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Effects of Participant Engagement on Alcohol Expectancies and Drinking Outcomes for a Computerized Expectancy Challenge Intervention

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Effects of Participant Engagement on Alcohol Expectancies and Drinking Outcomes for a

Computerized Expectancy Challenge Intervention

By

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A dissertation submitted in partial fulfillment
of the requirements for the degree of
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Effects of Participant Engagement on Alcohol Expectancies and Drinking

Outcomes for a Computerized Expectancy Challenge Intervention

William Michael Hunt

ABSTRACT

The purpose of the present study was to examine the effect of varying the amount

of participant engagement on alcohol expectancy and drinking outcomes during a

social/sexual expectancy challenge based on Darkes and Goldman's (1993, 1998)

protocol. This study was also intended to provide a test of the efficacy of administering

an alcohol/placebo expectancy challenge outside of a live drinking scenario through

video presented as part of a computerized intervention.

One hundred fifty-eight male participants across three sites were randomized into

a no-intervention control group that received non alcohol-related information in a

minimally interactive computerized format, a low-level engagement experimental group

that received minimally interactive computerized expectancy-related information, and a

high-level engagement experimental group that received the same expectancy-related

information presented in a more interactive computerized format that included games and

audiovisual elements such as video clips, graphics, live narrations, and music. It was

hypothesized that high-level engagement participants would report being more engaged

in their computerized program and demonstrate greater decreases in social/sexual alcohol

expectancies and drinking levels relative to control and low-level engagement

participants. Results indicated that while high-level engagement participants reported

being more engaged in their interventions, none of the groups exhibited changes in the

alcohol expectancies measured. In addition, all three groups experienced significant but

comparable decreases in drinking levels. Exploratory follow-up analyses were also

conducted to provide suggestions for future directions.

Introduction

Alcohol use has been linked to traffic crash fatalities, shown to cause cirrhosis of the liver, and indicated as the primary cause of a variety of short-term hospitalizations (e.g., alcohol dependence syndrome, alcoholic psychoses, and nondependent abuse of alcohol). Additionally, alcohol abuse contributes to a wide range of legal, social, and occupational problems (National Institute on Alcohol Abuse and Alcoholism, 2000). A short list of such problems can include absences from work, lost wages, losses in work productivity, work-related injuries, marital distress, and disorderly conduct.

Alcohol problems flourish in our institutions of higher learning as well. In fact, in the most recent update of a periodic national college drinking survey (Wechsler, Lee, Kuo, & Lee, 2000), it was found that the proportion of students engaging in frequent binge drinking has been increasing on campuses over the past several years. These drinkers are responsible for drinking two-thirds of the alcohol consumed by college students and account for over three-fifths of the most serious alcohol-related problems on college campuses (e.g., drinking and driving, alcohol-related injuries, and vandalism). The survey also found that the proportion of student drinkers who had been drunk three or more times in the previous month (prior to the survey) had increased, as had the proportion of those who drank on ten or more occasions and who drank for the sole purpose of getting drunk.

Given the large and growing number of problems associated with excessive alcohol use, particularly on college campuses, it is not surprising that significant effort has been dedicated to the prevention and reduction of drinking. To this end, one concept that has received increasing scientific interest over the last several decades is that of alcohol expectancies, which are defined and discussed below.

The Expectancy Concept

The general expectancy concept dates back a considerable way and has undergone significant changes in meaning over the years from an early affiliation with behaviorism (Tolman, 1932) to a more cognitive bent in more modern times. Goldman (1999) has recently expanded upon the expectancy concept in an effort to take it more fully into the cognitive realm. He views expectancy, in a broad sense, as patterns or templates of information that are stored in memory and as the use of this information to produce behaviors. These stored memories serve to help an organism deal (usually) more efficiently with new situations that are similar to ones previously experienced. New information that is perceived is compared to existing information templates (expectancies). This comparison helps the organism to organize, interpret, and structure and enact behaviors accordingly. Goldman (1999) also maintains that expectancies are an active system, operating automatically as well as under conscious control of the organism. Alcohol expectancies are best understood as a specific type of general expectancies people may hold.

The Expectancy Concept Applied to Alcohol

Inasmuch as alcohol expectancies describe a small subset of an individual's total expectancy network, a discussion of the alcohol expectancy concept would seem simply to require the specific application of general expectancy theory to the behavior of alcohol consumption. Applying Goldman's (1999) general definition of expectancies, alcohol expectancies are information stored in one's memory about the way alcohol consumption affects behavior. Taken previously from direct experience, or observation of others, these stored memories cause individuals to anticipate certain consequences from the consumption of alcohol. Depending on whether an individual finds the anticipated consequences of drinking reinforcing, that individual may or may not engage in the behavior.

Problems arise for people when their alcohol expectancies lead them to drink excessively and to engage in other behaviors while drinking that have a negative impact upon their lives (e.g., driving while intoxicated, having unsafe sex, and getting into fights). If theory holds, then, it is not difficult to conclude that finding ways to alter people's alcohol expectancies in such a way that they no longer anticipate positive consequences from alcohol consumption (or anticipate positive consequences to a lesser degree) should result in a decrease in their level of drinking and/or the problems that arise from drinking. Because expectancies operate largely without conscious control, Goldman (1999) suggests that, after determining which erroneous expectancies are influencing a behavior (such as problematic drinking), helping individuals bring those

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expectancies into conscious awareness and disconfirm them should have a significant impact on that behavior.

Scientific Support for the Utility of Alcohol Expectancies

In the past several decades, a growing body of research has begun to clarify the relationship between expectancies and alcohol use. For example, alcohol expectancies have been shown to form in children before drinking is initiated (Dunn & Goldman, 1996), to predict concurrent drinking over and above prediction using background variables alone (Brown, 1985a; Christiansen & Goldman, 1983), to discriminate problem and nonproblem drinkers (Brown, Goldman, & Christiansen, 1985; Christiansen, Goldman, & Brown, 1985), to be related to alcoholism treatment outcome and predictive of abstinence after treatment (Brown, 1985b), and to predict future drinking behavior (Christiansen, Smith, Roehling, & Goldman, 1989; Goldman, Greenbaum, & Darkes, 1997). Alcohol expectancies and drinking have also been demonstrated to influence each other in a reciprocal fashion over time (Sher, Wood, Wood, & Raskin, 1996; Smith, Goldman, Greenbaum, & Christiansen, 1995). This existence of a reciprocal relationship supports the theory that modifying alcohol expectancies might lead to a change in alcohol consumption. Naturally, the greatest utility in modification of alcohol expectancies would lie in the control and reduction of problematic drinking. The following three sections will introduce a procedure developed for changing alcohol expectancies and drinking behavior, called the expectancy challenge, and will attempt to identify possible key components of this methodology.

Altering Alcohol Expectancies to Change Drinking Behavior

In 1987, Henderson and Goldman attempted to decrease drinking through the manipulation of alcohol expectancies. In a pre-post design spanning two weeks, three groups of female college students were submitted to either an alcohol education program, a no treatment control, or an expectancy modification program. The expectancy modification procedure involved administration of placebo alcohol in a social situation that pulled for behaviors like those found in real-life drinking situations. After the manipulation, participants were told of the true (no alcohol) nature of their beverage, and it was explained that their intoxicated behavior was caused not by pharmacology but by their expectancies for the effects of alcohol on them.

Measures of participants' alcohol expectancies taken at pre-treatment and post-treatment showed decreases in alcohol expectancies only for the expectancy modification group. However, measures of alcohol consumption taken at baseline and two-week post treatment showed decreases in drinking for both the expectancy modification group and the alcohol education group. The decrease in drinking, unfortunately, was not maintained for the expectancy modification group at four-week post treatment assessment.

Massey and Goldman (1988) expanded Henderson and Goldman's (1987) paradigm the following year. In this study female participants were again divided into an alcohol education group, a no treatment control group, and an expectancy modification program, each of which met for a total of four sessions. The first session of this expectancy program, however, involved giving some of the participants real alcohol in addition to giving some participants placebo alcohol. The participants' task was to

observe each other during a social interaction (a game of charades) and then to guess

afterward, based on behavior, which of them had received the real alcohol. The

remainder of the first session was spent discussing why the participants could not

accurately identify the women who had imbibed alcohol and discussing other aspects of

expectancy theory. Sessions two through four involved similar expectancy theory lessons

along with a review and discussion of expectancy logs which the expectancy program

participants completed each day between sessions. These logs were intended to help the

participants become aware of the myriad of sources (e.g., advertisements, television, and

movies) in their daily environments from which they received alcohol expectancy

information.

Results at four-week follow-up for this study showed decreases in alcohol

expectancies for all three groups of participants. However, while decreases in drinking

were found for both the high-level and low-level drinkers in the expectancy program,

none of the control group and only low-level drinkers in the alcohol education program

showed decreases in drinking. Although these results provided stronger support for the

mediational role of alcohol expectancies in drinking behavior, the decrease in alcohol

expectancies for all participants, particularly for those in the control group who displayed

no changes in drinking pattern, tended to weaken the position. In explanation, however,

the researchers did advance the theory that the measurement and alteration of

expectancies that were more specific to a particular situation may have led to more

definitive results (e.g., assessing and altering social alcohol expectancies for a social

situation rather than assessing and altering more general alcohol expectancies in a social situation).

This issue of targeting expectancies that are specific to a particular situation was addressed in a similar study conducted by Darkes and Goldman (1993). In this case, they focused on social and sexual expectancies in situations that pulled for them.

Undergraduate, male drinkers were randomly assigned to one of three groups in a pre-post design spanning one month. One group, the control, received pre-treatment assessment and post-treatment assessment on a variety of measures, including drinking behavior and alcohol expectancies, and was asked to monitor their daily drinking for a month. The two experimental groups were treated identically to the control group. Additionally, one of the groups received three sessions of a traditional college prevention program. The other group, the expectancy challenge group, received three sessions designed to challenge their expectancies about alcohol by demonstrating that the sexual and social effects they attribute to the pharmacological effects of alcohol are actually due to the placebo effect (i.e., their expectancies about alcohol). They were also assigned homework for the month involving keeping a log of situations in their environments (e.g., media advertisements) that served to reinforce their alcohol expectancies. The idea for the homework assignment was to bring their expectancies more into conscious deliberation and to challenge their expectancies further by helping them find instances when the environment reinforced their previous, erroneous expectancies.

The first two sessions for the expectancy challenge group were conducted by having participants of legal age consume either two alcohol or two placebo alcohol

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beverages without being told which type of drink they were receiving. The group's task was to identify which group members had actually imbibed alcohol, basing their guesses on observations of the individuals' behavior during situations involving socially-related or sexually-related content (playing Win-Lose-or-Draw or rating slides of women for attractiveness, respectively). The group's inability to discriminate the individuals who had actually received alcohol from the individuals receiving placebo alcohol was used to demonstrate to them that many of the behavioral effects of alcohol are actually due to people's expectations rather than the pharmacology of the drug. In the third session the group leaders reiterated the lessons of the first two sessions, provided information on expectancy theory and related research findings, and facilitated a group discussion of what had been learned by participating in the sessions and by completing the homework assignment.

All three groups had equivalent levels of drinking and social/sexual expectancies during pre-assessment. At follow-up, only the expectancy challenge group had lower levels of social/sexual expectancies. The expectancy challenge group also showed the greatest level of decrement in drinking, followed by the traditional prevention condition. The assessment control group showed no decreases in drinking at follow-up.

Although considered by Darkes and Goldman (1993) mainly as strong evidence for the mediational role of alcohol expectancies in drinking behavior, the results of this study also suggested that drinking reductions (over and above those achieved by traditional interventions) could be achieved in males by reducing their expectancies for

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social facilitation and sexual enhancement from alcohol. The authors noted two other particularly interesting findings as well.

The first was that the expectancy challenge intervention appeared to be equally effective for underage individuals who were not allowed legally to consume a beverage on the chance that it could be alcoholic. This result implies that such an intervention could be effective as a treatment or prevention for individuals (e.g., adolescents or younger children who have or may soon develop expectancies associated with future problematic drinking) without actually having them partake in the experiential aspect of the challenge (i.e., drinking the alcohol or placebo beverage). Such a finding has ramifications for dissemination of this intervention to a far wider audience.

Second, although the traditional prevention condition had levels of success equivalent to the expectancy challenge intervention for lighter drinkers, only the challenge intervention was effective for the heavier drinkers (15.88 or more drinks per week). The authors hypothesized that the reason only the challenge intervention was effective for the heavier drinkers was that, even though they were the most committed to drinking, the challenge decreased alcohol expectancies of increased arousal and energy – expectancies which seem to drive heavy drinking the most. This finding suggests that the expectancy challenge may be a useful intervention for drinkers who are traditionally the most difficult to influence.

In 1998, Darkes and Goldman conducted another expectancy challenge study of male college drinkers. This time, however, they expanded the scope of the study by increasing the treatment duration, adding a treatment booster session, and extending the

evaluation of alcohol expectancies and drinking to six weeks beyond the initial treatment phase. They also added a second expectancy challenge group, addressing affective/cognitive arousal, with which they could compare the social/sexual expectancy challenge group designed in Darkes and Goldman (1993), and an attention/monitoring control group. Finally, as an added test of the efficacy of the expectancy challenge procedure, the study was timed so that the post-treatment drinking assessment phase would coincide with spring break, a period of known increase in alcohol consumption for college populations.

By study end, both challenges had resulted in a decrease in expectancies and alcohol consumption as compared with the control group, with expectancies generally being lowest for the social/sexual group. Interestingly, alcohol consumption had actually increased during the post-treatment assessment phase (overlapping with spring break) for the control group but not for either challenge group.

Variations on the Expectancy Challenge Theme

A number of attempts have been made to reproduce the alcohol/placebo expectancy challenge procedure established by Darkes and Goldman (1993, 1998), both to identify its boundary conditions and to determine its key components. Corbin, McNair, French, and Black (1998), for instance, conducted a study in which they did away with the alcohol/placebo drinking component of the Darkes and Goldman (1993, 1998) expectancy challenge. Instead, they gave groups of college students several lectures on alcohol expectancies and asked them to "challenge" items from alcohol expectancy measures after each lecture. While this exercise led to a decrease in alcohol

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expectancies later measured with the same questionnaires, there was no corresponding decrease in drinking levels.

Corbin and colleagues conducted a similar study more recently that included mixed gender groups, most notably heavy drinking females (Corbin, McNair, & Carter, 2001). As in the previous study, they found decreases in alcohol expectancies for those individuals participating in the expectancy challenge. Interestingly, however, they found trends toward better drinking outcomes for the males in their expectancy challenge but increases in alcohol consumption for the females.

Despite some methodological disadvantages (i.e., the dubious value of using the same questionnaires for follow-up that were used during the intervention and the high potential for experimental demand effects), the findings from these studies suggest that decreases in drinking may not come about simply by changing people's explicit views about the effects of alcohol. Perhaps exposure to an expectancy-disconfirming experience such as the alcohol/placebo administration of Darkes and Goldman (1993, 1998) and efforts to get participants to adopt new beliefs about the effects of alcohol are instrumental in effecting a change in drinking.

In 1999, an attempt was made to administer a social/sexual expectancy challenge in a single session to mixed-sex groups (Maddock, Wood, Davidoff, Colby, & Monti). While the challenge was adapted from the Darkes and Goldman (1993, 1998) methodology, it was only somewhat successful in altering alcohol expectancies and proved ineffective in decreasing drinking. Little detail was given, however, regarding what material was sacrificed to reduce the Darkes and Goldman challenge contact time

by half and regarding what adaptations were made to accommodate female participants in the mixed-sex groups. (The Darkes and Goldman challenge material addressing sexual expectancies only discusses male sexual functioning under the influence of alcohol.)

Another attempt to test an expectancy challenge with women was made the following year. In 2000, Dunn, Lau, and Cruz borrowed the full Darkes and Goldman (1993, 1998) protocol for challenging social/sexual expectancies, applying it to men as well as adapting it for use with women (treated separately from the men). They demonstrated the challenge's effectiveness in significantly changing hypothesized patterns of organization of expectancies in memory and in decreasing drinking for men. They were unable, however, to demonstrate these changes in women. They hypothesized that the challenge's lack of effect on women's drinking might have been due to the relatively small amount of change the women exhibited in their expectancy patterns. This minimal change in expectancy patterns, it was suggested, may have been the result of a failure to translate the challenge protocol's material enough to address issues of concern for women (e.g., a discussion of the negative sexual side effects of drinking had less of an impact on women than it did on men).

Musher-Eizenman and Kulick (2003) attempted further study of the findings of Dunn et al. (2000) by conducting their own expectancy challenge with female drinkers. Unlike Dunn et al. (2000), these authors detected short-lived decreases in alcohol expectancies for the challenge group. They also found decreases in drinking for the challenge and control groups alike. Interestingly, the authors reported that the follow-up

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assessment period fell during the week before final exams and that drinking levels may have been suppressed in both groups as a result.

In 2004, Wiers and Kummeling also adapted the Darkes and Goldman (1993) protocol for administration to a mixed gender group. In contrast to Dunn et al. (2000), however, they detected reductions in positive alcohol expectancies and alcohol consumption in heavy drinking women in the challenge group but not their male counterparts. Both challenge and control groups showed significant decreases in drinking by follow-up.

Findings from these studies suggest a few tentative conclusions that bear further examination. Perhaps modification of alcohol expectancies and a corresponding change in drinking requires exposure to one or more salient events such as the expectancy-disconfirming experience of the alcohol/placebo administration of Darkes and Goldman (1993, 1998). Without this powerful experience as a demonstration of the disconnect between alcohol expectancies and pharmacology, participants may fail to buy in to the message sufficiently to effect a behavioral change.

Another point to consider is that even with a salient demonstration of the disconnect between expectancies and pharmacology, participants may require help identifying the personal relevance of the information. If the explanation of how higher doses of alcohol can result in effects contrary to those expected and desired is too brief, or if effects are discussed that do not apply directly to the participants (such as pointing out to women how alcohol consumption can lead to erectile failure), the impact of the expectancy challenge may be diminished. If this is the case, an overly abbreviated

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presentation or a lengthier presentation directed to an extremely diverse group (e.g., mixed sex) may dilute the power of the expectancy challenge procedure.

Finally, a growing number of studies support the efficacy of an experientially based expectancy challenge in altering alcohol expectancies and drinking for groups of men. However, the effect of adapting such an intervention for mixed gender groups and all female groups remains less clear.

Challenging Alcohol Expectancies Vicariously

Another interesting variation of the Darkes and Goldman (1993, 1998) expectancy challenge procedure involves the presentation of the alcohol/placebo expectancy-disconfirming experience vicariously through a multimedia presentation. In addition to the obvious benefit of increased ease of dissemination (without the need of a mock bar and bartenders to run an intervention), a vicarious experience of the alcohol/placebo administration would allow use of the intervention with individuals for whom alcohol consumption would be problematic (e.g., underage drinkers or alcoholics).

In 1995, Wooten attempted this variation of the Darkes and Goldman (1993, 1998) expectancy challenge with eighth grade students -- an entirely underage sample. Because none of the participants were old enough to consume alcohol, they were exposed to the alcohol/placebo challenge component vicariously by helping to plan and then viewing an expectancy challenge session for college student drinkers. By allowing the eighth graders to participate in the planning phase of the challenge, it was hoped that they would find the challenge more believable when viewing it later.

The adolescents were educated about the differences between expectancy effects and pharmacological effects of alcohol. They were also asked to help generate related Win-Lose-or-Draw phrases for the group activity of the expectancy challenge intervention with college students. This challenge intervention was videotaped for later viewing by the eighth graders. The video showed the college students consuming either alcohol or placebo alcohol beverages before participating in the group activity.

In spite of the fact that her sample only experienced the alcohol/placebo expectancy challenge vicariously, Wooten (1995) found decreases in expectations for changes in social behavior and arousal in the adolescents in her (vicariously) modified expectancy challenge group, as compared with those in an alcohol education group and those in a no-treatment control group. She was unable to study the effect on drinking patterns due to the small number of drinkers in her sample, however.

In 1999, Keillor, Perkins, and Horan attempted a vicarious presentation of the alcohol/placebo challenge in college students. They compared videotaped expectancy challenge followed by live didactic information with an alcohol information condition. The content for the expectancy plus didactic information group was based on Darkes and Goldman's (1993, 1998) protocol.

Male college students attending an alcohol education program as a result of a single alcohol offense participated in two 90-minute alcohol information sessions or two 90-minute expectancy challenge sessions. For each expectancy challenge session, participants viewed a 25-minute videotape of male college students drinking either alcohol or placebo-alcohol drinks and interacting by playing Win-Lose-or-Draw or by

rating slides of women on level of attractiveness (one interaction per session). After the

video, the participants spent five minutes writing down their guesses as to which drinkers

on the video had consumed alcohol. The participants then viewed a seven minute video

of the drinkers being told the correct answers and discussing their own identification

errors. Finally, the videos were followed by a presentation on the development,

maintenance, and operation of alcohol expectancies.

Results indicated that while the alcohol information group demonstrated increased

knowledge of the effects of alcohol, neither group exhibited changes in alcohol

expectancies at posttest. Additionally, neither group exhibited decreases in drinking

behavior. Thus, the videotaped expectancy challenge plus live didactic presentation on

alcohol expectancies failed to result in changes in alcohol expectancies or drinking

behavior.

The authors suggested a number of possibilities for a lack of expectancy and

drinking modification in the video challenge group. Two possibilities had to do with the

nature of their sample. The participants were adjudicated rather than volunteers and, as

such, may have been less open to the intervention than previous samples of volunteers.

Additionally, because they were still drinking in spite of experiencing negative

consequences (i.e., being charged with an alcohol offense), the authors suggested that the

participants might have had more ingrained drinking patterns than typical college student

volunteers.

In addition to characteristics of the sample, methodological issues may have

affected the results. It is possible that merely viewing a video of the drinking component

of the expectancy challenge was insufficient to alter expectancies. However, Wooten (1995) demonstrated some success in modifying expectancies of children with a similar video and didactic format. It may be that the children were more amenable to expectancy modification than adjudicated college students due to their relative lack of experience with alcohol and its potential effects on drinkers, but other factors could have been involved as well. For instance, a 25-minute video of other college students drinking and playing a game may have been too long to hold the interest of, and thus make an impact on, the college-aged viewers, particularly if they had other risk factors for alcohol problems potentially affecting attention span or were experiencing alcohol or drug-related cognitive difficulties.

The theory that the vicarious expectancy challenge of the Keillor, Perkins, and Horan (1999) study was ineffective because the participants were not engaged by the lengthy video may hold some merit, especially given that the production values of the study video were not of particularly high quality (J. J. Horan, personal communication, June 3, 2002). As such, future investigations of expectancy challenges should consider the role of engagement in the efficacy of the intervention. Additionally, in spite of the disappointing findings of Keillor et al., the potential benefits of a vicariously administered expectancy challenge, along with the partial success of Wooten (1995) in administering one to a younger population, argue for further investigation of vicarious administration of expectancy challenges.

In summary, research on the expectancy challenge procedure has identified several possible key components that individually, or in combination, may contribute to

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its efficacy. One is exposure to a salient expectancy-disconfirming experience such as an

alcohol/placebo administration. Another is the inclusion of content that is personally

relevant to the participants. Additionally, characteristics of the population receiving the

intervention may play a role in how effective it is. The intervention seems to work best

on a homogenous population of relatively heavy-drinking college males. Finally, the

level of participant engagement may play a role in the effectiveness of the challenge by

varying the "dose" that participants receive as a result of their ability to attend to and be

influenced by the intervention.

Computer technology offers an ideal tool for examining these key components, in

particular the role of participant engagement as a variable affecting expectancy and

drinking outcomes. One benefit of using computer software is that intervention content

(i.e., a salient experience and relevance to the intended audience) can be kept similar

across groups while participant engagement can be manipulated by varying the level of

program interactivity. As will be demonstrated in the following section, computers

provide the opportunity to vary the style of presentation of material, making it more or

less engaging through the use of audiovisual technology such as videos, graphics,

narrations, music, and sound effects.

Computers and Multimedia Technology in the Enhancement of Learning and Change

The use of computers and multimedia technology for education, prevention, and

treatment has exploded in recent years. For example, they have been used to administer

cognitive-behavioral therapy for depression (Selmi, Klein, Greist, Sorrell, & Erdman,

1990), for AIDS and sexually transmitted disease education (Seidner, Burling, &

Marshall, 1996), to treat agoraphobia (Ghosh & Marks, 1987) and panic disorder

(Newman, Kenardy, Herman, & Taylor, 1997), to treat (Winzelberg, Taylor, Sharpe,

Eldredge, Dev, & Constantinou, 1998) or reduce the risk of eating disorders (Zabinski,

Pung, Wilfley, Eppstein, Winzelberg, Celio, & Taylor, 2001), and to improve weight loss

(Taylor, Agras, Losch, Plante, & Burnett, 1991). They have also been used and evaluated

extensively as alcohol and drug education aids and to teach drug refusal skills (e.g.,

Alterman & Baughman, 1991; Rickert, Graham, Fisher, Gottlieb, Trosclair, & Jay, 1993;

Duncan, Duncan, Beauchamp, Wells, & Ary, 2000; Bryson, 1999). There have been few

published studies, however, examining the efficacy of computers and multimedia

technology in the reduction of drinking or drug use. Nevertheless, recent research in

interactive multimedia learning has contributed a wealth of suggestions for creating and

maximizing the effects of such interventions.

Recently, experts in interactive multimedia learning have begun to set forth

conditions as well as principles of software construction that enhance user engagement,

motivation, and learning. These suggestions encompass both the modalities of

information presentation (e.g., audio, graphic, and text-based) and the types of learning

activities believed to be the most effective in engaging and motivating software users.

Mayer and Moreno (2002) recently proposed a cognitive theory of multimedia

learning, which they adapted from dual coding theory, cognitive load theory, and

constructivist learning theory. In essence, their theory states that multimedia learning is

most enhanced when the learner is able to select, organize, and integrate new knowledge

(constructivist learning) best processed through two different systems, the visual and

verbal processing systems (dual coding theory), without exceeding the learner's cognitive capacity (cognitive load theory).

Defining multimedia as the combination of words (written or narrated) and pictures (animation, video, or static graphics) they conducted a series of studies testing the tenets of their theory. Based on these studies, they set forth five principles they found significantly enhanced computer-based multimedia learning, specifically the learning of the step-by-step operation of cause-and-effect systems (e.g., how biological systems work or the processes involved in the creation of lightning). These principles are as follows:

1. Multiple representations – learning is improved when material is presented in words and pictures rather than just in words
2. Contiguity – learning is improved when corresponding words and pictures are presented simultaneously rather than separately
3. Coherence – material is better understood and learned when few extraneous words and sounds are included in the presentation
4. Modality – it is better to present words as narration than on-screen text
5. Redundancy – the addition of on-screen text to concise animation and narration diminishes understanding

When attempting to enhance engagement and learning, however, some researchers believe that addressing the user's affective state is as important as cognitive considerations. Lamenting that adult interactive multimedia often lacks the appeal and engaging interfaces and content of children's software, Stoney and Oliver (1998) asserted

that multimedia materials must address both the cognitive and affective needs of adults. After a review of the relevant literature, they described several factors believed to enhance motivation and engagement of adults during interactive multimedia learning.

The first of these factors is "immersion" where the learner becomes absorbed and engaged in the content of the program. Immersion is best accomplished through the use of games and by avoiding gender bias and asking the learner to adopt a foreign persona (e.g., having a female learner assume the identity of a male character). Related to immersion are the concepts of "play and flow", where boredom and anxiety in the learner are diminished by making the learning process more like a fun game than a learning assignment; "fantasy", best accomplished by simulating a scenario where knowledge must be applied in order to succeed in a task; and "curiosity", which is increased through the incorporation of novelty and surprises throughout the program.

Stoney and Oliver (1998) also state that engagement can be increased by letting the learner set the pace and order of the learning activities ("learner control"), encouraging "collaboration" with either other humans, the computer, or a computer-simulated expert, and by challenging the learner to demonstrate competence with the material, preferably through its application as opposed to through testing ("challenge"). Finally, engagement can be increased by encouraging "reflection" in learners during which they apply new knowledge to perform an activity and then receive feedback that furthers their understanding of the concept.

Rationale for the Present Study

The purpose of the present study was to examine the effect of varying the amount of participant engagement on alcohol expectancy and drinking outcomes during a social/sexual expectancy challenge based on Darkes and Goldman's (1993, 1998) protocol. This study was also intended to provide a test of the efficacy of administering an expectancy challenge outside of a live drinking scenario because the alcohol/placebo expectancy-disconfirming experience was presented vicariously (via video presented as part of a computerized challenge program).

Efforts were taken to replicate, and maintain across groups, the other three previously discussed possible key components of the expectancy challenge: presenting the original protocol content to a homogenous sample of heavy-drinking college male volunteers along with a video of an alcohol/placebo expectancy-disconfirming experience. Only level of participant engagement was intentionally manipulated by presenting the intervention via computer software that, using techniques previously discussed, varied the level of interactivity required to complete it. For the purposes of this study, the definition of "to engage", as adapted from Webster's Ninth New Collegiate Dictionary (1990), is to attract and hold attention; to involve; to encourage active participation.

As explained in more detail in the method section, three groups were included in this study. The first was a no-intervention control group that received non alcohol-related information in a computerized format that was minimally engaging. The second was a similarly low-level engagement group. Participants in this group, however, received

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minimally engaging computerized expectancy-related information (PowerPoint slides containing program information in text format with minimal graphics) and were provided with a description of an in vivo alcohol/placebo expectancy-disconfirming experience. The third group, a high-level engagement group, viewed a video of a group undergoing an in vivo alcohol/placebo expectancy-disconfirming experience and received the same computerized content as the low-level engagement group; however, the high-level engagement group received the program information in a more engaging format. Presentation of text-based material was broken up by games and questions requiring active application of the information by the participants. Additionally, the program was made more interesting through the use of audiovisual elements such as video clips, graphics, live narrations, and music.

It was hypothesized that how engaging participants found the computer interventions would affect how much attention they paid to the information provided and how much they processed that information. Information that is processed more thoroughly (i.e., that presented in the high-level engagement group) was expected to result in a greater impact on the participants with regard to both changes in alcohol expectancies and changes in drinking levels. More specifically, it was hypothesized that:

1. Participants in the high-level engagement group would display greater engagement in their computerized intervention than low-level engagement and control groups.

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2.   At one-month follow-up, the high-level engagement group would display greater

changes in alcohol expectancies (decreases in social/sexual expectancies) than

low-level engagement and control groups.

3.   Level of drinking would decrease for the high-level engagement group relative to

low-level engagement and control groups at one-month follow-up.

Method

Participants

Wood's (1997) meta-analysis of the effect sizes obtained in Darkes and Goldman (1993, 1998) suggested .75 as an appropriate effect size for in vivo expectancy challenges. However, given the possibility that a computerized intervention may be less efficacious than an in vivo intervention, a more conservative effect size of .40 was chosen. Thus, a total of 156 participants split into three groups were needed to provide power of .80 for the two-tailed analyses and alpha of .05 used in this study (Cohen, 1992).

College student drinkers were recruited from the psychology department on-line participant pools at the University of South Florida, San Diego State University, and the University of California San Diego. In each case, the university Institutional Review Boards approved the study, and students received course extra credit in exchange for their participation in the study. To create the best chances of success for the computerized intervention, the sample used in this study was composed solely of male college student volunteers. In this way, the protocol used successfully by Darkes and Goldman (1993, 1998) was kept in as nearly an unaltered format as possible. This was an attempt to eliminate the problems experienced by other researchers (Corbin et al., 2001; Dunn et al., 2000; Maddock et al., 1999; Musher-Eizenman & Kulick, 2003; Wiers & Kummeling, 2004) when they tried to alter the protocol to accommodate more diverse groups (i.e.,

females and mixed sex groups) and when they tried to work with adjudicated students (Keillor, Perkins, & Horan, 1999).

Although the study was designed for drinkers, no alcohol was served (the alcohol/placebo expectancy-disconfirming experience was presented vicariously via video). Thus, students aged 18 years and older were eligible for participation as long as they consumed between 6 drinks per week and less than 6 drinks per day, criteria used in Darkes and Goldman's (1993) original expectancy challenge procedure. Finally, students who had previously participated in similar expectancy challenge research were not eligible for this study.

Design

The study utilized a between groups design with three groups. These groups varied along two dimensions: level of engagement (low vs. high) and type of information provided (alcohol expectancy vs. information unrelated to alcohol). The group designated the control group received information unrelated to alcohol that was presented in a low-level engagement format. Both intervention conditions received the same information intended to challenge their alcohol expectancies. However, for the low-level engagement expectancy challenge group, the information was presented in a minimally engaging format that did not require active processing of the information. For the other condition, the high-level engagement expectancy challenge group, the information was presented in a more engaging format that required active use of the information provided. To this end, software design suggestions for improving participant learning and

engagement were incorporated into the high-level engagement software program (Mayer & Moreno, 2002; Stoney & Oliver, 1998).

Del Boca, Darkes, Greenbaum, and Goldman (2004) observed that college student drinking varies considerably throughout the school year depending on environmental influences such as exam periods and holidays. In an attempt to reduce the effect of this variation on drinking outcomes, participants were assigned randomly in blocks to one of the three conditions. In addition, because data were collected over the period of a full calendar year and at three separate universities with different academic holidays, participant drinking data was reviewed before being analyzed, and drinking falling on local or national holidays was removed from the data. This procedure was intended to reduce site and time differences in the sample (e.g., because the data collection proceeded for a full year, some participants' pretest drinking fell during spring break whereas other participants' posttest data fell during spring break).

Equipment

Participants in each group completed their computerized programs using personal computers with headphones when sound was included in the program. The control and low-level engagement group programs were created using Microsoft Corporation's PowerPoint 2000 software. The high-level engagement group program was created using Macromedia's Authorware 5 Attain software.

Instruments

1. The Demographics and Drinking Styles Questionnaire is a series of questions created to facilitate collection of demographic information about

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respondents as well as a rough measure of their alcohol consumption

patterns. Completion time is less than five minutes. See Appendix A.

2.   The Alcohol Expectancy Circumplex (AEC) was formerly known as the

Alcohol Expectancy Inventory (Rather & Goldman, 1994; Rather,

Goldman, Roehrich, & Brannick, 1992). It is a 24-item list of single word

adjective descriptions of possible effects of alcohol. Respondents are

asked to indicate on a seven point Likert-type scale ranging from 0

(Never) to 6 (Always) how often "Drinking alcohol makes one _____"

where the list word is inserted in the blank. These adjectives comprise

eight factors or octants of alcohol expectancies including those from

positive, negative, arousing, sedating, positive-arousing, negative

-arousing, positive-sedating, and negative-sedating expectancies.

Approximately 10 minutes are needed to complete this questionnaire. The

AEC has been shown to predict drinking concurrently, accounting for

30% of drinking variance, and at one-year post assessment, accounting for

24% of drinking variance (Goldman & Darkes, submitted). Additionally,

reliability and validity have been demonstrated for the AEC (Darkes,

Sheffield, & Goldman, 2001; Goldman & Darkes, submitted; Sheffield,

Darkes, Del Boca, & Goldman, 2001). See Appendix B for this measure.

3.   The Timeline Follow-Back (TLFB; Sobell & Sobell, 1992) is a method of

obtaining self-reports of drinking. It takes the form of a calendar upon

which drinkers write the number of standard alcoholic drinks consumed

each day of the time period in question. It takes approximately 15 minutes

to complete a 30-day time period and has been used extensively in the

college student population. The Timeline Follow-Back has been shown to

be both reliable and valid as well as ideally suited to evaluating specific

changes in drinking before and after treatment. Test-retest reliability is

high for the college student population ranging from .87 to .97 for 30-day

time periods (Sobell, Sobell, Leo, & Cancilla, 1988). Moderate to high

correlations with collateral reports of drinking and moderate to high

concurrent validity have also been demonstrated for the Timeline Follow-

Back questionnaire (Sobell & Sobell, 1992). See Appendix C for this

measure.

4. The Driving Practices Questionnaire is a series of questions created

   for the control group that asks whether and how often they engage in

    particular activities while driving that might decrease their ability to drive

   safely. The purpose of this questionnaire was to increase the range of

   questions the control group receives beyond the scope of alcohol

   consumption and alcohol expectancies so as to make it less obvious that

   they were a control group. Completion time is less than five minutes. See

   Appendix D for this measure.

5. The Driving Beliefs Questionnaire follows the same format as the

   Alcohol Expectancy Circumplex (see above) and asks participants how

   important they think it is to avoid engaging in behaviors that may interfere

with safe driving. This questionnaire was being used for the control group to increase the range of questions they received beyond the scope of alcohol consumption and alcohol expectancies so as to make it less obvious that they were a control group. Completion time is less than five minutes. See Appendix E for this measure.

6. The Level of Engagement Questionnaire was created specifically for this study to assess participants' opinions about how engaging they found their particular tasks on the computer to be. Respondents are also asked to indicate how much time they typically spend on a computer and the internet throughout the week. The portion of the questionnaire assessing participant engagement showed adequate reliability (Cronbach's Alpha = .91). Completion time is approximately five minutes. See Appendix F for this measure.

7. The Defensive Driving Content Questionnaire was created specifically as a manipulation check for this study to assess participants' level of understanding and recognition of the information provided by the defensive driving program. Completion time is less than five minutes. See Appendix G for this measure.

8. The Alcohol Program Content Questionnaire was created specifically as a manipulation check for this study to assess participants' level of understanding and recognition of the information provided by both of the alcohol programs (low-level engagement and high-level engagement).

Completion time is less than five minutes. See Appendix H for this

measure.

9.   The Debriefing Form was provided to participants after completion of the

computerized interventions. See Appendix I and Appendix J for this form.

Procedure

Potential participants were recruited directly from psychology classes or via

psychology department participant pool websites. Those meeting the study criteria were

allowed to sign up for a time to complete the first part of the study in person and agreed

to participate in a brief follow-up phone interview one month after participation in the

study.

When participants arrived for the study, they were assigned randomly in blocks to

the control group or to one of the two experimental groups. Participants in all three

groups completed an informed consent and the Demographics and Drinking Styles

Questionnaire followed by the Alcohol Expectancy Circumplex as a measure of their

alcohol expectancies prior to participation in the study. Members of the control group

additionally completed the Driving Practices Questionnaire and the Driving Beliefs

Questionnaire. All participants next completed a Timeline Follow-Back of their drinking

for the 30 days prior to the day of participation.

After the Timeline Follow-Back, members of the control group completed a low-

level engagement computerized training on safe driving practices for approximately 12

minutes (see below for details). At this time, members of the low-level engagement

experimental group completed a computerized training of equal duration and number of

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slides that covered the alcohol expectancy challenge intervention (see below for details).

Also during this time, members of the high-level engagement experimental group

completed an alcohol expectancy challenge intervention with similar content but with the

addition of interaction components and two videos (see below for details). This

intervention lasted approximately 20 minutes.

After participation in their respective computerized interventions, participants in

each of the groups completed the Level of Engagement Questionnaire as an indicator of

how engaging each program was for them and either the Defensive Driving Content

Questionnaire (control group) or the Alcohol Program Content Questionnaire (both

experimental groups). All participants were then debriefed, awarded extra credit points

for their participation in the study, and reminded of their appointment to receive a follow-

up phone interview in one month for additional extra credit.

At the one-month follow-up, all participants again completed the Alcohol

Expectancy Circumplex along with a second Timeline Follow-Back (covering 30 days

beginning with the day of their first participation in the study) to measure potential

changes in their patterns of alcohol expectancies and drinking behavior.

Computerized Interventions

As previously stated, members of the control group completed a low-level

engagement tutorial on safe driving practices. Members of the experimental groups

completed either a low-level engagement or a high-level engagement computer-based

expectancy challenge intervention.

Control group program.

Participants in the control group watched a 12-minute PowerPoint slide presentation on safe driving practices. The slides were self-timed, included some pictures, and covered material to improve defensive driving techniques such as scanning, managing one's space and speed, communicating one's intent while driving, and the utility of headlights in preventing accidents.

Low-level engagement program.

Participants in the low-level engagement group also watched a 12-minute PowerPoint slide presentation. The slides were self-timed, included some pictures, and covered alcohol expectancy challenge material based on that used by Darkes and Goldman (1993, 1998). The presentation began by describing an in vivo alcohol expectancy challenge intervention that had been conducted in a mock bar with college-age males (during the filming of the video used in the High-level Engagement Program described below) and the in vivo participants' verbal reactions to the intervention. Comments made by the participants after their in vivo alcohol expectancy challenge were used to segue into the next phase of the computerized intervention consisting of a series of text-based PowerPoint slides describing the alcohol expectancy concept and the effect of alcohol expectancies on drinking behavior.

High-level engagement program.

Participants in the high-level engagement group received the same information that was presented to the low-level engagement group except that it was presented in a more interactive format. They also spent an additional eight and a half minutes viewing

two videos, one of an in vivo alcohol expectancy challenge intervention conducted in a mock bar with college-age males, and a second of the in vivo participants' verbal reactions to the intervention. (During participant debriefing after the study, all but one who saw the video reported believing the people in the video were real as opposed to actors.)

Comments made by the in vivo participants after their in vivo alcohol expectancy challenge were used to segue into the next phase of the computerized intervention consisting of a series of modules describing the alcohol expectancy concept and the effect of alcohol expectancies on drinking behavior. With the intention of making the intervention more engaging for the participants, however, this information was broken up and interspersed with game-like exercises and questions designed to encourage deeper processing of the expectancy information. It was intended that completion of these exercises and answering these questions would entail drawing conclusions from the information provided and applying what they had learned about alcohol expectancies. The video, information, interactive elements, and goals of the program are described as sequential modules below.

Module 1.

The first module began by showing the participant a video of a group of males drinking either real alcohol or placebo alcohol and interacting in a bar setting. After a few minutes the video stopped and the participant was asked to guess which individuals in the video received real alcohol. The participant guessed by clicking his mouse on the photo of each the individuals he thought was intoxicated. After the participant had

finished guessing, the video resumed and the individuals in the video discussed who they thought were drinking and why. The video concluded with the video individuals and the participant being told who actually consumed alcohol.

Following that, the participant's guesses were compared with the correct answers, and he was told how he performed. The participant was told that, on average, guessers do no better than chance in selecting the correct drinkers. It was explained that the poor performance is due to the fact that people often act in contradictory ways when they have been drinking and that these contradictory behaviors are the result of alcohol expectancies, not the real effects of alcohol. Module 1 ended by posing the question, "Why do people start to act in certain ways (e.g., happy or social) when they've been drinking or when they *think* they've been drinking but didn't consume alcohol?"

Module 2.

The second module began by introducing a game intended to help the participant discover the answer to the question posed at the end of module 1. The participant was given a list of words describing different ways people can act (i.e., mellow, "pumped up", quiet, extroverted, friendly, aggressive, sleepy, and sexually aroused). The participant was asked to select the behaviors he thought people often attribute to the effects of drinking alcohol.

After he made his selections, the participant was told that most people think alcohol has all of those effects on people. It was then pointed out that the behaviors listed can often contradict each other ("Does alcohol make us mellow or 'pumped up'? Quiet

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or extroverted? Friendly or aggressive? Sleepy or sexually aroused?"), and it was asked how the same drug can have opposite effects.

The program continued by maintaining that alcohol cannot have all of these opposite effects on people and by explaining that alcohol expectancies are responsible for these behaviors, not pharmacology. The module ended by telling the participant that, because they affect how people act when they drink, alcohol expectancies also influence people's decisions to drink.

Module 3.

The third module introduced another game for the participant in which he had to distinguish between expectancy effects of alcohol and real, physiological effects of alcohol. The program provided a list of words describing effects from alcohol consumption and asked the participant to drag the words either to a body (if they were real, physical effects) or a thought bubble (if they were inaccurate, expectancy effects). The program provided corrective feedback if the participant chose incorrectly.

Following that exercise, the participant was asked a multiple choice question requiring him to characterize the inaccurate, expectancy effects of alcohol. ("Which of the following characterizes the inaccurate beliefs/expected effects of alcohol?") The program provided feedback either reinforcing his correct response or correcting his incorrect response.

Module 3 ended with the program providing an example of how people's inaccurate beliefs about the effects of alcohol differ from the real effects of alcohol. The

example contrasted the facts that while men often expect alcohol to make them more sexually aroused, it actually diminishes the ability for men to perform sexually.

Module 4.

The fourth module introduced "labeling" as one mechanism by which people acquire and maintain alcohol expectancies. (Alcohol consumption causes a general mental slowing that facilitates the attribution of certain effects and outcomes to alcohol. These attributions are dependent on the situation and one's expectations for the effects of alcohol.) After working through two examples where people often attribute social facilitation and increased sexual arousal to alcohol consumption ("labeling"), the program asked where these inaccurate alcohol expectancies originate.

In answer to the question, the program explained that alcohol expectancies are often learned as children grow up hearing adults talk about their expectations or watching them drink and act certain ways. Additionally, the program also implicated advertising as a source for acquiring and maintaining alcohol expectancies.

After presenting a number of alcohol advertisements and pointing out their implied messages (e.g., that consuming a particular beverage will lead to sexual encounters with attractive people or fun parties), the module summarized the information presented during the program. It concluded by asserting that the goal was not to keep participants from consuming alcohol but to help them realize that because many of the desirable effects are due to expectancies and not alcohol itself, it is possible to drink less alcohol and enjoy oneself while reducing the risks for negative consequences.

Results

Participant Characteristics by Group and Site

Research findings suggest that levels of alcohol consumption differ by gender and among ethnic groups, and they vary within those ethnic groups by drinker age (See Gerstein, Grat, Epstein, & Ghadialy, 1994; Jackson, Williams, & Gomberg, 1998; or the National Institute On Alcohol Abuse and Alcoholism's Tenth Special Report to the U. S. Congress on Alcohol and Health: Highlights from Current Research, 2000). As a result, comparisons were made to determine whether participant age and ethnicity were similarly represented in each experimental group and at each study site. As previously stated, only males were included in this study to keep the protocol used successfully by Darkes and Goldman (1993, 1998) in as nearly an unaltered format as possible.

Although the content of the experimental interventions targeted expectancies related more to social facilitation and sexual arousal and performance (as opposed to sexual orientation), the distribution of participants of differing sexual orientations across sites and groups was examined. The distribution of participants into groups at each site was also checked for comparability. In this case, comparisons were made to insure that similar proportions of participants from each study site were randomized into each of the study groups.

Age.

Table 1 presents mean ages of participants broken down by group condition and site. There were no significant age differences across groups within the full sample or across groups within individual sites. There were also no significant differences across sites for any individual group. However, when comparing across sites, the USF site (22.12 years) as a whole had significantly older participants than both the SDSU sites (19.53 years) and the UCSD sites (20.64 years) as a whole $F(2, 155) = 5.84$, $p = .004$. Thus, USF participants were on average 2.59 years older than their counterparts at SDSU and 1.48 years older than their UCSD counterparts. While this difference among sites was not large, it was considered a potential source of variance in the main analyses.

Table 1
Participant Ages by Group and Site

Participant Ages in Years								
	Full Sample		USF		SDSU		UCSD	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Control group	20.89 (n=54)	2.98	21.65 (n=26)	3.86	19.43 (n=7)	1.72	20.43 (n=21)	1.54
Low level group	21.13 (n=52)	2.56	21.96 (n=26)	2.66	20.33 (n=6)	3.83	20.30 (n=20)	1.59
High level group	21.69 (n=52)	4.73	22.73 (n=26)	6.36	18.83 (n=6)	1.17	21.20 (n=20)	1.47
Combined groups	21.23 (n=158)	3.54	*22.12 (n=78)	4.52	*19.53 (n=19)	2.41	*20.64 (n=61)	1.56

* significant at the p < .05 level

Ethnicity.

Figure 1 displays the distribution of participants across ethnicities that were randomized into each of the study's groups. A two-way contingency table analysis was

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conducted to evaluate whether the same proportion of participants across groups was from each ethnicity. The two variables were ethnicity (African American, Asian, Hispanic/Latino, Native American, White/Caucasian, and Other) and group (Control, Low level, and High level). Proportions of participants from each ethnicity were not significantly different across groups, Pearson χ^2 (8, $N = 158$) = 8.24, $p = .410$.
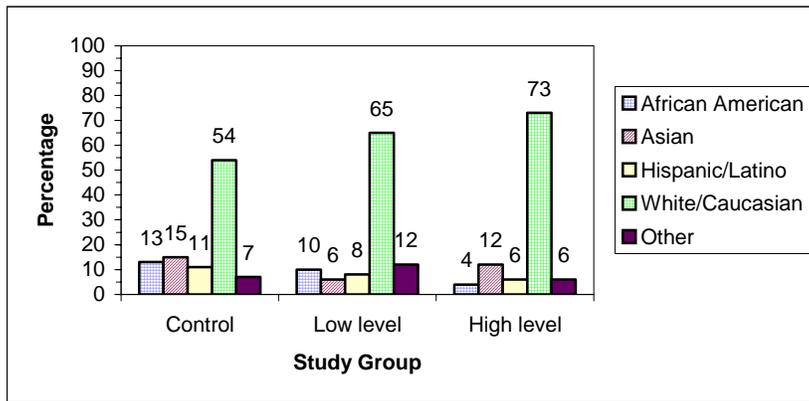
Figure 1. Participant ethnicity by group.

Figure 2 displays the distribution of participants across ethnicities that were in each of the study's sites. A two-way contingency table analysis indicated that ethnicity and site were significantly related, Pearson χ^2 (8, $N = 158$) = 32.66, $p = .000$. Follow-up pairwise comparisons conducted using the Holm's sequential Bonferroni method to control for Type I error at the .05 level across all three comparisons indicated that the only significant pairwise difference was between USF and UCSD, Pearson χ^2 (4, $N = 139$) = 26.43, $p = .000$. The USF sample was comprised of roughly 17% African American, 1% Asian, 10% Hispanic/Latino, 67% White/Caucasian, and 5% "Other" participants. In contrast, UCSD's sample was roughly comprised of 2% African American, 25% Asian, 5% Hispanic/Latino, 59% White/Caucasian, and 10% "Other"

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participants. As shown in Figure 2, the most notable differences were in the greater

proportion of African Americans at USF (17% vs. 2%) and Asians at UCSD (25% vs.

1%).

Thus, while there were no group differences based on ethnicity, two of the sites

reliably differed in their ethnic distributions. As a result, ethnicity was also considered a

potential source of variance in the main analyses.

Figure 2. Participant ethnicity by site.

Sexual orientation.

Figure 3 displays the distribution of participants across sexual orientations that

were randomized into each of the study's groups. Results of a two-way contingency

Figure 3. Participant sexual orientation by group.

table analysis indicated that proportions of participants from each orientation were not

significantly different across groups, Pearson Chi-Square (2, $N = 157$) = 1.50, $p = .472$.
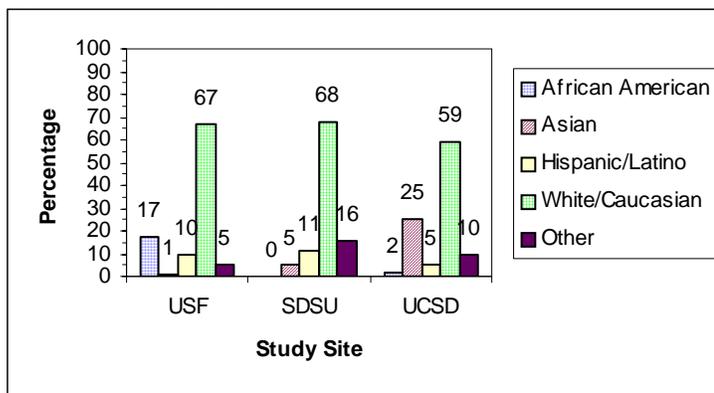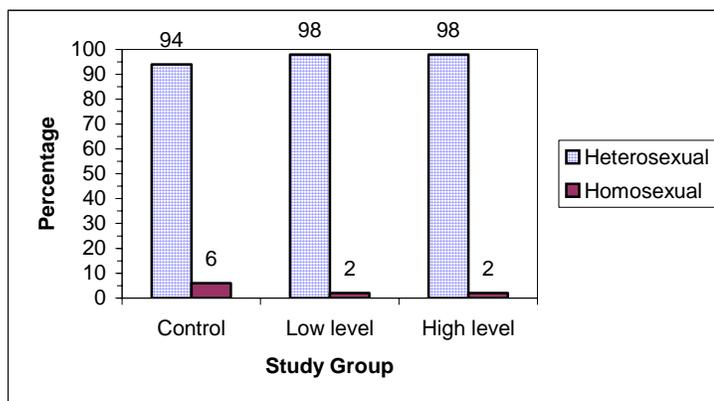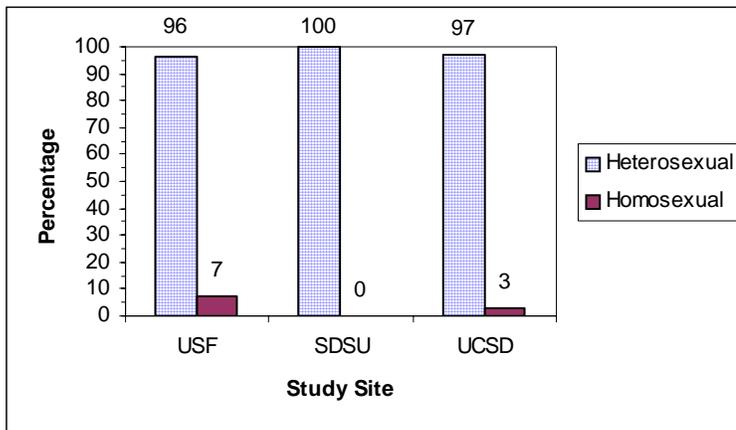
Figure 4 displays the distribution of participants across sexual orientations that

were in each of the study's sites. Again, a two-way contingency table analysis indicated

that the proportions of participants from each sexual orientation were not significantly

different across sites, Pearson Chi-Square (2, $N = 157$) = 0.74, $p = .691$.

Given the similarity across both groups and sites in participant sexual orientation

and the relatively small numbers of homosexual participants, the impact of this variable

on study outcomes was considered minimal. Therefore, sexual orientation was not

treated as a source of additional variance in the main analyses, nor were participants

excluded from analysis based on sexual orientation.

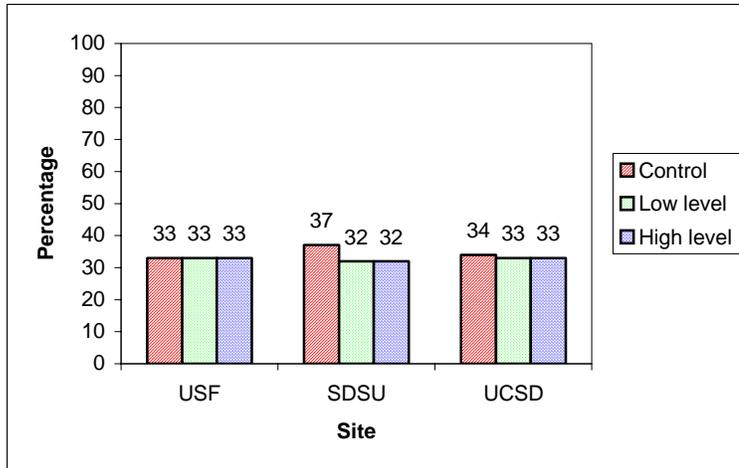*Figure 4*. Participant sexual orientation by site.

Distribution among groups at each site.

As depicted in Figure 5, a two-way contingency table analysis indicated that the

proportion of participants from each of the groups was not significantly different across

sites, Pearson Chi-Square $(4, N = 158) = .086, p = .999$. As a result, the random distribution of participants to groups within each site was considered successful.

Figure 5. Participant group assignment by site.

In summary, no reliable differences were found among groups for age, ethnicity, or sexual orientation. In addition, there were no site differences for sexual orientation or in terms of the distribution of participants into each of the study groups. However, there was variation among sites with regard to both participant age and ethnicity with USF having significantly older students and an ethnic distribution that differed from that of UCSD.

As a result of these findings, both age and ethnicity were considered potential sources of additional variance in the main analyses. Given that both variables contributed to site differences, and, in an attempt to diminish the impact of differences among sites with regard to time of year when the interventions were administered (discussed in more detail below), study site was incorporated into the main analyses as a between subjects variable to clarify the role it played in this study. (The analyses were also conducted assigning age and ethnicity as covariates, but this did not result in different findings.)

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Participant Attention and Engagement

The first of the study hypotheses was that participants in the high-level engagement group would display greater levels of engagement in their computerized intervention than participants in the low-level engagement and control groups. Before assessing engagement, however, it was necessary to ascertain whether participants were attending to their computerized programs.

To this end, every participant completed a content quiz after viewing his program as a manipulation check to determine roughly if he was attending to his program. As shown in Table 2, participants in each of the study groups generally did well on the quiz, correctly answering between 3 and 4 questions out of 5.

Table 2
Mean Participant Performance on 5-point Content Summary Score

Group	Mean (SD)	Site	Mean (SD)
Control (n=54)	3.63 (.81)	USF (n=78)	3.64 (.64)
Low level (n=52)	3.52 (.70)	SDSU (n=19)	3.37 (.90)
High level (n=52)	3.65 (.62)	UCSD (n=61)	3.62 (.73)
Group total (n=158)	3.60 (.71)	Site total (n=158)	3.60 (.71)

To test the engagement hypothesis, a 3 (group) X 3 (site) analysis of variance was also conducted on the summary engagement scores (minimum score = 0, maximum score = 18). Results indicated a significant main effect for group $F(2, 149) = 74.63$, $p < .001$, partial $\eta^2 = .500$, but not for site $F(2,149) = 1.10$, $p = .335$, partial $\eta^2 = .015$, or for the interaction of group and site $F(4,149) = 1.94$, $p = .107$, partial $\eta^2 = .050$. As can be seen in Figure 6, post hoc analyses conducted with Dunnett's C indicated that the high-level engagement group (mean engagement score = 13.38) reliably reported being more engaged in their intervention than the low-level engagement group whose mean

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engagement score was 10.42 ($p < .001$) and control group ($p < .001$) whose mean

engagement score was 5.46. In addition, the low-level engagement group reliably

reported being more engaged in their intervention than the control group ($p < .001$).

Figure 6. Participant engagement by group (min = 0,
max = 18).
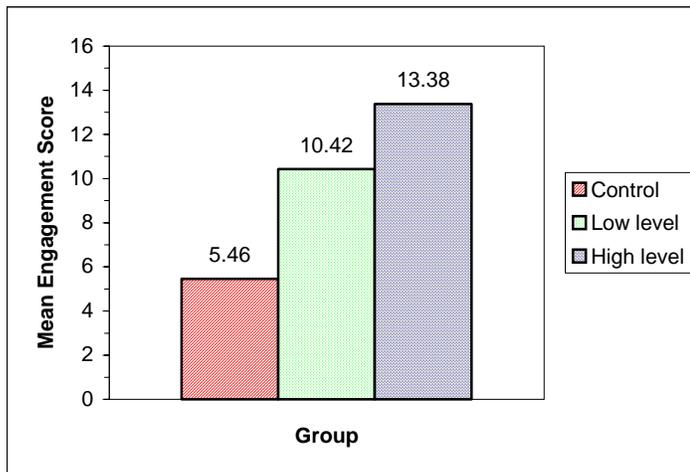
Thus, it appeared that the participants overall attended fairly well to their

respective interventions. In addition, there was support for the first study hypothesis in

that participants in the high-level engagement group reported being more engaged by

their intervention than other group members. Although no predictions were made with

regard to the relative levels of engagement for the low-level engagement and control

groups, findings suggest that low-level engagement group members were generally more

engaged in their intervention than control group members. Once support was found for

the first hypothesis, analyses continued with those addressing the outcome variables.
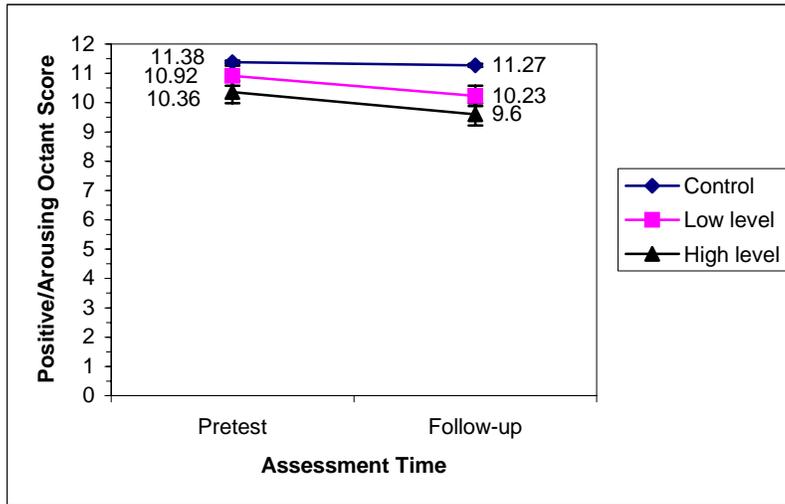
Alcohol Expectancies

The second study hypothesis was that the high-level engagement group would

display greater decreases in social/sexual expectancies by follow-up than either of the

other groups. To address this, participant scores for the AEC positive/arousing octant, arousing octant, and positive octant were examined because they are comprised of the social/sexual expectancies addressed by the expectancy challenge material. (Examples of positive/arousing octant expectancies are that drinking alcohol makes one erotic, horny, and lustful. Examples of arousing octant expectancies are that drinking alcohol makes one appealing, attractive, and beautiful. Examples of positive octant expectancies are that drinking alcohol makes one outgoing, sociable, and social.) Because there was no missing data, sample sizes remained constant across groups and sites (USF n=78, SDSU n=19, UCSD n=61) for every analysis.

Positive/Arousing octant scores.

A 2 (time) X 3 (group) X 3 (site) mixed model analysis of variance was conducted to detect changes in participant positive/arousing expectancies from pretest to follow-up. The results for the ANOVA indicated no significant main effect for time, Wilks' lambda = .981, $F(1,149) = 2.82$, $p = .095$, multivariate $\eta^2 = .019$, time by group interaction, Wilks' lambda = .994, $F(2,149) = .45$, $p = .641$, multivariate $\eta^2 = .006$, time by site interaction, Wilks' lambda = .967, $F(2,149) = 2.57$, $p = .080$, multivariate $\eta^2 = .033$, or three-way interaction of time by group by site, Wilks' lambda = .993, $F(4,149) = 0.26$, $p = .902$, multivariate $\eta^2 = .007$. Thus, positive/arousing octant expectancy scores appeared not to change as a result of any of the group interventions. See Figure 7.

Figure 7. Positive/Arousing octant scores (max=18) as a
function of group.

Arousing octant scores.

A 2 (time) X 3 (group) X 3 (site) mixed model analysis of variance was also
conducted to detect changes in participant arousal expectancies from pretest to follow-up.
As with the positive/arousing expectancy scores, the results for the ANOVA indicated no
significant main effect for time, Wilks' lambda = .997, $F(1,149) = 0.52$, $p = .473$,
multivariate $\eta^2 = .003$, time by group interaction, Wilks' lambda = .980, $F(2,149) = 1.55$,
$p= .216$, multivariate $\eta^2 = .020$, time by site interaction, Wilks' lambda = .975, $F(2,149)$
$= 1.94$, $p = .147$, multivariate $\eta^2 = .025$, or three-way time by group by site interaction,
Wilks' lambda = .988, $F(4,149) = 0.44$, $p = .779$, multivariate $\eta^2 = .012$. Again,
arousing octant expectancy scores appeared unaffected by any of the interventions. See
Figure 8.

Figure 8. Arousing octant scores (max=18) as a function of group.
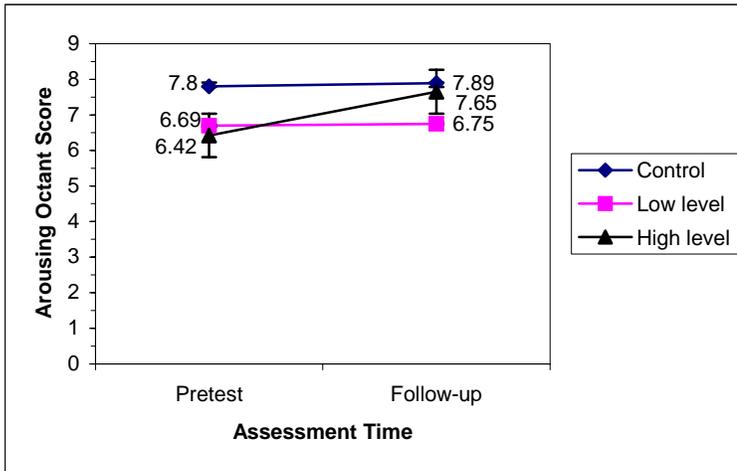
Positive octant scores.

When conducted on positive octant scores, which were normalized by squaring them, the 2 (time) X 3 (group) X 3 (site) mixed model analysis of variance indicated slightly different results. There was still no significant main effect for time, Wilks' lambda = .983, $F(1,149) = 2.60$, $p = .109$, multivariate $\eta^2 = .017$, interaction of time and group assignment, Wilks' lambda = .970, $F(2,149) = 2.33$, $p = .100$, multivariate $\eta^2 = .030$, or three-way interaction of time by group by site, Wilks' lambda = .991, $F(4,149) = 0.35$, $p = .845$, multivariate $\eta^2 = .009$. There was, however, a significant time by site interaction (Wilks' lambda = .930, $F(2,149) = 5.65$, $p = .004$, multivariate $\eta^2 = .070$), suggesting that the change in positive octant scores over time was different for different sites.

As shown in Figure 9, the change in positive octant scores over time for USF was significantly different from the change in scores for both SDSU, Wilks' lambda = .957, $F(1,91) = 4.09$, $p = .046$, multivariate $\eta^2 = .043$, and UCSD, Wilks' lambda = .933,

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$F(1,133) = 9.48$, $p = .003$, multivariate $\eta^2 = .067$. In this case the positive octant scores

increased over time for USF while they decreased for both SDSU and UCSD suggesting

that, by follow-up, USF participants reported increases in the frequency with which they

believed that alcohol makes one outgoing, social, or sociable. The frequency of these

beliefs decreased for SDSU and UCSD participants by follow-up.

Figure 9. Time by site interaction for positive octant score
(max=18; shown with non transformed data).
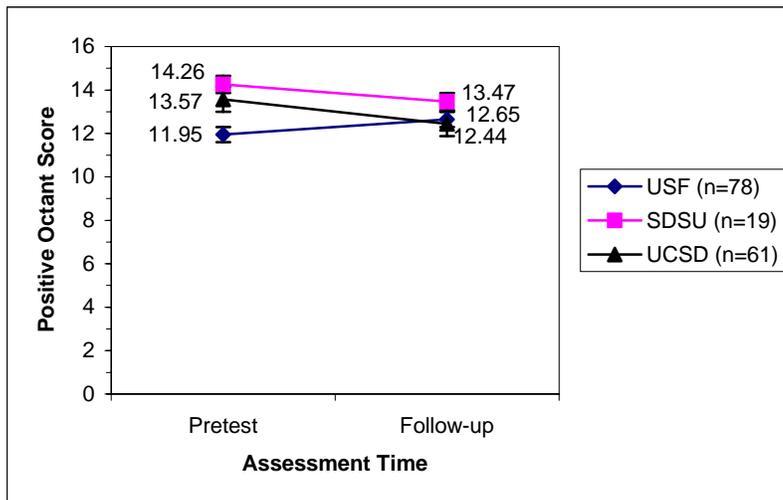
In summary, the three groups' expectancy octant scores appeared unaffected by

any of the interventions. As such, results did not support the hypothesis that participants

in the high-level engagement group would display greater changes in alcohol

expectancies than the low-level engagement and control groups.

Alcohol Consumption

The final hypothesis proposed in this study was that level of drinking would

decrease for the high-level engagement group relative to the low-level engagement and

control groups by one-month follow-up. Because the expectancy challenge intervention

focuses more on decreasing quantity than frequency of drinking, the methods chosen for

analyzing drinking data focused on this outcome. More specifically, drinking data were conceptualized and analyzed in three ways: (1) mean drinks consumed per day, (2) quantity/frequency (total number of drinks consumed/number of drinking days), and (3) proportion of binge days (where a binge is defined as 5 or more drinks in one day and the proportion of binge days equaled the number of binge days/number of drinking days).

Del Boca et al. (2004) reported that college student drinking is contingency driven such that it tends to increase around holidays and decrease when academic requirements intensify. Thus, in an effort to minimize site differences both in terms of local school holidays and time of year, drinking data were excluded from analysis when they coincided with holidays in which students were off from classes. However, drinking data falling on midterm and final exam days were included in analyses because of the variability in individual students' exam schedules, particularly across sites and during summer classes. In addition, not all students have midterm exams or exams every day of finals, and some have exams the week before finals week.

Thus, as a rule, any day when classes were cancelled due to a holiday was removed from analysis. In addition, because students would likely begin drinking more heavily the night before a free day, the day before a free day was removed from analysis. For major holidays such as spring break and winter or summer recess, the weekends preceding and following such holidays were removed from analysis as well.

Stated more specifically, at USF, spring break, summer break, Memorial Day, and Independence Day were removed from students' drinking data. At SDSU, Thanksgiving, winter recess, Martin Luther King Jr. holiday, and spring break were removed from

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students' drinking data. At UCSD, President's Day, spring break, Memorial Day, and a

local drinking holiday called the sungod festival (which, although classes are not

cancelled, is widely accepted as the heaviest drinking day of the academic year) were

removed from students' drinking data.

Mean drinks consumed per day.

To obtain this measure, the total number of drinks each participant consumed was

divided by the total number of days in his particular Timeline Follow-Back (i.e., after

removing holidays) during pretest and again during follow-up. The mean drinks variable

was normalized by square root transformation and then entered into a 2 (time) X 3

(group) X 3 (site) mixed model analysis of variance.

The results for the analysis indicated a significant main effect for time such that

all three groups decreased in mean drinks consumed by follow-up, Wilks' lambda = .768,

$F(1,149) = 45.11$, $p < .001$, multivariate $\eta^2 = .232$. The interaction of time with group

was not significant, Wilks' lambda = .989, $F(2,149) = 0.81$, $p = .445$, multivariate $\eta^2 =$

.011, nor was the interaction of time with site, Wilks' lambda = .971, $F(2,149) = 2.23$, p

$= .112$, multivariate $\eta^2 = .029$, or the three-way interaction of time by group by site,

Wilks' lambda = .940, $F(4,149) = 2.36$, $p = .056$, multivariate $\eta^2 = .060$.

Thus, participants in all three study groups decreased their mean drinks by

follow-up. There were no differences among groups or among sites with regard to the

level of change over time. As a result, no intervention appeared more favorable that the

others with regard to the mean number of drinks consumed per day. Figure 10 displays

the change in mean drinks across groups from pretest to follow-up.

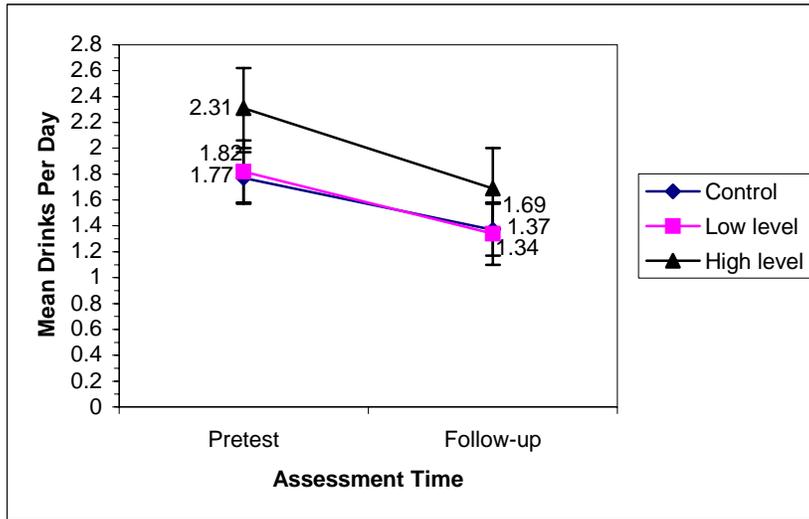*Figure 10.* Mean drinks consumed per day at pretest and follow-up for each group (shown with non transformed data).

Quantity/Frequency.

To obtain this measure, the total number of drinks each participant consumed was divided by the total number of drinking days in his particular Timeline Follow-Back (i.e., after removing holidays) during pretest and again during follow-up. The Q/F of drinking variable was normalized by taking the square root of the square root transformation and then entered into a 2 (time) X 3 (group) X 3 (site) mixed model analysis of variance.

As with the mean drinks data, results indicated a significant main effect for time such that all three groups decreased in Q/F of drinking by follow-up, Wilks' lambda = .948, $F(1,142) = 7.74$, $p = .006$, multivariate $\eta^2 = .052$. Non significant results were indicated for the time by group interaction, Wilks' lambda = .997, $F(2,142) = 0.22$, $p = .800$, multivariate $\eta^2 = .003$, for the time by site interaction, Wilks' lambda = .997, $F(2,142) = 0.21$, $p = .812$, multivariate $\eta^2 = .003$, and for the three way interaction of time by group by site, Wilks' lambda = .986, $F(4,142) = 0.52$, $p = .721$, multivariate $\eta^2 =$

.014. In addition, there was a between-subjects effect for study site such that, summing

across groups and time, USF participants were significantly lower on the Q/F of drinking

variable than both SDSU and UCSD participants, $F(2,142) = 3.918$, $p = .022$, partial $\eta^2 =$

.052.

Just as with mean drinks, participants in all three study groups displayed

decreases in their Q/F of drinking by follow-up. There were no differences among

groups or among sites with regard to the level of change over time even though USF

participants began and ended at lower levels on the Q/F variable. Again, these findings

did not suggest that one intervention led to superior outcomes relative to the others.

Figure 11 shows the change in Q/F of drinking across groups from pretest to follow-up.

Figure 11. Quantity/Frequency of drinking at pretest and
follow-up for each group (shown with non transformed data).
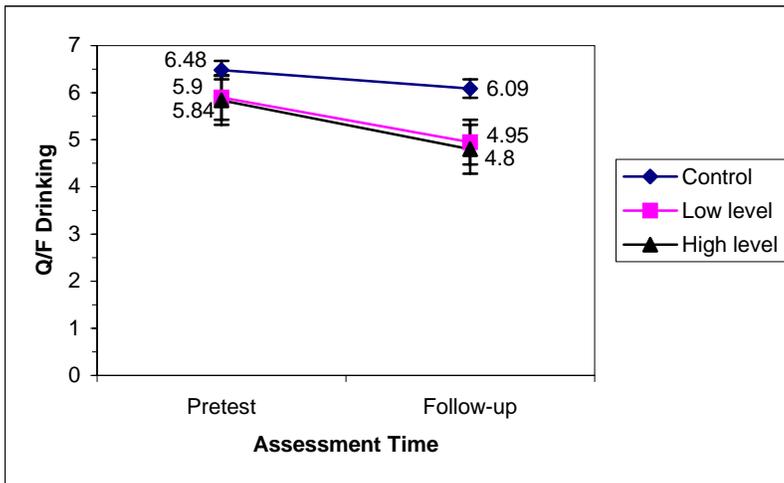
Proportion of binge days.

As previously stated, participants were considered to have binged on any day in

which they consumed five or more drinks during that day. This variable was created by

summing the number of binge days (after removing holidays) and dividing that sum by

the number of drinking days during pretest and again during follow-up. The variable was

then entered into a 2 (time) X 3 (group) X 3 (site) mixed model analysis of variance.

The results of the analysis indicated no significant main effect for time (Wilks'

lambda = .981, $F(1,142) = 2.78$, $p = .098$, multivariate $\eta^2 = .019$). There were also no

significant interactions (time by group Wilks' lambda = .998, $F(2,142) = 0.14$, $p = .871$,

multivariate $\eta^2 = .002$, time by site Wilks' lambda = .992, $F(2,142) = 0.55$, $p = .579$,

multivariate $\eta^2 = .008$, time by group by site Wilks' lambda = .981, $F(4,142) = 0.69$, $p =$

.600, multivariate $\eta^2 = .019$). Thus, as displayed in Figure 12, there was virtually no

change in the proportion of binge drinking days among groups from pretest to follow-up;

there were also no differences over time among the study sites.

Figure 12. Proportion of binge days at pretest and
follow-up for each group.
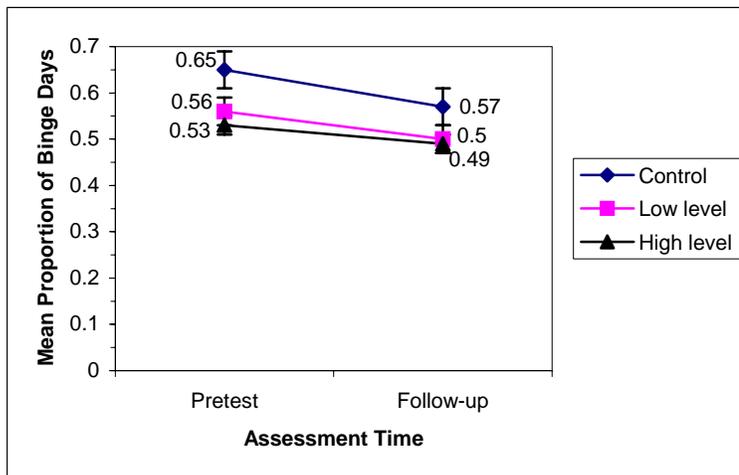
In summary, results of the analyses did not support the third and final hypothesis

that the high-level engagement group would decrease their level of drinking more than

the low-level engagement and control groups. Instead, all three groups appeared to

decrease in both their mean drinks per day and quantity/frequency of drinking by one-

month follow-up. While the overall decrease in drinking levels for the three groups is a positive outcome, these results did not provide support for the efficacy of this study's expectancy challenge interventions over and above that of the control group's assessment and defensive driving intervention.

Exploratory Analyses

Of the three study hypotheses, only the first (that the high-level engagement group would report being more engaged by their intervention) was supported by analysis. However, there were a number of sources of additional variance that were not initially incorporated into the study and that may have contributed to a lack of findings with regard to the second and third hypotheses.

One source of additional variance was that data was collected at three different sites rather than one. The sites not only differed in important demographic characteristics such as age and ethnicity but also differed with regard to which holidays were recognized by the universities (possibly affecting drinking levels). Another source of variance was created by the long period of time over which the study was run. Unlike the Darkes and Goldman (1993, 1998) studies, which took place over approximately one and three months (respectively), data collection for this project proceeded over the period of an entire calendar year. Based on the findings of Del Boca et al. (2004), it is not hard to imagine that contingencies affecting student drinking over winter recess may differ significantly from those contingencies in effect during finals week, spring break, or summer session.

As reported earlier, steps were taken to reduce the impact of these additional sources of variance such as including site as a between subjects factor and removing holidays from each participant's drinking data. However, it may be that real group differences were obscured in the process of removing the additional sources of variability. Therefore this section addresses the attempt to cull cleaner, more homogenous samples from the database to explore, very tentatively, whether any conditions exist in which future, similar interventions might be more successful.

During the process of conducting the exploratory analyses, data were divided into twelve different subsamples reflecting the attempt to separate participants by site, by time of year when they participated in the study, and by level of drinking where the split between light and heavy drinking was based on the heavy drinking sample shown to benefit most from the expectancy challenge in Darkes and Goldman (1998). Finally, Caucasians in general and those between the ages of 18 and 25 were also examined as groups because they comprised a large proportion of the whole sample and because, as discussed earlier, they tend to have the highest drinking trajectories during typical college age years. Table 3 lists the specific ways in which the data were grouped. Asterisks in the table indicate subsamples in which significant results or interesting trends were found. These results will be further described below.

Table 3

Data Groupings for Exploratory Analyses

	USF
Site	SDSU
	*UCSD
	USF with spring break in pretest
	*UCSD with spring break in pretest
Time of Year	USF and UCSD with spring break in pretest
	*UCSD with spring break in follow-up
	*USF summer 2003 and summer 2004
	Caucasians
	*Heavier drinkers with mean drinks greater than or equal to 2.16 per day (comparable to heavier drinking sample in Darkes and Goldman, 1998)
Drinker Level	*Caucasian heavier drinkers (mean of 2.16 or more drinks per day) ages 18 to 25
	*Lighter drinkers (mean less than 2.16 drinks per day)

Note. * denotes significant results or interesting trends meriting elaboration.

In the process of conducting the exploratory analyses, two interesting findings began to materialize. The first was that, when there were trends where the challenge groups showed decreases in expectancies relative to the control group, the positive octant tended to be the one most often affected. The second finding was that analyses conducted with lighter drinking subsamples tended to be the ones that showed more favorable results for the challenge groups with regard to changes in expectancies and drinking.

Interesting trends and even significant results were observed in a number of seemingly different subsamples that, upon further inspection, had in common that their participants on average drank less than the 2.16 drinks per day during pretest adopted from the Darkes and Goldman (1998) study. Before discussing particular subsamples, however, it is important to note that, while the full sample from which these subsamples were drawn (i.e., with holidays intact) had a daily pretest mean of 2.29 drinks, the sample

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upon which the main study analyses were conducted (i.e., with holidays removed) had a daily mean of only 1.97 drinks during pretest. This latter mean is also below the 2.16 drinks per day mark. Nevertheless, the subsamples appear to yield more favorable results – perhaps due to different proportions of particular ethnic groups, participants of particular ages, time of year during which data was collected, chance, or some other factors.

UCSD.

The first subsample was composed of participants from the UCSD site. It was comprised of 61 participants who on average drank 1.90 drinks per day during pretest. The subsample was analyzed in a 2 (time) X 3 (group) mixed model analysis of variance. As can be seen in the top line graph of Figure 13, the high-level engagement and low-level engagement group appeared to have a sharper rate of decrease in positive octant expectancy scores than the control group. The group by time interaction, however, was not significant, Wilks' lambda = .950, $F(2,58) = 1.54$, $p = .223$, multivariate $\eta^2 = .050$.

As shown in the bottom line graph of Figure 13, a similar pattern held for the mean drinks per day. Again, however, the group by time interaction was not significant, Wilks' lambda = .956, $F(2,58) = 1.34$, $p = .271$, multivariate $\eta^2 = .044$.

Thus, this subsample fits both the pattern of favorable trends for the challenge groups in lower drinking samples and positive octant expectancies being most affected. In addition, a decreasing trend in some alcohol expectancies coincided with a decreasing trend in drinking levels for the challenge groups.
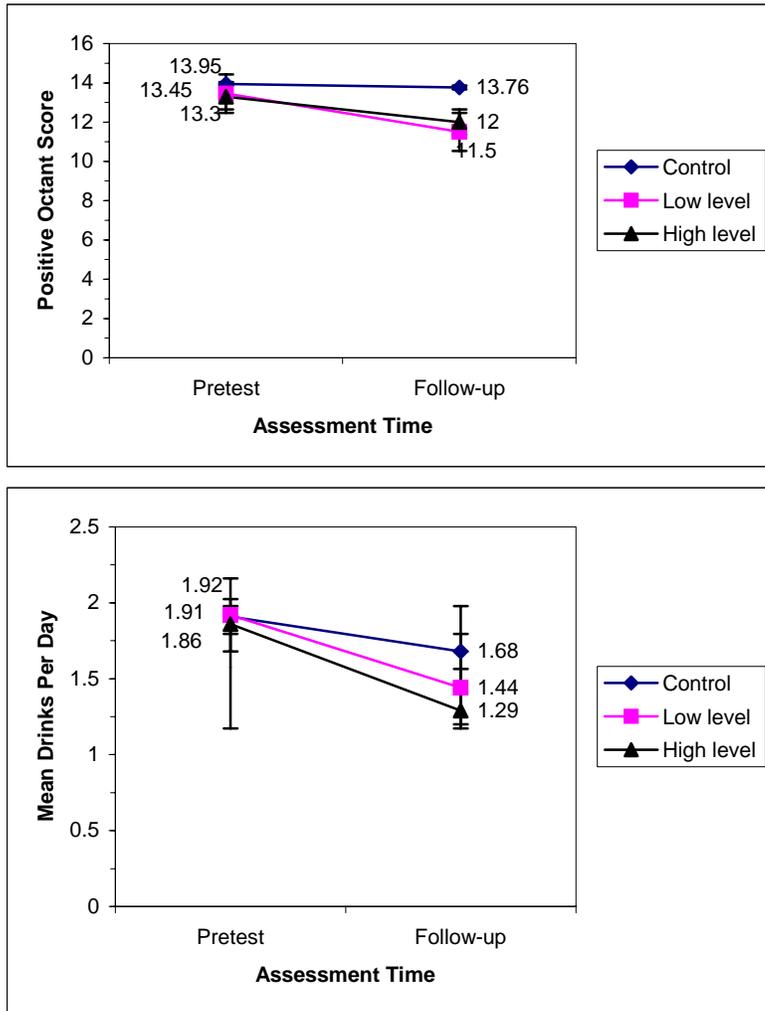
UCSD with spring break in pretest.

The next subsample was composed of participants from the UCSD site who

received their interventions shortly after spring break such that their pretest drinking data

included spring break. This subsample held 36 participants with a mean pretest number

of daily drinks equaling 1.89. The subsample was also analyzed in a 2 (time) X 3 (group)

mixed model analysis of variance. As can be seen in the top line graph of Figure 14, the

two challenge groups appeared to have a slightly sharper rate of decrease in positive

octant expectancy scores than the control group. The group by time interaction was not

significant, however, Wilks' lambda = .933, $F(2,33) = 1.18$, $p = .319$, multivariate $\eta^2 =$

.067.

Figure 14. Positive octant scores (max=18) and positive/
arousing octant scores (max=18) for UCSD subsample with
spring break in pretest.
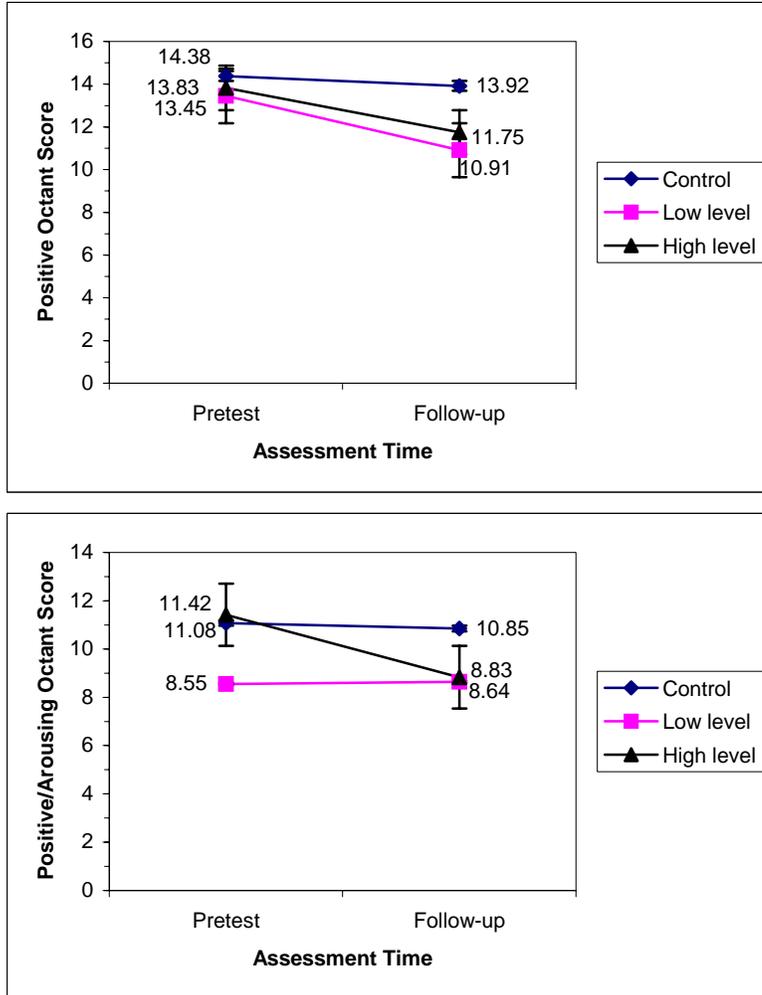
As seen in the bottom line graph of Figure 14, the high-level engagement group

had a much larger rate of decrease in positive/arousing octant expectancy scores than the

control group, while the low-level engagement group experienced a slight increase in

their slope relative to the control group. The group by time interaction was not significant, Wilks' lambda = .874, $F(2,33) = 2.37$, $p = .109$, multivariate $\eta^2 = .126$. While the trends for changes in expectancies were not consistent decreases for both challenge groups and there were no corresponding decreasing trends in drinking levels, it is nonetheless interesting to note that the trends that were found occurred in a lighter drinking subsample and positive octant expectancies were again affected.

UCSD with spring break in follow-up.

This subsample was comprised of UCSD participants whose follow-up assessment period overlapped with spring break. There were 24 participants in this subsample, and they consumed an average of 1.91 drinks per day during pretest. As before, the subsample was analyzed in a 2 (time) X 3 (group) mixed model analysis of variance. For this subsample, there were three interesting results.

The first was a statistically significant effect for the time by group interaction for the mean drinks per day, Wilks' lambda = .674, $F(2,21) = 5.09$, $p = .016$, multivariate $\eta^2 = .326$. Follow-up comparisons revealed significant differences in the change over time between the control and low-level engagement groups, Wilks' lambda = .714, $F(1,14) = 5.60$, $p = .033$, multivariate $\eta^2 = .286$, and between the control and high-level engagement groups, Wilks' lambda = .651, $F(1,13) = 6.98$, $p = .020$, multivariate $\eta^2 = .349$. These findings are illustrated in the top line graph of Figure 15 where the slope of the control group remains fairly constant over time while the slopes of the challenge groups decrease over time.

Figure 15. Mean drinks per day and arousing octant scores
(max=18) for UCSD subsample with spring break in follow-up.
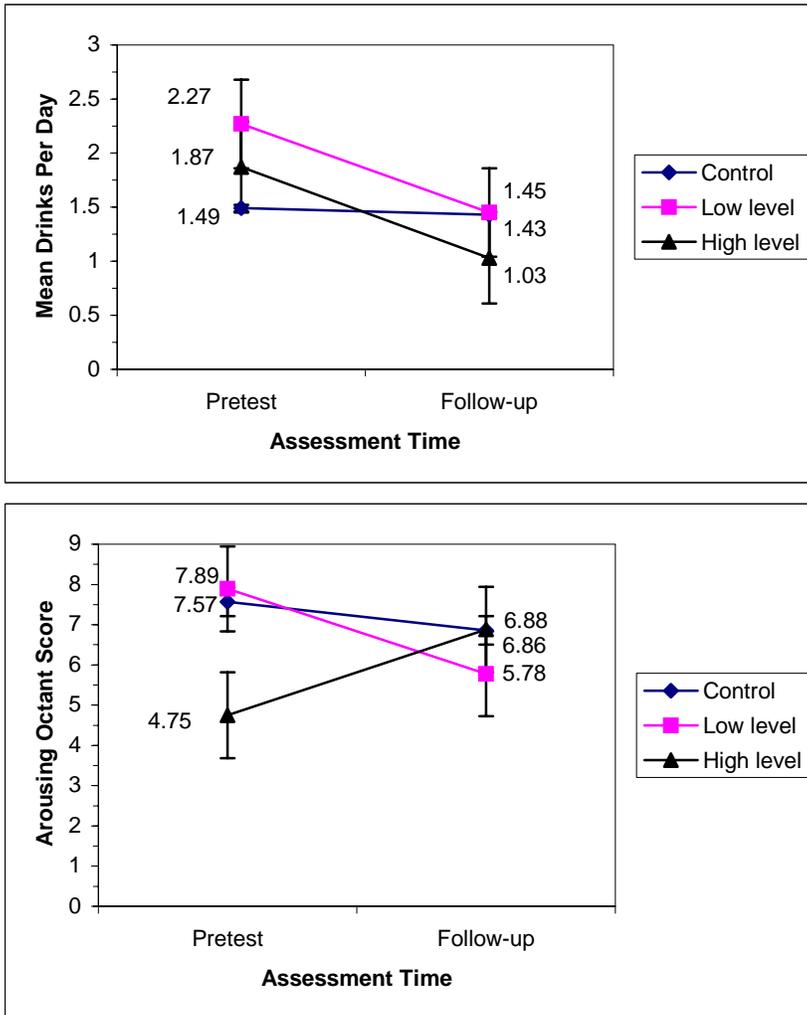
The second interesting result was another significant effect for the time by group
interaction for the arousing octant expectancy score, Wilks' lambda = .715, $F(2,21) =$
4.18, $p = .030$, multivariate $\eta^2 = .285$. In this case, however, follow-up comparisons
revealed significant differences in the change over time between the low-level
engagement group and the high level engagement group, Wilks' lambda = .641, $F(1,15)$
= 8.40, $p = .011$, multivariate $\eta^2 = .359$. There was unfortunately a reliable difference in

the two group slopes where the low-level group decreased and the high-level group

increased in arousing octant scores (see bottom line graph of Figure 15).

The third interesting finding for this subsample was a trend in which the control

group increased in positive octant expectancy scores over time while the low-level

engagement group decreased and the high-level engagement group remained about the

same (see Figure 16). The group by time interaction was not significant, however,

Wilks' lambda = .937, $F(2,21) = .708$, $p = .504$, multivariate $\eta^2 = .063$.

Figure 16. Positive octant scores (max=18) for UCSD
subsample with spring break in follow-up.
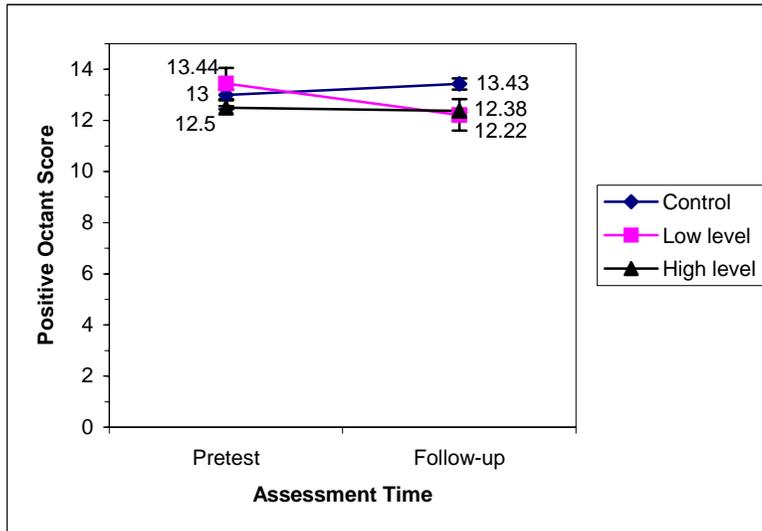
In summary, then, this lighter drinking subsample actually produced statistically

significant findings where the mean number of drinks per day decreased for the

experimental groups relative to the control group. Contrary to expectation, however,

these findings were accompanied by a statistically reliable increase in the slope of the

high-level engagement group's arousing octant score and a trend for the positive octant

score to remain unchanged over time. Nevertheless, in line with expectation, the reliable

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decrease in the low-level engagement group's mean number of drinks per day was also accompanied by a reliable decrease in that group's arousing octant score and a decreasing trend in its positive octant score over time (while the control group's mean number of drinks remained unchanged and the group's positive octant score displayed an increasing trend over time).

USF summer 2003 and summer 2004.

This subsample was comprised of USF participants who participated in the study during one of the two summers in which data was collected. There were 23 participants in this subsample, and they consumed an average of 1.71 drinks per day during pretest. As before, the subsample was analyzed in a 2 (time) X 3 (group) mixed model analysis of variance.

The first interesting finding was a statistically significant effect for the time by group interaction for the quantity/frequency of drinking, Wilks' lambda = .689, $F(2,20) = 4.52$, $p = .024$, multivariate $\eta^2 = .311$. Follow-up comparisons revealed significant differences in the change over time between the control and low-level engagement groups, Wilks' lambda = .661, $F(1,13) = 6.66$, $p = .023$, multivariate $\eta^2 = .339$, and between the low-level and high-level engagement groups, Wilks' lambda = .726, $F(1,13) = 4.90$, $p = .045$, multivariate $\eta^2 = .274$. These findings are illustrated in the top line graph of Figure 17 where the slope of the low-level engagement group decreases while the slope of the control group increases and the slope of the high-level engagement group remains fairly constant over time.

The next interesting finding for this subsample was a trend in which the control group increased in proportion of binge drinking days over time while the low-level engagement group decreased and the high-level engagement group remained about the same (see bottom line graph of Figure 17). The group by time interaction was not significant, Wilks' lambda = .862, $F(2,20) = 1.61$, $p = .226$, multivariate $\eta^2 = .138$.

Figure 17. Quantity/Frequency of drinking and proportion of binge days for USF subsample for summer 2003 and summer 2004.
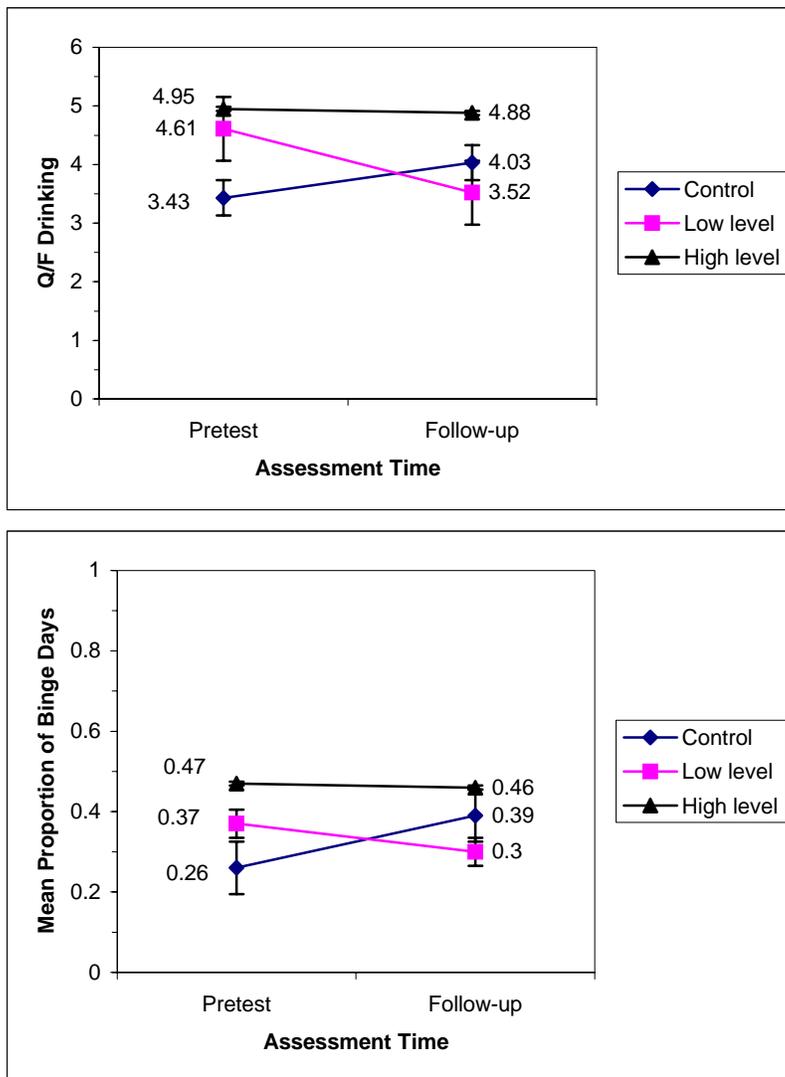
Again, statistically significant results and trends favored the low-level engagement group (but not the high-level engagement group) over the control group for two drinking variables in this lighter drinking subsample. There were no favorable findings, however, for expectancy scores, positive octant or otherwise.

Heavier drinkers.

There were two subsamples of heavier drinkers. The first was one where heavier drinkers were defined as consuming greater than or equal to 2.16 drinks per day on average. The second heavier drinking subsample had the same drinking criterion but was further restricted to Caucasians aged 18 to 25 years.

The first heavier drinking subsample held 66 participants who drank an average of 3.68 drinks per day. Analysis in a 2 (time) X 3 (group) X 3 (site) mixed model analysis of variance revealed a trend for the positive octant expectancy score where the control group increased over time while the two challenge groups decreased. The group by time interaction was not significant, Wilks' lambda = .968, $F(2,57)$ = .93, p = .399, multivariate η^2 = .032. See Figure 18.

Figure 18. Positive octant expectancy score (max=18) for heavier drinker subsample (mean daily drinks = 2.16 or higher).
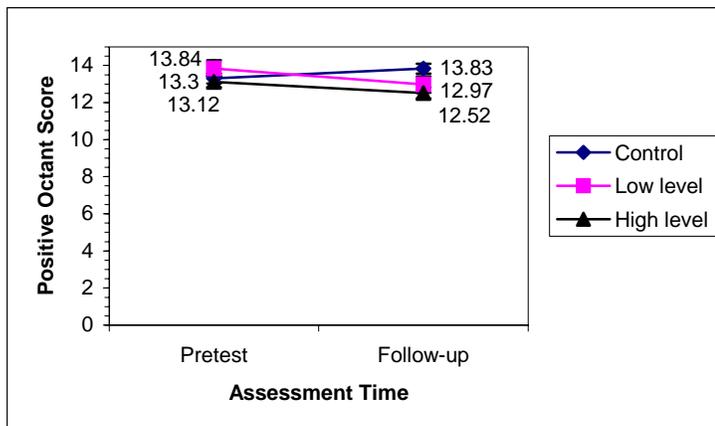
The second heavier drinking subsample (consisting of Caucasians aged 18-25) held 47 participants who drank an average of 3.72 drinks per day. As with the other heavier drinking subsample, analysis in a 2 (time) X 3 (group) X 3 (site) mixed model analysis of variance revealed a trend for the positive octant expectancy score. In this case, the control group increased slightly while the low-level engagement group decreased slightly and the high-level engagement group decreased more substantially over time. The group by time interaction was again not significant, Wilks' lambda = .941, $F(2,38) = 1.19$, $p = .314$, multivariate $\eta^2 = .059$. See Figure 19.

Figure 19. Positive octant expectancy score (max=18) for heavier drinker subsample (mean daily drinks = 2.16 or higher) comprised of Caucasians aged 18-25 years.
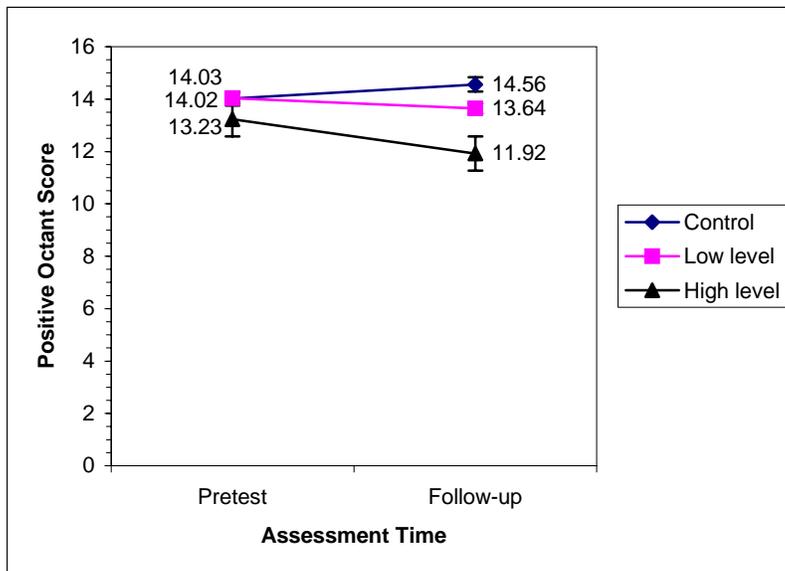
These subsamples were comprised of heavier drinkers relative to the other subsamples. However, in both cases there were trends where positive octant expectancy scores decreased over time for both challenge groups relative to the control group.

Lighter drinkers.

This last subsample was created to contrast the heavier drinking subsamples and to test further the theory that more favorable trends for the challenge groups occurred in lighter drinking subsamples. As such, the final subsample was comprised of all individuals who consumed less than 2.16 drinks per day on average. It held 92 participants who actually consumed 1.30 drinks per day on average.

This subsample was also analyzed in a 2 (time) X 3 (group) X 3 (site) mixed model analysis of variance and resulted in an interesting trend for the positive octant expectancy score. In this case, the control group increased slightly while the high-level engagement group decreased slightly and the low-level engagement group decreased more sharply over time. The group by time interaction was not significant, Wilks' lambda = .961, $F(2,83) = 1.67$, $p = .196$, multivariate $\eta^2 = .039$. (See Figure 20.)

Figure 20. Positive octant expectancy score (max=18) for lighter drinker subsample (mean daily drinks < 2.16).
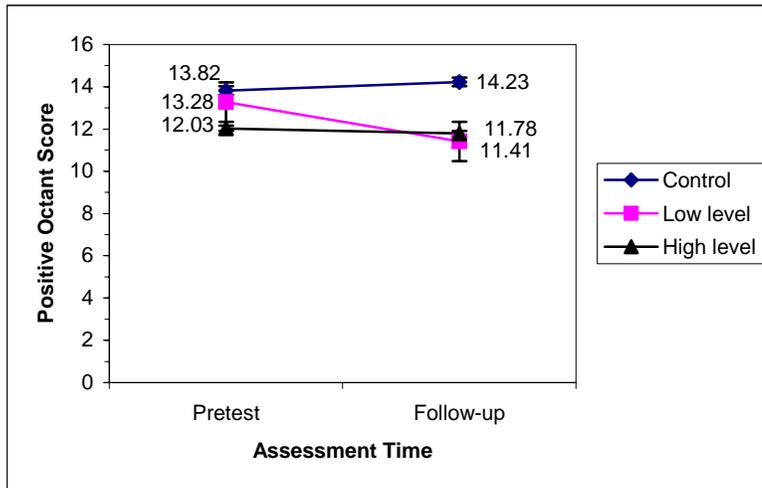
This trend did fit the pattern of more favorable trends for the challenge groups in lighter drinking subsamples, but, in essence, it displayed the same pattern of only

favorable trends in the positive octant scores found in the two heavier drinking subsamples. Furthermore, no favorable trends were found for drinking variables in this subsample.

In summary, given the exploratory nature of these analyses, it is impossible to draw any firm conclusions. However, as originally noted at the beginning of this section, when more homogenous subsamples were analyzed, favorable trends occasionally resulted. Additionally, there appeared to be some commonality in these findings such that they were detected in lighter drinking subsamples or involved positive octant expectancy scores (or both). While there were instances where trends in both favorable decreases in expectancy scores and drinking outcomes coincided, this occurred far less consistently.

In addition to the previous investigations, exploratory analyses were also conducted using the main variables of interest (i.e., site, time of year, and drinker level) as interactions terms in the hope of gaining more statistical power. The results of these analyses were not significantly different from those previously discussed.

Discussion

The purposes of this investigation were to examine the effect of varying the amount of participant engagement on alcohol expectancies and drinking outcomes during a social/sexual alcohol expectancy challenge intervention and to test of the efficacy of administering an expectancy challenge in a computerized format rather than in vivo. It was hypothesized that participants experiencing a challenge intervention that was more interactive would find it more engaging and would exhibit greater changes in alcohol expectancies and drinking levels, presumably because they paid more attention to and processed the intervention more deeply.

Results of this study suggested that, as predicted, participants in the high-level engagement group reported finding their intervention more interesting than participants in either the low-level engagement group or the control group. Members of the low-level engagement group, in turn, found their intervention more interesting than members of the control group did. Given that presentation format differed from high-level engagement group to low-level engagement group and that content differed from low-level engagement group to control group, it would seem that content as well as presentation format contributed to how engaged participants were with their interventions.

Interestingly, regardless of their self-reported level of engagement, members of all three groups performed equally well when quizzed on the content of their interventions. Because the mean accuracy level was around 70% for each of the groups, a ceiling effect

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is not implicated. Thus, within this study, higher levels of self-reported engagement did not lead to greater levels of mastery over the intervention material. If this is the case, it may help explain why the remaining study hypotheses were not supported.

With regard to alterations in social/sexual alcohol expectancies targeted by the expectancy challenge intervention, none of the groups showed significant changes from pretest to one-month follow-up. Nevertheless, all three groups displayed significant decreases over time on two of the three alcohol consumption variables (mean drinks per day and quantity/frequency of drinking). These findings are curious given that alcohol expectancies are the putative mechanism for change in the expectancy challenge, and an examination of potentially contributing as well as confounding factors is warranted.

One explanation for drinking changes without expectancy changes is that alterations in alcohol expectancies, while leading to decreases in drinking in the two experimental groups, may themselves have been shorter lived and vanished by one-month follow-up. However, such a supposition is not supported by other expectancy research and fails to account for the similar level of decrease in drinking found in the control group, which did not experience an expectancy challenge.

Another possible explanation for drinking changes in all three groups that might occur without expectancy changes is that participants became more aware of their drinking habits while completing the Timeline Follow-Back at pretest. This enhanced self-awareness could have contributed to a decrease in their drinking over the follow-up period, assuming they believed there was such a need.

A related explanation is that of experimental demand. In this case, participants could have become aware that the research goal was to decrease drinking and tried to help the researcher achieve that goal, either by drinking less or by reporting a decrease in drinking. Care was taken to hide the true nature of the study from the control group by adding questionnaires about safe driving practices and to refrain from sharing with any group members which information would be gathered at follow-up. In the latter instance, participants were only told that they would be repeating some of the same questionnaires at follow-up, not which ones. Nevertheless, the true nature of the study was still likely implicit inasmuch as participants were in a psychology study that asked numerous questions about alcohol consumption and beliefs about the effects of alcohol. If this were the case, though, one might wonder why members of the two experimental groups did not also endorse decreases in their alcohol expectancies at follow-up.

The answer to this question may lie in a dosing effect. While the notion of counting how many drinks one consumes is not a foreign concept to most drinkers, the idea of noting and challenging alcohol expectancies likely is. Perhaps members of the experimental groups did not endorse lasting changes in alcohol expectancies because the one brief exposure to the concept afforded by this study was insufficient to produce a lasting effect. A more long-term reduction in alcohol expectancies may require multiple exposures to expectancy challenging procedures as provided in both of Darkes and Goldman's 1993 and 1998 studies. In this regard, it would have been informative to assess for changes in alcohol expectancies immediately after the intervention in addition to the one-month follow-up.

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Another potential confound for this study was that participants were recruited from three separate sites that are disparate with regard to geography and academic as well drinking reputations. Further, the number of participants recruited from each site differed significantly as did important demographic characteristics such as age and ethnicity. Attempts were made when reviewing, cleaning, and analyzing the data to help identify and compensate for site effects, but the study would undoubtedly have been more powerful with a more homogenous sample collected at one site only.

A related potential confound lay in the extended period of time over which data was collected. Unlike the Darkes and Goldman studies (1993, 1998), participants were recruited for this study over the period of a full calendar year. As previously noted, Del Boca et al. (2004) observed significant changes in drinking patterns throughout the academic year. Even though attempts were made to help control for these contingency-driven fluctuations in drinking that were idiosyncratic to site and time of data collection, it is very likely that some "noise" remained in the data.

Exploratory analyses were conducted to address some of these confounding issues by reducing variability through the creation of smaller, more homogenous subsamples and repeating the main study analyses on them. Although power issues were undoubtedly a problem as well as type I errors, these analyses still suggested some trends in the data that might inform future challenge studies.

One such trend was that positive octant expectancies (i.e., that alcohol makes one outgoing, sociable, and social) tended to decrease over time for the challenge groups relative to the control group. Such a trend might be explained by the fact that the video

in the high-level engagement group and the description of it in the low-level engagement group depicted a group of men in a social situation and their erroneous attributions regarding the effects of alcohol on each other's sociability. While the original Darkes and Goldman (1993, 1998) protocol included such a focus for one of its sessions, that focus was balanced by a second session addressing more arousing (i.e., that alcohol makes one appealing, attractive, and beautiful) and positive/arousing expectancies (i.e., that alcohol makes one erotic, horny, and lustful) by having the participants rate slides of females on level of attractiveness. This content was omitted from the current study protocol.

It may also be that expectancies did change as a result of the intervention but were not detectable by one-month follow-up either due to their short longevity or because of the assessment measure used to detect them. While the Alcohol Expectancy Circumplex was used in this study and detected no changes, the Expectancy Context Questionnaire, which reputedly measures shorter-term changes in alcohol expectancies, was used with more success in Darkes and Goldman (1993, 1998).

Another interesting finding of the exploratory analyses was that the challenge groups in lighter drinking subsamples tended to yield a greater number of favorable outcome trends than their heavier drinking subsample counterparts. This finding is somewhat perplexing given the greater efficacy of the Darkes and Goldman (1993, 1998) protocol for their heavier drinking participants. Perhaps the difference lies in the more social rather than sexual focus of the current challenge in that the heavier drinkers are more affected by challenges to their sexual expectancies.

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Another explanation potentially lies in the single-session nature of the current study's challenge compared with the three sessions and the expectancy awareness homework assignments of the Darkes and Goldman (1993, 1998) protocol. It may be that a certain threshold is reached after more than one exposure to expectancy challenge material that causes greater or more lasting changes in participants, particularly heavier drinkers.

Given these two trends detected during the exploratory analyses, future expectancy challenges may yield better results by addressing both social and sexual expectancies. They may also do better by providing more than one exposure to expectancy challenging material, either through more than one session, through homework assignments, or both.

This study was a success in translating the expectancy challenge material to computerized formats that were capable of affecting participants' levels of engagement. As previously mentioned, participant engagement was one of four identified possible key components to a successful expectancy challenge, the others being exposure to a salient expectancy-disconfirming experience, inclusion of content that is personally relevant to participants, and use of a homogenous sample of relatively heavy-drinking college males. To the degree that exposure to the other three possible key components was achieved and successfully held constant across groups, this study can be judged as useful in determining that varying participant engagement is not sufficient to effect changes in alcohol expectancies and drinking levels alone. Given the relative ease and cost-effectiveness of administering computerized interventions, however, future research may

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be informed by the conclusions drawn and questions raised from this study and should

not abandon this methodology as a means for affecting alcohol consumption.

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Appendices

_____   _____
Student name (print neatly)   Date

Please complete the following so that we may contact you for your follow-up phone appointment:

_____
      Phone Number

_____   _____
      Best day to call   Best time to call

Please provide answers to the following questions.

When were you born?

      _____/_____/_____
      month   day   year

How old are you currently?

      _____
      (years)

What is your GPA?

      _____

Please place your responses to the questions below on the scantron provided.

1. How would you describe your sexual orientation?

   (a) Heterosexual   (b) Bisexual   (c) Homosexual

2. Which ethnicity best describes you?

   (a)   African American, Black
   (b)   Asian
   (c)   Hispanic/Latino/Latina
   (d)   Native American
   (e)   White, Caucasian
   (f)   Other

3. Which of the following best describes you?

   (a) Never used alcohol
   (b) Used to drink in the past, but now abstain from alcohol
   (c) Recovering alcoholic
   (d) Light drinker
   (e) Social drinker
   (f) Moderate drinker
   (g) Regular drinker
   (h) Heavy drinker

4. How old were you when you first tried alcohol – more than just a few sips?

   (a) Never used alcohol
   (b) 10 years old or younger
   (c) 11
   (d) 12
   (e) 13
   (f) 14
   (g) 15
   (h) 16
   (i)17 years or older

5. <u>During the past year</u>, about how <u>frequently</u> did you drink alcohol? Please choose the
   response which comes closest to describing your drinking pattern.

      (a) Never; I don't use alcohol
      (b) Once or twice during the year
      (c) 3 to 6 times per year
      (d) 7 to 10 times per year
      (e) About once a month
      (f) 2 or 3 times per month
      (g) Once or twice a week
      (h) 3 or 4 times a week
      (i) 5 or more times per week

6. On occasions when you drink, about how many drinks do you <u>typically</u> consume?
   Please estimate the actual number of drinks, where:
      1 drink = approximately 1 can of beer, or
             = 1 glass of wine or wine cooler, or
             = 1 serving of liquor or a mixed drink.

      (a) None, I don't use alcohol
      (b) One drink
      (c) 2 drinks
      (d) 3 drinks
      (e) 4 drinks
      (f) 5 drinks
      (g) 6-8 drinks
      (h) 9-12 drinks
      (i) 13-16 drinks
      (j) 17 or more drinks

7. <u>During the past month</u>, how frequently did you drink enough alcohol to get <u>drunk or</u>
   "<u>high</u>"? Please choose the response which comes closest to describing your drinking
   pattern.

      (a) Never
      (b) Once
      (c) Twice
      (d) 3 times
      (e) Once or twice a week
      (f) 3 or 4 times a week
      (g) 5 or 6 times per week
      (h) Daily or almost daily

8. <u>During the past year</u>, how frequently did you drink enough alcohol to get <u>drunk or</u>
    "<u>high</u>"? Please select the response which comes closest to describing your drinking pattern.

    (a) Never
    (b) Once or twice during the year
    (c) 3 to 6 times per year
    (d) 7 to 10 times per year
    (e) About once a month
    (f) 2 or 3 times per month
    (g) Once or twice a week
    (h) 3 or 4 times a week
    (i) 5 or more times per week

Appendix B: Alcohol Expectancy Circumplex

This page contains words describing possible effects of alcohol. For each word, imagine it completing the sentence: "**DRINKING ALCOHOL MAKES ONE_____.**" Then, for each word **mark the number that indicates how often you think that this effect happens or would happen 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. Please mark your answers on the computer answer sheet.

The available responses/numbers and their meaning are indicated below:

0	1	2	3	4	5	6
Never	Very Rarely	Rarely	Occasionally	Frequently	Very Frequently	Always

"DRINKING ALCOHOL MAKES ONE _____."

9. Appealing

10. Arrogant

11. Attractive

12. Beautiful

13. Cocky

14. Dangerous

15. Deadly

16. Dizzy

17. Drowsy

18. Egotistical

19. Erotic

20. Hazardous

21. Horny

22. Ill

23. Light-headed

24. Lustful

25. Nauseous

26. Outgoing

27. Sick

28. Sleepy

29. Sociable

30. Social

31. Tired

32. Woozy

Appendix C: Timeline Follow-Back

January

Sun	Mon	Tue	Wed	Thu	Fri	Sat
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

2004

Appendix D: Driving Practices

Please place your responses to the questions below on the <u>SCANTRON 2</u> provided.

1. How often do you *make* cell phone calls (without a hands-free device) while operating a motor vehicle?

    (a) Almost every time I drive
    (b) Many times when I drive
    (c) Occasionally when I drive
    (d) Never when I drive

2. How often do you *answer* cell phone calls (without a hands-free device) while operating a motor vehicle?

    (a) Almost every time I drive
    (b) Many times when I drive
    (c) Occasionally when I drive
    (d) Never when I drive

3. How often do you read (e.g., map, newspaper, book, magazine, etc.) while operating a motor vehicle?

    (a) Almost every time I drive
    (b) Many times when I drive
    (c) Occasionally when I drive
    (d) Never when I drive

4. How often do you eat while operating a motor vehicle?

    (a) Almost every time I drive
    (b) Many times when I drive
    (c) Occasionally when I drive
    (d) Never when I drive

5. Have you ever taken a safer driving course?

    (a) Yes
    (b) No
    (c) Unsure

Appendix E: Driving Beliefs

Please place your responses to the questions below on the <u>SCANTRON 2</u> provided.

This page contains a list of behaviors in which people sometimes engage while operating a motor vehicle. For each item, **mark the number that indicates how important you think it is to avoid engaging in that behavior while operating a motor vehicle.**

Answer each item according to your own personal beliefs about these behaviors. Please mark your answers on the scantron provided.

The available responses/numbers and their meaning are indicated below:

0 **Not At All** **Important**	**1** **Very** **Unimportant**	**2** **A Little** **Unimportant**	**3** **Somewhat** **Important**	**4** **Important**	**5** **Very** **Important**	**6** **Extremely** **Important**

"WHILE OPERATING A MOTOR VEHICLE ONE SHOULD AVOID _____."

6. Eating

7. Using A Palm Pilot

8. Operating the stereo

9. Smoking

10. Self-grooming (e.g., combing hair, shaving, etc.)

11. Using over-the-counter drugs

12. Reading (e.g., map, newspaper, book, magazine, etc.)

13. Operating Climate Control (e.g., Heat, Air Conditioning, etc.)

14. Talking to others in the vehicle

15. Making Cell Phone Calls

16. Receiving Cell Phone Calls

17. Searching For Objects in the Vehicle

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Appendix F: Level of Engagement Questionnaire

Please place your responses to the questions below on the <u>SCANTRON 1</u> provided.

For the items below, please indicate your opinion of your time spent on the computer during this study. Please be <u>as honest as you can</u> so that we may take your responses into consideration when adapting this program for future users.

33. The computer program

    (a) Attracted my attention throughout
    (b) Attracted my attention most of the time
    (c) Attracted my attention once in a while
    (d) Didn't really attract my attention at all

34. During my time on the computer

    (a) I was very involved in the program from start to finish
    (b) I was mostly involved in the program, but there were moments when my mind wandered
    (c) I was somewhat involved in the program, but my mind wandered quite a bit
    (d) I was hardly involved in the program at all. My mind wandered virtually the whole time

35. I found that the computer program

    (a) Encouraged a lot of active participation on my part
    (b) Required some active participation on my part
    (c) Asked me to do only a few things
    (d) Just required that I sit passively while it ran

36. In general the computer program was

    (a) Very interesting and didn't really seem to drag at all
    (b) Fairly interesting but dragged from time to time
    (c) A little interesting but dragged quite a bit
    (d) Pretty boring overall

37. If others were to complete the same program they would likely find it

    (a) Very engaging
    (b) Mostly engaging
    (c) Somewhat engaging
    (d) Hardly engaging at all

38. For other individuals completing this computer program

      (a) It would hold their attention virtually the whole time
      (b) It would keep their attention most of the time but their minds would wander from
            time to time
      (c) Their minds would wander quite a bit
      (d) They would hardly be able to pay attention at all

Please answer the following questions so we may understand how computer experience may affect the way people viewed the computer program differently.

39. During the <u>past 30 days</u> (excluding participation in this study) I have used a computer for work/school

      (a) Never
      (b) Once
      (c) Twice
      (d) 3 times
      (e) Once or twice a week
      (f) 3 or 4 times a week
      (g) 5 or 6 times per week
      (h) Daily or almost daily

40. How many hours per occasion did you <u>typically</u> use the computer for work/school?

      (a) None, I haven't used a computer for work or school in the last 30 days
      (b) 1 hour or less
      (c) 2 hours
      (d) 3 hours
      (e) 4 hours
      (f) 5 hours
      (g) 6 hours
      (h) 7 hours
      (i) 8 hours
      (j) 9 or more hours

41. During the <u>past 30 days</u> (excluding participation in this study) I have played computer/video games

      (a) Never
      (b) Once
      (c) Twice
      (d) 3 times
      (e) Once or twice a week
      (f) 3 or 4 times a week
      (g) 5 or 6 times per week
      (h) Daily or almost daily

42. How many hours per occasion did you <u>typically</u> play computer/video games?

      (a) None, I haven't played computer/video games in the last 30 days
      (b) 1 hour or less
      (c) 2 hours
      (d) 3 hours
      (e) 4 hours
      (f) 5 hours
      (g) 6 hours
      (h) 7 hours
      (i) 8 hours
      (j) 9 or more hours

43. During the <u>past 30 days</u> I have been in internet chat rooms

      (a) Never
      (b) Once
      (c) Twice
      (d) 3 times
      (e) Once or twice a week
      (f) 3 or 4 times a week
      (g) 5 or 6 times per week
      (h) Daily or almost daily

44. How many hours per occasion did you <u>typically</u> spend in internet chat rooms?

      (a) None, I haven't visited internet chat rooms in the last 30 days
      (b) 1 hour or less
      (c) 2 hours
      (d) 3 hours
      (e) 4 hours
      (f) 5 hours
      (g) 6 hours
      (h) 7 hours
      (i) 8 hours
      (j) 9 or more hours

45. During the <u>past 30 days</u> I have surfed the internet

      (a) Never
      (b) Once
      (c) Twice
      (d) 3 times
      (e) Once or twice a week
      (f) 3 or 4 times a week
      (g) 5 or 6 times per week
      (h) Daily or almost daily

46. How many hours per occasion did you <u>typically</u> spend surfing the internet?

      (a) None, I haven't surfed the internet in the last 30 days
      (b) 1 hour or less
      (c) 2 hours
      (d) 3 hours
      (e) 4 hours
      (f) 5 hours
      (g) 6 hours
      (h) 7 hours
      (i) 8 hours
      (j) 9 or more hours

Appendix G: Defensive Driving Content Questionnaire

Please answer the following questions about the material presented by the computer program.

47. Defensive driving includes all the following *except* for _____.

   (a) Making safe turns
   (b) Managing your space
   (c) Communicating your intentions
   (d) Maintaining concentration
   (e) All of the above
   (f) None of the above

48. Which of the following behaviors are helpful defensive driving "scanning" techniques?

   (a) Making sure you're in the center of your lane when driving
   (b) Checking your mirrors before changing speed or position in traffic
   (c) Maintaining a safe following distance
   (d) Keeping your eyes moving from far to near
   (e) "a" and "b", above
   (f) "b" and "d", above
   (g) "a" and "d", above
   (h) "b" and "c", above

49. When managing your speed, "stopping" time includes which of the following?

   (a) The time it takes to perceive a hazard
   (b) The time it takes to react
   (c) The time it takes to stop once the brakes are applied
   (d) "A" and "B" above
   (e) All of the above
   (f) None of the above

50. Because honking your horn may spark an aggressive response in others, you should only use it to prevent an accident

   (a) True
   (b) False

51. There is no benefit to driving with your headlights on during the day.

   (a) True
   (b) False

Appendix H: Alcohol Program Content Questionnaire

Please answer the following questions about the material presented by the computer program.

47. Alcohol expectancies (effects people expect from alcohol that are not really caused by alcohol) include all the following *except* for _____.

    (a) Emotional states like becoming happy or sad
    (b) Sexual arousal like becoming more sexually aroused
    (c) Social effects like becoming more extroverted
    (d) Physiological changes like becoming dizzy
    (e) All of the above
    (f) None of the above

48. Which of the following behaviors that people often attribute to the effects of alcohol are inaccurate expectancy effects?

    (a) Becoming talkative
    (b) Becoming nauseous
    (c) Becoming sleepy
    (d) Becoming sexually aroused
    (e) "a" and "b", above
    (f) "b" and "d", above
    (g) "a" and "d", above
    (h) "b" and "c", above

49. How do people acquire inaccurate expectancy beliefs about the effects of alcohol?

    (a) By watching and hearing adults talk about their alcohol expectancy beliefs
    (b) By seeing adults drink and engage in behaviors based on their alcohol expectancy beliefs
    (c) By seeing alcohol expectancy beliefs linked with alcohol in advertising
    (d) "A" and "B" above
    (e) All of the above
    (f) None of the above

50. Alcohol expectancy effects do not really come from drinking alcohol, but people often feel that way when they drink. This is because alcohol causes a general mental slowing and numbing effect and people label what is happening around them based on the situation (e.g., being at a party) and their beliefs about the effects of alcohol (e.g., having a good time).

    (a) True
    (b) False

51. At higher does, alcohol makes it *easier to perform* sexually.

    (a) True
    (b) False

Appendix I: Debriefing Form for University of South Florida

Thank you for participating in this study! Don't forget that **you will be contacted 30 days from today to complete a brief follow-up phone interview.**

The goal of this study was to look at how different ways of presenting computerized information can affect how engaged participants become while using a computer program and what type of effect the program has on participants' behaviors. Your participation will aid in psychologists' understanding of how these computerized interventions work.

Previous research has established principles of software construction that enhance user engagement, motivation, and learning. These suggestions encompass both the modalities of information presentation (e.g., audio, graphic, and text-based) and the types of learning activities believed to be the most effective in engaging and motivating software users. Some examples of techniques believed to improve user engagement and learning include presenting material with words and pictures rather than words alone and reducing the number of extraneous words and sounds included in a presentation.

If you are interested in learning more about principles of software construction and how these may affect software users, please feel free to contact William Hunt at 974-6963 or at the University of South Florida Psychology Department in PCD 4118G. Additionally, you may find the references below of interest.

Related references:

Goldman, M. S. (1999). Expectancy operation: Cognitive/neural models and architectures. In I. Kirsch (Ed.), *Expectancy, experience, and behavior* (pp. 41-63). Washington, D.C.: APA Books.

Mayer, R. E. & Moreno, R. (2002). Aids to computer-based multimedia learning. *Learning and Instruction, 12,* 107-119.

Stoney, S. & Oliver, R. (1998). Interactive multimedia for adult learners: Can learning be fun? *Journal of Interactive Learning Research, 9(1),* 55-81.

Appendix J: Debriefing Form for San Diego State University and University of California, San Diego

Thank you for participating in this study! Don't forget that **you will be contacted 30 days from today to complete a brief follow-up phone interview.**

The goal of this study was to look at how different ways of presenting computerized information can affect how engaged participants become while using a computer program and what type of effect the program has on participants' behaviors. Your participation will aid in psychologists' understanding of how these computerized interventions work.

Previous research has established principles of software construction that enhance user engagement, motivation, and learning. These suggestions encompass both the modalities of information presentation (e.g., audio, graphic, and text-based) and the types of learning activities believed to be the most effective in engaging and motivating software users. Some examples of techniques believed to improve user engagement and learning include presenting material with words and pictures rather than words alone and reducing the number of extraneous words and sounds included in a presentation.

The information presented in this study concerned behaviors in which people may engage that have the potential to place them or others at risk of harm or even death. Risky driving behavior may include driving aggressively such as cutting people off on the road, exceeding the speed limit, and making sudden or unexpected lane changes. Risky drinking behavior may include consuming alcohol in situations that require the exercise of good judgment (e.g., sexual encounters or deciding to practice safe sex) or that require coordination (e.g., such as driving). Additionally, as a rule it is not recommended by the medical profession that adults consume more than one or two drinks per day. It is illegal for individuals under the age of 21 to consume alcohol at all.

If you are interested in learning more about principles of software construction and how these may affect software users, in safe driving practices, or in the effects of alcohol consumption, please feel free to contact William Hunt at (858) 642-3261 or

C/o Sandra A. Brown, Ph.D.
9500 Gilman Dr.
McGill Hall (0109)
La Jolla, CA 92093.

Additionally, you may find the references below of interest:

Goldman, M. S. (1999). Expectancy operation: Cognitive/neural models and architectures. In I. Kirsch (Ed.), *Expectancy, experience, and behavior* (pp. 41-63). Washington, D.C.: APA Books.

Mayer, R. E. & Moreno, R. (2002). Aids to computer-based multimedia learning. *Learning and Instruction, 12,* 107-119.

Stoney, S. & Oliver, R. (1998). Interactive multimedia for adult learners: Can learning be fun? *Journal of Interactive Learning Research, 9(1),* 55-81.

About the Author

William Michael Hunt received a Bachelor's of Science Degree from James Madison University, Harrisonburg, Virginia, in 1994 where he majored in psychology and minored in anthropology. He received his first master's degree from Hollins University, Roanoke, Virginia, in 1995, studying general/experimental psychology, and a second master's degree in clinical psychology from the University of South Florida in 2001. Between the two degrees he lived in London and served as a resident advisor for the James Madison University studies abroad program.

Upon completion of his second M.A., Mr. Hunt proceeded to doctoral candidacy, earning minors in quantitative methodology and in computer programming and data analysis. After fulfilling course requirements for the program, he completed a one-year clinical internship at the University of California, San Diego. Mr. Hunt currently resides in San Diego and is working as a National Institute on Alcohol Abuse and Alcoholism postdoctoral fellow at San Diego State University.