Decreasing Alcohol Use Among High School Students By Challenging Alcohol Expectancies

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REDUCING ALCOHOL CONSUMPTION AMONG HIGH SCHOOL STUDENTS BY CHALLENGING ALCOHOL EXPECTANCIES

by

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ABSTRACT

Altering alcohol expectancies has reduced alcohol use among college students and may lead to successful prevention of alcohol use among high school students. We randomly assigned 379 12th-grade students to an expectancy challenge, traditional alcohol information, or control condition, and used Individual Differences Scaling to map expectancies into memory network format with Preference Mapping to model likely paths of association. After expectancy and traditional alcohol interventions, higher drinking male participants exhibited a greater likelihood to associate alcohol use with negative and sedating consequences and a decreased likelihood to associate alcohol with positive and arousing consequences. Drinking decreases paralleled the magnitude of changes in their likely path of expectancy activation. Children and adults who emphasize negative and sedating effects have been found to be less likely to use alcohol. Therefore, expectancy challenge interventions that have been successful at modifying expectancies and subsequently decreasing alcohol consumption among heavy drinking college students may be useful in the development of prevention curricula for high school students.

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LIST OF ACRONYMS/ABBREVIATIONS

INDSCAL	Individual Differences Scaling
PREFMAP	Preference Mapping

INTRODUCTION

Existing empirical research on the effectiveness of school-based substance use prevention programs indicate more effective prevention programs are needed. Specifically, commonly implemented approaches have not been found to be effective in significantly reducing substance use in later years (White & Pitts, 1998; Gorman, 1998**)** and use of most substances has not decreased significantly over the past 15 years. This lack of effectiveness could be due to the fact that "most of the money spent in this country on drug education has not been spent on promising programs" (p. 166, Dusenbury & Falco, 1994). Recent reviews of the prevention literature suggest that the effectiveness of school-based alcohol use prevention programs in decreasing actual substance use is small when measured using immediate post-tests (Tobler, Roona, Ochshorn, Marshaall, Streke, & Stackpole, 2000) and non-existent or negative at longer follow-ups (Dunn, Bowers, Cruz, Ingram, & Besaw, 1998; West & O'Neal, 2004). The lack of effectiveness of popular programs could be due to the fact that many of the commonly implemented school-based prevention programs (e.g., Project DARE) are intuitive rather than research-based (Dusenbury & Falco, 1995). Although theoretically-based programs have been designed and implemented with promising results on a variety of variables, these approaches have only just begun to evaluate and incorporate the vast number of variables that have been associated with substance use (e.g., Botvin & Griffin, 2004; Cuijpers, 2001; Ellickson & Bell, 1990; Graham, Johnson, Hansen, Flay, & Gee, 1990; Sussman, Dent, & Stacy, 2002). New efforts to develop prevention strategies that target potential causal mechanisms are clearly warranted. These efforts are particularly important among high school students, given the continued prevalence of substance use and associated negative consequences among this population.

One promising area in alcohol prevention research makes use of information about the effects of alcohol stored in memory, often referred to as alcohol expectancies. Recent conceptualizations of expectancies have advanced the concept that expectancies can be "seen as a functional approach to adaptation and survival that has been manifested in multiple biological systems using different structures and processes (Goldman, in press)." Such expectancies may prove to be crucial in primary alcohol prevention because expectancies about the affective and behavioral effects of alcohol may serve as a common pathway between antecedent variables and actual drinking (Goldman, Brown, Christiansen, & Smith, 1991; Stacy, Widaman, & Marlatt, 1990). Support for a causal relationship between alcohol expectancies and alcohol consumption comes from studies that have found that expectancies exist prior to drinking experience (e.g., Kraus, Smith, & Ratner, 1994; Dunn & Goldman, 1996), predict drinking initiation (e.g., Christiansen, Smith, Roehling & Goldman, 1989), differentiate light drinking and heavy drinking children and adults (e.g., Dunn & Goldman, 1998, 2000; Dunn & Earlywine, 2001; Rather, Goldman, Roehrich, & Brannick, 1992; Rather & Goldman, 1994), and mediate the influence of antecedent variables on alcohol use (Goldman & Darkes, 1997; Sher, Walitzer, Wood, & Brent, 1991; Stacy, Newcomb, & Bentler, 1991). Furthermore, manipulation of expectancies has been shown to consequently decrease drinking significantly in heavy drinking college students (Darkes & Goldman, 1993, 1998; Dunn, Lau, & Cruz, 2000).

Numerous studies have focused on memory processes to gain a better understanding of the relationship between stored information about drugs and actual substance use. Stacy and colleagues have employed association measures to successfully demonstrate a clear and consistent relationship between memory processes and use of alcohol, marijuana, cocaine, and smokeless tobacco (Stacy, 1997; Stacy, Leigh, & Weingardt, 1994; Stacey, Newcomb, & Bentler, 1995; Stacy, Dent, Sussman, & Raynor, 1990). Goldman and colleagues have pursued a

different, but complementary approach to studying memory processes and have focused primarily on alcohol use. They have asserted that expectancies could be conceptualized as units of information about the effects of alcohol acquired in childhood and young adulthood. Furthermore, this information may be stored in an associative memory network (and at numerous other levels in the nervous system ranging from individual neurons to higher order cognitive processes) and subsequently influences an individual's decision to drink (Goldman, in press; Goldman, 1989; Goldman, Del Boca, & Darkes, 1999; Goldman & Rather, 1993). Alcohol expectancies may be represented in associative networks by information nodes that are linked together based on intrinsic meaning and learning history (Collins & Loftus, 1975; Rather et al., 1992). It has been hypothesized that the strength of associations between nodes in the network represents the strength of associations between units of information about the effects of alcohol (Goldman, 1989). Additionally, higher order concepts are formed when activation spreads from node to related node in response to particular stimuli (Goldman & Rather, 1993).

A memory framework is a useful working model because such models can be formalized through mathematical procedures such as Multidimensional Scaling (MDS). These statistical procedures provide a graphic or pictorial representation of stimulus items, which are "mapped" relative to each other in multidimensional space (Goldman & Rather, 1993). The space between stimulus items represents psychological similarity or difference between those items. In other words, items closer to each other in the stimulus configuration are more likely to be activated together. These scaling procedures are particularly helpful in that they provide insight into the complex relationships among different expectancies and how these expectancies may combine and operate to affect drinking behavior (Rather et al., 1992).

Individual Differences Scaling (INDSCAL), a variant of MDS, has been used to model the organization and activation of expectancy information in the memory of children (Dunn & Goldman, 1996, 1998) and adults (Dunn et al., 2000; Dunn & Earleywine 2001; Rather & Goldman, 1994; Rather et al., 1992). Children tended to organize expectancy information along the same dimensions as adults (i.e., positive-negative and arousal-sedation). However, the expectancies most likely to activate changed as a function of age. For younger children (2nd grade), it was found that alcohol expectancies were organized almost entirely along a positive-negative dimension and that negative expectancies were more likely to activate than positive ones. On the other hand, older children (4th & 5th graders) were more likely to expect positive and arousing outcomes from drinking (Dunn & Goldman, 1996). In turn, evidence suggests that such changes in alcohol expectancy information may influence the initiation and development of drinking as children age into adolescence (e.g., Miller, Smith, & Goldman, 1990). In a study that modeled activation patterns of children in 3rd through 12th grade in relation to drinking, it was found that higher drinking children in each grade were more likely to activate positive and arousing expectancies in memory than lower drinking children (Dunn & Goldman, 1998). These MDS findings were subsequently validated through other means of tapping memory processes (Dunn & Goldman, 2000). In addition, INDSCAL has been used to show that alcohol expectancy activation patterns of children are malleable (Dunn & Yniguez, 1999), that changes in likely activation patterns predict subsequent changes in actual alcohol use (Dunn et al., 2000), and that likely expectancy activation patterns vary in relation to the ascending or descending limb of the blood alcohol curve (Dunn & Earleywine, 2001). Specifically, heavier drinkers were more likely to activate positive and arousing expectancies experienced as blood alcohol levels increase (the ascending limb of the blood alcohol curve), whereas lighter drinkers were more

likely to activate negative and sedating expectancies experienced as blood alcohol levels fall (the descending limb of the blood alcohol curve). Finally, INDSCAL has been applied to show that expectancy activation patterns vary in relation to use of other substances including marijuana (Linkovich-Kyle & Dunn, 2001), MDMA (Harper, Dunn, & Earleywine, 2001), and cigarette smoking (Linkovich-Kyle & Dunn, 1998).

In the studies noted above that used INDSCAL to model alcohol expectancies, it was consistently found that less emphasis on positive and arousing effects and greater emphasis on negative and sedating effects corresponded to less alcohol use, and in one study, this pattern of expectancy emphasis actually predicted future decreases in alcohol use (Dunn et al., 2000). In concert, these findings indicate that prevention approaches developed to undermine the anticipation of positive effects of alcohol may be more effective than traditional knowledge-based prevention approaches. The efficacy of this concept has already been demonstrated in a secondary intervention effort described as an "expectancy challenge" (Darkes & Goldman, 1993, 1998; Dunn et al., 2000). In this series of studies, heavy drinking college students were exposed to an intervention that challenged their expectancies of positive arousal in relation to alcohol use. In all three studies, the expectancies of males were changed and their drinking subsequently decreased. In one study, it was shown that decreased activation of positive and arousing consequences in memory predicted subsequent decreases in alcohol use (Dunn et al., 2000).

Although previous expectancy challenge studies have successfully changed expectancies and subsequently decreased drinking significantly among heavy-drinking college students, efforts to incorporate expectancy modification strategies into alcohol prevention are still in their infancy. In our previous study (Cruz & Dunn, 2003), we attempted to extend the expectancy challenge approach for the first time to primary prevention. We compared a newly developed

interactive classroom exercise designed to alter the expectancy processes of twelfth grade children to a traditional alcohol education control group and an assessment-only control group. Twelfth graders were selected as the target population for this study based on previous studies that identified a developmental shift toward positive alcohol expectancies that is most pronounced between the third and fifth grades (Miller et al., 1990; Dunn & Goldman, 1996, 1998, 2000). Expectancy processes were empirically modeled before and after treatment to assess the impact of these interventions on expectancy activation patterns in memory. As hypothesized, students exposed to the alcohol expectancy modification condition, relative to students in the control conditions, exhibited a decreased emphasis on the arousal-sedation dimension and an increased emphasis on the positive-negative dimension, which is consistent with a decreased likelihood to drink in the future (Dunn & Goldman, 1998; Dunn et al., 2000). Additionally, results indicated that the association paths of children who participated in the expectancy modification exercise changed in a pattern similar to that observed in the heavy drinking college males, with negative-sedating expectancies (such as feeling sleepy, tired, and dizzy) becoming more likely to activate after exposure to the expectancy modification alcohol prevention exercise. Actual alcohol consumption, however, could not be measured due to the extremely low drinking rates among children in 4th grade. Therefore, the purpose of the present study is to modify the Darkes & Goldman (1993, 1998) expectancy challenge protocol, implement, and test its effectiveness in reducing alcohol use among 12th grade students. Twelfth-grade students were targeted because they have initiated regular consumption of alcohol. Further, the present study compares the effectiveness of this expectancy modification strategy in reducing alcohol consumption against a traditional alcohol education control group and an assessment-only control group.

METHODOLOGY

Participants

Participants were 379 twelfth grade students (49% male and 51% female) from two public high schools. Detailed demographics for each ethnic group by experimental condition are presented in Table 1. Chi-square analyses conducted to assess equivalence of gender and ethnicity across experimental groups indicated no significant differences between groups ($\chi 2$ = 4.54, p = .605). An active informed consent procedure was used in which parents were informed of the research and were asked to provide permission for their child to participate in the study. Only students who returned parental permission forms participated. Ninety-two percent of parents and students provided consent and assent to participate. Of those students, 89% completed pre- and post-test measures. Chi-square analyses indicated no significant differences on initial test data between these participants and participants with missing data. All data were collected in classroom settings.

Measures

Memory-Model Based Expectancy Measure. Expectancies were assessed using a memory model-based instrument developed in previous work (MMBEQ; Dunn & Goldman, 1996, 1998; Dunn et al., 2000; Dunn & Yniguez, 1999). A sample of this measure is provided in Appendix A. This measure consists of 41 expectancy words or phrases that can be readily mapped into network format with MDS techniques and has been used to differentiate between heavier and lighter drinking children and adults (Dunn et al., 2000; Dunn & Goldman, 1998). Students were asked to indicate on a 4-point Likert scale how often "people" feel the alcohol expectancy effect depicted by each word in the instrument when they consume alcohol.

Coefficient alpha was .78 for a sample of 4th and 5th graders (n = 362), .79 for a sample of 6th, 9th and 12th graders (n = 1,003), and .95 for a sample of college undergraduates (n = 243; Dunn, 2000).

Timeline follow-back. Drinking was assessed with a timeline follow-back procedure (Sobell, Sobell, Klajner, Pavan, & Basian, 1986) for the 30-day period before and the 30-day period after participation in the study. Participants recorded their alcohol intake on a 1-month calendar with self-identified reference points to facilitate memory. A sample calendar is provided in Appendix B. Such procedures have been found to minimize memory errors and the validity of such self-reports of drinking behavior has been demonstrated among adults (e.g., Babor, Brown, & DelBoca, 1990; Sobell & Sobell, 1990) and children (Smith, McCarthy, & Goldman, 1995). Participant drinking by gender and condition at each assessment time is presented in Table 2. A one-way ANOVA conducted to assess equivalence of alcohol consumption across experimental conditions at pre-assessment indicated no significant drinking differences between groups ($F = 0.005$, $p = 0.995$). This measure also included demographic questions regarding age, sex, and ethnicity. A sample of this survey is provided in Appendix C.

Procedure

Students were informed of the upcoming research project, and written information on the study was distributed to be taken home to parents. Parents were informed that their child's classroom may be selected to receive one of two one-session alcohol prevention presentations (expectancy modification or traditional alcohol education) or selected for an anonymous survey. Classrooms were then randomly assigned to one of three treatment conditions (expectancy modification, traditional alcohol education, or assessment-only control).

Administration of Pre-Test Measures with All Conditions. At least two weeks after permission slips were given to students to take home to parents, the primary researcher visited classrooms to administer pre-test measures. The pre-test session with each participating class consisted of administration of pre-test questionnaires (expectancy questionnaire and demographic/drinking measure) and a brief introduction to the purpose of the visit. Students in the expectancy and alcohol education conditions were informed that the next visit would consist of a brief presentation in which they would engage in interactive games and discussions involving alcohol-related information. The assessment-only control group was informed of the next visit to complete a survey and thanked participating in the study.

Expectancy Modification Condition. One week after the pre-test data collection visit, the primary researcher visited the classrooms assigned to the expectancy modification condition. The purpose of this visit was to implement a strategy designed to increase participants' attention to the sedating effects of alcohol and undermine the anticipation of arousing effects believed to be associated with alcohol use. The protocol designed for the expectancy modification condition was based on the Expectancy Challenge protocol of Darkes & Goldman (1993, 1998). The expectancy modification presentations opened with the presenter eliciting beliefs about the effects of alcohol and why they think "people" drink. Students were then shown picture slides of images (e.g., clip art) depicting effects commonly believed to be associated with alcohol. This exercise served as the starting point of a brief discussion regarding the pharmacological (or "real") effects of excessive alcohol consumption.

At no point during the presentation were students encouraged to "say no" to alcohol or to believe that drinking is wrong. Instead, the emphasis was on challenging commonly held beliefs about positive social and arousing effects of alcohol (e.g., feeling happier, funnier, more social,

more outgoing, and friendlier). We explained that people expect positive effects from alcohol and that most positive effects of alcohol (e.g., feeling more fun, social, energetic, happy) are not necessarily pharmacological (or "real") effects. They also learned that people often drink excessively in pursuit of positive and arousing effects and that the "real" effects of alcohol (especially if consumed in large quantities) are sedation, tiredness, and dizziness because alcohol is a central nervous system depressant. The extent to which people experience positive effects from alcohol is directly related to their expectancies or beliefs. Additionally, we highlighted that individuals often consume alcohol in the presence of a variety of positive stimuli (e.g., with friends or family, at parties, at celebrations, etc.) and that perhaps the positive effects associated with alcohol are not a result of the pharmacological properties of alcohol but the environment in which it is consumed. As a result, individuals have a good time at a party not because they consumed alcohol, but because they were surrounded by friends, music, and other positive stimuli. However, because they were drinking alcohol, they may attribute the positive effects to alcohol. We then encouraged students not to make the same error. Once the "real" and "believed" effects of alcohol were presented and discussed, the class was divided into two teams to play a quiz game in which the objective was to correctly identify an effect of alcohol as "real" (pharmacological effect) or "believed" (expectancy effect). Incorrect responses during the game served as an opportunity for discussion of "real" effects of alcohol.

Traditional Alcohol Education Condition. As in the alcohol expectancy modification condition, one week after the pre-test data collection visit, the primary researcher visited the classrooms assigned to the traditional alcohol education condition. However, unlike the alcohol expectancy modification condition, the traditional alcohol education presentation emphasized the negative and dangerous effects of alcohol. In order to maintain similarity between both alcohol

prevention conditions, the presentation began with the presenter eliciting students' beliefs regarding the negative consequences associated with alcohol abuse. This exercise served as the starting point of a brief presentation regarding the harmful consequences associated with alcohol abuse. Similarly, the presenter used slides of pictures depicting dangerous or hazardous consequences associated with alcohol abuse such as auto accidents, cirrhosis of the liver, and dependence. Once the hazardous consequences of alcohol were discussed, the classroom was divided into two teams to play a quiz game in which the objective of the game was to recognize the negative consequences associated with alcohol abuse.

Students in the expectancy modification and alcohol education conditions were encouraged to remember the alcohol-related information they were presented and encouraged to make use of that information in future occasions when they may be faced with the opportunity and/or decision to consume alcohol.

Post-Test Meeting with All Conditions. Thirty days after receiving the alcohol prevention presentations, the primary researcher returned to the classrooms to administer post-test measures. After completion of the post-test measures, all participants were thanked for their participation in the research study.

RESULTS

Initial Participant Characteristics

A one-way analysis of variance (ANOVA) was conducted to assess alcohol consumption equivalence between experimental conditions at pre-assessment. Results indicated that alcohol consumption among participants across the three different conditions was not significantly different at baseline. Participant drinking data by experimental condition at pre-test are presented in Table 1. Additionally, MANOVAs were conducted to assess differences in alcohol expectancies among participants in the three experimental conditions at pre-test. No significant alcohol expectancy differences were found between groups at pre-test.

Changes in Alcohol Consumption

Gender and drinking level were taken into consideration in all analyses because the Darkes and Goldman (1993, 1998) expectancy challenge protocol was originally developed for and tested only on heavy drinking college males. To separate participants into lower drinking and higher drinking groups, a median split was conducted. Lower drinking participants consumed 6 drinks or less and higher drinking participants consumed more than 6 drinks at pre-test. For each drinking group (lower and higher drinking), drinking changes were assessed with a 3 (expectancy challenge, alcohol education, assessment-only control) x 2 (pre-post) x 2 (male, female) repeated measures ANOVA. Among higher drinking participants, results revealed a significant 3-way interaction between condition, gender, and assessment time, $\underline{F}(2,183) = 26.29$, $p < 0.005$. Post hoc analyses indicated that, for higher drinking male participants, exposure to the expectancy challenge and alcohol information conditions was associated with significant drinking decreases from pre- to post-intervention when compared to the assessment-only control

condition. As can be seen in Figure 1, higher drinking males who participated in the expectancy modification condition drank 29% less after exposure to the single-session presentation designed to alter social and positive alcohol-related expectancies. Higher drinking males in the alcohol information condition exhibited a drinking reduction of 9%. In contrast to higher drinking male participants, drinking did not change significantly among higher drinking female participants in any of the three conditions. Among lower drinking male and female participants, results indicated no significant drinking changes from pre- to post-intervention across the three conditions, $F(2,186 = .058, p = 0.944)$.

Configuration of Alcohol Expectancies in Memory

As in previous work (Dunn et al., 2000; Dunn & Earleywine, 2001; Dunn & Goldman, 1996, 1998; Dunn & Yniguez, 1999; Rather & Goldman, 1994), Individual Differences Scaling (INDSCAL) was used to map alcohol expectancies into memory network format, in which expectancies can be represented by nodes that are closely or more distantly linked. INDSCAL analyzes proximity matrices consisting of a measure of the relatedness for every possible combination of expectancy words. Additionally, it provides a pictorial representation of those expectancies which are mapped relative to each other in multidimensional space. An important feature of INDSCAL is that it simultaneously analyzes matrices of more than one group and computes a stimulus configuration that best represents the entire sample included in the analysis.

Given that lower drinking participants did not exhibit changes in alcohol consumption from pre- to post-test, the alcohol expectancies of higher drinking male participants are the focus of the remainder of this paper. Therefore, proximity matrices for higher drinking males of each experimental condition and assessment time were used as input for the INDSCAL analysis to produce a stimulus configuration representing the memory network of higher drinking males. A

two-dimensional solution (see Figure 1), accounting for 80.5% of the variance (stress = 0.22) was considered optimal based on Davison's (1992) technique of dimension selection. Stress and R are indices of the fit of the dimensional solution to the original data matrix; low stress and high R values indicate good fit. A three-dimensional solution offered only a small increase in variance accounted for (2.2%). As in previous work with adults (Dunn et al., 2000; Rather & Goldman, 1994) and children (Dunn & Goldman, 1996, 1998; Dunn & Yniguez, 1999; Dunn & Cruz, 2003), the two dimensions could best be described as representing positive-negative and arousing-sedating effects of alcohol.

Preference Mapping (PREFMAP) Analyses

Estes (1991) proposed that memory networks could be modeled using points in multidimensional space and plotting vectors representing paths of activation within cognitive space. PREFMAP is a multiple regression procedure that places a vector through a stimulus configuration that can be used to model association pathways through hypothetical expectancy networks. In previous alcohol expectancy research, studies using PREFMAP have indicated that association paths are related to drinking level in children (Dunn & Goldman, 1996, 1998) and in adults (Dunn et al., 2000; Dunn & Earleywine, 2001; Rather et al., 1992). Specifically, results indicated that as children get older and gain more drinking experience, they begin to associate alcohol with more positive and arousing outcomes (e.g., feeling "cool"). Similarly, heavier drinking adults are more likely to activate positive and arousing effects associated with drinking than lighter drinkers, who are more likely to activate sedating effects. Most recently, likely paths of association of heavy drinking college males changed toward negative and sedating expectancies after participating in an expectancy challenge program (Dunn et al., 2000). Further, changes in expectancy activation predicted a subsequent significant decrease in alcohol

consumption. Therefore, if the present brief expectancy modification exercise had an impact on higher drinking male participants' alcohol expectancies in a way that would change their alcohol consumption, it should be reflected in their likely paths of activation.

To plot paths of association in the present study, mean frequency of occurrence ratings for each expectancy word were computed for each of the six higher drinking male groups (expectancy modification, traditional alcohol information, and assessment-only control at pre- and post-test). These means were used by PREFMAP to plot vectors through the INDSCAL stimulus configuration. Resultant Rs were between .988 and .997 for each vector, and the overall root mean square was .994, indicating excellent fit of the PREFMAP vectors to the data. Examination of the PREFMAP vectors for each group depicted in Figure2 indicated that the association paths of higher drinking males who participated in the expectancy modification exercise were rotated toward the sedating end of the arousal-sedation dimension and were less likely to contain positive and arousing expectancies after intervention. Although the PREFMAP vector of higher drinking males who participated in the alcohol information condition was also rotated toward the sedating end of the arousal-sedation dimension, the rotation was smaller in magnitude in comparison to the expectancy modification condition. The PREFMAP vectors of participants in the assessment-only control condition exhibited a small clockwise rotation, which is not associated with significant drinking reductions in previous work. Therefore, in the present study, as in previous work (e.g., Dunn et al., 2000), substantial vector rotations among higher drinking males in the expectancy challenge and alcohol information conditions were associated with statistically significant changes in their drinking, whereas a small rotation among participants in the assessment-only control did not correspond to significant changes in drinking. Likely expectancy activation through the hypothetical memory network can be modeled by

moving a perpendicular line down each PREFMAP vector starting at the arrowhead, a technique that has been validated using the method most recommended by memory researchers to tap uncontaminated memory contents (Dunn & Goldman, 2000). Use of this technique suggested that the first 5 expectancies most likely to activate among the higher drinking males in expectancy modification condition before the intervention were *friendly, happy, relaxed, outgoing*, *funny,* and *outgoing*. In contrast, moving down the preference vectors at post-test indicated that the five expectancies most likely activate were *slow, sleepy, dizzy, sick,* and *stupid*. Consistent with previous work, negative-sedating expectancies (*sleepy, stupid,* and *sick*) became more likely to activate after treatment. Additionally, moving further down the preference vectors at post-test, positive expectancies such as *talkative* and *cool* were more likely to activate later in the sequence of activation in comparison to the path of activation at pre-test. Therefore, it appeared that participating in a brief alcohol expectancy modification exercise led to a greater likelihood of activating sedating and negative expectancies in memory among higher drinking males. Although changes in likely expectancy activation were also evident among higher drinking males exposed to the alcohol information condition, these changes were not as pronounced as in the expectancy modification condition. Use of the same technique required moving further down the preference vectors at post-test to note that sedating-negative expectancies such as *loud, crazy, sleepy, dizzy*, and *stupid* were more likely to activate earlier in the sequence of activation in comparison to the activation path at pre-test. These changes in likely activation were assessed prior to the significant drinking decreases noted after participating in the brief alcohol classroom presentations. In sum, changes in the likely expectancy activation paths paralleled drinking changes among higher drinking male participants. Specifically, the likely expectancy activation path for expectancy challenge males

was substantial, and was followed by a significant drinking decrease (29%). The changes in expectancy activation were less pronounced among males in the alcohol education condition, and subsequent drinking decreased by 9%. Finally, the likely path of activation for assessment-only control participants changed very little, and subsequent drinking behavior did not change significantly.

Table 1. Participant Demographics by Experimental Condition.

	Expectancy Modification	Traditional Alcohol Education	Assessment-Only Control	Total
Gender				
Males	50% (n = 64)	50% (n = 59)	51% (n = 63)	49% (n = 187)
Females	50% (n = 66)	50% (n = 61)	49% (n = 66)	51% (n = 192)
Ethnicity				
Caucasian	72% (n = 94)	72% (n = 79)	66% (n = 79)	70% (n = 255)
Hispanic	15% (n = 20)	15% (n = 16)	18% (n = 22)	16% (n = 61)
African-American	11% (n = 14)	8% (n = 9)	12% (n = 14)	10% (n = 40)
Asian-American	1% (n = 3)	5% (n = 6)	3% (n = 4)	3% (n = 16)
Other/Mixed	1% (n = 2)	0% (n = 1)	1% (n = 2)	1% (n = 7)

Table 2. Participant Drinking by Gender and Experimental Condition at Pre-Test

Gender	Condition	Mean	Standard Deviation	N
Female	Expectancy Challenge	12.8	18.5	65
	Alcohol Information	14.1	19.33	61
	Assessment-Only Control	13.8	17.9	66
Male	Expectancy Challenge	19.2	23.4	64
	Alcohol Information	18.9	27.2	60
	Assessment-Only Control	19.8	25.8	63

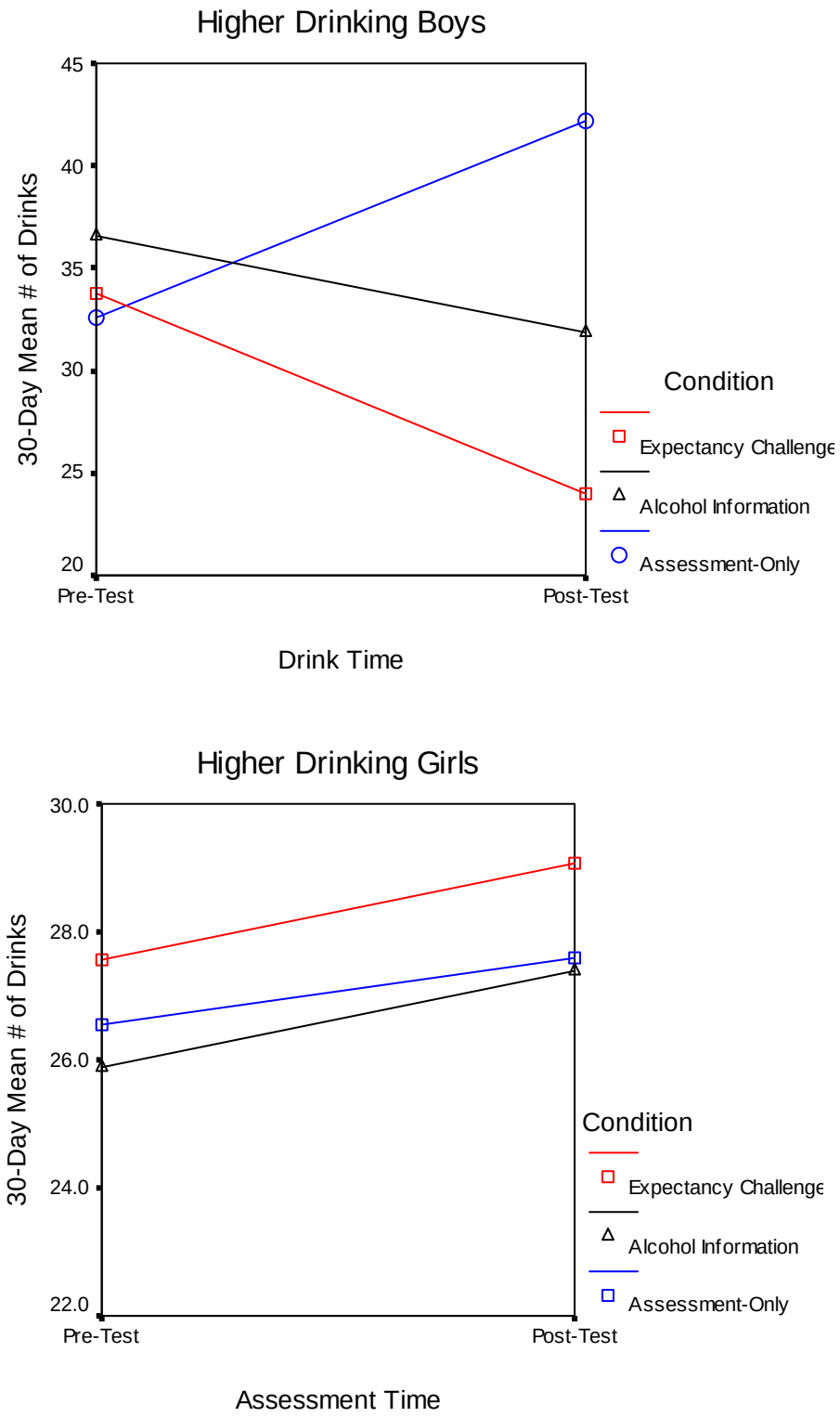

Figure 1. Mean Alcohol Consumption by Gender, Condition, and Assessment Time

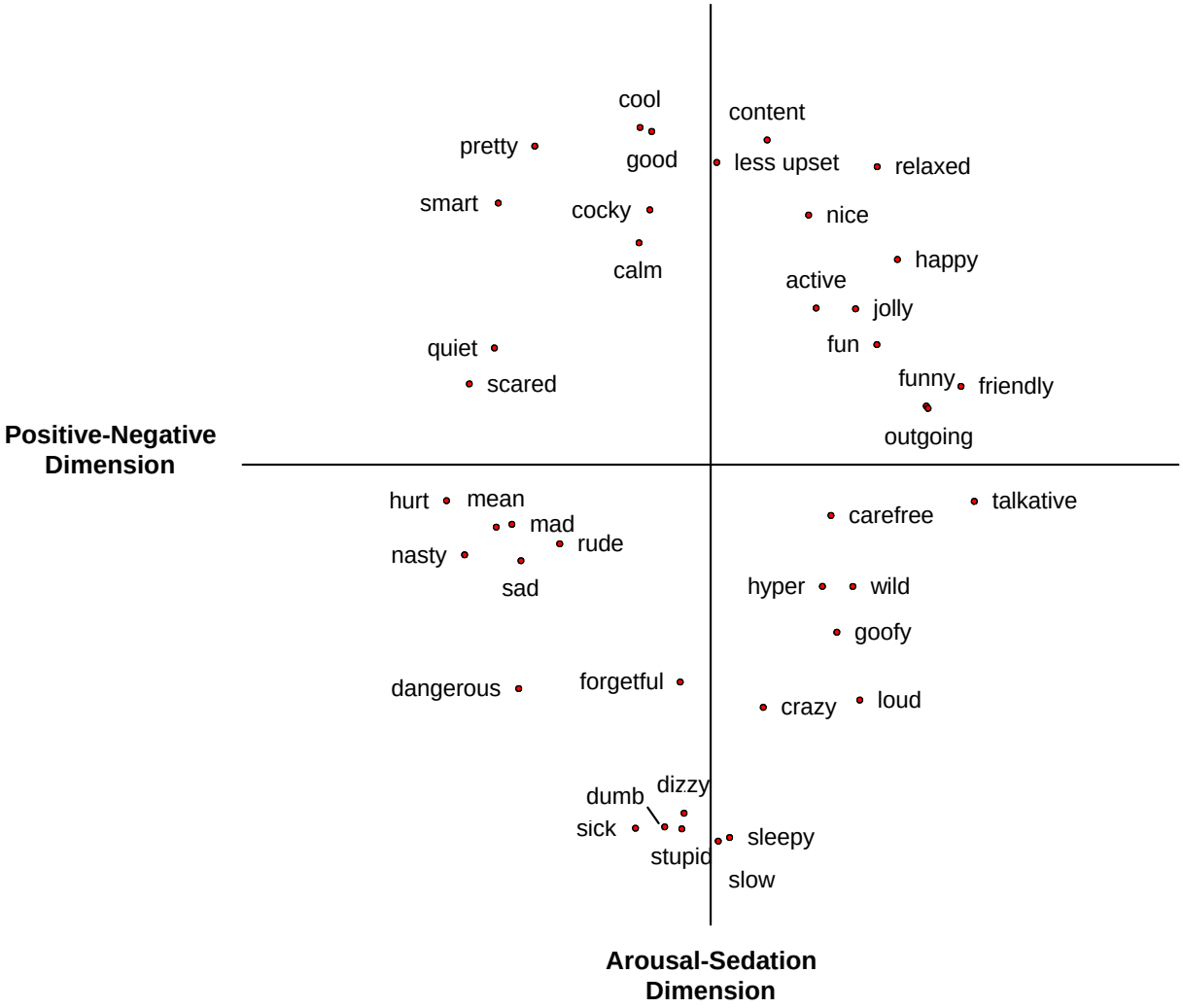

Figure 2. Individual Differences Scaling Stimulus Configuration

INDSCAL for alcohol expectancy words representing nodes of meaning within a hypothetical expectancy network. The horizontal dimension represents valence (positive-negative) and the vertical dimension represents arousal-sedation.

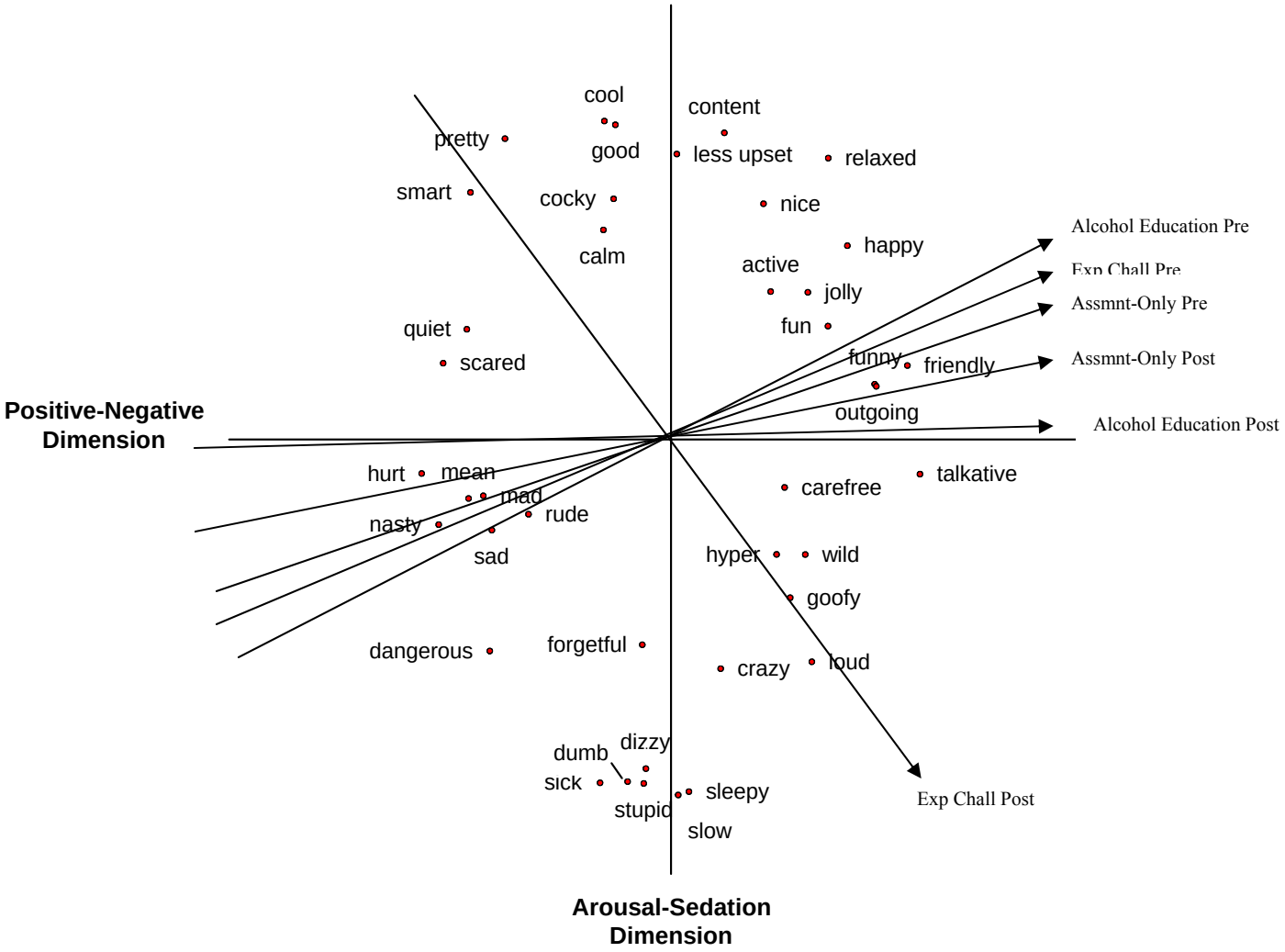

Figure 3. INDSCAL Stimulus Configuration with Preference Mapping Vectors

INDSCAL stimulus configuration with preference mapping vectors (PREFMAP) representing possible paths of association through a memory network of higher drinking males.

DISCUSSION

Previous expectancy challenge studies have successfully modified alcohol expectancies and subsequently decreased drinking significantly among heavy drinking college males (Darkes & Goldman, 1993, 1998; Dunn et al., 2000). Despite the continued prevalence of substance use among high school students and the need for effective prevention approaches, the expectancy challenge procedure has not been applied effectively among this population. Therefore, in the present study, an expectancy challenge protocol previously found to be effective in decreasing college males' alcohol use was modified for use with 12th grade students. Further, the present study compared the effectiveness of this interactive, single-session expectancy challenge presentation against a traditional alcohol education control group and an assessment-only control group. Results indicated that higher drinking males in both the expectancy challenge and alcohol education conditions exhibited significant drinking reductions from pre- to post-intervention. The interventions, however, were not found to be effective in reducing the alcohol use of higher drinking females or lower drinking participants.

To assess the relationship between alcohol expectancies and drinking changes among higher drinking males, likely paths of expectancy activation were modeled pre- and post-intervention. Findings indicated that higher drinking male participants in the expectancy challenge condition exhibited the most substantial changes in likely path of expectancy activation after exposure to the single-session intervention. Specifically, higher drinking males in the expectancy condition were more likely to activate sedating and negative expectancies in memory post-intervention. Changes in likely expectancy activation were also present among higher drinking males in the traditional alcohol education condition; however, these changes were not as pronounced as in the expectancy modification condition.

The observed changes in likely paths of activation paralleled drinking changes among higher drinking male participant. Specifically, a substantial shift in the likely path of activation among higher drinking males in the expectancy challenge condition was followed by a 29% drinking reduction during the 30-period after participating in the expectancy challenge activity, whereas a smaller shift in likely association path of participants in the traditional alcohol education condition led to a 9% drinking reduction among higher drinking males. In contrast, higher drinking male participants in the assessment-only condition did not exhibit changes in likely path of activation or in subsequent drinking. These findings support the memory model conceptualization as a way of understanding the mechanism by which expectancies influence drinking.

Although only higher drinking male participants exhibited changes in alcohol expectancies and subsequent drinking, the findings of the present study suggest that expectancy challenge interventions that have been successful at modifying and subsequently decreasing alcohol consumption in heavy drinking male college students (Darkes & Goldman, 1993, 1998; Dunn et al., 2000) may have some applicability in the continued development of theory-based alcohol prevention curricula. Continued development and dissemination of such theory-based prevention curricula (e.g., Botvin et al., 1990; Ellickson & Bell, 1990; Graham et al., 1990; Sussman et al., 1998) is essential given the continued prevalence of adolescent alcohol use and the lack of effectiveness of popular prevention programs implemented in schools today.

The present study contributes to the growing body of literature supporting the effectiveness of expectancy challenge procedures (Darkes & Goldman, 1993, 1998; Dunn et al., 2000; Cruz & Dunn, 2003) in modifying expectancy processes to make negative and sedating expectancies more salient and positive and arousing expectancies less salient. Further, the

results of this study suggest that experiential expectancy challenge strategies may be successfully modified and implemented in a classroom setting. Until now, effective expectancy challenge procedures with college students have involved a bar-laboratory setting, small same-gender groups, multiple sessions, and administration of beverages that contain alcohol. In the present study, the expectancy challenge was modified and implemented for use with 12th grade participants in a mixed-gender classroom setting during a single-session. Despite the modifications, this classroom-based expectancy modification exercise was able produce expectancy changes and corresponding decreases in drinking albeit among a subset of high-school-age students (i.e., higher dinking males). The present study is the first to develop, implement, and evaluate a single-session expectancy modification exercise for high school students.

There are several limitations in the present study that must be noted. The present findings require replication over a longer follow-up and replication with participants of diverse ethnicity and varying risk status such as individuals with a positive family history of alcoholism. Additionally, while this expectancy modification strategy successfully altered higher drinking male participants' expectancy processes, additional research is necessary to assess the longevity of these changes. Therefore, in future studies, it would be useful to assess the longevity of changes in alcohol expectancies as participants continue to have more experiences with alcohol (e.g., upon entering college). Specifically, it would be useful to assess the extent to which the expectancy training provided interferes with the "positive experiences" often expected as a result of consuming alcohol. In addition, because the present study relied on a single outcome measure due to time constraints in the school settings, future studies should rely on additional outcome measures to minimize the potential for bias in interpreting the effectiveness of the intervention.

Finally, the lack of effectiveness of the expectancy challenge in altering alcohol expectancies and reducing alcohol use among female study participants highlights the continued need to identify those expectancies that most clearly predict drinking among females of this age-group. A better understanding of the factors driving alcohol use among adolescent females would facilitate the development of an expectancy challenge protocol tailored to this population that may be more effective in changing expectancy activation and reduce drinking.

In conclusion, the present study represents an initial step in modifying, implementing, and evaluating a single-session, interactive expectancy challenge exercise for use with 12th grade students based on the expectancy challenge program that has been successfully used with college-age male drinkers (Darkes & Goldman, 1993, 1998; Dunn et al., 2000). The present work indicates that a promising approach to high school substance use prevention may involve altering expectancy processes that undermine the anticipation of positive and arousing expectancies. Further, these findings underscore the importance of continuing to develop and implement theory-based prevention curricula that may enhance the effectiveness of current alcohol use prevention programs.

APPENDIX A: MMBEQ (EXPECTANCY QUESTIONNAIRE)

MMBEQ

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, scotch, 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**
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**

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 B: SAMPLE TIMELINE FOLLOWBACK CALENDAR

February 2005

SUN	MON	TUE	WED	THU	FRI	SAT
				1	2	3
4	5	6	7 Sample	8	9	10
11	12	13	14 Sample	15	16	17
18	19	20	21 Sample	22	23	24
25	26	27	28 Sample	29	30	

APPENDIX C. PARTICIPANT DEMOGRAPHIC INFORMATION

DEMOGRAPHIC INFORMATION

AGE: _____

For the following questions, please circle one response.

SEX: FEMALE

MALE

Ethnicity:

White/Caucasian

Black/African-American

Hispanic

Asian-American

Other

APPENDIX D: EXPECTANCY CHALLENGE PROTOCOL

Expectancy Challenge Protocol

"First, I'd like to thank all of you for agreeing to participate in this meeting today. Before we begin, let's take a few minutes to complete a short interview regarding your drinking over the last four weeks."

Pass out the Drinking Calendars and administer Timeline-Followback (TLFB) according to protocol instructions. Supervise participants and provide any help necessary as they complete the four-week TLFB.

"My name is _____ and I am here today to share some very interesting information about alcohol. This is information that not a lot of people know, so you are among the first to find out! Now, you may be thinking that I'm here to tell you that alcohol is terrible and that you shouldn't drink, but that's not why I'm here at all. Instead, I am here to tell you about alcohol's REAL effects on people. Whether or not you decide to drink or how much you decide to drink is your decision, BUT I hope that this information stays with you and that it is useful in making that decision when the time comes."

"Now, all of us have beliefs about the effects of alcohol. Basically, we all have ideas about how people feel after they've had a few drinks of alcohol. For example, some people feel that drinking makes them have more fun at a party. Tell me some other effects that you may expect to be a result of consuming alcohol." Let participants come up with examples of expectancies such as feeling friendlier, more talkative, having more energy, being less nervous, etc. If they are having difficulties coming up with examples, provide them with some help (e.g., *"Some people think drinking alcohol makes them more outgoing.") "Those are all excellent examples of how we expect people to feel to feel after consuming alcohol. These kinds of beliefs about alcohol's effects are quite common in that most of us have very similar beliefs about how alcohol affects people. Now, let's explore more common belief about alcohol's effects."*

Slide #1

Common Beliefs about the Effects of Alcohol:

Alcohol makes us have more fun (talk and laugh more).
Alcohol makes it easier to talk to people, especially someone we like.

BUT, These Types of Beliefs....

1) Are typically NOT right (they are WAY off!)
2) Are often contradictory or oppose each other (talkative AND relaxed?!)
3) Have a powerful influence over how we behave when we drink

---

"Now, some of you are probably doubting whether what I am saying is true, so that's why I am going to share with you some research findings that should convince you without a doubt! Believe it or not, some scientists get paid to research the effects of alcohol on human behavior and emotions! And there is one type of study that has been really useful in showing what effects are due to the chemical effects of alcohol (e.g., the REAL effects of alcohol) and what effects are due to our beliefs about alcohol's effects.

You may or may not have heard about sugar pills (which are also called placebos), and how people who are given sugar pills get "better" because they ***thought*** *that they were taking a real medicine, even though they WERE NOT. Basically, these people's improvement is in part because of their positive expectations about the effects of the sugar pill. Something similar happens when people drink alcohol. So the effects people often feel from drinking are a result of their beliefs or expectations about how alcohol will affect them. Does everyone understand what expectations or expectancies are?"* Answer questions as necessary.

"So basically expectancies are our beliefs about the effects of alcohol. (Slide#2). *And these expectancies about the effects of alcohol can create or add to the effects people experience when they drink. Just like the people that "got better" after taking sugar pills!"*

Slide#2

Expectancies = Beliefs about the effects of alcohol

These expectancies can create or add to the effects people experience when they drink.

"Let me show you how researchers have been able to show what effects really come from drinking alcohol and which effects come from expectancies." (Slide #3).

Slide#3

Study Design

Told they are drinking alcohol, BUT actually drinking FAKE drink (NO ALCOHOL)	Told they are drinking FAKE drink, BUT actually drinking ALCOHOL
Told they are drinking alcohol, and actually drinking ALCOHOL	Told they are FAKE drink, and actually drinking FAKE drink

Which group do you think will:

* talk more in social situation?

* laugh more at funny things?

"To figure out alcohol's real effects and expectancies' effects, researchers give people "fake drinks" (placebo drinks), but tell them that their drinks have alcohol in them. Then these people are put in a social situation to see how they act. Not surprisingly, the researchers found that these people that ***THOUGHT*** *they were drinking alcohol (even though they weren't) were more outgoing, more talkative, and laughed more when put in a social situation. So we are clearly able to see expectancies at work in this study! The participants in this study reported feeling happier, more social, and having more fun because they believed they had alcohol and also because they believe that alcohol will make them feel these things. But these effects cannot be due to drinking alcohol, because these participants did not really have any alcohol; they just thought they did. So the effects they feel and the way they act are not due to drinking alcohol; they are due to expecting these positive social effects from alcohol. And it's not just the participants in these studies that have these expectancies about the effects of alcohol. These expectancies are quite common in the United States and around the world. In fact, these expectancies are so common and POWERFUL that they cause people to* ***MISTAKENLY*** *think that drinking alcohol makes them feel more social and outgoing. "*

"Now, I'm not saying that alcohol doesn't have any effects on people. Alcohol has some serious effects on both our mental and physical functioning. Alcohol is a powerful depressant drug that slows down our mental and physical functions. 'What does that mean?,' you might be asking yourself. What that means is that when people drink excessively they can't think as clearly as they think they can. For example, they might think that they can drive safely when they really cannot. Or they might think that it's safe to jump from a 4th floor without getting hurt. Or they might accept a ride from a complete stranger. These are all things that people have done after drinking excessively and their thinking was affected by alcohol. But I'm not here to tell you about all the bad things that can happen from drinking too much. I hope you all are sharp enough to know all the bad stuff that can happen when people drink too much. What's important is that you know that drinking affects thinking in such a way that people feel kind of slow and numb. People then label what's going on around them when they have these vague feelings. For example, imagine a person is at a party with all of their friends around them, a DJ spinning their favorite music, talking to the guy or girl that they like, making jokes, laughing at friends' jokes, and having a GREAT time. Now, imagine that this person is also drinking and feeling these vague effects of alcohol. This person then makes the common mistake that most people make – he or she MISTAKENLY assumes that they are having a good time BECAUSE they are drinking. When in fact, they were having a good time even BEFORE they started to drink!"

"I understand if you have doubts about what I am saying. But remember, ***I am not saying that alcohol has no effect on us. Alcohol is a very powerful depressant drug.*** *Drinking alcohol, especially drinking alcohol excessively, can have serious consequences for us and those around us. For example, about 30% of fatal car crashes (that is when someone dies) involving drivers your age involve drunk driving. The effects that large amounts of alcohol can have on our judgment and physical coordination has been shown time and again. People slur their words and can hardly walk upright after drinking too much. If lucky, they just embarrass themselves. However, people don't drink so that they can get into car accidents or look like a fool on the dance floor. And the fact that accidents or bad dancing can result from excessive drinking doesn't mean that people can't drink at all. Most people drink because they think that alcohol will do good things for them. They are not aware of the depressant effects of alcohol because they are so focused on what they expect the effects of alcohol will be (e.g., happier, funnier, more talkative, etc.)."*

"You may be asking yourself, 'Where do people learn to expect these effects from alcohol?' Information about alcohol's effects is everywhere! Growing up we see adults drinking or hear them talking about it. We also see people drinking in television or in movies, and even in cartoons! If you've been in Disney's "Pirates in the Caribbean" Ride you may remember the part where the pirates are drinking in a bar and chasing women! So, information about alcohol really is all around from a very young age! One place where we get A ***LOT*** *of information about what alcohol can do for us and how "cool" it will make us is from advertisements in magazines and TV commercials. Companies that make money off alcohol spend billions to convince us that alcohol has effects it doesn't really have. You would be stupid to think drinking a particular beer is going to make hot babes throw themselves at you or make guys think you are hot. But that is exactly what alcohol companies try to teach you through their ads. How dumb do they think we are? The sad part is that after we see these kinds of ads thousands of times through our lives, we actually believe this stuff just because we have seen it in so many ads. But if you realize that they are trying to control you, you start to see the ads as the silly fiction they really are and you can get a good laugh out of pointing out the lies in them."*

In the next few examples from magazines which any of us might read (e.g., Maxim, Stuff, Cosmopolitan, etc.*), let's see if you can point out the positive expectancy effect that the alcohol company is trying to convince people that they will get if they drink."*

Show magazine ads from magazines and elicit from the participants which expectancy is being promoted by the alcohol advertisement. Give examples if participants do not

create them on their own (e.g., "If you drink our beer, you will date these beautiful girls." "Drink our liquor and have the time of your life." "Drinking this wine will bring you and your friends closer."). Point out how these ads are promoting positive social expectancies rather than pharmacologic effects of alcohol.

"Now, let's summarize what we have learned about how and where we learn expectancy information. What are some of the ways that we learn these ***INACCURATE BELIEFS,*** *or expectancies, about the effects of alcohol?" (Slide#4)*

Slide#4

How Do We Learn Expectancies?

* People around us
* TV commercials/Print ads in magazines
* Movies and TV shows
* Even cartoons!!

"Now let me briefly review the major points that we've talked about today. (Slide #5). Remember that 'expectancies' are our beliefs about the effects of alcohol. These expectancies 'trick' people into believing that alcohol has positive social effects, like making us friendlier or more outgoing after drinking. Alcohol does have some REAL effects, like making people sleepy, dizzy, and tired. So most effects people think are from drinking alcohol are actually due to our EXPECTANCIES for those effects. Again, we know that these effects are from EXPECTANCIES and NOT real effects of alcohol because people display these effects when they THINK they are drinking alcohol but are actually drinking a placebo drink. Finally, people learn to expect these expectancy effects from alcohol from a variety of sources, like people around them that drink, from TV shows, movies, TV commercials, and magazines ads."

Slide #5

What We Learned Today:

- Expectancies are our beliefs about the effects of alcohol.
- Most effects thought to be from alcohol are actually due to expectancies for these effects.
- Alcohol does have some true physical and mental effects that are different that what we expect.
- People act differently when they think they are drinking alcohol (more cheerful and talkative) when they are told they are drinking alcohol, even though they are not!
- People learn expectancies for the effects of alcohol from different sources.

"Now let's play a game to review the information that we've been talking about. We are going to play "Expectancy Pictionary." First, let's divide the class into two teams."

Divide the class and explain game.

"Now, the phrases that you are going to draw are either common expectancies about the effects of alcohol that we've talked about today OR they are REAL effects of alcohol. The phrases will be picked out from this jar and the person drawing them will have one minute to try and get their team to guess the phrase. For an additional point, the team will also say whether the phrase is a REAL effect or an EXPECTANCY effect. If the first team doesn't guess correctly, the other team will get to guess the phrase and the type of effect."

Play **Expectancy Pictionary** until jar is out phrases and use incorrect guesses as an opportunity to reiterate the information presented. (Sample phrases or words include: Dizzy Lizzy, Tired Puppy, Social Butterfly, Sick Rick, Sleeping Beauty, Talking Doll, Nauseous Nachos, Energizer Bunny, Sad Cat, Happy Camper, etc.).

"You all did a GREAT job!!! And now you know some information that very few people know. Before I go today, I would like to thank you for being such active participants during this exercise! Now that you're aware of alcohol's REAL and BELIEVED effects, I hope that you are able to use this information to make decisions about drinking in the future."

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