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Projected Alcohol Dose Influences on the Activation of Alcohol Expectancies in College Drinkers

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Abstract

Background—Alcohol expectancies have been linked to drinking behavior in college students, and vary according to a number of factors, including projected dose of alcohol. Research using Multidimensional Scaling (MDS) suggests that drinking may be influenced by activation of differing expectancy dimensions in memory, yet studies have not examined expectancy activation according to projected alcohol doses.

Methods—The present study used Individual Differences Scaling (INDSCAL) to map expectancy networks of college students ($n = 334$) who imagined varied drinking at high and low alcohol doses. Expectancy activation was modeled by dose, as well as by gender and by drinking patterns (typical quantity, blood alcohol content, heavy episodic drinking, and alcohol consequences). Expectancies were organized along positive-negative and arousal-sedation dimensions. Anticipation of a high dose of alcohol was associated with greater emphasis on the arousal-sedation dimension, whereas anticipation of a lower dose was associated with greater emphasis on the positive-negative dimension.

Results—Across heavy, medium, and light drinkers, expectancy dimensions were most distinguishable at higher doses; activation patterns were more similar across drinking groups at lighter doses. Modest evidence for the influence of gender on activation patterns was observed. Findings were consistent across alcohol involvement indices.

Conclusions—These data suggest that both dimensionality and context should be considered in the refinement of interventions designed to alter expectancies in order to decrease hazardous drinking.

Keywords

College Students; Alcohol Expectancies; Expectancy Activation

ALCOHOL EXPECTANCIES: DIMENSIONS AND INFLUENCES

BELIEFS ABOUT ALCOHOL (i.e., expectancies) are important predictors of drinking in college (e.g., Bartholow et al., 2000; Kassel et al., 2000; Sher et al., 1996), and are a target in preventive interventions (e.g., Corbin et al., 2001; Darkes and Goldman, 1993, 1998; Dunn et al., 2000). Social Learning Theory (Maisto et al., 1999) posits that alcohol beliefs are fundamental to the learning and reinforcement of alcohol behaviors, and they both shape and

are shaped by experience (Jones et al., 2001; Sher et al., 1996; Stacy et al., 1991). Increasingly, evidence shows expectancies to consist not of just one, but of many dimensions, with each dimension uniquely affected by individual characteristics, and contextual factors (e.g., Dunn and Earleywine, 2001; Leigh and Stacy, 1994; Palfai et al., 1997; Wiers et al., 2002).

ALCOHOL EXPECTANCY ACTIVATION

Expectancy *activation*—the extent to which expectancy memory networks become activated in memory—is one important dimension of the expectancy construct. Activation occurs when previously learned alcohol information is retrieved and interpreted, presumably in the service of determining behavioral outcomes. As Goldman and colleagues (1999) outline in their review of Alcohol Expectancy Theory, memory for alcohol (or other) information is not maintained in tact in memory, but instead is assembled when various component parts are needed. This assembly generally occurs in response to relevant stimuli, and occurs sequentially. Specifically, the beliefs most closely related to that stimuli are assembled first, with other beliefs becoming activated in order of the emphasis placed on those beliefs relative to the stimuli. This sequential activation process can be contrasted with the more static and oft-studied dimension of expectancy *endorsement*. Whereas expectancy activation reflects the extent to which and in what context a belief is brought forth in memory, expectancy endorsement represents the extent to which an individual holds a belief about alcohol's effects. Thus, the activation of expectancy networks is thought to reflect evaluations of alcohol's effects that occur automatically, outside of conscious awareness. Such automatic—sometimes referred to as “implicit”—cognitions have been shown to be important for understanding alcohol behavior (Palfai and Ostafin, 2003; Wiers et al., 2002).

Multidimensional Scaling (MDS) is a data analytic approach that has been used to assess the activation dimension of the expectancy construct. This technique focuses on the structure of associations among alcohol cognitions in order to statistically map expectancy “nodes” (or pieces of information) similar to the way that one might map memory nodes (Dunn and Goldman, 2000; Goldman et al., 1999; Leigh, 1989; Rather and Goldman, 1994; Rather et al., 1992). Grounded in network theory (Collins and Loftus, 1975), these procedures employ mathematical algorithms to calculate spatial maps of relations among expectancy constructs. Thus, solutions resulting from MDS analyses are thought to represent a proxy of expectancy networks, depicting the structure of associations among alcohol cognitions (Dunn and Goldman, 2000; Goldman et al., 1999; Rather and Goldman, 1994). This again is in contrast to more traditional methods for examining alcohol expectancies. Rather than interpreting item responses as indicators of the presence or absence of a set of beliefs, MDS procedures attempt to delineate expectancy process by examining patterns of sequential activation (Goldman et al., 1999).

CONTEXTUAL VARIABILITY IN EXPECTANCIES AND EXPECTANCY ACTIVATION

As noted, expectancy endorsement and expectancy network activation reflect 2 distinct expectancy dimensions. Analysis of patterns of activation, such as is done in MDS, may offer insight into the structure of relationships among different types of expectancies that cannot be gleaned from analysis of expectancy endorsement alone. Furthermore, MDS can assess these associative pathways as a function of individual differences (e.g., Dunn and Earleywine, 2001; Dunn and Goldman, 1998; Rather and Goldman, 1994). As such, MDS analysis may help to describe when and for whom expectancy activation patterns may hold.

DRINKING CONTEXT FACTORS: IMAGINED ALCOHOL DOSE

Imagined Alcohol Dose

Alcohol's effects are not uniform, and can include both excitatory and inhibitory outcomes, depending among other things on where an individual falls on the blood alcohol curve. As such, expectations for alcohol's effects are likely to be influenced by the quantity of alcohol one expects to drink. Early work by Southwick and colleagues (1981) found that indeed, expectations for alcohol's effects were contingent on dose, varying depending on whether a heavy or a light dose of alcohol was anticipated in association with the effect. Since then, there has been surprisingly little research that takes dose influences on the anticipation of alcohol's effects into account. A handful of studies have examined expectancy endorsement across perceived alcohol doses (Dunn and Earleywine, 2001; Guarna and Rosenberg, 2000; Wiers et al., 1997, 2000). This work is corroborated by other research using balanced placebo and other designs where expectation for alcohol administration is manipulated. Findings from this work may have particular relevance to the present study, as these designs isolate expectancies as they become activated by the anticipation of alcohol consumption. These investigations have demonstrated that perceived alcohol and other drug outcomes vary according to instructional (dose) set (c.f., Fillmore et al., 1998; Juliano and Brandon, 2002; Marlatt et al., 1973; Perkins et al., 2008), with at least some studies suggesting that expectations for dose exert an influence independent of actual alcohol consumption (Marlatt et al., 1973). No study to our knowledge has assessed the influence of imagined alcohol dose on the associative structure of alcohol expectancies in memory.

The small body of literature that has examined dose in regard to alcohol expectancies has identified 2 individual-level factors that may qualify the association between dose and activation of expectancy structures in memory, drinking status and gender.

INDIVIDUAL-LEVEL FACTORS

Drinking Status

Drinking status may influence and be influenced by expectancy processes. Heavy drinkers tend to endorse positive expectancies more than lighter drinkers (e.g., Brown et al., 1980; Mooney et al., 1987; Rohsenow, 1983), and to respond faster to positive expectancy words (Read et al., 2004). Studies of expectancy structure show similar findings. Previous work by Dunn and colleagues (Dunn and Goldman, 1998, 2000; Dunn and Yniguez, 1999) has used MDS to model alcohol expectancies across drinker status, finding heavier drinkers to show greater spreading activation of positive alcohol expectancies than lighter drinkers. Importantly, studies examining the effects of drinking status on expectancy process typically have relied on a single index of alcohol involvement—often a representation of typical quantity and frequency of drinking. Yet, data suggest utility in examining separately multiple indicators of alcohol involvement, as deleterious outcomes have been associated not just with drinking, but with drunkenness—sometimes differentially so (e.g., Read et al., 2008; Turner et al., 2004), and with heavy episodic, or “binge” drinking (Borsari et al., 2001).

Social learning models posit that cognitions about alcohol are learned and reinforced in various ways (Maisto et al., 1999). Among the most primary mechanisms for this learning is through experiences with alcohol. Indeed, both theory and empirical evidence suggest that anticipation of alcohol's effects both shape and are shaped by experience. Experience with alcohol (i.e., typical drinking behavior) likely has an influence on dose-related perceptions of alcohol's effects. Some data have offered support for the idea that heavier drinkers, and those at greater risk for alcohol problems (i.e., family history of alcoholism) show greater endorsement of both positive and negative expectancies at higher alcohol doses (Fromme et al., 1993; Wiers et al., 1997, 2000). Individuals with more drinking experience may have not only more strongly

formed (endorsement) of alcohol expectancies than newer or lighter drinkers, but also enhanced activation of specific types of memory network pathways. As more alcohol involvement likely provides greater opportunities for pairing of associations between expectations and drinking outcomes, the associative networks connecting these beliefs may be more readily activated in heavier drinkers.

Heavier drinkers may also show greater activation of expectancy networks at higher imagined doses, though to date this is unknown, as no studies have examined the effects of drinking status on dose-related expectancy activation.

Gender

Gender is another individual difference factor thought to affect expectancy processes (e.g., Brown et al., 1980; Edgar and Knight, 1994; Lundahl et al., 1997; Read et al., 2004; Rohsenow, 1983). Gender may be of particular importance to expectancy activation, as socialization and other processes may shape beliefs about what drinking outcomes are acceptable or desirable for each gender (Windle and Davies, 1999). Furthermore, women metabolize alcohol differently than men, resulting in greater drunkenness (other factors held constant) at lower doses than would be required for men. These differences in alcohol's physical effects, when combined with social expectations for how women should behave when drinking or inebriated may cause women to place more emphasis on the effects of alcohol at higher doses. These higher doses may carry with them greater physiological and social consequences. At least 2 studies have documented the potential importance of gender with respect to dose-contingent expectancies. Work in the early nineties by Earleywine and Martin (1993) and then later by Wall and colleagues (2000) showed dose-dependent expectancies to be qualified by gender, with higher-dose expectancies to be more pronounced for women than for men.

In the only study to our knowledge to model the activation of expectancy networks by both drinking status and gender, Rather and colleagues (1992) found modest sex differences among heavy and light drinking college students; women showed greater dispersion of expectancy vectors within drinking groups. The authors interpreted these findings as indicating that the relative importance of expected alcohol effects are less uniform for women. Whether gender also is important to dose-dependent activation of expectancy networks is unknown.

In summary, both drinking status and gender are important contextual variables that may influence expectancies. Although a number of studies have examined associations of these contextual variables on *endorsement* of alcohol expectancies, very few studies have examined associations of these individual difference factors in the *activation* of expectancy networks. Importantly, none has modeled expectancy activation at varying imagined alcohol doses, or examined how such activation may differ across persons of different genders and drinking habits. Such an investigation will help to elucidate specific mechanisms through which expectancy activation is qualified, and thus may inform the tailoring of expectancy-based interventions designed to reduce problem drinking.

THE PRESENT STUDY

The purpose of the present study was to provide what we believe is the first examination of patterns of expectancy activation at differing levels of alcohol involvement (4 indices: typical quantity, typical blood alcohol content, heavy episodic "binge" drinking status, and alcohol consequences), across genders, at varying *imagined doses* of consumption. We assessed multiple dimensions of alcohol involvement for a more reliable assessment of this construct. Consistent with Rather and colleagues (1992), we expected greater dispersion in MDS expectancy models based on gender and drinking status such that differences between heavy, medium, and light drinking women would be greater than differences between heavy, medium,

and light drinking men. We also hypothesized that alcohol expectancies would vary by imagined alcohol “dose,” and according to drinker status and gender, with more involved drinkers showing greater activation.

METHOD

Participants

Participants ($n = 334$; 173 women) were introductory psychology students at a mid-sized university in the northeast U.S. The majority ($n = 280$, 83.8%) of participants were White. Just over half ($n = 191$, 57.2%) were first year students and the average age was 18.9 (SD = 1.4).

Procedure

Introductory psychology students were screened for study eligibility via a mass-testing procedure which took place in the first week of each semester. The screening instrument included questions about the frequency of alcohol consumption. To be eligible for the study, participants had to drink alcohol at least once weekly for the past 3 months. Students were unaware of this criterion, as drinking screen questions were embedded in many other questions. All students who met this criterion were invited by e-mail to participate in what was described as a study of “Alcohol Beliefs in College Students.” Students signed up for study sessions via web. Study sessions were conducted over the course of 2 (fall, spring) semesters, in groups of 10 to 20 (mixed-sex) participants. Informed consent was obtained at the beginning of each session. Students received academic credit for their participation.

Measures

Demographic Information—Demographic data gathered in this assessment battery included gender, age, ethnicity, height and weight, year in school, and residential status.

Alcohol Involvement: Use—The Timeline Follow-Back Interview (TLFB) and adaptations of it have been used widely in college and adolescent samples (e.g., Kokotailo et al., 2004; LaBrie et al., 2006; Murphy et al., 2007). Thus, we used a self-report, calendar-based measure of alcohol consumption based on this interview (Sobell and Sobell, 1992) to assess daily alcohol consumption. In the present study, participants were asked to report on a calendar the number of drinks consumed each day in the past 90 days, and number of hours over which they consumed those drinks. The literature provides evidence of reliable recall of alcohol consumption for 90 days or more (Deas et al., 2000; Martin et al., 1998), and at least 1 study using the TLFB approach specifically in a sample of adolescents (Levy et al., 2004) supports the reliability of this method over a periods of 3 months. Prior to questionnaire administration, the term “standard drink” was defined (i.e., the equivalent of 1 standard drink in liquor, wine, beer, etc.) and specific examples were given (e.g., how a mixed-drink, a tumbler of beer, or a “shooter” would be categorized). Research assistants monitored data collection and answered questions about the alcohol measurements. From this TLFB-based measure, information about alcohol consumption, heavy episodic drinking, and drinking frequency was yielded, as described below.

Typical Consumption—Typical consumption was represented by drinks per drinking day. Following previous work (Dunn and Earleywine, 2001), drinking categories (light, medium, and heavy) for MDS analyses were then created based on a tertile split by gender.

Heavy Episodic (“Binge”) Drinking—The participants’ heavy episodic drinking, or binge drinking, was also assessed using the calendar. Participants were categorized as “binge” drinkers if they drank an average of at least 5 drinks per occasion for males, 4 or more for

females (National Institute on Alcohol Abuse and Alcoholism, 2004). This was dichotomized (had or had not engaged in “binge” drinking in past 90 days).

Estimated Blood Alcohol Concentrations—Based on the daily consumption measure, the estimated blood alcohol concentrations (eBACs) were calculated for each participant on each day of drinking. For this, an eBAC equation was used; $[(c/2) \times (GC/w)] - (\beta_{60} \times t)$, where c = total standard drinks consumed, GC = gender constant (9.0 for women, 7.5 for men), w = weight in pounds, β_{60} = hourly rate of metabolism of alcohol (estimated at .02), and t = total drinking hours. Hustad and Carey (2005) found this equation to produce retrospective blood alcohol concentrations (eBAC) that were most similar to actual breath samples. For MDS analyses, groups (low, high typical BAC) were based on median split of eBAC calculations.

Alcohol Frequency—Drinking frequency was assessed using the drinking calendar. For each day that participants reported drinking, they received a “1” on the drinking frequency count variable, to represent a drinking day. Number of drinking days in the past 90 days was summed to form the frequency variable.

Alcohol Involvement: Consequences

Alcohol Consequences—The 48-item Young Adult Alcohol Consequences Questionnaire (YAACQ; Read et al., 2006) assesses a broad range of alcohol-related consequences experienced by college students. The YAACQ contains 8 subscales (Read et al., 2006; Social-Interpersonal Consequences, Impaired Control, Self-Perception, Self-Care, Risk Behaviors, Academic/Occupational Consequences, Physical Dependence, and Blackout Drinking) that all load on a single, higher-order factor. Response options are rated dichotomously (yes/no). Higher scores represent a greater number of consequences, with possible scores ranging from 0 to 48. Cronbach’s alpha for the YAACQ in this sample was 0.89. For MDS analyses, groups (low, medium, and high consequences) were based on a tertile split of the YAACQ distribution.

ALCOHOL EXPECTANCIES

Alcohol Expectancies

The expectancy measure was designed to assess a broad range of positive and negative beliefs about alcohol. Accordingly, participants were given a list of 132 expectancy words derived from previous work by Goldman and colleagues (see Dunn and Goldman, 1996; Goldman and Darkes, 2004; Rather et al., 1992). Each word was preceded by a stem phrase describing the effects of alcohol, and orienting the participant to the expected effects of either a low or a high dose of alcohol. Questionnaires for men and women differed on these expected doses. For women, a low dose was described as about 2 drinks; a high dose was 4 or more drinks. To report on expectancies at a low dose, men were asked to describe how they would anticipate the effects of 4 drinks (low dose); and the effects of 6 or more drinks (high dose). Thus each participant completed the following stem sentences for all 132 expectancy words; “Drinking 2/4 drinks makes me __” and “Drinking 4/6 or more drinks makes me __.” Each item was rated on a 7-point scale with response options from 0 (“never”) to 6 (“always”). The 132 expectancy words are grouped into 33 iso-meaning adjectives groups, each consisting of 4 expectancy items. Each group represents the specification of an expectancy node, and represents the frequency of occurrence of that node (Rather et al., 1992). The possible range of iso-meaning word scores is 0 to 24.

The dose categorization is based on literature that defines heavy drinking as 6 or more drinks (for men) and links it to behavioral impairment, increased acute risks, and increased mortality (Rohsenow, 2001; Sobell and Sobell, 1980). Gender differences in doses as defined for men and women were based on Rohsenow (2001).

Analytic Approach

A variant of MDS called Individual Differences Scaling (INDSCAL) was used to model configurations of alcohol expectancies in network form. INDSCAL has been applied to the study of the drinking habits of adults and children, limb of the blood alcohol curve, expectancy changes related to expectancy challenge interventions, and changes in drinking in relation to changes in expectancies (Cruz and Dunn, 2003; Dunn and Earleywine, 2001; Dunn and Goldman, 1998, 2000; Dunn and Yniguez, 1999; Dunn et al., 2000; Rather and Goldman, 1994; Rather et al., 1992).

INDSCAL and MDS are essentially mathematical algorithms applied to data formatted into proximity matrices to derive a location for each item in the analysis in relation to every other item. The relations between the items are then depicted on a multidimensional map (stimulus configuration). This map is the single best representation for all groups in the analysis, and represents depiction of an empirically derived alcohol expectancy network as it could be stored in memory. INDSCAL is a form of MDS that quantifies group differences along each dimension in a scaling analysis.

The first step in the INDSCAL analysis was the *creation of participant groups*. These participant groups were based on instructional set (imagining the effects of alcohol at either a high dose or a low dose of alcohol) and gender (female or male). The second step in our analyses was the *identification of an optimal dimensional structure* for each measure of drinking. These identified dimensions were then labeled with identifying descriptors for the anchoring point of each of the dimensions.

The third step was the *computation of group weights*. In addition to mapping possible expectancy configuration in memory, INDSCAL provides information about how participants use expectancy nodes by computing group weights for each dimension. Group weights correspond to the degree of emphasis or importance each participant group places on a dimension (ranging from 0 to 1). As the weight increases, differences between the expectancy nodes increase along that dimension. Higher weights indicate that a dimension is more influential in the decisions made by that participant group when judging the proximity between stimulus items, and lower weights indicate that a dimension is less important.

To model alcohol expectancies in relation to the 4 alcohol use metrics of interest (quantity, blood alcohol level, binge drinking, and alcohol consequences, see below), it was necessary to conduct 4 separate sets of INDSCAL analyses. A single proximity matrix is used for each group in each INDSCAL analysis, resulting in variations in the number of proximity matrices in analyses from 12 for analyses based on quantity and alcohol consequences, to 8 for each of the sets of analyses based on eBAC and binge drinking. Unequal group sizes do not adversely affect the final solution because INDSCAL uses 1 proximity matrix to represent each group in the analysis regardless of group size. Proximity matrices are remarkably stable and insensitive to outliers after group size exceeds a threshold size of approximately 20 to 25. Matrix stability directly corresponds to the reliability of the INDSCAL solution. In the present INDSCAL analyses, group sizes were large enough to yield very stable matrices with a corresponding level of reliability of conclusions.

Finally, *preference mapping* (PREFMAP) was used to model likely paths of expectancy activation through the expectancy network derived from the INDSCAL stimulus configurations. PREFMAP is essentially a multiple regression procedure that locates a vector through an MDS stimulus configuration that best represents the ordering of each expectancy type for a particular group of participants. Associational pathways were generated as a function of gender and projected alcohol dose.

Four sets of parallel analyses as described above were conducted for the 4 alcohol involvement indices. For each involvement index, drinkers were grouped into categories by level of alcohol involvement. This included (i) typical quantity consumed (low, medium, and high, based on a frequency distribution), (ii) typical eBAC (low and high, based on a median split), (iii) binge drinking status (dichotomized into “binge” and “non-binge” based on whether consuming an average of 5+ drinks per occasion for males, 4+ for females) and alcohol consequences (trichotomized based on a tertile split). Drinking indices were assessed for the past 3 months. Alcohol consequences were assessed for the past year. To examine whether the categories that we created from empirical cutoffs indeed reflected real differences in alcohol involvement, we compared groups on drinking outcomes such as drinks per drinking day, typical frequency of consumption, and alcohol consequences. In the interest of conserving space, we present only the comparisons based on the first of the 4 alcohol involvement indices, Typical Quantity. However, with a single exception, findings are consistent for typical eBAC and binge drinking groups, with significant differences on drinking outcomes across empirically derived categories (all p values <0.05). Furthermore, we took the additional step of analyzing differences on the Physiological Dependence subscale of the YAACQ across our 3 Typical Quantity drinking groups. Items on this subscale reflect physiological dependence as conceptualized in the DSM-IV-TR. Findings revealed that heavy drinkers scored significantly higher than both light and medium drinkers on physiological dependence items, $F(2, 333) = 7.34, p < 0.01$. Physiological dependence has been suggested to act as a marker of significant problem drinking and/or the presence of an alcohol dependence syndrome. As such, these groups not only are distinct from one another, but also appear to reflect different points along the spectrum of the development of significant alcohol problems.

Regardless of their own drinking history, all participants were asked to rate alcohol’s expected effects at both high and low doses. Thus, to get a sense of how much experience participants in each of the drinking groups had with the higher doses of alcohol, we examined frequencies for consuming a high dose of alcohol in the past month. Of the men in the low typical quantity drinking group, 83.3% had at least 1 occasion of consuming a high dose of alcohol (i.e., at least 6 drinks) in the previous 30 days. Of the women in the low drinking group, 75.9% had at least 1 occasion of consuming a high dose of alcohol (i.e., at least 4 drinks) in the previous 30 days. This is in contrast to 100% of men in the moderate drinking group and 98.2% in the heavy drinking group reported drinking at least 6 drinks on at least 1 occasion in the past 30 days. Ninety-three percent of women in the moderate drinking group and 96.5% in the heavy drinking group reported drinking at least 4 drinks on at least 1 occasion in the past 30 days. These data suggest that, although our “typical quantity” light drinkers may not do so regularly, a substantial portion of them have experience with higher doses of alcohol. Drinking patterns by created groups are in Table 1. INDSICAL analyses are non-metric and do not have statistical inference tests. However, data suggest that the magnitude of group weight differences is associated with behaviorally meaningful differences (see Cruz and Dunn, 2003;Dunn and Goldman, 1998).

RESULTS

All analyses were conducted across 4 alcohol involvement indices (typical quantity, typical blood alcohol, heavy episodic drinking, and alcohol consequences). Findings were remarkably consistent across all 4 distinct alcohol variables. As such, detailed findings for only 1 of the 4 indicators (typical quantity) are presented here in text and in figures. Throughout, we reference the consistency of each finding for other involvement indicators to support the robustness of these solutions.

Network Configuration of Expectancies in Memory

Identification of Dimensional Structure—Results were virtually identical for each of the 4 alcohol involvement indices in 4 separate sets of INDSCAL analyses. For each measure of drinking, determination of the optimal number of dimensions for INDSCAL analysis was based on Davison's (1983,1992) technique for determining dimensionality by graphing R^2 . Two-dimensional solutions for analyses conducted with participants grouped on average alcohol consumption quantity, typical eBAC, binge frequency, and alcohol consequences accounted for 91, 93, 90, and 92% of the variance, respectively. In each set of analyses, addition of a third dimension increased the variance accounted for by only 1 or 2%. Therefore, a 2-dimensional solution was viewed as optimal for all alcohol indices.

Dimension Descriptors—A description of the dimensional structure was created in 2 steps. In the first step, we examined the configuration of items in the 2-dimensional solutions for each of the 4 alcohol involvement groups (see Fig. 1 for solution based on typical quantity drinking groups). As stimulus configurations for each alcohol involvement grouping were nearly identical, identical dimension names represent all 4 configurations. The next step involved comparison of the present configurations to past work. This comparison of the stimulus configurations in the present analyses to past work (Dunn and Goldman, 1998; Rather and Goldman, 1994) indicated that the same set of descriptors provided the best conceptual description of the dimensions.

Dunn and Earleywine (2001) noted that dimensions identified in INDSCAL procedures represent an overall conceptual understanding of possible effects of alcohol and, importantly, how activation of various expectancy effects may cluster together. It is important to note that correct interpretation of INDSCAL solutions is not necessarily contingent on the location of any particular expectancy relative to a particular dimension. Instead, meaning is interpreted based on the location of each item in relation to every other item and in relation to all dimension poles in the configuration. As such, emphasis in the interpretation of INDSCAL solutions is placed less on items falling reliably into particular dimensions such as would be the case in factor analysis, and more on the relational location of each item (other items, dimensional poles). Thus, dimensions contextualize the patterns of activation observed for the individual expectancy group nodes. Here, to facilitate interpretation, we labeled the horizontal dimension in all 4 two-dimensional solutions as most consistent with “positive-negative” (valence) effects of alcohol while the vertical dimension is characterized as “arousal-sedation.”

Computation of Group Weights (INDSCAL Analyses)—As noted previously, group weights yielded from MDS analyses correspond to the degree of emphasis or importance each participant group places on each dimension (ranging from 0 to 1).

Figure 2 depicts the participant “weight space,” which is a visual representation of participant group weights that is much easier to interpret than a table of weights. Inspection of Fig. 2 indicates that dimension weights for participants (grouped by typical drinking quantity) given a low dose instructional set were clustered near the positive-negative dimension, suggesting that this dimension was more salient when imagining a low versus a high dose. As the dose instruction increased, participants placed less emphasis on the positive-negative dimension and more emphasis on the arousal-sedation dimension. When the weight increases, differences between the expectancy nodes increase along that dimension. Therefore, under low dose instructions, the positive-negative dimension is most salient and participants rate positive and negative expectancies as being more dissimilar than when given high dose instructions. The same is also true at projected high dose on the arousal-sedation dimension. The dimension weight space graphs for eBAC, binge drinking groups, and alcohol consequences replicate the relationships depicted in Fig. 2, revealing strong consistency across alcohol indices.

Preference Mapping—Consistent with the INDSCAL analyses described above, separate PREFMAP analyses were conducted based on drinking status, typical eBAC, binge drinking status, and alcohol consequences. The PREFMAP program plotted vectors through the stimulus configuration by regressing frequency of occurrence ratings for each expectancy onto positions of expectancies in the network. This “ideal vector” represents the judged frequency of occurrence ratings of each alcohol effect (from most to least) at projected high and low doses of alcohol for each gender and each domain of alcohol involvement; that is, if each expectancy were placed on the ideal vector via a perpendicular line from the vector to the expectancy’s location in the network, then the expectancies would lie along the vector in approximate order of their judged frequency of occurrence. In the PREFMAP analysis based on typical quantity drinking, resultant Rs ranged from 0.991 to 0.999 for each vector, and the overall root mean square was 0.995. Examination of the PREFMAP vectors for each quantity drink group (Fig. 1) indicated that the association paths of expectancies at projected low dose of alcohol were rotated toward the positive-negative dimension. At a higher projected alcohol dose, the vectors shift toward the arousal-sedation dimension. Therefore, it appears that anticipation of a high alcohol dose primarily activated arousing expectancies. Differences between groups were consistent with the differences in plotted dimension weights described above. Specifically, the vector located closest to the arousal-sedation dimension and furthest from the positive-negative dimension is the vector for female low drinkers imagining a high alcohol dose. And again, the orientation of the PREFMAP vector for this group was most consistent with the orientation of the PREFMAP vector for the heaviest drinking participant group in previous work (Dunn and Earleywine, 2001).

To enhance our understanding of the MDS analyses, and to place them in the context of our group difference analyses, we placed in rank order the 10 most strongly endorsed iso-meaning word groups or expectancy nodes for male and female drinkers in low, medium, and high quantity drinking groups (depicted in Table 2). Means for the iso-meaning adjective word groups from the expectancy measure are presented in Tables 3 and 4. Examination of means confirm findings from the PREFMAP analysis in that variability in expectancy activation is observed when imagining higher doses. For example, inspection of the top 10 expectancies (ranked in Table 2) most likely to activate at a low dose revealed no significant differences among classes of (especially) female drinkers, while several differences were observed at high dose (e.g., sociable, funny, jolly, verbal, and energetic). This supports our interpretation that the greatest contextual (sex, drinker status) variability in expectancies is observed at higher doses of alcohol, with more similarity across groups at lower doses.

MDS analyses conducted with the other 3 alcohol use metrics (i.e., binge drinking, typical eBAC, and alcohol consequences) consistently corresponded to the pattern of results described above, with plots virtually identical to the PREFMAP vectors plotted in Fig. 1.

DISCUSSION

In this study, we examined the influence of instructional set (i.e., low or high imagined alcohol dose) on activation of expectancy dimensions in undergraduate drinkers. We also sought to test whether patterns of expectancy association varied by individual-level differences such as drinking status or gender. From our findings, we conclude that dose matters when it comes to estimating the effects of alcohol. Specifically, we found that much of the variability in the activation of expectancy networks is seen at higher doses; anticipation of a high dose (i.e., 4 +/6+ drinks for women/men) was associated with the memory activation of expectancies along the arousal-sedation dimension. In contrast, expectancy dimensions were less distinguishable among drinkers (i.e., heavy, medium, and light; male, female) at lower imagined doses, tending to cluster around the valence expectancy dimension (i.e., positive vs. negative). Importantly,

this pattern of activation was observed across all 4 alcohol involvement indices, typical quantity, “binge” drinking, typical BAC, and alcohol consequences.

Level of alcohol involvement also appeared to influence the salience of different vectors for each participant group; PREFMAP vectors lined up in order based on intensity of alcohol’s effects they would be likely to expect based on instructional set and level of alcohol involvement. The least alcohol-involved individuals would be likely to experience the most marked effects of alcohol. Accordingly, female light drinkers imagining a high alcohol dose represented the most extreme PREFMAP vector, a vector located closest to the arousal-sedation dimension. Further support is found in scores on the iso-meaning word groups, where female light drinkers imagining a high alcohol dose endorsed woozy, intoxicated, and wobbly as more likely to occur. After that most extreme group, female light drinkers and male light drinkers are located next, followed by female and male medium drinkers, and female heavy drinkers. Last among the high dose instruction groups are those that might expect the least amount of effect from a high alcohol dose, heavier drinking men. The 6 low dose instruction groups are clustered too closely together near the positive-negative dimension to interpret specific ordering. From this, we infer that when imagining alcohol’s effects at lower doses, those of all levels of alcohol involvement tend to focus more on alcohol’s positive or negative effects, whether the effects are arousing or sedating.

Prior to this study, one of the only examinations of activation patterns at differing levels of alcohol effects was by Dunn and Earleywine (2001), who compared expectancy activation at ascending and descending limbs of the blood alcohol curve. Our findings show remarkable consistency with this work. In both studies, activation patterns were most strongly related to prior alcohol involvement rather than to gender. Also consistent with results presented here is Dunn and Earleywine’s finding that lighter drinkers place more emphasis on expectations for the descending limb of the blood alcohol curve. In particular, they observed as we did here that lighter drinkers were more likely to show activation of sedating expectancies in particular. Our findings, when considered in light of the Dunn and Earleywine work, add support for the notion that the negative and sedating effects of alcohol are those that lighter drinkers may focus on when anticipating heavy doses of alcohol. These expectations may serve as a protective factor, making heavy drinking less appealing.

Moreover, our group difference analyses were consistent with our MDS analyses, and with work by Dunn and Earleywine (2001), suggesting that it is only at higher alcohol doses that drinkers begin to distinguish arousing versus sedating effects. At such doses, heavier drinkers place greater value among those effects that are both arousing and positive and lighter drinkers placing greater value on those effects that are sedating and negative.

The examination of the activation of expectancy networks in the context of imagined alcohol dose is novel. Previous modeling of alcohol expectancy configurations in relation to drinking habits has not focused participants on a specific alcohol dose (Cruz and Dunn, 2003; Dunn and Goldman, 1998; Dunn and Yniguez, 1999; Dunn et al., 2000; Rather and Goldman, 1994; Rather et al., 1992). Findings from these studies have suggested that heavier drinkers require higher weights on the arousal-sedation dimension and lower weights on the positive-negative dimension to accurately represent their expectancy patterns.

In this study, the group likely to expect the most intense alcohol effects would be those with the lowest tolerance (i.e., lightest drinking females) when given a high dose instruction set. Looking again at Fig. 2, this description aptly fits the group whose dimension weights are highest among the groups on arousal-sedation, and lowest on positive-negative. As such, the pattern of weights observed here is quite consistent with the past MDS-based work. These data also are consistent with Alcohol Expectancy Theory, as they provide evidence for a process

through which alcohol beliefs become assembled sequentially, in order of relevance to the stimuli (i.e., dose instruction set) provided. Furthermore, examination of 4 unique alcohol involvement grouping variables allows for evaluation of the consistency of these findings across different metrics. This finding may also provide insight into responding patterns in much of the extant expectancy research, as it appears from these data that students may typically envision higher doses of alcohol when describing their expectations for alcohol's effects.

Study Limitations

Conclusions from this study should be considered in the context of its limitations. As noted, reliance on cross-sectional data to test our network models is a limitation. Although both theory (e.g., Expectancy Theory, Goldman et al., 1999; Social Learning Theory, Maisto et al., 1999) and data (Carey, 1995; Stacy et al., 1991) suggest alcohol expectancies to serve as proximal determinants of drinking behavior, research also suggests that drinking behavior can shape and/or be reciprocally related to expectancies (Sher et al., 1996; Smith et al., 1995). Thus, an alternative explanation for our findings is that differences in expectancy activation patterns among light, heavy, and medium drinkers are a byproduct of the drinking behaviors themselves. As such, because light drinkers do not frequently experience the effects of heavy doses of alcohol, they might imagine such effects to be unpleasant and sedating in a way that heavy drinkers do not. Our data are cross-sectional, thus precluding the determination of temporal ordering of drinking versus expectancy effects.

This study represents one of the first efforts to model dose-related expectancies across gender and drinking status and as such, there are some aspects of measurement of alcohol dose that can be improved upon in future work. For example, we did not instruct participants to consider the time frame over which the dose is consumed. Thus, the dose imagined by our participants may reflect a bolus dose in which the alcohol is consumed all at once and resulting in a high BAC, or a slower administration in which alcohol is consumed over the course of several hours. Another measurement advance for future will be to build on earlier work (e.g., Wigmore and Hinson, 1991) employing methods such as in-lab tests of dose-related expectancies (e.g., administering an alcohol-placebo and asking participants to rate effects at varying doses) that would ensure that an individual's expectancies were clearly linked to a particular dose of alcohol.

In our study, we modeled expectancies by dose and drinking status across consumption, heavy episodic drinking, blood alcohol level, and alcohol consequences. Consistent with previous work, we based our grouping on percentile splits in our data for 3 (consumption, eBAC, and consequences) of these variables. Our examination of drinking outcomes (quantity, frequency, and alcohol consequences) based on the groups that we chose suggested that the percentile splits in fact yielded groups that were meaningfully different from one another with respect to alcohol involvement. Further support is offered by the convergence that we observed in MDS findings across the 4 alcohol involvement indices. Still, it is certainly possible that other grouping methods may have yielded different results.

Although not necessarily a limitation, we would like to draw the readers' attention to an important consideration regarding our interpretation of the expectancy dimensions in this study. Consistent with previous literature and based on our own interpretation, we labeled our dimensional poles "valence" and "arousal." Although there was much consistency in our solutions with previous work, there also were some discrepancies. This is consistent with the body of MDS expectancy work, that has generally yielded similar but not exactly the same PREFMAP solutions (see for examples Dunn and Goldman, 1998; Rather and Goldman, 1994). There also are some cases where items don't map intuitively into dimensional quadrants. For example, the word "forceful" falls in the negative-sedation dimension though some might think of this as a more activating word. Thus, it is important to bear in mind that there is much

precedence for both the variability and the unique mapping of expectancy nodes, and also that the correct interpretation of INDSCAL solutions is not contingent upon the location of any single expectancy item relative to any given dimension. Indeed, as underscored by Dunn and Earleywine (2001), PREFMAP solutions identify a hypothetical memory network, indicated by a perpendicular line cutting across the dimensions of the solution. It is these vectors, and not the location of individual expectancy nodes, that represent putative paths of spreading activation.

We believe that the labels of arousal-sedation and negative-positive that we chose to describe the observed dimensions best capture the overall essence of this stimulus configuration. Still, other interpretations are possible. Nonetheless, alternative interpretations of the dimensions would not take away from the most important finding from this work—that expectancy activation does vary both by perceived dose and according to alcohol involvement. Together, these findings underscore the importance of identifying at what dose, and for whom alcohol beliefs become activated.

Implications and Future Directions

To our knowledge, this is the first study to model expectancy network activation according to an imagined dose of alcohol. As such, this research represents a novel and potentially important contribution to our understanding of alcohol expectancy processes, and adds to a body of research that has emphasized the importance of considering alcohol dose in the evaluation of expectancies (e.g., Earleywine, 1994; Earleywine and Martin, 1993; Guarna and Rosenberg, 2000; Read and O'Connor, 2006). Expectancy network theory posits that beliefs about alcohol are represented in memory nodes that are located relative to one another in multidimensional space. These beliefs are assembled when a network of closely linked nodes becomes activated (Goldman et al., 1999). Consistent with this conceptualization, our data suggest that lighter drinkers may be more likely to weigh negative and sedating effects most heavily as they contemplate decisions regarding whether and how much to drink. Among heavier drinkers, it may be beliefs about the effects resulting from heavy—rather than moderate—drinking that may be the active mechanism underlying drinking behavior. Accordingly, these findings point to the potential utility of focusing not only on broad expectations for alcohol outcomes, but more specifically on alcohol's effects at varying (and in particular, higher) doses in preventive interventions.

Expectancy challenges and individual motivational interventions are 2 types of intervention that have shown good outcomes in modifying drinking attitudes and behaviors (Darkes and Goldman, 1993, 1998; Dunn et al., 2000), and that also may be readily modified to include discussion of the anticipated effects of alcohol at particular doses. Specifically, our findings suggest that some of the physiological effects most commonly experienced at the descending limb of the blood alcohol curve are particularly salient when envisioning heavier alcohol doses. Knowing that these anticipated effects are more salient to college drinkers only as they begin to imagine higher alcohol doses, interventions may focus on some of the sedating and generally less desirable effects associated with high BACs. This may be especially true for lighter drinkers, as group difference analyses suggested that lighter drinkers tended to place more emphasis (as indicated by means for iso-meaning adjective groups) on negative and sedating effects (e.g., sick, undependable, woozy, and foolish) as compared to their heavier drinking counterparts. Focusing on the negative and sedating effects of alcohol at higher doses may be especially potent for these lighter drinkers. Therefore, preventive interventions should be aimed at maintaining low-risk drinking or abstinence among those not currently engaging in heavy drinking, or individuals for whom drinking patterns and expectations for alcohol still are being formed.

Although not pronounced, we did observe some evidence for slight gender differences in activation patterns of alcohol expectancies. Expectancy-based interventions (e.g., challenges) designed to intervene on salient expectancies have shown some initial promise in altering alcohol expectancies and in decreasing alcohol consumption in college drinkers (Darkes and Goldman, 1993, 1998). Evidence indicates that these interventions may be more effective for men than for women (Corbin et al., 2001; Dunn et al., 2000). These findings suggest a need for closer examination of the role of expectancies in drinking among female college students.

Expectancies are a multidimensional construct. Full understanding of expectancy processes calls for approaches that seek to examine these many dimensions. In this work, we used multidimensional scaling to assess the activation of expectancies in memory. Other methods for studying activation or similar implicit processes to characterize individuals' beliefs about alcohol will build on this work. Derived largely from cognitive psychology, such methodologies include approaches such as semantic priming, incidental recall tasks, the Implicit Attitudes Task (IAT), self-generated expectancies, and Stroop tasks (Stetter et al., 1995; Wiers et al., 2002; Williams et al., 1996; Wood et al., 1996). Alternative methodologies will allow for a more comprehensive examination of a range of alcohol expectancies across varying doses.

Expectations for alcohol's effects occur across the lifespan, in a variety of types of drinkers, and even in nondrinkers (Cameron et al., 2003; Chassin et al., 2001; Cruz and Dunn, 2003). Another way in which future work might build on the present study is in the replication of these findings in samples that are more heavily alcohol involved (e.g., alcohol dependent or problem drinkers) or in samples that represent earlier or later developmental life stages.

Previous work has shown alcohol expectancies to predict drinking prospectively (Sher et al., 1996). Information about the variability in the prediction of future alcohol involvement based on dose-relevant expectancies ultimately will provide information that will aid in the early identification of beliefs about heavy, moderate, and light drinking that will aid in the early identification and possibly intervention for those beliefs most closely associated with high risk drinking behaviors. Accordingly, an important next step will be the examination of expectancy activation, by dose, relative to alcohol involvement using longitudinal designs that allow for the delineation of temporal ordering.

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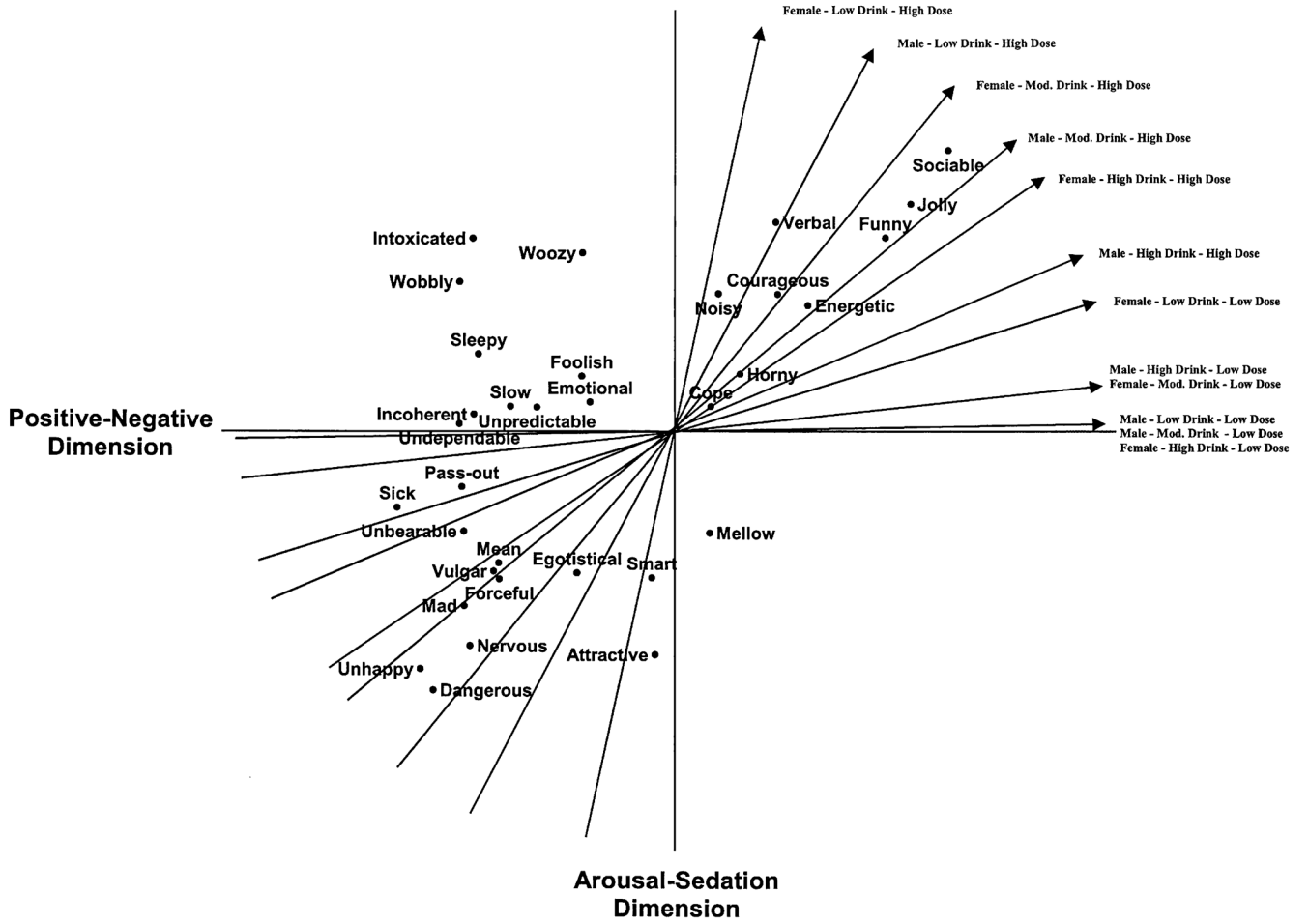


Fig. 1. Individual differences scaling stimulus configuration with preference mapping vectors representing possible paths of association through a memory network for each gender of varying drinking statuses across 2 projected alcohol doses.

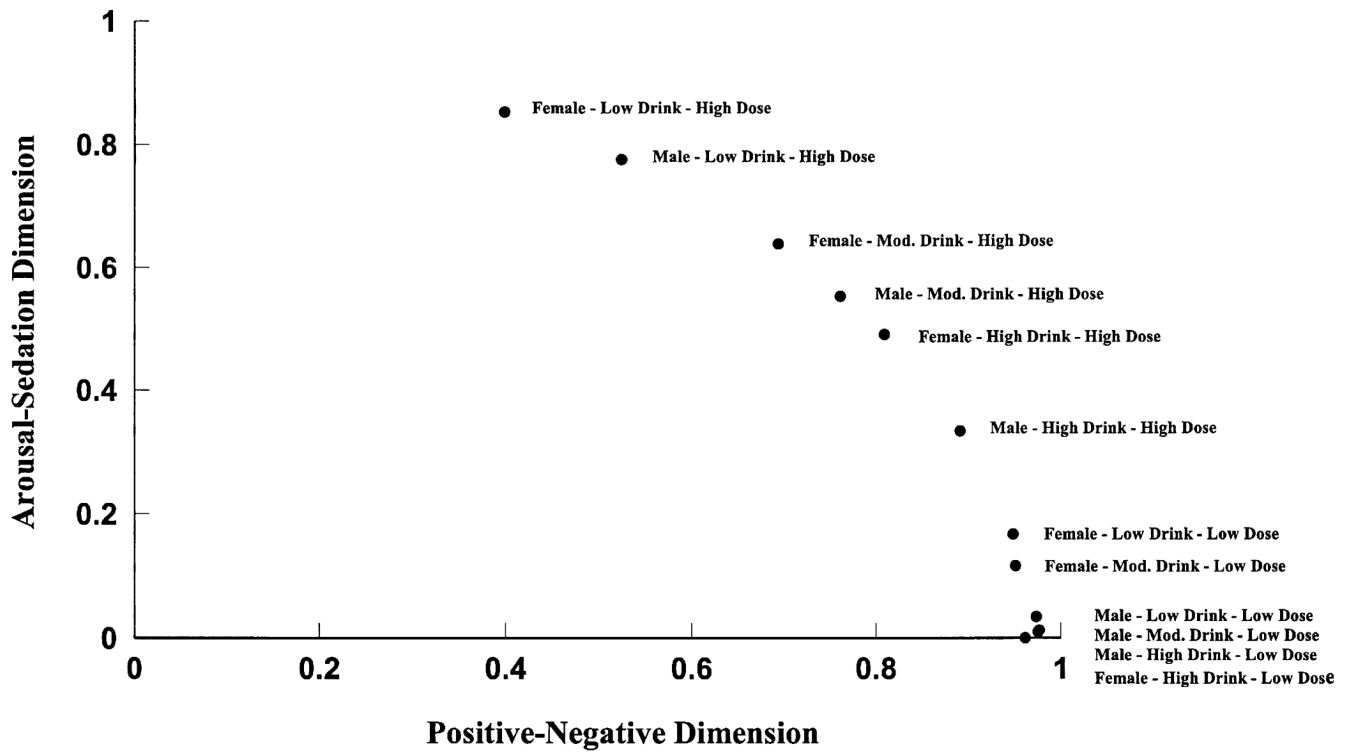


Fig. 2. Individual differences scaling participant weights on the positive-negative dimension and the arousal-sedation dimension for each gender of varying drinking statuses across 2 projected alcohol doses.

Table 1
 One-Way Analysis of Variance and Drinking Behaviors by Typical Quantity Drinking Group

Alcohol involvement behaviors	Light drinkers (<i>n</i> = 112)		Medium drinkers (<i>n</i> = 110)		Heavy drinkers (<i>n</i> = 112)		<i>F</i> (2,332)
	Mean (SD)	Range	Mean (SD)	Range	Mean(SD)	Range	
Drinks per drinking day ^a	3.73 (1.27) ^{ab}	0.25-5.94	6.21 (1.25) ^{ac}	4.13-8.63	9.82 (3.08) ^{bc}	6.26-24.93	247.99 ^{**}
Typical drinking frequency ^b	25.30 (15.30) ^a	1-71	28.10 (12.94)	6-80	30.95 (14.28) ^a	2-64	4.41 [*]
Consequences ^c	12.57 (7.23) ^a	0-36	14.27 (7.19) ^b	2-35	17.51 (8.15) ^{ab}	2-42	12.40 ^{**}

Means in the same row with a common subscript are significantly different from one another at $p < 0.05$ using Fisher's least significant difference test.

^aBased on the previous 90 days.

^bNumber of days in the previous 90 days.

^cNumber of unique consequences experienced in the past year.

* $p < 0.05$

** $p < 0.01$.

Ranking of 10 Most Strongly Endorsed Alcohol Outcome Expectancy Iso-Meaning Groups by Gender and Drinking Group

Table 2

Expectancy word group	Females			Males		
	Light drinkers	Medium drinkers	Heavy drinkers	Light drinkers	Medium drinkers	Heavy drinkers
Low dose expectancies						
Sociable	1	1	1	1	1	1
Jolly	2	2	2	2	2	2
Funny	3	3	3	3	3	3
Verbal	4	5	5	5	6	7
Energetic	5	4	4	4	4	4
Courageous	6	6	7	6	5	6
Noisy	7	9	6	8	8	10
Cope	8	7	8	7	7	9
Mellow	9	8	10	10	10	5
Horny	10	10	9	9	9	8
High dose expectancies						
Sociable	1	1	1	1	1	1
Jolly	2	2	3	2	3	3
Funny	3	3	2	3	2	2
Verbal	4	4	5	4	4	5
Woozy	5	7	10	9	-	10
Energetic	6	5	4	8	6	6
Intoxicated	7	10	-	6	10	-
Courageous	8	6	6	7	5	4
Noisy	9	8	7	5	7	7
Wobbly	10	-	-	-	-	-
Horny	-	9	8	10	8	8
Cope	-	-	9	-	9	9

Table 3
 One-Way Analysis of Variance and Pattern of Means for High and Low Dose Expectancies by Drinking Status - Female Drinkers

Iso-meaning expectancy group	Low dose			High dose			F(2,171)	F(2,171)
	Light drinkers	Medium drinkers	Heavy drinkers	Light drinkers	Medium drinkers	Heavy drinkers		
Sick	2.39 _{ab}	0.67 _a	0.64 _b	7.86 _a	6.02	4.43 _a	6.54 ^{**}	5.11 ^{**}
Unhappy	2.02	1.72	1.09	4.07 _a	3.12	2.14 _a	2.15	3.50 [*]
Dangerous	1.59	1.56	0.72	3.36	3.36	1.95	2.27	2.21
Wobbly	4.00 _{ab}	2.19 _a	1.50 _b	12.60 _{ab}	9.50 _a	9.17 _b	7.04 ^{**}	4.59 [*]
Pass out	4.10 _{ab}	2.03 _a	1.91 _b	8.45 _{ab}	6.16 _a	5.55 _b	9.72 ^{**}	5.62 ^{**}
Undependable	3.64 _{ab}	2.28 _a	1.33 _b	9.64 _{ab}	6.83 _a	5.97 _b	6.58 ^{**}	7.54 ^{**}
Intoxicated	3.67 _{ab}	2.19 _a	1.33 _b	13.43 _a	11.54	9.85 _a	6.18 ^{**}	4.37 [*]
Nervous	3.22 _a	2.72	1.76 _a	4.59	3.88	3.10	3.91 [*]	2.02
Unbearable	3.28 _{ab}	2.09 _a	1.62 _b	6.60 _a	5.09	4.38 _a	4.26 [*]	3.44 [*]
Incoherent	4.64 _{ab}	2.74 _a	1.74 _b	10.00 ^{**}	7.95	6.83 _a	10.00 ^{**}	4.59 [*]
Mad	2.72 _a	2.33	1.26 _a	4.88	4.91	3.52	3.91 [*]	1.84
Forceful	2.84	3.33	2.12	5.40	6.00	5.34	1.98	0.30
Vulgar	3.53 _{ab}	2.22 _a	1.76 _b	5.57	4.48	4.47	5.52 ^{**}	1.12
Mean	3.69	3.09	2.26	5.67	5.85	4.45	2.83	1.58
Sleepy	6.40 _{ab}	4.12 _{ac}	2.34 _{bc}	11.38 _{ab}	7.98 _{ac}	5.31 _{bc}	11.57 ^{**}	15.91 ^{**}
Unpredictable	4.62	3.43	3.38	9.31	8.09	8.60	2.35	1.03
Slow	6.81 _{ab}	2.91 _a	2.40 _b	10.50 _{ab}	7.12 _a	5.47 _b	22.05 ^{**}	13.87 ^{**}
Woozy	8.26 _{ab}	6.21 _{ac}	4.53 _{bc}	14.33 _a	13.07 _b	10.78 _{ab}	11.54 ^{**}	6.72 ^{**}
Foolish	7.31 _{ab}	5.28 _a	4.88 _b	11.22 _a	9.57	8.40 _a	6.47 ^{**}	5.28 ^{**}
Emotional	7.53 _a	6.45	5.03 _a	10.86	10.64	9.21	5.53 ^{**}	2.12
Attractive	6.50	6.12	6.60	6.02	7.07	8.16	0.13	1.60
Egotistical	4.93	3.88	3.45	6.16	5.50	5.71	1.58	0.20
Smart	6.66	5.60	5.62	6.52	6.28	7.09	0.87	0.47
Mellow	9.66 _a	8.69 _b	7.09 _{ab}	9.47	8.57	7.69	5.31 ^{**}	2.26
Horny	8.98	6.79	7.28	11.02	12.00	11.98	2.31	0.45
Noisy	9.97	7.81	8.64	12.71	13.02	13.72	2.47	0.64
Cope	9.90	8.90	7.99	10.59	10.62	10.98	2.56	0.125

Iso-meaning expectancy group	Low dose			High dose			F(2,171)
	Light drinkers	Medium drinkers	Heavy drinkers	Light drinkers	Medium drinkers	Heavy drinkers	
Courageous	10.59	8.83	8.55	13.43	13.31	13.93	0.18
Verbal	12.34	10.93	10.52	14.78	15.90	15.93	0.99
Energetic	11.97	11.10	11.66	14.03	14.91	16.10	2.89
Funny	13.36	12.12	12.19	15.29 _{ab}	17.47 _a	17.74 _b	4.47 [*]
Jolly	14.78	13.57	12.90	16.00	17.72	17.64	2.36
Sociable	15.67	14.88	13.91	17.21 _{ab}	20.07 _a	20.00 _b	8.67 ^{**}

Means in the same row (within dose) with a common subscript are significantly different from one another at $p < 0.05$ using Fisher's least significant difference test. Expectancies characterized as negatively valenced are in bold.

* $p < 0.05$

**

$p < 0.01$.

Table 4
 One-Way Analysis of Variance and Pattern of Means for High and Low Dose Expectancies by Drinking Status - Male Drinkers

Iso-meaning expectancy group	Low Dose			High Dose			F(2,157)
	Light drinkers	Medium drinkers	Heavy drinkers	Light drinkers	Medium drinkers	Heavy drinkers	
Sick	0.91	1.31	0.71	6.13 _a	6.04 _b	2.58 _{ab}	9.54 ^{***}
Unhappy	1.74 _a	2.14 _b	0.86 _{ab}	3.83 _a	3.96 _b	1.73 _{ab}	6.04 ^{***}
Dangerous	2.33	2.25	1.38	4.15	4.44	3.35	0.77
Wobbly	2.50	2.98	1.50	10.89 _a	10.52 _b	8.05 _{ab}	3.59 [*]
Pass out	2.69 _a	2.96 _b	1.47 _{ab}	6.66 _a	6.83 _b	4.60 _{ab}	3.83 [*]
Undependable	3.02 _a	3.56 _b	1.66 _{ab}	8.15 _a	8.04 _b	5.64 _{ab}	3.51 [*]
Intoxicated	3.07 _a	3.12 _b	1.27 _{ab}	13.06 _a	12.49 _b	10.16 _{ab}	3.75 [*]
Nervous	3.11	2.87	2.42	4.36	4.37	2.87	3.06
Unbearable	3.31 _a	3.29 _b	1.95 _{ab}	6.51	6.21	4.53	2.46
Incoherent	3.35 _a	3.65 _b	1.90 _{ab}	8.25 _a	8.44 _b	5.96 _{ab}	3.61 [*]
Mad	3.43	3.20	2.25	5.87	6.08	4.93	0.82
Forceful	3.64	4.65	2.93	6.26	7.82	6.30	1.51
Vulgar	4.11	4.06	3.02	6.87	7.12	6.35	0.31
Mean	4.15	4.40	3.36	7.08	7.16	6.31	0.47
Sleepy	4.41 _a	4.50 _b	2.71 _{ab}	9.96 _a	9.04 _b	5.84 _{ab}	9.21 ^{***}
Unpredictable	4.52 _a	5.06 _b	3.20 _{ab}	9.45	10.89	9.05	2.01
Slow	5.06	5.29	4.25	10.23	9.08	7.91	2.51
Woozy	5.80 _a	6.23 _b	4.26 _{ab}	11.96	11.87	10.24	1.73
Foolish	5.91 _a	6.19 _b	4.42 _{ab}	10.23	10.32	9.36	0.56
Emotional	6.00 _a	6.37 _b	4.38 _{ab}	9.34	9.87	8.93	0.50
Attractive	6.62	7.46	7.45	6.19 _a	8.60	9.62 _a	3.76 [*]
Egotistical	7.07	6.54	5.36	9.26	9.88	8.76	0.41
Smart	7.20	8.42	7.49	7.13	9.19	8.93	2.32
Mellow	8.89	10.13	9.23	10.77	9.90	9.56	1.05
Horny	9.02	10.34	8.85	11.47	13.62	13.85	2.32
Noisy	9.26 _a	10.58	7.82 _a	13.34	14.58	14.09	0.79
Cope	9.31	10.96 _a	7.84 _a	10.98	12.90	10.80	2.84

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Iso-meaning expectancy group	Low Dose			High Dose			<i>F</i> (2,157)
	Light drinkers	Medium drinkers	Heavy drinkers	Light drinkers	Medium drinkers	Heavy drinkers	
Courageous	10.23	12.21	9.82	12.47 _{ab}	15.85 _a	15.75 _b	6.16 ^{**}
Verbal	10.41	11.35	9.50	14.04	16.12	15.52	2.54
Energetic	11.19	12.27	10.55	12.21 _{ab}	15.33 _a	15.35 _b	8.59 ^{**}
Funny	12.94	14.08	13.02	14.83 _{ab}	17.40 _a	18.60 _b	8.00 ^{**}
Jolly	13.54	14.63	14.02	15.59 _a	17.35	18.25 _a	4.20 [*]
Sociable	14.52	16.00	14.26	16.47 _{ab}	19.10 _a	20.44 _b	12.06 ^{**}

Means in the same row (within dose) with a common subscript are significantly different from one another at $p < 0.05$ using Fisher's least significant difference test. Expectancies characterized as negatively valenced are in bold.

^{*} $p < 0.05$

^{**} $p < 0.01$.