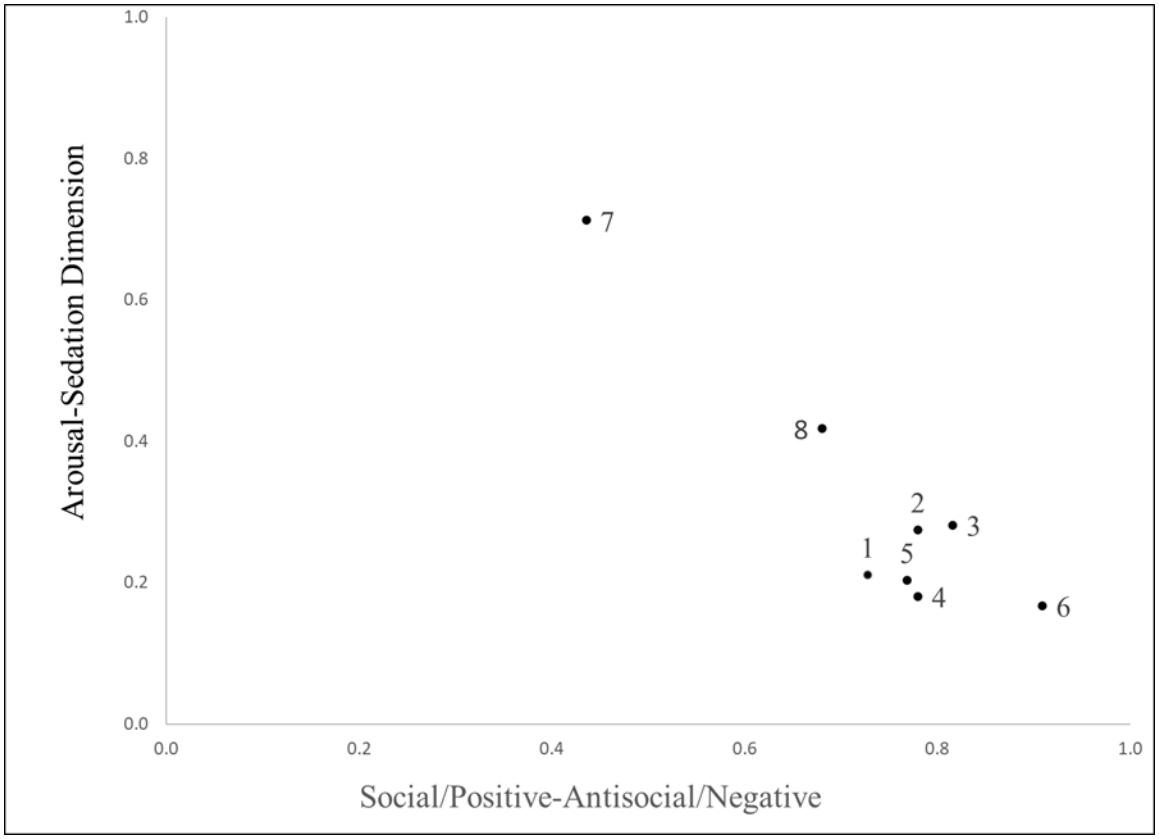

Figure 5. *Individual Differences Scaling (INDSCAL) participant group weights on positive-negative dimensions utilizing the Comprehensive Effects of Alcohol (CEOA).*

Note. 1 = male pre-control; 2 = female pre-control; 3 = male pre-ECALC; 4 = female pre-ECALC; 5 = male post-control; 6 = female post-control; 7 = male post-ECALC; 8 = female post ECALC.

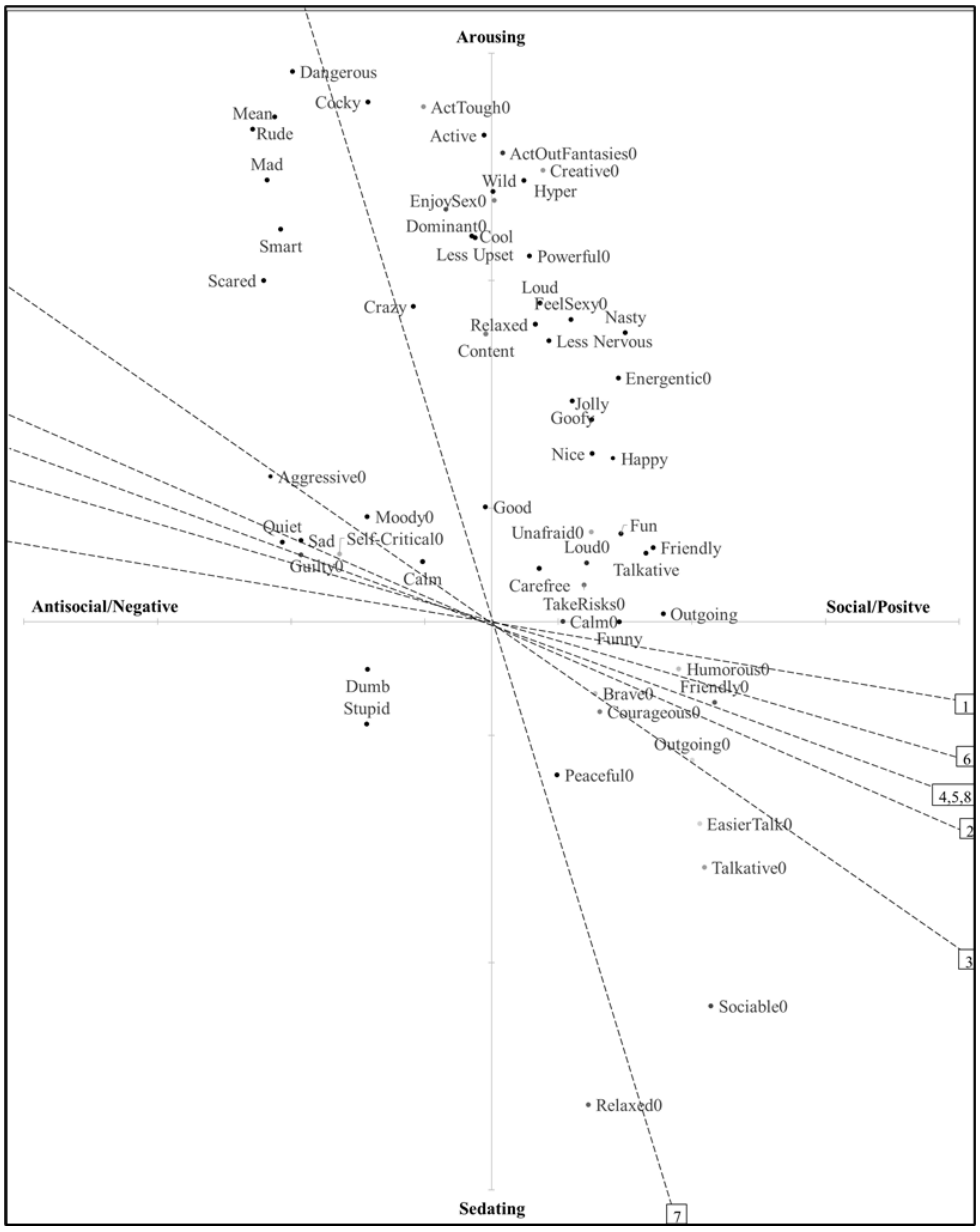

Figure 6. *Individual Differences Scaling (INDSCAL) stimulus configuration with PREFMAP vectors representing possible paths of activation through a memory network pre- and post-intervention/control utilizing the Comprehensive Effects of Alcohol (CEOA) and Memory Model-Based Expectancy Questionnaire (MMBEQ).*

Note. 1 = male pre-control; 2 = female pre-control; 3 = male pre-ECALC; 4 = female pre-ECALC; 5 = male post-control; 6 = female post-control; 7 = male post-ECALC; 8 = female post ECALC. Items with a 0 are from the CEOA.

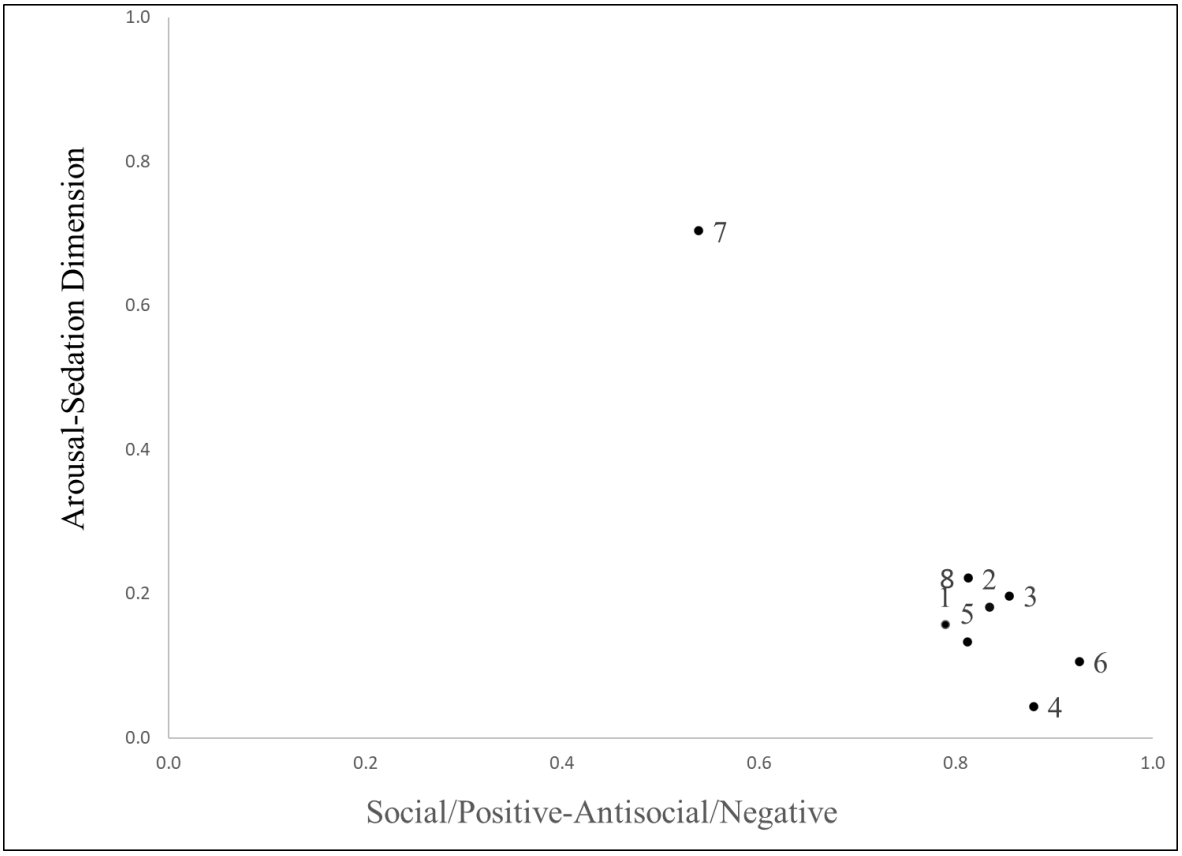

Figure 7. *Individual Differences Scaling (INDSCAL) participant group weights on positive-negative dimensions utilizing the Comprehensive Effects of Alcohol (CEOA) and Memory Model-Based Expectancy Questionnaire (MMBEQ).*

Note. 1 = male pre-control; 2 = female pre-control; 3 = male pre-ECALC; 4 = female pre-ECALC; 5 = male post-control; 6 = female post-control; 7 = male post-ECALC; 8 = female post ECALC.

APPENDIX A: SCREENING SURVEY

Screening Survey

What is your first name?: _____

What is your last name?: _____

What is your email address?: _____

What is your phone number?: _____

How old are you?: _____

What is your biological sex?:

MALE FEMALE OTHER

What year are you in school?

FRESHMAN SOPHOMORE JUNIOR SENIOR

What answer best describes your race? (choose all that apply):

WHITE/CAUCASIAN BLACK/AFRICAN AMERICAN ASIAN

NATIVE HAWAIIAN/PACIFIC ISLANDER

AMERICAN INDIAN/ALASKAN NATIVE

OTHER

Do you identify as Hispanic, Latino, or Latinx?

YES NO

In the past 30 days, have you had more than 4 drinks (for women) or 5 drinks (for men) in one sitting?

YES NO

APPENDIX B: GROUP CONSENT FORM

UNIVERSITY OF CENTRAL FLORIDA

EXPLANATION OF RESEARCH

Title of Project: Effectiveness of the Expectancy Challenge Alcohol Literacy Curriculum for College Students

Principal Investigator: Jessica Flori

Other Investigators: Mark Crisafulli, Gabrielle Lynch, Amy Sparks, Emy Willis

Faculty Supervisor: Michael Dunn, PhD.

You are being invited to take part in a research study. Whether you take part is up to you. The purpose of this study is to investigate students' alcohol use behaviors, and beliefs about alcohol. The researchers hope to learn more about how information presented to college students about media literacy may affect these behaviors and beliefs.

Your participation will involve completing pre-survey before watching a presentation about alcohol in a group setting with other study participants. Which presentation you will watch will be assigned randomly. You will not be able to choose or change which presentation you watch. During the presentation, you will interact with trained facilitators that will guide you through the information. After the presentation, you will be asked to complete a short post-survey. One month after the presentation, you will be asked to complete the follow-up survey. Additionally, six months after the presentation, will asked to complete a follow up survey. The pre, post, and two follow-up surveys will ask you about alcohol use and related attitudes and behaviors. You do not have to answer every question or complete every task. You will not lose any benefits if you skip questions or tasks.

Location: University of Central Florida- Psychology Building

Time Required: We expect participation in this study will require approximately 2.5 hours over the course of a six month period. Completing this consent form will take approximately 15 minutes. You will also be asked to complete a questionnaire before the presentation which will require approximately 15 minutes of your time, the presentation which will require approximately 60 minutes of your time, and a brief post-presentation survey which will require approximately 15 minutes of your time. In one month and six months, you will be asked to complete additional questionnaires that will take approximately 30 minutes of your time each.

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Your participation in this study is voluntary. You are free to withdraw your consent and discontinue participation in this study at any time without prejudice or penalty. Your decision to participate or not participate in this study will in no way affect your relationship with UCF, including continued enrollment, grades, employment or your relationship with the individuals who may have an interest in this study.

Risks: There are no reasonably foreseeable risks or discomforts involved in taking part in this study. This survey contains questions about alcohol use and personal questions about alcohol consumption. Due to the sensitivity of the subject, if at any time during the survey you feel uncomfortable please stop and close the survey. Should you have an emotional reaction to any of the material presented, or concern specific to the content regarding your alcohol consumption, please notify the following resources for further services and information:

Behavioral Health Clinic in the Student Health Center or Intervention Services Counseling Center

University of Central Florida
Orlando, FL 32816-3330
407.823.2924

University Of Central Florida
Orlando, FL 32816-3330
407.823.2811

Benefits: We cannot promise any benefits to you or others from your taking part in this research. However, possible benefits include an increased understanding how media influences our attitudes and beliefs about alcohol. You may also gain a greater understanding of research and the research process through your participation in this study.

Compensation or payment: You will receive 2 SONA points for completing the consent, in-person questionnaires, and presentation today. If you are eligible for receiving SONA credit, you will receive an additional 0.5 SONA points for each follow up survey completed. You are eligible for completing follow up surveys at six months regardless of whether or not you are enrolled in an additional psychology class. For the 6 month follow up survey, you can choose to receive SONA credit or a $5 Amazon gift card. If you choose not to participate, you may notify your instructor and ask for an alternative assignment of equal effort for equal credit. There will be no penalty if you choose to discontinue your participation in this study at any time.

Confidential research: You will be assigned a unique code number so we can link the information you provide at each point during the study, but your name will never be associated with this code. In other words, after you complete the online screening measures and are contacted to schedule your participation in the study, the information you provide throughout the study will be confidential and your name will never be linked with the information you provide. No one, not even members of the research team will know that the information you gave came from you. You will be asked to provide contact information in the form of an email address and phone number to contact you with reminders about follow up assessments. At the completion of the study, your contact information will be destroyed.

You must be 18 years of age or older to take part in this research study.

Study contact for questions about the study or to report a problem: If you have questions, concerns, or complaints: Jessica Flori, Graduate Student, Clinical Psychology PhD Program, College of Sciences, (407) 823-4344 or by email at Jessica.flori@ucf.edu or Dr. Michael Dunn, Faculty Supervisor, Department of Psychology at (407) 823-2522 or by email at michael.dunn@ucf.edu.

IRB contact about your rights in this study or to report a complaint: If you have questions about your rights as a research participant, or have concerns about the conduct of this study, please contact Institutional Review Board (IRB), University of Central Florida, Office of Research, 12201 Research Parkway, Suite 501, Orlando, FL 32826-3246 or by telephone at (407) 823-2901, or email irb@ucf.edu.

APPENDIX C: GREEK CONSENT FORM

UNIVERSITY OF CENTRAL FLORIDA

EXPLANATION OF RESEARCH

Title of Project: Effectiveness of the Expectancy Challenge Alcohol Literacy Curriculum for Greek Life

Principal Investigator: Jessica Flori

Other Investigators: Mark Crisafulli, Gabrielle Lynch, Amy Sparks, Emy Willis

Faculty Supervisor: Michael Dunn, PhD.

You are being invited to take part in a research study. Whether you take part is up to you. The purpose of this study is to investigate students' alcohol use behaviors, and beliefs about alcohol. The researchers hope to learn more about how information presented to college students about media literacy may affect these behaviors and beliefs.

Your participation will involve completing pre-survey before watching one of two presentations about alcohol. Which presentation you will watch will be assigned randomly. You will not be able to choose or change which presentation you watch. During the presentation, you will interact with trained facilitators in person or via zoom that will guide you through the information. After the presentation, you will be asked to complete a short post-survey. One month after the presentation, you will be asked to complete the follow-up survey. Additionally, six months after the presentation, will asked to complete a follow up survey. The pre, post, and follow-up questions will ask you about alcohol use and related attitudes and behaviors. You do not have to answer every question or complete every task. You will not lose any benefits if you skip questions or tasks.

Location: Rollins College or UCF - Greek Life Houses OR via Zoom

Time Required: We expect participation in this study will require approximately 2.5 hours over the course of a six month period. Completing this consent form will take approximately 15 minutes. You will also be asked to complete a questionnaire before the presentation which will require approximately 15 minutes of your time, the presentation which will require approximately 60 minutes of your time, and a brief post-presentation survey which will require approximately 15 minutes of your time. In one month and six months, you will be asked to complete additional questionnaires that will take approximately 30 minutes of your time each.

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Your participation in this study is voluntary. You are free to withdraw your consent and discontinue participation in this study at any time without prejudice or penalty.

Through use of a code page, you will be assigned a unique code number so we can link the information you provide at each point during the study, but your name will never be associated with this code. No one, not even members of the research team will know that the information you gave came from you.

This survey contains questions about alcohol use and personal questions about alcohol consumption. If at any time during the survey you feel uncomfortable, please stop and close the survey. Should you have an emotional reaction to any of the material presented, or concern specific to the content regarding your alcohol consumption, please notify the following resources for further services and information:

For UCF participants:

- Behavioral Health Clinic in the Student Health Center at 407.823.2924
- Intervention Services Counseling Center at 407.823.2811

For Rollins College participants:

- Wellness Counseling Center 407.628.6340

You must be 18 years of age or older to take part in this research study.

Study contact for questions about the study or to report a problem:

If you have questions, concerns, or complaints: Jessica Flori, Graduate Student, Clinical Psychology PhD Program, College of Sciences, (407) 823-4344 or by email at jessica.flori@ucf.edu or Dr. Michael Dunn, Faculty Supervisor, Department of Psychology at (407) 823-2522 or by email at michael.dunn@ucf.edu.

IRB contact about your rights in this study or to report a complaint: If you have questions about your rights as a research participant, or have concerns about the conduct of this study, please contact Institutional Review Board (IRB), University of Central Florida, Office of Research, 12201 Research Parkway, Suite 501, Orlando, FL 32826-3246 or by telephone at (407) 823-2901, or email irb@ucf.edu.

APPENDIX D: ANONYMOUS CODE PAGE

What is your zodiac sign (PICK ONLY ONE):

Aquarius (Jan21-Feb19) Pisces (Feb 20-Mar 20) Aries (Mar 21-Apr 20) Taurus (Apr21-May21)

Gemini (May22-Jun21) Cancer (June22-July22) Leo (Jul23-Aug21) Virgo (Aug22-Sep23)

Libra (Sep24-Oct 23) Scorpio (Oct 24-Nov22) Sagittarius(Nov 23-Dec 22) Capricorn (Dec 23-Jan 20)

How many BIOLOGICAL siblings do you have who are OLDER than you? (CIRCLE ONE)

0 1 2 3 4 5 or more

What is the FIRST LETTER of your BIOLOGICAL MOTHER'S FIRST name? (CIRCLE ONE)

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z Don't know/Not applicable

What is the FIRST LETTER of your BIOLOGICAL FATHER'S FIRST name? (CIRCLE ONE)

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z Don't know/Not applicable

What is the FIRST LETTER of the name of the high school you graduated from or intend to graduate from? (CIRCLE ONE)

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z Not applicable

What is the FIRST letter of the name of the city you were born in? (CIRCLE ONE)

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z Don't know

APPENDIX E: DEMOGRAPHICS QUESTIONNAIRE

DEMOGRAPHICS QUESTIONNAIRE

Age: _____ years old

Gender: Male Female Trans/Other

What year are you in school?

FRESHMAN SOPHOMORE JUNIOR SENIOR

Which answer best describes your ethnicity? (circle all that apply)

White/Hispanic	Black/ Hispanic
White/Non-Hispanic	Black/ Non-Hispanic
Asian	American Indian or Alaskan Native
Native Hawaiian or other	
Pacific Islander	Other:_____

Are you currently a member of a fraternity or sorority? (circle one)

YES NO

APPENDIX F: MEMORY MODEL-BASED EXPECTANCY QUESTIONNAIRE

MMBEQ (Adult Version)

The following pages contain words describing possible effects of alcohol. For each word, imagine it completing the sentence: "DRINKING ALCOHOL MAKES ME _____." Then, for each word circle the word that indicates how often you think that this effect **happens or could happen to you after drinking several drinks of alcohol**. "Drinking alcohol" refers to drinking any alcoholic beverage such as beer, wine, wine coolers, whiskey, vodka, gin, or mixed drinks.

There are no right or wrong answers. **Answer each item quickly according to your first impression and according to your own personal beliefs about the effects of alcohol.** Circle one answer for each question.

"DRINKING ALCOHOL MAKES ME _____."

1.	Less Nervous	**NEVER**	**SOMETIMES**	**USUALLY**	**ALWAYS**
2.	Active	**NEVER**	**SOMETIMES**	**USUALLY**	**ALWAYS**
3.	Cocky	**NEVER**	**SOMETIMES**	**USUALLY**	**ALWAYS**
4.	Content	**NEVER**	**SOMETIMES**	**USUALLY**	**ALWAYS**
5.	Dangerous	**NEVER**	**SOMETIMES**	**USUALLY**	**ALWAYS**
6.	Dizzy	**NEVER**	**SOMETIMES**	**USUALLY**	**ALWAYS**
7.	Dumb	**NEVER**	**SOMETIMES**	**USUALLY**	**ALWAYS**
8.	Friendly	**NEVER**	**SOMETIMES**	**USUALLY**	**ALWAYS**
9.	Funny	**NEVER**	**SOMETIMES**	**USUALLY**	**ALWAYS**
10.	Happy	**NEVER**	**SOMETIMES**	**USUALLY**	**ALWAYS**
11.	Loud	**NEVER**	**SOMETIMES**	**USUALLY**	**ALWAYS**
12.	Mad	**NEVER**	**SOMETIMES**	**USUALLY**	**ALWAYS**
13.	Nasty	**NEVER**	**SOMETIMES**	**USUALLY**	**ALWAYS**
14.	Pretty	**NEVER**	**SOMETIMES**	**USUALLY**	**ALWAYS**
15.	Relaxed	**NEVER**	**SOMETIMES**	**USUALLY**	**ALWAYS**

"DRINKING ALCOHOL MAKES ME _____."

16.	Rude	**NEVER**	**SOMETIMES**	**USUALLY**	**ALWAYS**
17.	Sad	**NEVER**	**SOMETIMES**	**USUALLY**	**ALWAYS**
18.	Scared	**NEVER**	**SOMETIMES**	**USUALLY**	**ALWAYS**
19.	Sleepy	**NEVER**	**SOMETIMES**	**USUALLY**	**ALWAYS**
20.	Slow	**NEVER**	**SOMETIMES**	**USUALLY**	**ALWAYS**
21.	Smart	**NEVER**	**SOMETIMES**	**USUALLY**	**ALWAYS**
22.	Talkative	**NEVER**	**SOMETIMES**	**USUALLY**	**ALWAYS**
23.	Wild	**NEVER**	**SOMETIMES**	**USUALLY**	**ALWAYS**
24.	Calm	**NEVER**	**SOMETIMES**	**USUALLY**	**ALWAYS**
25.	Fun	**NEVER**	**SOMETIMES**	**USUALLY**	**ALWAYS**
26.	Jolly	**NEVER**	**SOMETIMES**	**USUALLY**	**ALWAYS**
27.	Outgoing	**NEVER**	**SOMETIMES**	**USUALLY**	**ALWAYS**
28.	Quiet	**NEVER**	**SOMETIMES**	**USUALLY**	**ALWAYS**
29.	Cool	**NEVER**	**SOMETIMES**	**USUALLY**	**ALWAYS**
30.	Goofy	**NEVER**	**SOMETIMES**	**USUALLY**	**ALWAYS**
31.	Less Upset	**NEVER**	**SOMETIMES**	**USUALLY**	**ALWAYS**
32.	Mean	**NEVER**	**SOMETIMES**	**USUALLY**	**ALWAYS**
33.	Nice	**NEVER**	**SOMETIMES**	**USUALLY**	**ALWAYS**
34.	Sick	**NEVER**	**SOMETIMES**	**USUALLY**	**ALWAYS**
35.	Hurt Others	**NEVER**	**SOMETIMES**	**USUALLY**	**ALWAYS**

"DRINKING ALCOHOL MAKES ME _____."

36.	Forgetful	**NEVER**	**SOMETIMES**	**USUALLY**	**ALWAYS**
37.	Crazy	**NEVER**	**SOMETIMES**	**USUALLY**	**ALWAYS**
38.	Good	**NEVER**	**SOMETIMES**	**USUALLY**	**ALWAYS**
39.	Stupid	**NEVER**	**SOMETIMES**	**USUALLY**	**ALWAYS**
40.	Carefree	**NEVER**	**SOMETIMES**	**USUALLY**	**ALWAYS**
41.	Hyper	**NEVER**	**SOMETIMES**	**USUALLY**	**ALWAYS**

APPENDIX G: COMPREHENSIVE EFFECTS OF ALCOHOL SCALE

Comprehensive Effects of Alcohol Measure

The following section assesses what you would expect to happen <u>if you were under the influence of alcohol</u>.

If you do not drink alcohol, please answer questions based on your beliefs, knowledge, and understanding of the effects of alcohol.

Circle one option from disagree to agree – depending on whether you expect the effect to happen to you if you were <u>under the influence of alcohol</u>. These effects will vary, depending upon the amount of alcohol you typically consume.

<u>This is not a personality assessment</u>. We want to know what you expect to happen if you were to drink alcohol, not how you are when you are sober. Example: If you are always emotional, you <u>would not</u> circle agree as your answer unless you expected to become MORE EMOTIONAL if you drank.

<u>If I were under the influence of alcohol</u>:

1. I would be outgoing……....	Disagree	Slightly Disagree	Slightly Agree	Agree
2. My senses would be dulled……...	Disagree	Slightly Disagree	Slightly Agree	Agree
3. I would be humorous……....	Disagree	Slightly Disagree	Slightly Agree	Agree
4. My problems would seem worse……...	Disagree	Slightly Disagree	Slightly Agree	Agree
5. It would be easier to express my feelings……...	Disagree	Slightly Disagree	Slightly Agree	Agree
6. My writing would be impaired……..	Disagree	Slightly Disagree	Slightly Agree	Agree
7. I would feel sexy……Disagree		Slightly Disagree	Slightly Agree	Agree
8. I would have difficulty thinking……	Disagree	Slightly Disagree	Slightly Agree	Agree
9. I would neglect my obligations……Disagree		Slightly Disagree	Slightly Agree	Agree
10. I would be dominant……..	Disagree	Slightly Disagree	Slightly Agree	Agree
11. My head would feel fuzzy……..Disagree		Slightly Disagree	Slightly Agree	Agree
12. I would enjoy sex more……..Disagree		Slightly Disagree	Slightly Agree	Agree
13. I would feel dizzy……	Disagree	Slightly Disagree	Slightly Agree	Agree
14. I would be friendly……..	Disagree	Slightly Disagree	Slightly Agree	Agree
15. I would be clumsy……..	Disagree	Slightly Disagree	Slightly Agree	Agree
16. It would be easier to act out my fantasies……..	Disagree	Slightly Disagree	Slightly Agree	Agree
17. I would be loud, boisterous, or noisy……..	Disagree	Slightly Disagree	Slightly Agree	Agree
18. I would feel peaceful……..	Disagree	Slightly Disagree	Slightly Agree	Agree
19. I would be brave and daring……..	Disagree	Slightly Disagree	Slightly Agree	Agree
20. I would feel unafraid……...Disagree		Slightly Disagree	Slightly Agree	Agree
21. I would feel creative……..	Disagree	Slightly Disagree	Slightly Agree	Agree
22. I would be courageous……..	Disagree	Slightly Disagree	Slightly Agree	Agree
23. I would feel shaky or jittery the next day…….Disagree		Slightly Disagree	Slightly Agree	Agree
24. I would feel energetic……..	Disagree	Slightly Disagree	Slightly Agree	Agree
25. I would act aggressively……	Disagree	Slightly Disagree	Slightly Agree	Agree
26. My responses would be slow……..	Disagree	Slightly Disagree	Slightly Agree	Agree
27. My body will be relaxed……..	Disagree	Slightly Disagree	Slightly Agree	Agree

28. I would feel guilty……	Disagree	Slightly Disagree	Slightly Agree	Agree
29. I would feel calm……	Disagree	Slightly Disagree	Slightly Agree	Agree
30. I would feel moody……..	Disagree	Slightly Disagree	Slightly Agree	Agree
31. It would be easier to talk to people……..	Disagree	Slightly Disagree	Slightly Agree	Agree
32. I would be a better lover……	Disagree	Slightly Disagree	Slightly Agree	Agree
33. I would feel self-critical……..	Disagree	Slightly Disagree	Slightly Agree	Agree
34 I would be talkative……	Disagree	Slightly Disagree	Slightly Agree	Agree
35. I would act tough……	Disagree	Slightly Disagree	Slightly Agree	Agree
36. I would take risks……	Disagree	Slightly Disagree	Slightly Agree	Agree
37. I would feel powerful……..	Disagree	Slightly Disagree	Slightly Agree	Agree
38. I would act sociable……	Disagree	Slightly Disagree	Slightly Agree	Agree

APPENDIX H: DAILY DRINKING QUESTIONNAIRE REVISED (DDQ)

STANDARD DRINK CONVERSION

When asked how much you drink in the following questions use this chart.

ONE STANDARD DRINK IS EQUAL TO:

Standard American BEER (3-5% alcohol) — 12 oz. Can, Bottle or Glass

Microbrew or European BEER (8%-12% alcohol) — 1/2 of a 12 oz. Can or Bottle

WINE (12 – 17% alcohol) — 5 oz. Glass

WINE Cooler — 10 oz. Bottle

HARD LIQUOR (80-proof, 40% alcohol) — 1-1/2 oz. or One Standard Shot

HARD LIQUOR (100-proof, 50% alcohol) — 1 oz.

WINE: 1 Bottle

25 oz. (12 – 17% alcohol) = 5 standard drinks
40 oz. (12 – 17% alcohol) = 8 standard drinks

HARD LIQUOR: 1 Bottle (80-proof)

6.8 oz. (Half-Pint) = 4 standard drinks
12.7 oz. (Pint) = 8 standard drinks
33.8 oz. (Liter) = 22 standard drinks
59.2 oz (Handle) = 39 standard drinks

DDQ-R (Daily Drinking Questionnaire-Revised)

Gender: Male_____ Female_____ **Height** _____' _____" (Feet) (Inches) **Weight**_____ lbs.

INSTRUCTIONS FOR RECORDING DRINKING DURING A TYPICAL WEEK

IN THE CALENDAR BELOW, PLEASE FILL-IN YOUR DRINKING RATE AND TIME DRINKING DURING A **TYPICAL WEEK** IN THE LAST **30 DAYS.**

First, think of a *typical week* in the last *30 days you.* (Where did you live? What were your regular weekly activities? Where you working or going to school? Etc.) Try to remember as accurately as you can, *how much* and for *how long* you *typically drank* in a week during that one month period?

For each day of the week in the calendar below, fill in the **number of standard drinks typically consumed on that day** in the upper box and the **typical number of hours you drank** that day in the lower box.

Day of Week	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Number of *Drinks*							
Number of *Hours Drinking*							

INSTRUCTIONS FOR RECORDING DRINKING FOR YOUR HEAVIEST DRINKING WEEK

IN THE CALENDAR BELOW, PLEASE FILL-IN YOUR DRINKING RATE AND TIME DRINKING DURING YOUR **HEAVIEST DRINKING WEEK** IN THE LAST **30 DAYS.**

First, think of your *heaviest drinking week* in the last *30 days*. (Where did you live? What were your regular weekly activities? Where you working or going to school? Etc.)
Try to remember as accurately as you can, *how much* and for *how long* did you drink during your *heaviest drinking week* in that one month period?

For each day of the week in the calendar below, fill in the **number of standard drinks consumed on that day** in the upper box and the **number of hours you drank** that day in the lower box.

Day of Week	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Number of *Drinks*							
Number of *Hours Drinking*							

APPENDIX I: BRIEF YOUNG ADULT ALCOHOL CONSEQUENCES QUESTIONNAIRE

Below is a list of things that sometimes happen to people either during, or after they have been drinking alcohol. Next to each item below, please circle either YES or NO to indicate whether that item describes something that has happened to you **IN THE PAST MONTH.**
In the **past month**…

		CIRCLE ONE	
1	While drinking, I have said or done embarrassing things.	YES	NO
2	I have had a hangover (headache, sick stomach) the morning after I had been drinking.	YES	NO
3	I have felt very sick to my stomach or thrown up after drinking.	YES	NO
4	I have often ended up drinking on nights when I had planned not to drink.	YES	NO
5	I have taken foolish risks when I have been drinking.	YES	NO
6	I have passed out from drinking.	YES	NO
7	I have found that I need larger amounts of alcohol to feel any effect, or that I could no longer get high or drunk on the amount that used to get me high or drunk.	YES	NO
8	When drinking, I have done impulsive things that I regretted later.	YES	NO
9	I've not been able to remember large stretches of time when drinking heavily.	YES	NO
10	I have driven a car when I knew I had too much to drink to drive safely.	YES	NO
11	I have not gone to work or missed classes at school because of drinking, a hangover, or illness caused by drinking.	YES	NO

12	My drinking has gotten me into sexual situations I later regretted	YES	NO
13	I have often found it difficult to limit how much I drink.	YES	NO
14	I have become very rude, obnoxious or insulting after drinking.	YES	NO
15	I have woken up in an unexpected place after heavy drinking.	YES	NO
16	I have felt badly about myself because of my drinking.	YES	NO
17	I have had less energy or felt tired because of my drinking.	YES	NO
18	The quality of my work or schoolwork has suffered because of my drinking.	YES	NO
19	I have spent too much time drinking.	YES	NO
20	I have neglected my obligations to family, work, or school because of drinking.	YES	NO
21	My drinking has created problems between myself and my boyfriend/girlfriend/spouse, parents, or other near relatives.	YES	NO
22	I have been overweight because of drinking.	YES	NO
23	My physical appearance has been harmed by my drinking.	YES	NO
24	I have felt like I need a drink after I'd gotten up (that is, before breakfast).	YES	NO

APPENDIX J: IRB APPROVAL LETTERS

University of Central Florida Institutional Review Board
Office of Research & Commercialization
12201 Research Parkway, Suite 501
Orlando, Florida 32826-3246
Telephone: 407-823-2901 or 407-882-2276
www.research.ucf.edu/compliance/irb.html

Approval of Human Research

From: **UCF Institutional Review Board #1**
FWA00000351, IRB00001138

To: **Jessica Flori and Co-PI: Mark Crisafulli**

Date: **September 21, 2018**

Dear Researcher:

On 09/21/2018 the IRB approved the following modifications until 05/02/2019 inclusive:

Type of Review:	IRB Addendum and Modification Request Form Expedited Review
Modification Type:	Addition of research personnel: Charlotte Stephens, Mark Crisafulli, Gina Cilluffo
Project Title:	Effectiveness of the Expectancy Challenge Alcohol Literacy Curriculum in Reducing Heavy Drinking Among College Students
Investigator:	Jessica Flori
IRB Number:	SBE-17-13574
Funding Agency:	
Grant Title:	
Research ID:	N/A

The scientific merit of the research was considered during the IRB review. The Continuing Review Application must be submitted 30 days prior to the expiration date for studies that were previously expedited, and 60 days prior to the expiration date for research that was previously reviewed at a convened meeting. Do not make changes to the study (i.e., protocol, methodology, consent form, personnel, site, etc.) before obtaining IRB approval. A Modification Form **cannot** be used to extend the approval period of a study. All forms may be completed and submitted online at https://iris.research.ucf.edu .

If continuing review approval is not granted before the expiration date of 05/02/2019, approval of this research expires on that date. When you have completed your research, please submit a Study Closure request in iRIS so that IRB records will be accurate.

All data, including signed consent forms if applicable, must be retained and secured per protocol for a minimum of five years (six if HIPAA applies) past the completion of this research. Any links to the identification of participants should be maintained and secured per protocol. Additional requirements may be imposed by your funding agency, your department, or other entities. Access to data is limited to authorized individuals listed as key study personnel.

In the conduct of this research, you are responsible to follow the requirements of the Investigator Manual.

This letter is signed by:

UNIVERSITY OF CENTRAL FLORIDA

Institutional Review Board
FWA00000351
IRB00001138
Office of Research
12201 Research Parkway
Orlando, FL 32826-3246

EXEMPTION DETERMINATION

September 23, 2019

Dear Jessica Flori:

On 9/23/2019, the IRB determined the following submission to be human subjects research that is exempt from regulation:

Type of Review:	Initial Study, Exempt Category
Title:	Effectiveness of the Expectancy Challenge Alcohol Literacy Curriculum for College Students
Investigator:	Jessica Flori
IRB ID:	STUDY00000811
Funding:	None
Grant ID:	None

This determination applies only to the activities described in the IRB submission and does not apply should any changes be made. If changes are made, and there are questions about whether these changes affect the exempt status of the human research, please contact the IRB. When you have completed your research, please submit a Study Closure request so that IRB records will be accurate.

If you have any questions, please contact the UCF IRB at 407-823-2901 or irb@ucf.edu. Please include your project title and IRB number in all correspondence with this office.

Sincerely,

Kamille Chaparro
Designated Reviewer

UNIVERSITY OF CENTRAL FLORIDA

Institutional Review Board
FWA00000351
IRB00001138
Office of Research
12201 Research Parkway
Orlando, FL 32826-3246

EXEMPTION DETERMINATION

September 16, 2019

Dear Jessica Flori:

On 9/16/2019, the IRB determined the following submission to be human subjects research that is exempt from regulation:

Type of Review:	Initial Study, Exempt Category
Title:	Effectiveness of the Expectancy Challenge Alcohol Literacy Curriculum for Greek Life
Investigator:	Jessica Flori
IRB ID:	STUDY00000810
Funding:	None
Grant ID:	None

This determination applies only to the activities described in the IRB submission and does not apply should any changes be made. If changes are made, and there are questions about whether these changes affect the exempt status of the human research, please contact the IRB. When you have completed your research, please submit a Study Closure request so that IRB records will be accurate.

If you have any questions, please contact the UCF IRB at 407-823-2901 or irb@ucf.edu. Please include your project title and IRB number in all correspondence with this office.

Sincerely,

Kamille Chaparro
Designated Reviewer

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