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An Assessment of Paired Similarities and Card Sorting

Theodore James Dwyer
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An Assessment of Paired Similarities and Card Sorting

by

Theodore James Dwyer

A thesis submitted in partial fulfillment of the requirements for the degree of Master of Arts
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Keywords: multidimensional scaling, individual difference scaling, similarities collection, disimilarities matrix, method comparison

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An Assessment of Paired Similarities and Card Sorting

Theodore James Dwyer

ABSTRACT

Alcohol Expectancies have been shown to be predictive of risk for alcohol problems. Experimental research studies have challenged participants’ expectancies with the end result demonstrating a mediational effect on participant drinking. Cognitive research using priming and word recognition tasks have led to the theory that expectancies operate in an associative network. Using dissimilarities information this network has been mapped using multidimensional scaling. The current techniques for collecting dissimilarities information directly in alcohol expectancy research has been limited to the use of the paired comparisons tasks. In order to investigate the utility of a different similarities task a comparison was made between a card sorting task and paired comparisons.

The overall comparisons of matrices and Individual Difference Scaling (INDSCAL; Carroll & Chang, 1970) results followed the expected trends and generally supported the hypotheses that the two methods would provide essentially the same information. However, a possible method effect for gender was observed. The method effect was seen when comparing across methods within the females dichotomized by drinker category. Further studies are necessary to replicate these findings and to attempt to identify which method has the effect.
An Assessment of Paired Comparison
and Card Sorting in Expectancy Research.

Introduction

Alcohol expectancies are cognitive constructs or beliefs about the rewarding qualities of alcohol consumption. Alcohol expectancies have been demonstrated to be linked to alcohol consumption. Additionally, expectancies have been manipulated, using true experimental designs, to show that they mediate drinking levels. In order to better understand the expectancy process, cognitive mapping procedures have been used for modeling the structure and visualizing the expectancy network. This study will explore an alternative method for collecting information used in cognitive mapping of alcohol expectancies.

Expectancy Research

The course of expectancy research begins in the 1930’s with Tolman (1932) who postulated the existence of a cognitive variable that predicts behavioral outcome. Several other researchers followed Tolman’s line of thought for inclusion of the cognitive variable expectancies within the more traditional stimulus - response conceptualization of behavior (MacCorquodale & Meehl 1953; Rotter, 1954; Bolles, 1972).

Expectancies in Alcohol

In the 1960’s, Merry (1966) challenged the “loss of control” theory by administering both alcohol and placebo to recovering alcoholics. These findings,
together with other researchers’ findings in balanced placebo studies (Engle & Williams, 1972; Marlatt, Demming, & Reid, 1973), demonstrated the need for an explanation of consumption patterns and responses to drinking alcohol (or placebo) that did not strictly conform with the pharmacological effects of the drink consumed. Tolman’s theory of expectancies was found not only applicable to alcohol consumption but also provided an excellent explanation for reported effects that did not correspond to the pharmacological effects of alcohol.

Correlational Findings

Brown and colleagues demonstrated that adults expected a variety of positive activities as a result of alcohol consumption and that these expectancies were related to their drinking patterns (Brown, Goldman, Inn, & Anderson, 1980). These findings were confirmed by other researchers (Southwick, Steel, Marlatt, & Lindell 1981; Rosenow, 1983), and were extended by Christiansen, Goldman, and Inn (1982) who demonstrated evidence of expectancies in children before their first drinking experience. These findings in children were replicated and extended into children as young as six years old (Miller, Smith, & Goldman, 1990; Dunn and Goldman, 1996).

Changes in Expectancies

In addition to the previous research which established the existence of expectancies in children, research has also shown that these expectancies could change with age (or change over the course of the lifespan, childhood, etc). Expectancies were found to be primarily negative (e.g. rude, dizzy) in the youngest cohort of children, with a consistent shift towards more positive expectancies (e.g. outgoing, less nervous) as
children approached adolescence and presumably their first direct drinking experience (Miller, Smith, & Goldman 1990). These findings were replicated by Dunn and Goldman (1996).

*Longitudinal Findings*

After demonstrating that expectancies were present before the first drinking experience, further research into the temporal relationship was conducted using longitudinal designs. Christiansen and colleagues (1989) reported that expectancies for positive outcomes predicted prospectively the onset of drinking, and expectancies for improved cognitive and motor performance predicted problem drinking (Christiansen et. al. 1989). Others found a reflective relationship between expectancies and drinking, such that positive expectancies increased as drinking increased, and positive expectancies decreased as drinking decreased (Christianson, Smith, Roehling, & Goldman 1989; Sher, Wood, Wood, & Raskin 1996; Smith, Goldman, Greenbaum, & Christianson, 1995).

*Experimental Evidence*

A further essential step in establishing that expectancies have causal status was to demonstrate the mediational link between the levels of expectancies and actual drinking behavior, using true experimental designs. Decreases in drinking were found in several studies, which experimentally manipulated expectancies, by challenging participants’ expectancies (Females – Massey and Goldman, 1988; Males - Darkes and Goldman 1993). Increases in drinking were found when expectancies were experimentally manipulated using cognitive priming (Roehrich and Goldman, 1995, Stein Goldman and Del Boca 1997). These studies provided evidence that expectancies can be
experimentally manipulated in order to produce a specific effect on drinking levels.

Therefore these studies show experimentally that expectancies mediated drinking levels.

*Cognitive Explanation of Expectancy Process*

Tolman’s conceptualization of expectancies as a cognitive construct provides an excellent segue to using cognitive psychology to explain how alcohol expectancies work. Within cognitive psychology there are several different explanations for cognitive processes; one of these models has been described as semantic networks, consisting of interconnected concepts or nodes (Collins and Loftus, 1975). The activation of one of the nodes in this semantic network provides a partial activation to connected concepts within the network (Collins and Loftus, 1975). Thus, expectancies can be explained using the concept of spreading activation within a semantic network, where activating one portion of the network causes activation of the related network through the links that bind them together.

*Cognitive Evidence of Alcohol Expectancies*

Concurrent with the investigation of expectancies and drinking, cognitive tasks investigating alcohol expectancies have provided evidence that is consistent with Collins and Loftus’s semantic networks and spreading activation models (Roehrich and Goldman 1995; Stein, Goldman and Del Boca 2000; Kramer and Goldman 2003; Rather and Goldman 1994; Dunn and Goldman 1996). For example, this relationship has been shown in studies of cognitive priming, which utilized both the word stem completion and Stroop tasks in an alcohol context or with alcohol expectancy words (Kramer and Goldman, 2003). Furthermore, Roehrich and Goldman (1995) demonstrated that alcohol
expectancy prime words produced more drinking than non-alcohol primes, and Stein and Goldman (1996) showed that alcohol related cues also produced more drinking than non-alcohol cues.

Visual Analog

In an attempt to model the overall relationship between expectancy concepts and to provide a visualization of the expectancy network itself, Rather and Goldman (1994) used Multidimensional scaling (MDS) techniques. MDS procedures generate models that are sometimes referred to as cognitive maps, or semantic networks (Collins & Loftus 1975; Collins & Quillian 1969). Rather and Goldman (1994) used sixteen alcohol expectancy words, to create 120 paired-comparisons. The resulting co-occurrence matrix resulted in an MDS solution, which provides a visual analog to the cognitive space of alcohol expectancies. The MDS solution arrived at by Rather and colleagues consisted of two dimensions. These dimensions have been characterized as valence and arousal. Similar MDS solutions for expectancies have been found by other researchers (Dunn & Goldman, 1996).

Techniques for Collecting Similarity Data

The paired comparison task provides the co-occurrence, or similarity data needed for an MDS solution, utilizing every possible permutation of sets of two stimuli from a list of stimuli. Paired comparison is analogous to a similarity judgment between each possible two stimulus combination. Paired comparisons allow for judgments based upon a participant’s decision concerning the relationship between each pair of stimuli. The collection effort, therefore, remains unaffected by the experimenters’ preconceptions.
about the structure of the content (Rosenberg, 1982). The result of a paired comparison task is a matrix providing similarity information that indicates how the participant perceives the relationships among all the stimuli. Some of the difficulties associated with paired comparison tasks are that they can take large amounts of time to administer, high levels of concentration, and considerable participant effort. As the number of stimuli increases, the number of comparisons increases at a rate of \( n^2(n-1)/2 \), where \( n \) is the number of stimuli being used. This means that with 16 words, there are 120 comparisons; with 30 words there are 435. Also, it has been suggested that there may be dimensions that paired comparisons do not capture (Drasgow, 1976, as cited in Rosenberg, 1982). Overall the paired comparison method provides a useful technique for the collection of similarity information (Torgerson, 1958).

Another common method of collecting similarity data is card sorting (Rosenberg, 1982). Card sorting and paired comparisons are similar in many ways. Like paired comparisons, card sorting allows the collection effort to remain unaffected by the experimenters’ preconceptions about the structure of the content (Rosenberg, 1982). Furthermore, the two methods are similar in that card sorting allows for judgments based upon a participant’s decision concerning the overall relationship of one concept to all others to be entered into a data matrix. However, unlike paired comparisons, one advantage of card sorting is that participants can make decisions about the entire set of stimuli at the same time. This simultaneous decision element eliminates the multiple pair-wise individual comparisons that are inherent in paired comparisons, reducing the amount of time required to compare large numbers of stimuli. However, sorting tasks
have not been used to study alcohol expectancies. They have, however, been used in various other domains including perceived attractiveness (Ashmore, Solomon, & Longo, 1996), educational planning (Maiden & Hare, 1998; Streveler, Miller & Boyd, 2001), and perceived personality traits (Rosenberg & Olshan, 1970; Davidson, 1972).

Comparison of MDS Collection Techniques

Previous research using personality terms and kinship terms compared the sorting method with other co-occurrence data methods. For example, Rosenberg and Olshan (1970) compared co-occurrence methods and demonstrated a high correlation between sorting and comparisons using 60 trait adjectives. An examination of sorting and paired comparisons of personality data by Van der Kloot and Van Herk (1991) also demonstrated high correlations between the methods. However, Drasgow’s attempt to predict the multidimensional structure of paired comparison data using sorting data (Rosenberg, 1982) was not as conclusive. Interestingly, Drasgow demonstrated that the MDS of the data from the sorting method not only captured similar relationships as found in paired comparison, but also may have captured dimensions that may not have been obtained using the paired comparison method (Rosenberg, 1982). Because studies have discovered a high correlation between paired comparison data and card sorting data (Rosenberg & Olshan, 1970; Van der Kloot & Van Herk, 1991), it is likely that the resulting similarities matrices from the two methods would be similar for expectancy data. However, Drasgow’s finding suggests that the card sorting task may yield additional dimensions not found using the paired comparison method. Therefore it may be
important to compare the two methods to determine if they provided the same information with regard to alcohol expectancy data.

**Rationale for the Study**

Currently, the method used for directly collecting similarity matrix data of individuals’ expectancies for alcohol is the paired comparison method. Although card sorting is another method which has been demonstrated to be useful when collecting similarities matrix data, it has not been used within alcohol expectancy research or expectancy research in general. There have been no attempts to determine if the matrix resulting from card sorting is similar to that found using the paired comparison task in expectancy research. In light of the implication of Drasgow’s finding that card sorting may provide access to dimensions that paired comparisons may miss, it is important to compare and contrast the methods to investigate if card sorting is useful for expectancy research. If the two methods provide similar data, card sorting could facilitate future expectancy studies by providing a quicker method of collecting essentially the same data. This study will collect both paired comparison information and sorting data information, it will then compare, and contrast the methods using the resulting data matrix.

**Hypotheses**

Given the findings of researchers comparing non-expectancy data (Rosenberg and Olshan 1970; van der Kloot and van Herk 1991) using correlations between sorting results and paired comparisons, it was hypothesized that the data matrices for expectancy data will demonstrate convergence across methods. In other words, the correlation
between paired comparison dissimilarity matrix for expectancy data and the card-sorting
dissimilarity matrix for expectancy data would be high.

Because previous research has shown that expectancies are causally related to
drinking, patterns should be observable when mapping the individual differences for
separate drinking groups. It is therefore further hypothesized that drinking groups will
provide disparate results from each other in relation to the expectancy network when
examined on both paired comparison and card sorting tasks. Specifically, there will be an
observable difference within gender between the heavier drinkers when compared to the
lighter drinkers using Individual Difference Scaling (INDSCAL; Carroll & Chang, 1970),
which will be consistent across collection methods.
Method

Participants

Participants in this study were 85 undergraduate students from the College of Arts and Sciences. A majority of the students were recruited from the psychology participant pool; however, seven were recruited from an Interdisciplinary Social Sciences statistics class. Three participants were removed based on failure to meet the inclusion criteria (two for age above 28 and one who reported not drinking). Analyses were conducted on the remaining 82 participants (36 males and 46 females). Participants’ mean age was 21.2 (SD=2.43) with a range of 18 to 27. The ethnic make-up of the study participants reflected the published statistics from the University of South Florida (01-02 school year). Participants identified themselves as Caucasian (59.8%) African American (19.5%), Hispanic/Latino/Latina (9.8%), Asian/Asian-American (4.9%), and “Other” (6.1%). In order to ensure that all participants were drinkers the participant pool selection program was used to only recruit participants who report drinking alcohol. Only one participant reported not drinking after being selected using the initial criteria. The non-drinking participant was excluded from analysis based on this criterion.

Study Design

Each participant was randomly assigned to complete either the paired comparison measure or a card sorting measure first. A correlation was performed between the 16 words from the paired comparison and the same 16 words from the card sorting task.
Dissimilarity matrices were used to compute the correlations providing 120 ratings for each to demonstrate that the two methods provided the same type of information. Individual Difference Scaling (INDSCAL; Carroll & Chang, 1970) was used to produce solutions which were compared to those previously reported in the literature; after visually inspecting the dimensions to ensure they were oriented the same across solutions. The direction of differences between drinker types were compared to those reported in the literature (Rather & Goldman, 1994; Dunn & Goldman, 1996, 1998; Dunn & Yniguez, 1999; Cruz & Dunn, 2003). Convergence between the methods was investigated by comparing the each INDSCAL solution’s pattern of differences across dimensions. This was accomplished by comparing the direction of deviation toward the derived dimensions for each solution and comparing the pattern across solutions.

Comparisons were conducted within subjects therefore steps were taken to control for order. To control for order effects, participants were randomly assigned to one of two orders of administration (the paired comparison and card sort task were counterbalanced); and a conceptually different distracter task (i.e., math problems) was included between each of the measures (Nelson & Goodmon, 2003). After completing all tasks, each participant also completed a demographic form which provided information on the quantity and frequency of drinking.

**Instruments**

**Paired Comparison Task**

Materials, including the instructions, rating scale, and word pairs used for the paired comparison task are shown in Appendix A. The paired comparison was carried out using
the same techniques and 16 expectancy words used by Rather and Goldman (1994). The paired comparison task is a paper and pencil task which consists of 120 comparisons on eight pages with the following instructions:

“In this experiment you will be presented with adjectives that describe some typical effects that people sometimes experience when they have been drinking alcohol and under the influence of alcohol. These adjectives will be presented in pairs for each pair of alcohol effects. Consider how likely or unlikely it is that you would feel or experience the two effects at the same time. (Very likely = 1, Likely = 2, Slightly Likely = 3, Equally Likely = 4, Slightly Unlikely = 5, Unlikely = 6, Very Unlikely = 7).”

Card Sorting Task

The words that were used for the card sorting task are listed in Appendix B. The card sorting task included a set of 32 words, 16 from the original paired comparison (Rather & Goldman 1994) and an additional 16 extracted from the large set of terms from which the original alcohol expectancy words were selected. The 32 words selected were shown simultaneously in front of the participant on 3” x 5” index cards. The participants received the following instructions for the card sorting task:

“These are adjectives that describe some typical effects that people sometimes experience when they have been drinking alcohol and are under the influence of alcohol. Each adjective is on one of these cards. Please sort these words into piles of effects that you would feel or experience together when drinking. Make as many or as few piles as you want, please try to make no more than 10 piles – but you can if you
want. Please look at all of the cards before you start sorting. Let me know when you are done. Do you understand what I have asked you to do?"

Participants were allowed to make any changes until they were completely satisfied with their groupings. Once they had sorted the cards, participants were asked to provide a name/label for each of the groups. After naming/labeling the groups, they were asked to rate each group on the dimensions of valence and arousal. Participants then identified their groupings of stimuli as positive, neutral or negative in valence; and high, neutral or low in arousal.

Stimuli selection for the card sorting task was conducted using occurrence data from first word associate data. Sixteen words were selected from the remaining (116) set of words from which the 16 included in the paired comparison task were selected. The frequency of occurrence information was from first word associate data collected in our lab for several larger studies. Words were identified by selecting the expectancy words with the highest number of occurrences in the first word associate data from each quadrant of the MDS solution found in previous research (Goldman, 1999), until an additional sixteen words have been selected.

Distracter Task

The math problems that were used for the distracter task are shown in Appendix C. The distracter task consisted of sheets of three by two-digit addition problems. Each participant was given a packet of addition problems, and told “This is the next task, complete as many problems as quickly and as accurately as you can”. The participants
performed this task for 10 minutes in order to ensure sufficient attention switching from the expectancy stimuli (Nelson & Goodmon, 2002; Nelson, personal communication).

**Demographics and Alcohol Use Questionnaire**

The Demographics and Alcohol Use Questionnaire that was used is shown in Appendix D. The demographics questionnaire consisted of basic demographic questions (i.e. age, gender, and ethnicity) with additional questions on the quantity and frequency of alcohol consumption.

**Procedure**

Participants were given an informed consent to read and sign. They then, based on random assignment, performed either the paired comparison or card-sorting task first, as described above. Upon completion of their first assigned task, participants then completed the addition problems. After working on the distracter task for ten minutes the participants completed the remaining similarity task. After completion of both the card sorting and the paired comparison tasks, they were given the demographics and drinking questionnaire. They were debriefed and thanked for their participation. Participants were awarded experimental points in accordance with the psychology department’s participant pool policy. All informed consent forms were kept separate from responses to all other questionnaires in order to maintain confidentiality, ensuring that participant’s responses could not be associated with their identity.
Results

Description of Sample

Analyses for overall correlations were conducted on the entire sample of 82 participants. Analyses for differences in drinker type were conducted both across the entire samples and for each gender. As can be seen in Table 1 the ethnic makeup of the subgroups by gender was consistent with the overall group.

Table 1 Participant Ethnicity and Total Group N

<table>
<thead>
<tr>
<th></th>
<th>All Participants</th>
<th>Females</th>
<th>Males</th>
</tr>
</thead>
<tbody>
<tr>
<td>N (% of total)</td>
<td>82 (100%)</td>
<td>46 (56.1%)</td>
<td>36 (43.9%)</td>
</tr>
<tr>
<td>High drinker n (%)</td>
<td>36 (45.1%)</td>
<td>20 (43.5%)</td>
<td>17 (47.2%)</td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caucasian</td>
<td>49 (59.8%)</td>
<td>26 (56.5%)</td>
<td>23 (63.9%)</td>
</tr>
<tr>
<td>African-American</td>
<td>16 (19.5%)</td>
<td>10 (21.7%)</td>
<td>6 (16.7%)</td>
</tr>
<tr>
<td>Hispanic/Latino(a)</td>
<td>8 (9.8%)</td>
<td>4 (8.7%)</td>
<td>4 (11.1%)</td>
</tr>
<tr>
<td>Asian/Asian-American</td>
<td>4 (4.9%)</td>
<td>2 (4.3%)</td>
<td>2 (5.6%)</td>
</tr>
<tr>
<td>Other</td>
<td>5 (6.1%)</td>
<td>4 (8.7%)</td>
<td>1 (2.8%)</td>
</tr>
</tbody>
</table>

The mean age of all participants was 21.16 years (2.43) with a range of 18 to 27. The mean age of females was 21.2 years (SD = 2.32) with a range of 18 to 27 years and the mean age of males was 21.1 years (SD=2.61) with a range of 18 to 27 years. Overall
Participants reported drinking an average of 3.9 (SD=2.09) standard drinks per occasion. Females reported drinking 3.7 (SD=1.94) standard drinks per occasion and males reported drinking 4.2 (SD=2.26) standard drinks per occasion (with a range of 1 to 9 standard drinks for all groups). The average number of drinks for each of the drinking groups within gender can be found in Table 2.

Table 2  Age and Drinking by gender for Low Drinkers (LD) and High Drinkers (HD)

<table>
<thead>
<tr>
<th></th>
<th>Drinking</th>
<th>Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Females</td>
<td></td>
<td></td>
</tr>
<tr>
<td>All</td>
<td>46</td>
<td>3.7</td>
</tr>
<tr>
<td>HD</td>
<td>20</td>
<td>5.4</td>
</tr>
<tr>
<td>LD</td>
<td>26</td>
<td>2.3</td>
</tr>
<tr>
<td>Males</td>
<td></td>
<td></td>
</tr>
<tr>
<td>All</td>
<td>36</td>
<td>4.2</td>
</tr>
<tr>
<td>HD</td>
<td>17</td>
<td>6.1</td>
</tr>
<tr>
<td>LD</td>
<td>19</td>
<td>2.6</td>
</tr>
</tbody>
</table>

*Analyses for Order Effect*

Analyses were first conducted to determine if there had been an effect from the order of administration of the collection methods. These analyses were completed by taking the correlation between each of the data collection techniques first and second collection points. The correlation was \( r(82) = .936 \) (\( p < .01 \)) for the card sorting and \( r(82) \).
= .970 (p < .01) for the paired comparison. Based on the correlations between each of the
different collection methods it appears that, due to random assignment to order and the
Distracter task, there was no effect for order. Therefore order of administration was not
considered in subsequent analyses.

*Classification of Drinker Types*

Participants’ reported quantity and frequency of alcohol consumption was used to
estimate the total number of standard drinks consumed per month. Using this estimate
participants who drank 40 or more drinks per month were placed into the high drinker
category (this figure was chosen because it best dichotomized the gender categories).
Further, participants who fell below this number but who, by current standards, would be
classified as binge drinkers (Wechsler & Toben, 2001) based on their reported quantity of
drinking (4 drinks per occasion for women and 5 per occasion for men) were also placed
in the high drinker category.

*Overall Method Comparison*

Analyses of the overall matrices of card sorting and paired comparisons were
conducted. This was accomplished by taking the ratings of likelihood (higher values
indicating lower likelihood of co-occurrence) for every possible combination of words in
the paired comparison task and correlating it with the non-occurrence (dissimilarity) data
for the same combination of words from the sorting data. Across all participants, data for
the card sort was significantly correlated with data from paired comparison, r (82) = .733
(p < .01). This result does not fully support the hypothesis that the two methods would
be highly correlated. It does however provide a moderately high correlation that indicates a large degree of overlap between the two methods.

**Individual Difference Scaling**

Individual Difference Scaling (INDSCAL) is a method of analysis used for comparing groups in MDS by analyzing multiple matrices produced by different sub-samples in relation to each other. The first step in the analysis is to derive a solution for the separate matrices in the same space. The resulting multidimensional space then serves as the solution against which each group’s matrix is compared. In order for the comparison to be made a solution is generated for each of the matrices. Table 3 provides the amount of variance accounted for by each solution for the matrices, as well as the stress rating, which is a measure of fit used to demonstrate optimum dimensionality. The percentage of the variance (R squared) is a measure of the variance which is accounted for by the distances found in the matrix. The two dimensional solutions reported are considered optimal based on dimensional selection techniques for MDS solutions using large changes in stress to identify dimensionality (Spence and Graef, 1974; Davison 1983, 1992; Borg and Groenen 1997). The amount of variance accounted for by the two dimensional solution together with the stress rating of the solution is listed in Table 3.
Table 3  INDSCAL Variance Accounted for and Stress of Solution.

<table>
<thead>
<tr>
<th>Groups</th>
<th>Sorting</th>
<th></th>
<th></th>
<th></th>
<th>3rd Dimension</th>
<th>change in stress</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>High Drinkers</td>
<td>Low Drinkers</td>
<td>Overall solution</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td>Males</td>
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<td>.198</td>
<td>.814</td>
<td>.191</td>
<td>.802</td>
<td>.191</td>
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<tr>
<td>Females</td>
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<td>.200</td>
<td>.871</td>
<td>.164</td>
<td>.838</td>
<td>.183</td>
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<tr>
<td>All</td>
<td>.804</td>
<td>.200</td>
<td>.871</td>
<td>.164</td>
<td>.838</td>
<td>.183</td>
</tr>
<tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Paired Comparison</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>Males</td>
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<td>.800</td>
<td>.184</td>
<td>.779</td>
<td>.195</td>
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<tr>
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<td>.208</td>
<td>.745</td>
<td>.210</td>
<td>.749</td>
<td>.209</td>
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<tr>
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<td>.188</td>
<td>.800</td>
<td>.185</td>
<td>.800</td>
<td>.186</td>
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</tbody>
</table>

INDSCAL Comparisons

The comparison of each matrix with the derived stimulus configuration provides a subject weight on each of the dimensions found in the stimulus space. These subject weights provide a measure of the importance of each dimension for each group when compared to the overall solution and can be used for further comparisons within the configuration space. Subject weights may not be used for a direct comparison across configuration spaces as each configuration space is unique to the solution for the specific groups included in the analysis. However, subject weights may be used to discuss overall patterns based on identification of the dimensions of the solution as they compare to other
solutions. In the case of expectancies, the dimensional names from solutions found by previous research (Rather & Goldman, 1994; Dunn & Goldman, 1996, 1998, 2000; Dunn & Yniguez, 1999; Cruz & Dunn, 2003) were used. A comparison across measures can also be discussed using the angle between the subject weights on each of the dimensions from the origin. This provides information about the two groups in relation to each of the derived dimensions. Thus a comparison of groups across methods should be discussed in terms of the angle of separation between groups for the solution and the group weights in relation to each dimension. Table 4 lists the dimension weights of each of the groups and Table 5 lists the angle between groups within each method.

Table 4 Dimension Weights

<table>
<thead>
<tr>
<th>Method and Group</th>
<th>Dimension 1</th>
<th>Dimension 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Card Sorting all high drinkers</td>
<td>.763</td>
<td>.505</td>
</tr>
<tr>
<td>Card Sorting all low drinkers</td>
<td>.759</td>
<td>.567</td>
</tr>
<tr>
<td>Paired comparison all high drinkers</td>
<td>.725</td>
<td>.522</td>
</tr>
<tr>
<td>Paired comparison all Low drinkers</td>
<td>.635</td>
<td>.630</td>
</tr>
<tr>
<td>Card Sorting females high drinking</td>
<td>.686</td>
<td>.578</td>
</tr>
<tr>
<td>Card Sorting females low drinking</td>
<td>.778</td>
<td>.516</td>
</tr>
<tr>
<td>Paired comparison females high drinking</td>
<td>.684</td>
<td>.534</td>
</tr>
<tr>
<td>Paired comparison females low drinking</td>
<td>.568</td>
<td>.650</td>
</tr>
<tr>
<td>Card sorting males high drinking</td>
<td>.789</td>
<td>.410</td>
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</table>

Continued on the next page
Table 4 (continued)

<table>
<thead>
<tr>
<th>Method and Group</th>
<th>Dimension 1</th>
<th>Dimension 2</th>
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</thead>
<tbody>
<tr>
<td>Card sorting males low drinking</td>
<td>0.752</td>
<td>0.499</td>
</tr>
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<td>Paired comparison males high drinking</td>
<td>0.716</td>
<td>0.496</td>
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<tr>
<td>Paired comparison males low drinking</td>
<td>0.680</td>
<td>0.581</td>
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<tr>
<td>Cards sorting male</td>
<td>0.704</td>
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</tr>
<tr>
<td>Cards sorting female</td>
<td>0.695</td>
<td>0.600</td>
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<tr>
<td>Paired comparison male</td>
<td>0.719</td>
<td>0.532</td>
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<tr>
<td>Paired comparison female</td>
<td>0.729</td>
<td>0.520</td>
</tr>
</tbody>
</table>

Table 5 Angle Between Groups Within Each Method

<table>
<thead>
<tr>
<th>Method by Group</th>
<th>angle within group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Card sorting by type of drinker</td>
<td>3.30</td>
</tr>
<tr>
<td>Paired comparison by type of drinker</td>
<td>8.99</td>
</tr>
<tr>
<td>Card sorting female by type of drinker</td>
<td>6.53</td>
</tr>
<tr>
<td>Paired comparison female by type of drinker</td>
<td>10.83</td>
</tr>
<tr>
<td>Card sorting male by type of drinker</td>
<td>6.09</td>
</tr>
<tr>
<td>Paired comparison male by type of drinker</td>
<td>5.78</td>
</tr>
<tr>
<td>Card sorting by gender</td>
<td>2.44</td>
</tr>
<tr>
<td>Paired comparison by gender</td>
<td>1.03</td>
</tr>
</tbody>
</table>
Comparison of Groups

A direct comparison *across* INDSCAL solutions using dimension weights is not possible. The solution and dimensional weights are specific to each INDSCAL solution. However, the solutions still provide a frame of reference from which general trends can be observed. Using visual inspection of previous MDS and INDSCAL solutions (Rather & Goldman, 1994; Dunn & Goldman, 1996, 1998; Dunn & Yniguez, 1999; Cruz & Dunn, 2003), dimensions for the present solutions were labeled for ease of reference. To maintain consistency across solutions –the dimensions were oriented in the same direction. The dimensions observed in the INDSCAL solutions for both card sorting and paired comparisons where consistent with those identified by earlier research. Each dimension was labeled either Arousal-Sedation or Positive-Negative based on the dimension that it matched in previous research. The direction of declination from the dimensions is consistent across comparisons. High drinkers consistently deviate from low drinkers toward the same dimension (see figures 1 thru 3). This declination was consistent with what has been observed in other research (Rather & Goldman, 1994). Therefore the differences support the hypothesis that drinker type would demonstrate a consistent pattern across methods.

Comparison of Drinker Types in Relation to Dimensions

The declination from each of the dimensions was examined to determine if the directions of the type of drinkers were consistent with those findings of previous literature (Rather and Goldman, 1992; Dunn and Goldman 1996, 1998). The dimension weights published for different drinker types (Rather and Goldman, 1994) were used as a
comparison between levels of drinking and the derived dimensions. The declination from the arousal sedation dimension across previous research was the least for heavy drinkers while the declination from the positive/negative dimension was the least for the lighter drinkers. The same pattern can be seen within both methods with the heavier drinkers deviating less from the arousal dimension and lighter drinkers deviating less from the valence dimension. The declination from the dimensions is consistent across comparisons. Therefore these differences further support the hypothesis that drinker types would demonstrate consistent patterns across methods.

Figure 1. Male Dimension Weights
Figure 2 Female Dimension Weights

Figure 3. Dimension Weights Drinker Type by Method
Analysis for a Further Dimension

As noted earlier, Drasgow suggested that a different dimensional solution might be found using card sorting as compared to those found using paired comparisons. The most commonly used method of determining dimensionality is to search for an “elbow” in the stress data when the amount of change in stress by number of dimensions levels off (Spence and Graef, 1974; Davison 1983, Borg and Groenen 1997). As can be seen in Table 3, a solution for a third dimension for card sorting does not change the stress any more than the change observed for paired comparisons. Thus it appears that for alcohol expectancies the card sorting method does not capture a different dimensional solution.
Discussion

The results of the comparisons largely support the hypothesis that the two collection methods provide similar information. The first hypothesis, that the two methods would be highly correlated, was not fully supported, although a moderately high correlation was found between the card sorting and paired comparison matrices. Although the correlation was not as high as those found in research using Personality items $r=.960$ and strategies for getting one’s way $r=.806$ (Van der Kloot & Van Herk, 1991), the observed correlation was sizable. The differences seen in the correlations may be an indicator of the effect within females and across drinker types discussed later. The implication for this difference is that although each of the methods provide the same type of data; paired comparisons (with an angle of deviation by drinker type of 8.99) may be better at identifying a real difference between subtypes of drinkers within gender.

The second hypothesis, that the differences between drinker types by gender would be consistent across methods, was supported by the observed separation between drinker types. This finding was consistent with the pattern observed in previous research (Rather & Goldman 1994). The second hypothesis was further reinforced by the observed declination from each solution’s dimensions which were consistent with the deviations from the dimensions seen in previous research (Rather & Goldman, 1994; Dunn & Goldman, 1996, 1998; Dunn & Yniguez, 1999; Cruz & Dunn, 2003).
Differences Across Methods Within Gender

An observed difference within the results which was not expected (discussed below) raises interesting questions about differences by gender and drinker type for each of the methods. A visual comparison of the MDS solutions for card sorting (figure 4) and paired comparison (figure 5) demonstrated quadrants that were very similar when either of the solutions is rotated 180 degrees. Since there was a relatively large degree of overlap between the methods, this observed consistency was expected.

Considering that the same individual participants provided information for each of the methods in the analysis, and an order effect was ruled out based on the observed high correlation between the different collection order positions for similar methods, the amount of difference between drinkers should have been consistent across the methods for each gender or type of drinker. Interestingly this was not the case for all of the categories. When a comparison was made using the males across method of collection (Figure 1) the difference in the angle was only .31 degrees while a comparison of the angles for gender (Figure 6) was a difference of only 1.41 degrees. This angular consistency was not seen when considering the angle of separation seen for the female drinker types (a 4.3 degree difference; Figure 2) and for the overall drinker types (a 5.69 degree difference; Figure 3). The small differences seen in the male and gender comparisons were what should be expected if there was no effect for method. If the differences were derived from females alone the differences should have been seen in the angular differences of the gender comparison. If the differences stemmed from the method of collection alone there should have been a similar difference across all of the
Figure 4 Overall Card Sorting Solution

Figure 5 Overall Paired Comparison Solution
angular comparisons. The differences observed in the drinker type data were mirrored in the female data and almost nonexistent in the male and gender data. As identified earlier, the comparisons that provide these angular differences were being made based on data collected from the same individuals. Therefore, the angular differences across females and overall drinker types seem to imply a method effect seen in females when dichotomized by type of drinker.

Several limitations of the investigation should be considered before utilizing the findings in future research. First and foremost, the sample should be considered. The pool of participants was restricted to those individuals within College of Arts and Science classes whose instructors provide extra credit for participation in experiments. Thus the results may not be generalizable beyond the Psychology participant pool. All of the participants were college students; therefore the results may not generalize beyond a college sample. Further, the sample was limited in age (18-27). Therefore the results may not generalize to different ages (these methods have not been used in expectancies for other age ranges). Second, temporal limitations for collection of alcohol consumption data should be considered. The data were collected at one time point and over a constrained three week period. The three week period immediately preceded the Mid-term examinations for most of the undergraduate classes which has been shown to be a decreased period of consumption for college students (Del Boca, Darkes, Greenbaum & Goldman 2003). Collection of drinking data at one time point is not sufficient for an identification of multiple drinker subgroups (which at any one time point may have similar drinking patterns) such as those seen in larger longitudinal studies (Schulenberg,
O’Malley, Bachman, Wadsworth & Johnston, 1996; Del Boca, Darkes, Greenbaum & Goldman, in press). Thus the generalizability may be limited by the lack of longitudinal type data to classify drinker types. Finally, the study was designed to determine if there was a difference between the methods of data collection it was not designed to identify how the participants were conceptualizing the tasks. Participants were asked if they understood the card sorting task, there was no record kept of those who asked for further clarification (further clarification consisted of reading the portion of the instructions that they did not understand to them a second time). There was also no question asked as to whether or not the participants understood the paired comparison task (although care was
made to clarify the rating scale). Therefore if participants were conceptualizing the tasks differently there is no way to tell from this study.

Categorization of drinkers was accomplished by selecting those who met the criteria for binge drinking (Wechsler & Toben, 2001) and for those who drank an estimated 40 or more drinks per month. This figure was arrived at because it dichotomized the sample and targeted participants who would be drinking high levels throughout the month. This number may not seem like a high level of drinking because it would result in an average of 1.33 standard drinks a day, if the 40 drinks are spread across a hypothetical month (30 days). However, by considering the drinking trends demonstrated by Del Boca and colleagues (in press) this level is much higher than it appears. Del Boca and colleagues (in press) observed that college student drinking is planned based on demands throughout the month and was shown to mostly occur over the weekends. This changes the drinking of 40 drinks a month from 1.3 drinks a day to close to binging levels (4.4 per day assuming 3 weekends a month).

Summary and Conclusions

The overall solutions and individual differences follow the expected trends and support the hypotheses. However, subtle differences within the methods might have been indicative of a different method of conceptualizing or a different approach to the separate tasks for one of the subtypes of drinkers within females. It is clear that additional research aimed at gaining a better understanding of the observed phenomena is necessary. It will be necessary to replicate these findings and to try and identify if there is a different approach to conceptualizing the task for drinker subtypes.
Should a decision need to be made on which of the two methods should be used to collect similarities data in expectancies, consideration of the possible differences observed within drinker type for the method of data collection should be included in this decision. Because the past literature in alcohol expectancies has used paired comparisons as a direct method of comparison it would be prudent to identify if there is a method effect related to card sorting before instituting this method and attempting to compare it with past research.
References


Appendix A: Paired Comparison Task

Think of the EFFECTS OF ALCOHOL on you. Consider how likely or unlikely it is that you would feel or experience the two effects at the same time. (Very likely =1 Likely =2 slightly likely =3 equally likely = 4 slightly unlikely =5 unlikely =6 very unlikely =7).”

1. Funny—Irresponsible  Very Likely 1 2 3 4 5 6 7 Very Unlikely
2. Sick-Sad  Very Likely 1 2 3 4 5 6 7 Very Unlikely
3. Sleepy-Smart  Very Likely 1 2 3 4 5 6 7 Very Unlikely
4. Irresponsible-Happy  Very Likely 1 2 3 4 5 6 7 Very Unlikely
5. Dizzy—Sad  Very Likely 1 2 3 4 5 6 7 Very Unlikely
6. Funny-Happy  Very Likely 1 2 3 4 5 6 7 Very Unlikely
7. Dangerous—Obnoxious  Very Likely 1 2 3 4 5 6 7 Very Unlikely
8. Intoxicated-Irresponsible  Very Likely 1 2 3 4 5 6 7 Very Unlikely
9. Happy-Dangerous  Very Likely 1 2 3 4 5 6 7 Very Unlikely
10. Relaxed-Sad  Very Likely 1 2 3 4 5 6 7 Very Unlikely
11. Obnoxious-Sick  Very Likely 1 2 3 4 5 6 7 Very Unlikely
12. Sad-Intoxicated  Very Likely 1 2 3 4 5 6 7 Very Unlikely
13. Irresponsible—Dangerous  Very Likely 1 2 3 4 5 6 7 Very Unlikely
14. Intoxicated-Smart  Very Likely 1 2 3 4 5 6 7 Very Unlikely
15. Dizzy-Obnoxious  Very Likely 1 2 3 4 5 6 7 Very Unlikely
16. Irresponsible-Talkative  Very Likely 1 2 3 4 5 6 7 Very Unlikely
17. Funny-Smart  Very Likely 1 2 3 4 5 6 7 Very Unlikely
18. Stupid-Funny  Very Likely 1 2 3 4 5 6 7 Very Unlikely
19. Horny-Stupid  Very Likely 1 2 3 4 5 6 7 Very Unlikely
Appendix A (Continued)

Think of the EFFECTS OF ALCOHOL on you. Consider how likely or unlikely it is that you would feel or experience the two effects at the same time. (Very likely = 1 Likely = 2 slightly likely = 3 equally likely = 4 slightly unlikely = 5 unlikely = 6 very unlikely = 7).”

20. Obnoxious—Irresponsible  Very Likely 1 2 3 4 5 6 7 Very Unlikely
21. Dangerous—Sad  Very Likely 1 2 3 4 5 6 7 Very Unlikely
22. Intoxicated-Sick  Very Likely 1 2 3 4 5 6 7 Very Unlikely
23. Sleepy-Funny  Very Likely 1 2 3 4 5 6 7 Very Unlikely
24. Relaxed-Happy  Very Likely 1 2 3 4 5 6 7 Very Unlikely
25. Horny-Sad  Very Likely 1 2 3 4 5 6 7 Very Unlikely
26. Sick-Horny  Very Likely 1 2 3 4 5 6 7 Very Unlikely
27. Smart-Happy  Very Likely 1 2 3 4 5 6 7 Very Unlikely
28. Funny-Relaxed  Very Likely 1 2 3 4 5 6 7 Very Unlikely
29. Intoxicated-Talkative  Very Likely 1 2 3 4 5 6 7 Very Unlikely
30. Irresponsible-Horny  Very Likely 1 2 3 4 5 6 7 Very Unlikely
31. Horny-Sleepy  Very Likely 1 2 3 4 5 6 7 Very Unlikely
32. Happy-Sad  Very Likely 1 2 3 4 5 6 7 Very Unlikely
33. Relaxed-Horny  Very Likely 1 2 3 4 5 6 7 Very Unlikely
34. Obnoxious-Funny  Very Likely 1 2 3 4 5 6 7 Very Unlikely
35. Dangerous—Horny  Very Likely 1 2 3 4 5 6 7 Very Unlikely
36. Irresponsible-Sick  Very Likely 1 2 3 4 5 6 7 Very Unlikely
37. Dizzy—Stupid  Very Likely 1 2 3 4 5 6 7 Very Unlikely
38. Happy-Sleepy  Very Likely 1 2 3 4 5 6 7 Very Unlikely
Appendix A (Continued)

Think of the EFFECTS OF ALCOHOL on you. Consider how likely or unlikely it is that you would feel or experience the two effects at the same time. (Very likely =1 Likely =2 slightly likely =3 equally likely = 4 slightly unlikely =5 unlikely =6 very unlikely =7).”

39. Talkative-Dizzy
   Very Likely 1 2 3 4 5 6 7 Very Unlikely

40. Funny-Intoxicated
   Very Likely 1 2 3 4 5 6 7 Very Unlikely

41. Obnoxious-Relaxed
   Very Likely 1 2 3 4 5 6 7 Very Unlikely

42. Smart-Horny
   Very Likely 1 2 3 4 5 6 7 Very Unlikely

43. Irresponsible-Relaxed
   Very Likely 1 2 3 4 5 6 7 Very Unlikely

44. Obnoxious-Smart
   Very Likely 1 2 3 4 5 6 7 Very Unlikely

45. Sleepy-Irresponsible
   Very Likely 1 2 3 4 5 6 7 Very Unlikely

46. Stupid-Obnoxious
   Very Likely 1 2 3 4 5 6 7 Very Unlikely

47. Confident-Intoxicated
   Very Likely 1 2 3 4 5 6 7 Very Unlikely

48. Relaxed-Sleepy
   Very Likely 1 2 3 4 5 6 7 Very Unlikely

49. Happy-Obnoxious
   Very Likely 1 2 3 4 5 6 7 Very Unlikely

50. Smart—Relaxed
   Very Likely 1 2 3 4 5 6 7 Very Unlikely

51. Sleepy-Obnoxious
   Very Likely 1 2 3 4 5 6 7 Very Unlikely

52. Talkative-Relaxed
   Very Likely 1 2 3 4 5 6 7 Very Unlikely

53. Stupid-Sick
   Very Likely 1 2 3 4 5 6 7 Very Unlikely

54. Talkative-Happy
   Very Likely 1 2 3 4 5 6 7 Very Unlikely

55. Sad-Stupid
   Very Likely 1 2 3 4 5 6 7 Very Unlikely

56. Sleepy-Sick
   Very Likely 1 2 3 4 5 6 7 Very Unlikely

57. Dangerous-Dizzy
   Very Likely 1 2 3 4 5 6 7 Very Unlikely
Think of the EFFECTS OF ALCOHOL on you. Consider how likely or unlikely it is that you would feel or experience the two effects at the same time. (Very likely =1 Likely =2 slightly likely =3 equally likely = 4 slightly unlikely =5 unlikely =6 very unlikely =7).”

<table>
<thead>
<tr>
<th>Effect 1</th>
<th>Effect 2</th>
<th>Likelihood</th>
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<tbody>
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<td>Stupid—Sleepy</td>
<td>Very Likely 1 2 3 4 5 6 7 Very Unlikely</td>
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<tr>
<td>59. Talkative-Smart</td>
<td>Talkative-Smart</td>
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</tr>
<tr>
<td>60. Confident-Dangerous</td>
<td>Confident-Dangerous</td>
<td>Very Likely 1 2 3 4 5 6 7 Very Unlikely</td>
</tr>
<tr>
<td>61. Intoxicated-Dizzy</td>
<td>Intoxicated-Dizzy</td>
<td>Very Likely 1 2 3 4 5 6 7 Very Unlikely</td>
</tr>
<tr>
<td>62. Stupid-Irresponsible</td>
<td>Stupid-Irresponsible</td>
<td>Very Likely 1 2 3 4 5 6 7 Very Unlikely</td>
</tr>
<tr>
<td>63. Obnoxious-Talkative</td>
<td>Obnoxious-Talkative</td>
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</tr>
<tr>
<td>64. Smart—Dizzy</td>
<td>Smart—Dizzy</td>
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</tr>
<tr>
<td>65. Relaxed-Stupid</td>
<td>Relaxed-Stupid</td>
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</tr>
<tr>
<td>66. Funny-Confident</td>
<td>Funny-Confident</td>
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</tr>
<tr>
<td>67. Sick—Dizzy</td>
<td>Sick—Dizzy</td>
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</tr>
<tr>
<td>68. Confident-Smart</td>
<td>Confident-Smart</td>
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</tr>
<tr>
<td>69. Dizzy-Sleepy</td>
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</tr>
<tr>
<td>72. Happy-Stupid</td>
<td>Happy-Stupid</td>
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</tr>
<tr>
<td>73. Confident-Sick</td>
<td>Confident-Sick</td>
<td>Very Likely 1 2 3 4 5 6 7 Very Unlikely</td>
</tr>
<tr>
<td>74. Dizzy-Funny</td>
<td>Dizzy-Funny</td>
<td>Very Likely 1 2 3 4 5 6 7 Very Unlikely</td>
</tr>
<tr>
<td>75. Sick-Talkative</td>
<td>Sick-Talkative</td>
<td>Very Likely 1 2 3 4 5 6 7 Very Unlikely</td>
</tr>
<tr>
<td>76. Smart—Dangerous</td>
<td>Smart—Dangerous</td>
<td>Very Likely 1 2 3 4 5 6 7 Very Unlikely</td>
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</tbody>
</table>
Think of the EFFECTS OF ALCOHOL on you. Consider how likely or unlikely it is that you would feel or experience the two effects at the same time. (Very likely =1 Likely =2 slightly likely =3 equally likely = 4 slightly unlikely =5 unlikely =6 very unlikely =7).”

77. Intoxicated-Relaxed
Very Likely 1 2 3 4 5 6 7 Very Unlikely

78. Smart-Stupid
Very Likely 1 2 3 4 5 6 7 Very Unlikely

79. Sad—Irresponsible
Very Likely 1 2 3 4 5 6 7 Very Unlikely

80. Sick-Dangerous
Very Likely 1 2 3 4 5 6 7 Very Unlikely

81. Talkative—Sad
Very Likely 1 2 3 4 5 6 7 Very Unlikely

82. Happy-Horny
Very Likely 1 2 3 4 5 6 7 Very Unlikely

83. Obnoxious-Confident
Very Likely 1 2 3 4 5 6 7 Very Unlikely

84. Irresponsible-Dizzy
Very Likely 1 2 3 4 5 6 7 Very Unlikely

85. Sleepy-Intoxicated
Very Likely 1 2 3 4 5 6 7 Very Unlikely

86. Dangerous-Sleepy
Very Likely 1 2 3 4 5 6 7 Very Unlikely

87. Confident-Relaxed
Very Likely 1 2 3 4 5 6 7 Very Unlikely

88. Irresponsible-Smart
Very Likely 1 2 3 4 5 6 7 Very Unlikely

89. Smart—Sad
Very Likely 1 2 3 4 5 6 7 Very Unlikely

90. Confident-Happy
Very Likely 1 2 3 4 5 6 7 Very Unlikely

91. Horny-Funny
Very Likely 1 2 3 4 5 6 7 Very Unlikely

92. Intoxicated-Dangerous
Very Likely 1 2 3 4 5 6 7 Very Unlikely

93. Confident-Irresponsible
Very Likely 1 2 3 4 5 6 7 Very Unlikely

94. Sad-Obnoxious
Very Likely 1 2 3 4 5 6 7 Very Unlikely

95. Funny-Talkative
Very Likely 1 2 3 4 5 6 7 Very Unlikely
Think of the **EFFECTS OF ALCOHOL** on you. Consider how likely or unlikely it is that you would feel or experience the two effects at the same time. (Very likely = 1 Likely = 2 slightly likely = 3 equally likely = 4 slightly unlikely = 5 unlikely = 6 very unlikely = 7).”

<table>
<thead>
<tr>
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</tr>
<tr>
<td>97. Talkative–Dangerous</td>
<td>Very Likely 1 2 3 4 5 6 7 Very Unlikely</td>
</tr>
<tr>
<td>98. Sleepy–Confident</td>
<td>Very Likely 1 2 3 4 5 6 7 Very Unlikely</td>
</tr>
<tr>
<td>99. Intoxicated–Happy</td>
<td>Very Likely 1 2 3 4 5 6 7 Very Unlikely</td>
</tr>
<tr>
<td>100. Sick–Relaxed</td>
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<td>101. Funny–Sick</td>
<td>Very Likely 1 2 3 4 5 6 7 Very Unlikely</td>
</tr>
<tr>
<td>102. Horny–Obnoxious</td>
<td>Very Likely 1 2 3 4 5 6 7 Very Unlikely</td>
</tr>
<tr>
<td>103. Relaxed–Dangerous</td>
<td>Very Likely 1 2 3 4 5 6 7 Very Unlikely</td>
</tr>
<tr>
<td>104. Dizzy–Horny</td>
<td>Very Likely 1 2 3 4 5 6 7 Very Unlikely</td>
</tr>
<tr>
<td>105. Obnoxious–Intoxicated</td>
<td>Very Likely 1 2 3 4 5 6 7 Very Unlikely</td>
</tr>
<tr>
<td>106. Sick–Happy</td>
<td>Very Likely 1 2 3 4 5 6 7 Very Unlikely</td>
</tr>
<tr>
<td>107. Stupid–Intoxicated</td>
<td>Very Likely 1 2 3 4 5 6 7 Very Unlikely</td>
</tr>
<tr>
<td>108. Sad–Sleepy</td>
<td>Very Likely 1 2 3 4 5 6 7 Very Unlikely</td>
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<tr>
<td>109. Sick–Smart</td>
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</tr>
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<td>110. Sleepy–Talkative</td>
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</tr>
<tr>
<td>111. Horny–Confident</td>
<td>Very Likely 1 2 3 4 5 6 7 Very Unlikely</td>
</tr>
<tr>
<td>112. Talkative–Stupid</td>
<td>Very Likely 1 2 3 4 5 6 7 Very Unlikely</td>
</tr>
<tr>
<td>113. Dizzy–Confident</td>
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<tr>
<td>114. Dangerous–Funny</td>
<td>Very Likely 1 2 3 4 5 6 7 Very Unlikely</td>
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Appendix A (Continued)

Think of the EFFECTS OF ALCOHOL on you. Consider how likely or unlikely it is that you would feel or experience the two effects at the same time. (Very likely =1 Likely =2 slightly likely =3 equally likely = 4 slightly unlikely =5 unlikely =6 very unlikely =7)."

115. Stupid-Confident  
Very Likely 1 2 3 4 5 6 7 Very Unlikely

116. Happy-Dizzy  
Very Likely 1 2 3 4 5 6 7 Very Unlikely

117. Confident-Talkative  
Very Likely 1 2 3 4 5 6 7 Very Unlikely

118. Sad-Funny  
Very Likely 1 2 3 4 5 6 7 Very Unlikely

119. Dangerous-Stupid  
Very Likely 1 2 3 4 5 6 7 Very Unlikely

120. Relaxed—Dizzy  
Very Likely 1 2 3 4 5 6 7 Very Unlikely

When you have completed this task let the experimenter know.
Appendix B: Card Sorting

The Following words will be the 32 stimuli included in the card sort task. The sorting task will be accomplished using 32 - 3 X 5 index cards. Each index card will have one stimulus on it for the sort.

Confident
Dangerous
Dizzy
Emotional
Energetic
Foolish
Forceful
Funny
Happy
Horny
Incoherent
Intoxicated
Irresponsible
Mean
Mellow
Nervous
Noisy
Obnoxious
Pass out
Relaxed
Sad
Sick
Sleepy
Smart
Social
Stupid
Talkative
Unbearable
Unhappy
Unpredictable
Verbal
Woozy
Appendix C: Addition task

\[
\begin{array}{cccc}
754 & 856 & 562 & 435 \\
+ 53 & + 63 & + 34 & + 89 \\
\hline
344 & 645 & 499 & 865 \\
+ 89 & + 96 & + 23 & + 56 \\
\hline
697 & 549 & 157 & 345 \\
+ 43 & + 59 & + 85 & + 98 \\
\hline
152 & 332 & 807 & 456 \\
+ 93 & + 54 & + 79 & + 56 \\
\hline
285 & 406 & 920 & 877 \\
+ 96 & + 65 & + 44 & + 56 \\
\hline
511 & 270 & 808 & 159 \\
+ 61 & + 70 & + 25 & + 65 \\
\hline
629 & 973 & 423 & 735 \\
+ 87 & + 52 & + 50 & + 45 \\
\hline
880 & 243 & 456 & 955 \\
+ 29 & + 79 & + 89 & + 65 \\
\end{array}
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Appendix C (Continued)

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+ 32 & + 59 & + 56 & + 56 \\
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\]

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951 & 785 & 654 & 591 \\
+ 54 & + 65 & + 86 & + 95 \\
\end{array}
\]

\[
\begin{array}{cccc}
753 & 486 & 954 & 543 \\
+ 68 & + 56 & + 56 & + 95 \\
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\]

\[
\begin{array}{cccc}
874 & 951 & 654 & 795 \\
+ 65 & + 54 & + 85 & + 62 \\
\end{array}
\]

\[
\begin{array}{cccc}
185 & 657 & 159 & 594 \\
+ 48 & + 95 & + 77 & + 65 \\
\end{array}
\]

\[
\begin{array}{cccc}
658 & 657 & 846 & 654 \\
+ 98 & + 65 & + 91 & + 82 \\
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\]

\[
\begin{array}{cccc}
655 & 159 & 177 & 198 \\
+ 54 & + 78 & + 54 & + 56 \\
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Appendix C (Continued)

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Appendix C (Continued)

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254 & 754 & 323 & 684 \\
+ 16 & + 19 & + 84 & + 63 \\
\hline
354 & 654 & 321 & 516 \\
+ 95 & + 36 & + 98 & + 84 \\
\hline
951 & 564 & 651 & 352 \\
+ 35 & + 15 & + 32 & + 16 \\
\hline
235 & 759 & 346 & 546 \\
+ 16 & + 65 & + 58 & + 98 \\
\hline
876 & 435 & 613 & 435 \\
+ 94 & + 12 & + 54 & + 16 \\
\hline
357 & 156 & 987 & 546 \\
+ 65 & + 45 & + 63 & + 87 \\
\hline
116 & 245 & 516 & 316 \\
+ 35 & + 65 & + 57 & + 54 \\
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Appendix C (Continued)

\[
\begin{array}{cccc}
984 & 156 & 765 & 513 \\
+ 65 & + 86 & + 46 & + 54 \\
616 & 519 & 876 & 654 \\
+ 87 & + 84 & + 46 & + 32 \\
654 & 321 & 878 & 546 \\
+ 13 & + 76 & + 35 & + 87 \\
216 & 513 & 746 & 325 \\
+ 57 & + 65 & + 87 & + 41 \\
324 & 651 & 984 & 687 \\
+ 98 & + 98 & + 32 & + 52 \\
791 & 762 & 169 & 432 \\
+ 48 & + 19 & + 87 & + 37 \\
745 & 876 & 354 & 687 \\
+ 16 & + 56 & + 63 & + 35 \\
\end{array}
\]
Appendix C (Continued)

\[
\begin{array}{cccc}
468 & 732 & 765 & 576 \\
+ 79 & + 16 & + 43 & + 35 \\
\hline
846 & 986 & 213 & 213 \\
+ 35 & + 79 & + 57 & + 57 \\
\hline
216 & 465 & 686 & 687 \\
+ 57 & + 46 & + 21 & + 43 \\
\hline
687 & 987 & 324 & 213 \\
+ 35 & + 35 & + 68 & + 57 \\
\hline
135 & 416 & 732 & 654 \\
+ 44 & + 35 & + 13 & + 16 \\
\hline
654 & 464 & 576 & 598 \\
+ 68 & + 35 & + 87 & + 43 \\
\hline
321 & 241 & 432 & 213 \\
+ 68 & + 68 & + 16 & + 73 \\
\end{array}
\]
Appendix C (Continued)

\[
\begin{array}{cccc}
216 & 631 & 687 & 887 \\
+ 35 & + 34 & + 98 & + 29 \\
687 & 687 & 746 & 357 \\
+ 31 & + 32 & + 35 & + 98 \\
686 & 135 & 323 & 112 \\
+ 54 & + 46 & + 54 & + 20 \\
321 & 987 & 383 & 383 \\
+ 65 & + 32 & + 82 & + 82 \\
498 & 135 & 683 & 683 \\
+ 76 & + 49 & + 68 & + 68 \\
352 & 873 & 939 & 939 \\
+ 13 & + 21 & + 36 & + 36 \\
546 & 685 & 837 & 837 \\
+ 87 & + 79 & + 28 & + 28 \\
\end{array}
\]
Appendix D: Demographics and Alcohol use questionnaire

Demographics and Alcohol Use Questionnaire

Date of Birth: ____/____/_____
Day /Month/Year

Sex: 0) Female 1) Male

Ethnicity:
0) Caucasian (non-Hispanic)
1) African American
2) Latino/Latina
3) Asian
4) Other

Have you ever had an alcoholic drink? (0) Yes (1) No

About how frequently do you drink alcohol?
0) Never
1) Once a year or less
2) 3-4 times a year
3) Once a month
4) 2-3 times a month
5) 2-3 times a week
6) 4-5 times a week
7) 6-7 times a week

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

0) None
1) One Drink
2) 2
3) 3
4) 4
5) 5-6
6) 7-8
7) 9 or more