Jajodia

(10) DOMAIN:A/1= race, B/2= ethnicityC/3 = gender-sexD/4 = food or drink OR (alcohol)

E/5 = other consumerF/6= politicalG/7 = drugs or tobacco

H/8 = self esteem J/9= personality/selfK/10 = clinical

L/11= relationships M/12= other? (not a tony category)

pg 129 (11) BEHAVIOR: ~~single=1~~, average=2 pg 129 ← error: said single before

pg 128 (12) IAT TYPE: ~~attitude=1~~, belief=2, self=3, not reported = 4 ← arousal IAT

pg 129 (13) EM TYPE: ~~attitude=1~~, belief=2, self=3, not reported = 4

(14) OVERALL METHOD: not=0, observed=1 , pg 129

(15) METHOD: RepPast=1, future=2, emotion=3, judge=4, obs=5, neuro=6, other=7 , pg 129

inferred pg 130 (16) SCORE: millisecond=0, log=1, algorithm=2, ~~NotReported=3~~ ← difference before not mill (inferred)

pg 128 (17) words=0, pictures=1, NotReported=2

(18) number of IATs: 2 ← correct pg 127 ← error: two but said one before

(19) IAT ORDER: NotReported=0, iatfirst=1, ~~iatsecond=2~~, iatthird=3

(20) EXPLICIT ORDER: NotReported=0, explicitfirst=1, expsecond=2, explthird=3 pg 127

(21) BEHAVIOR ORDER: NotReported=0, behfirst=1, behsecond=2, behthird=3

(22) IAT vs. behavior: NotReported=0, before=1, after=2, counter=3

(23) EXPLICIT vs. beh: NotReported=0, explicitfirst=1, expsecond=2, counter=3

(24) IAT SESSION: same=0, different=1

(25) EXPLICIT SESSION: same=0, different=1

(26) IAT SOCIAL DESIRABILITY 1-7 4 , pg 128

(27) EXPLICIT SOCIAL DESIRABILITY 1-7 4 , pg 129

(28) BEHAVIOR CONTROLLABLE: **1-10** 5, pg 129

(29) IAT SPECIFIC 1-7 ~~3~~ 3, pg 128

(30) EXPLICIT SPECIFIC 1-7 ~~2~~ 3, pg 129

(31) OPPOSITION **1-5** 1, pg 128

(32) RACIAL, 0=not, 1=racial not (0), pg 126

(33) type of iat: single=1, dual=2, personalized=3 , pg 128

#40-140 group

DONE

ctive Behaviors
2, 126–133

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Measuring Alcohol Expectancies With the Implicit Association Test

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Researchers have relied primarily on self-report questionnaires to measure alcohol expectancies. These questionnaires assess explicit expectancies about alcohol but do not provide any measure of the implicit processes that might also play an important role in determining drinking. The implicit association test (IAT; A. G. Greenwald, D. E. McGhee, & L. K. Schwartz, 1998), a reaction time task, measures differential associations of 2 target concepts with an attribute. In this study, the IAT provided a measure of the strength of associations of alcohol concepts to positive or negative outcomes in memory. This implicit measure of alcohol expectancies successfully predicted alcohol use in 103 undergraduates. The findings also supported the hypothesis that an implicit measure of expectancy can add to the predictive power of existing questionnaire-based measures.

Alcohol expectancies serve as powerful predictors of drinking across participants, methods, and studies (Christiansen, Smith, Roehling, & Goldman, 1989; Dunn & Goldman, 1996; Goldman, Del Boca, & Darkes, 1999; Smith, Goldman, Greenbaum, & Christiansen, 1995). Researchers have primarily used self-report questionnaires to measure alcohol expectancies (e.g., Brown, Christiansen, & Goldman, 1987; Earleywine & Erblich, 1996; Fromme, Stroot, & Kaplan, 1993; Leigh & Stacy, 1993). Despite their success at predicting drinking, questionnaires present several problems, such as self-representation issues and experimenter demand.

The association of alcohol concepts to positive or negative outcomes in memory is an important process feature of alcohol expectancies (Goldman, Brown, Christiansen, & Smith, 1991; Palfai & Wood, 2001; Rather & Goldman, 1994; Rather, Goldman, Roehrich, & Brannick, 1992; Stacy, 1995; Weingardt, Stacy, & Leigh, 1996) that is particularly relevant to predicting alcohol use (Earleywine, 1995; Stacy, Leigh, & Weingardt, 1994). Hence, an instrument that measures these associations directly might very well add to the utility of questionnaires in predicting drinking behavior.

Researchers have conceptualized alcohol expectancies somewhat differently. Leigh (1989) defined them as beliefs about the effects that alcohol has on people. Stacy (1997) operationally defined outcome expectancies similarly as behavioral beliefs or subjective probabilities of outcomes as reported on questionnaires. Goldman et al. (1999), however, conceptualized expectancies as information templates stored in the nervous system. Processing this information in memory produces behavioral output. This broader conceptualization of expectancy, as delineated below, is the one used in this study.

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A Memory Network Model of Alcohol Expectancies

Expectancies are cognitive processes, often involving memory templates of previous experiences that guide future behavior. In the context of alcohol consumption, alcohol expectancies are the learned relationships among alcohol cues, drinking behavior, and the outcome of drinking (Goldman et al., 1999). In keeping with this model, several experimental studies have used priming techniques to support the idea that expectancies can be activated implicitly and automatically, without the use of attentional resources (Roehrich & Goldman, 1995; Stein, Goldman, & Del Boca, 2000; Weingardt et al., 1996). These studies suggest that measuring the implicit processes underlying alcohol expectancies is important for predicting drinking behavior.

Expectancy accessibility and the strength of association of alcohol cues to memories of previous positive alcohol outcomes (measured using word association tasks) have also been found to be correlated with alcohol use and abuse (Stacy, 1995; Stacy et al., 1994). Stacy (1997), in a related prospective study, also found memory associations to be significantly predictive of subsequent alcohol and marijuana use, suggesting that an implicit cognition component operates along with the outcome belief component to motivate alcohol use.

In a related line of investigation, researchers have used multidimensional scaling to empirically model an alcohol expectancy memory network (Dunn & Earleywine, 2001; Rather & Goldman, 1994; Rather et al., 1992) showing important differences between the expectancy activation of heavy drinkers versus light drinkers. These studies found negative expectancy nodes to be further along the expectancy network, which implies that they would be less likely to influence drinking behavior.

All of the above studies point to memory association research as very important to the understanding of expectancy processing in alcohol consumption and abuse. An implicit instrument that measures the strength of association of alcohol cues to positive outcomes in memory could add significantly to the predictive power of existing paper-and-pencil expectancy measures. The evaluation of this relatively unexplored hypothesis is central to this study.

Role of Negative Expectancies

of negative expectancies in understanding alcohol use also seems to be important, but its relationship with behavior appears much more complex than that of posi- pectancies. In her review of the alcohol expectancy litera- Leigh (1989) reported mixed results with trying to predict king with negative expectancies. Some studies reported no fferences between different drinking populations in terms of egative expectancies, whereas others found them to be positively related to drinking, and still others found a negative relationship. This difference in predictive power of the positive and negative expectancies could be due to the differences between proximal (e.g., feeling relaxed right now) and distal (e.g., eventual loss of job) consequences in determining behavior. Jones and McMahon (1994, 1996) showed in subsequent research that in a clinical sample, negative expectancies rather than positive ones were predictive of length of period of abstinence after treatment. In a college sample, however, Fromme et al. (1993) found positive and not negative expectancies to be associated with alcohol use. Lee, Greely, and Oei (1999) recently suggested that whereas positive expectancies get people to begin drinking, negative expectancies serve to limit the amount consumed. More careful research is required to determine the exact role of negative alcohol expectancies in predicting amount of drinking and problem drinking. With this investigation we also sought to explore the relationship of implicit negative associations with alcohol use.

The Implicit Association Test

The implicit association test (IAT; Greenwald, McGhee, & Schwartz, 1998) has been used in attitude research to measure differential association of two target concepts with an attribute. The two target concepts (e.g., flowers vs. insects), as well as attribute words (e.g., *pleasant* vs. *unpleasant*) are presented in a discrimination task. In one set of trials, participants have to respond to highly associated concepts with the same key (e.g., flowers + pleasant words with the left key, insects + unpleasant words with the right key) and in another set of trials must respond to less associated concepts with the same key (e.g., insects + pleasant words with the left key, flowers + unpleasant words with the right key). Participants are faster to respond when highly associated categories are given the same response key. Thus, when participants are responding to both flowers and pleasant words with one key (compatible responding), there can be rapid responding due to the shared positive valence of the two categories. However, when the task is changed so that participants are responding to flowers and unpleasant words with one key, and to insects and pleasant words with the other key (incompatible responding), the response time increases, because the high degree of association between the concept of flowers and pleasant words interferes with rapid responding in this case. The difference between the participants' performance in the two sets of trials (incompatible and compatible responding) is called the *IAT effect*. It provides a measure of the differential association of the concepts with the attribute.

The IAT has shown sensitivity not only to commonly accepted evaluative differences (flowers and insects) but also to consciously disavowed prejudices (African American vs. White names; Greenwald et al., 1998). The IAT appears to be a stable and valid measure for implicit cognitions, appears fairly resistant to self-presentational factors, and has been shown to exhibit divergent validity from explicit beliefs (Bosson, Swann, & Pennebaker, 2000; Greenwald & Farnham, 2000). It also appears to be superior to another implicit technique: priming, by showing twice the effect size. The IAT has already been used to measure varied concepts, such as prejudices, implicit self-concept and self-esteem, and negative self-evaluative biases in formerly depressed people, as well as snake and spider fears (Gemar, Segal, Sagrati, & Kennedy, 2001; Greenwald & Farnham, 2000; Greenwald et al., 1998; Teachman, Gregg, & Woody, 2001). It has also been shown to have predictive validity when predicting affect (e.g., negative mood in response to threatening feedback; Greenwald & Farnham, 2000) as well as behavior (e.g., use of negative emotion words on essays as related to implicit self-concept; Bosson et al., 2000).

IATs

We used the IAT to measure the differential association of alcohol-related words to positive versus neutral adjectives and to negative versus neutral adjectives. We expected that the stronger the association of each of these attributes to alcohol concepts, the greater the IAT effect. We then explored the relationship of the observed IAT effects to drinking behavior and evaluated the incremental predictive utility of the IAT over a well-established alcohol expectancy questionnaire.

The importance of studying memory associations to alcohol cues in relation to drinking behavior and problems is well established. The studies conducted thus far have used either word association tasks or semantic priming. The IAT may be more sensitive to differences in individual cognition than these kinds of measures. The role of negative expectancies has also not been explored extensively in these studies, and using negative expectancies with the IAT may help to clarify their importance (or lack of it) in determining drinking behavior. Being relatively free of self-presentational and subjective factors, the IAT may add to the predictive utility of existing questionnaire-based expectancy measures.

Method

Participants

One hundred fifteen students participated for course credit. Complete data on the most important measures were obtained for 112 participants. As mentioned below, some participants were deemed probable outliers on either or both implicit measures and were excluded from the analyses, resulting in a final sample size of 103. Of these participants, 59% were women, 40% were men, and 1 person did not report sex. The ethnicity of this sample was 42% Caucasian, 24% Asian, 13% Hispanic, 4% African American, and 17% other; the mean age was 20.4 years (*SD* = 1.51).

Procedure

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To prevent any effect of priming of alcohol concepts on the reaction time measures, the participants were not told that this study was related to alcohol, and the implicit measures were administered before the drinking or alcohol expectancy measures. Measures were administered to each participant individually, and in privacy, in a room with a desktop PC.

Implicit Measures

The two IAT tasks were administered on a desktop PC. The participants viewed the words on the PC monitor and gave left or right responses on the 18 computer keyboard by pressing either of two keys. Each participant completed the two IAT tasks in succession.

The positive-expectancy IAT task involved seven blocks of 48 items each (see Figure 1). Participants were asked to rapidly categorize the series of stimuli words presented. Each block was preceded by instructions about categorization. In the first block, participants practiced *concept discrimination* by categorizing items as either alcohol or mammal. The stimuli were names of 12 alcoholic beverages and 12 mammals, repeated once and randomly displayed (see the Appendix for the lists of words). The concept words were presented in uppercase. In the second block, participants practiced *attribute discrimination* by categorizing items as either positive or neutral. The stimuli were 12 positive adjectives (related to the effects of alcohol; see Appendix) and 12 neutral adjectives, repeated once and presented randomly. The attribute words were displayed in lowercase. In the third block, the concept and attribute words of the previous two blocks were combined, and participants practiced categorizing alcohol + positive expectancy words with one key and mammal + neutral words with another. Attribute and concept words were presented alternately. The stimuli were the 12 alcoholic beverages, 12 names of mammals, 12 positive adjectives, and 12 neutral adjectives used before, presented randomly. The fourth block was the same as the third block and was a critical block, as the data from this block were used to compute the IAT effect.

The fifth block was the *reversed attribute discrimination* task, in which participants practiced on stimuli identical to the earlier attribute discrimination task (Block 2), with key assignment reversed. The sixth block provided practice for the *reversed combined task.* The stimuli used were the same as those used during the third block, but key assignments on the attributes were reversed, so participants now had to respond to alcohol + neutral words with one key and mammal + positive expectancy words with another. The seventh block was the data collection block and was identical to the preceding block.

We computed the implicit positive association measure (PIAT) as the difference between the trimmed mean of latencies for Block 7 and the trimmed mean of latencies for Block 4. This difference estimates the degree of difficulty participants had in responding to alcohol and positive expectancy words with different keys, relative to responding to them with the same key. Thus, we postulated that the more these positive expectancy words were associated with alcohol concepts in a person's memory, the more difficulty the person would have on the incompatible-responding task (relative to the compatible task) and hence the greater the PIAT observed would be.

The negative-expectancy IAT tasks were the second set of IAT tasks administered and were identical to the tasks for positive expectancy, with two exceptions. First, negative expectancy words were used instead of the positive expectancy words (see Appendix), and second, the initial concept discrimination block (Block 1) was not presented, as participants had already had considerable practice on these items. The neutral words used on this set of tasks were different from the neutral words used on the positive-expectancy tasks. As with the PIAT, the negative IAT effect (NIAT) was computed as the difference between the trimmed mean of latencies for the reversed combined task and the trimmed mean of latencies for the initial combined task.

Choice of IAT items. One of the concerns of the initial IAT experiment was the confounding of differential amount of prior exposure to the stimuli with positive evaluations (Greenwald et al., 1998); that is, participants might respond faster to more familiar words and not just to those with stronger targeted associations. Another difference in words that might lead to differential responding to them is word length. If words in two categories are of different lengths, then a person might take different amounts of time to process and hence to respond to them. To control for these two factors, the words chosen for each IAT task were matched in length and frequency to the words in the other category in the discrimination task. The list of all the words used is presented in the Appendix.

Alcoholic beverages. A list of 241 alcoholic beverages was compiled from a thesaurus and an encyclopedia. We then used the British National Corpus (1998; a 100 million word collection of samples of written and spoken language from a wide range of sources, designed to represent a wide cross-section of current British English) and a computer program to generate the frequencies of these words in the English language. Words that had a frequency less than 5 in the corpus were eliminated; so were words that could be used in a sense other than an alcoholic beverage (e.g., *port, punch*). The final list was generated after the matching category was decided, as we mention below.

Mammals. Words belonging to several supposedly neutral categories were compiled from a thesaurus and an encyclopedia as before (animals, birds, dogs, fish, fruits, mammals, and plants). The frequencies for each list were also generated as with the alcohol words, and each list was matched with the alcohol words on length as well as frequency. The category of mammals was the one that generated the highest number of matches. The 12 most frequent words were then chosen from both the alcohol and mammals lists.

Positive and neutral adjectives. Anderson (1968) provided a long list of personality-trait words rated by their likableness in a college student sample. The most likable adjectives of this list were chosen (a likableness rating of >400 on a maximum possible rating of 600). Most positive alcohol expectancy adjectives as found in Rather et al. (1992; Rather & Goldman, 1994) and Stacy et al. (1994) were already on this list; a few that were not on it were added (*funny, jolly, social,* and *attractive*). We prepared the final list by picking out the 12 alcohol expectancy words that met most of these criteria; they (a) had been used previously in the literature (Rather

Block #	1	2	3, 4	5	6, 7
1st set Positive expectancies	• ALCOHOL MAMMALS •	• positive neutral •	• ALCOHOL • positive MAMMALS • neutral •	• neutral positive •	• ALCOHOL • neutral MAMMALS • positive •
Block #		8	9,10	11	12, 13
2nd set Negative expectancies		• negative neutral •	• ALCOHOL • negative MAMMALS • neutral •	• neutral negative •	• ALCOHOL • neutral MAMMALS • negative •

Figure 1. Blocks used in the implicit association test (IAT). Black dots indicate the correct responses. Blocks 3, 6, 9, and 12 are practice blocks and are repeated. The data from Blocks 4 and 7 are used to compute the positive IAT effect, which is the difference in response times between these two blocks. Similarly, Blocks 10 and 13 are used to compute the negative IAT effect.

et al., 1992; Stacy et al., 1994), (b) had high frequency in the English language, and (c) had high likableness ratings. As before, we used the British National Corpus to match the length and frequency of these positive words with other adjectives. Twelve of the most neutral of these adjectives were then picked to match with the positive words.

Negative and neutral adjectives. For negative and neutral adjectives, we used a procedure similar to the one for positive adjectives. The initial set of adjectives was picked from the ones in Anderson (1968) that had the lowest likableness rating (not greater than 200), with the words *sick* and *dangerous* added from the alcohol expectancy literature. We prepared the final list by picking out 12 alcohol expectancy words used previously in the literature (Rather et al., 1992) that also had high frequency and low likableness ratings. Twelve matching neutral adjectives were also chosen, as before.

Alcohol Use

The participants next filled in their daily drinking data for the past 30 days in a computerized interactive calendar that was based on the alcohol time line follow-back method (TLFB; Sobell & Sobell, 1995). The participants filled in the number of drinks they had over the past 30 days, aided by holidays and several other tricks to help them recall their drinking. The participants were asked to fill in their drinking in terms of standard drinks (one standard drink is a 12 oz beer, 4 oz glass of wine, or 1.5 oz liquor). The TLFB has been evaluated extensively with clinical and normal drinking populations and can provide more precise and varied information about a person's drinking than produced by quantity–frequency methods (Allen & Columbus, 1995). Our software version of the TLFB was designed to mimic the actual TLFB interview as closely as possible. The program provided voice instructions, and participants could replay any missed parts as desired. The software was also designed to ensure that all participants made use of the memory aids to reliably recall their drinking (participants could not skip any part of the interview). This version of the TLFB thus reduced the effect of self-presentational issues that the presence of an interviewer might have generated, without sacrificing reliability. The TLFB yielded three indexes of alcohol habits: (a) total number of drinks consumed over the past 30-day period (TQTY), (b) total number of drinking days or the frequency of drinking in the past 30 days (FREQ), and (c) maximum number of drinks consumed on any one day during the past month (MAX).

Alcohol Problems

Participants next completed the Rutgers Alcohol Problem Index (RAPI; White & Labouvie, 1989) as a measure of the negative sequelae of alcohol use. The RAPI is a 23-item self-report questionnaire that assesses problem drinking in adolescent and young adult populations. The test score for each respondent can be used as a continuous variable indicating the frequency with which negative consequences of alcohol use are experienced (Allen & Columbus, 1995). We modified the response format to an 11-response option format to increase the range of the instrument.

Explicit Alcohol Expectancies

The participants filled out the 120-item Alcohol Expectancy Questionnaire (AEQ; Brown et al., 1987). The AEQ is the most widely used self-report questionnaire for measuring alcohol expectancies and has well-demonstrated predictive and concurrent validity. Issues of dicriminant validity were raised by Leigh (1989) and have been addressed by Goldman et al. (1991) and Goldman, Greenbaum, and Darkes (1997). The AEQ has six subscales: Global Positive Changes, Sexual Enhancement, Social and Physical Pleasure, Social Assertiveness, Relaxation, and Arousal/Aggression. To add range and variability to the scores for the purpose of regression analysis, we modified the AEQ from the dichotomous form to an 11-option Likert response form. This change in format did not result in any loss of internal consistency of the subscales: the coefficient alphas for the six subscales were .94, .89, .88, .95, .91, and .77, respectively.

General Information

The participants also filled out some general information about themselves, such as age, sex, ethnicity, religion, year in college, handedness, whether their parents had ever had any drinking problems, and some more questions about drinking habits in the past.

Outlier Detection

Reaction time data are inevitably marked by the presence of numerous outliers in the response times. These outliers are caused by phenomena other than those of interest, such as random guesses, accidental keypresses, or inattention, which makes choosing a measure of central tendency that is resistant to the presence of outliers very important. The mean is not very resistant to the presence of outliers and hence is not a good choice as a measure of central tendency for reaction time data (Ratcliff, 1993). One can obtain trimmed means by removing some of the smallest and largest values from the sample and computing the mean from the rest. They are resistant alternatives to the mean in the presence of outliers (Wilcox, 1996). Hence, we used .2 trimmed means (where 20% of the data were trimmed from each end) of the response times for the correct responses on the data collection blocks to generate the IAT effects.

The IAT effect for positive expectancy words (PIAT) was computed as the difference between the trimmed means of the latencies in Block 7 and Block 4 (see Figure 1), and the IAT effect for negative expectancy words (NIAT) was computed as the difference between trimmed means of latencies in Block 13 and Block 10 (see Figure 1). Boxplots of the trimmed means of latencies and error rates on data collection blocks revealed 9 participants as probable outliers on the PIAT task, indicating that these 9 had taken substantially greater time (or had made more than 25% errors) than all other participants on most of their responses, possibly on account of any number of factors unrelated to the phenomenon under investigation, such as overcautious responding, language problems, or lack of concentration. These 9 participants were excluded from further analyses. Three other participants had too many errors or took too long to respond to items on the NIAT tasks, and so they were excluded from the analyses involving the NIAT measure but were retained for other analyses (as they seemed to have performed adequately on the PIAT).

In other IAT experiments, the order of compatible and incompatible responding blocks has been counterbalanced across participants, but the counterbalancing variable has not been found to have a significant effect on the IAT measures (e.g., Greenwald & Farnham, 2000); hence, counterbalancing on this variable was not undertaken in this experiment. Moreover, the use of a more resistant measure of central tendency in this study (trimmed mean vs. mean, in the other IAT experiments) was expected to have helped minimize the effect of interference from previous response patterns.

Results

Drinking Habits

The women in this sample reported drinking an average of 1.85 drinks (SD = 1.84) on 3.23 occasions (SD = 4.09) in the past month, whereas men reported drinking an average of 4.26 drinks (SD = 3.45) on 6.74 occasions (SD = 5.82). Women also reported fewer drinking problems (mean RAPI score = 16.03, SD = 27.35) than men (mean RAPI score = 30.79, SD = 34.33). There was a wide range of drinkers in our sample (TQTY, range = 0–177; FREQ, range = 0–18; MAX, range = 0–30). Participants also reported a wide range of drinking problems, with RAPI scores as high as 144. Twenty-eight participants reported consuming 0 drinks in the past month. Because the participants were young, few of those who abstained in the past month were expected to have done so because of drinking problems in the past; hence, abstainers were retained in the analyses. A comparison of the total amount of alcohol consumed to the scores on the problem drinking measures (RAPI) revealed just 1 participant who seemed to be trying to cut down (RAPI score = 144, and only 1 drink consumed in the past month).

Bivariate Analyses

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Both the positive as well as negative IAT measures were analyzed to ascertain effect sizes. Participants were much faster in responding to alcohol words and positive or negative expectancy words with the same key than with different keys. Paired t tests were highly significant for both positive, $t(102) = 7.58, p < .001, d = .93$, as well as negative, $t(101) = 9.16, p < .001, d = .91$, associations.

Correlations among all the variables appear in Table 1. Gender showed significant correlations with four of the six AEQ measures, with men endorsing more positive expectancies than women, but showed almost no correlation with both the implicit measures. The two IAT measures were significantly correlated with each other ($r = .27$), but not as strongly as the AEQ measures (for the 15 correlations among the AEQ subscales, mean $r = .71$). The PIAT had only weak correlations with the AEQ subscales, with most of the correlations being positive. The NIAT also did not correlate significantly with any of the AEQ measures.

All the drinking measures (TQTY, FREQ, and MAX) showed significant correlations with the PIAT: $r = .32$ ($p < .01$) for TQTY, $r = .30$ ($p < .01$) for FREQ, and $r = .30$ ($p < .01$) for MAX. The NIAT however, produced no significant correlations with the drinking measures. The AEQ measures correlated significantly with all the alcohol use measures at $p = .01$ or lower. The negative consequences of drinking measure (RAPI) produced significant correlations with all the AEQ subscales but not with either of the IAT measures.

Multivariate Analyses

We conducted multivariate analyses using hierarchical multiple regression, with the drinking measures (TQTY, FREQ, MAX, RAPI) as dependent variables and the explicit expectancy and implicit measures as predictors for the entire sample and then for the subset who had had at least one drink during the month (see Table 2). In each case, gender was entered in the first step to control for differences in alcohol use and problems between men and women. Subsequent steps evaluated (a) how much unique variance in alcohol use and problems, over and above the explicit alcohol expectancy measures, could be accounted for by the positive implicit association measure, and (b) whether implicit negative associations made any further unique contributions to predicting drinking behavior.

The six AEQ subscales had very high correlations with each other (mean $r = .71$), which meant that using all of them as separate predictors in a regression equation could lead to the problem of multicollinearity (Cohen & Cohen, 1983; Rosenthal & Rosnow, 1991). Moreover, in a regression equation, the use of several variables that are related to the same underlying construct may also result in paradoxical suppression effects. To avoid these problems, Cohen and Cohen (1983) suggested either dropping the less important variables or combining the variables to form a single composite score or index. Goldman et al. (1997) showed that the six AEQ subscales are related to a higher order expectancy construct with both common as well as unique components. Hence, instead of dropping most of the subscales, we created a

Table 1
Means and Standard Deviations for, and Intercorrelations Between, All Measures

Measure	1	2	3	4	5	6	7	8	9	10	11	12	13
1. PIAT	—												
2. NIAT	.27**	—											
3. AEQ1	.08	.02	—										
4. AEQ2	.17	.05	.77**	—									
5. AEQ3	.17	.09	.65**	.62**	—								
6. AEQ4	.15	.00	.76**	.69**	.75**	—							
7. AEQ5	.09	.04	.78**	.67**	.70**	.76**	—						
8. AEQ6	−.05	−.06	.77**	.66**	.61**	.80**	.73**	—					
9. TQTY	.32**	.16	.28**	.29**	.47**	.36**	.42**	.32**	—				
10. FREQ	.30**	.18	.33**	.36**	.59**	.45**	.49**	.35**	.86**	—			
11. MAX	.30**	.13	.29**	.29**	.50**	.39**	.42**	.34**	.89**	.75**	—		
12. RAPI	.18	.09	.28**	.27*	.39**	.32**	.36**	.27**	.65**	.60**	.61**	—	
13. Gender	.09	−.09	.26*	.26*	.24*	.20	.26*	.20	.40**	.35**	.44**	.24*	—
M	89.9	85.2	74.2	23.2	47.1	49.6	42.9	37.8	22.7	4.71	5.11	22.4	
SD	120.4	93.9	40.3	15.2	17.6	22.5	19.5	13.8	33.9	5.13	5.75	31.1	

Note. For gender, 0 = female, 1 = male. PIAT = positive implicit alcohol expectancy measure; NIAT = negative implicit alcohol expectancy measure; AEQ1 = Alcohol Expectancy Questionnaire, Global Positive Changes subscale; AEQ2 = AEQ Sexual Enhancement subscale; AEQ3 = AEQ Social and Physical Pleasure subscale; AEQ4 = AEQ Social Assertiveness subscale; AEQ5 = AEQ Relaxation subscale; AEQ6 = AEQ Arousal/Aggression subscale; TQTY = quantity of alcohol consumed over the past month; FREQ = number of drinking occasions over the past month; MAX = maximum number of drinks consumed in a day during the past month; RAPI = Rutgers Alcohol Problem Index (alcohol-related negative consequences during the past 3 years).
$^{*}p < .05$. $^{**}p < .01$.