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## Incorporating social anxiety into a model of college student problematic drinking

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### Abstract

College problem drinking and social anxiety are significant public health concerns with highly negative consequences. College students are faced with a variety of novel social situations and situations encouraging alcohol consumption. The current study involved developing a path model of college problem drinking, including social anxiety, in 316 college students referred to an alcohol intervention due to a campus alcohol violation. Contrary to hypotheses, social anxiety generally had an inverse relationship with problem drinking. As expected, perceived drinking norms had important positive, direct effects on drinking variables. However, the results generally did not support the hypotheses regarding the mediating or moderating function of the valuations of expected effects and provided little support for the mediating function of alcohol expectancies in the relations among social anxiety and alcohol variables. Therefore, it seems that the influence of peers may be more important for college students than alcohol expectancies and valuations of alcohol's effects are. College students appear to be a unique population in respect to social anxiety and problem drinking. The implications of these results for college prevention and intervention programs were discussed.

### Keywords

Social anxiety; College students; Problem drinking; Drinking norms; Path analysis; Expectancies

## 1. Introduction

Problem drinking among college students represents a major public health concern. Although problematic alcohol use occurs across many age groups, young adults aged 18–24 show the highest rates of alcohol use and have the greatest percentage of problem drinkers (Kandel & Logan, 1984; US Department of Health and Human Services [DHHS], 1984, 1997). The majority of college students have consumed alcohol in the past year (over 80% throughout the 1990s; Johnston, O'Malley, & Bachman, 2000), with at least 40% reporting a recent heavy or binge drinking episode (5+ standard drinks for men, 4+ for women in one sitting) in national studies (O'Malley & Johnston, 2002; Wechsler, Davenport, Dowdall, Moeykens, & Castillo, 1994; Wechsler, Dowdall, Maenner, Gledhill-Hoyt, & Lee, 1998; Wechsler, Lee, Kuo, & Lee, 2000).

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The pattern of college drinking is unique because it seems to be relatively variable and has a transitory course with only a subset of students exhibiting heavy drinking patterns into adulthood (Weingardt et al., 1998). Although many students “mature out” of heavy drinking (Zucker, 1987), some do not (e.g., Weingardt et al., 1998). Moreover, heavy drinking puts these students at risk for experiencing significant, negative alcohol-related consequences during their college years. Since the mid-1990s, there has been greater media attention given to alcohol-related deaths among college students, including deaths by acute alcohol poisoning, falls, drownings, automobile collisions, fires, and hypothermia resulting from exposure (Wechsler et al., 2000). However, there is a multitude of other less severe negative consequences more commonly experienced by heavy drinkers that may be neglected by the media (e.g., unplanned sexual activity, hangovers, academic problems, legal problems, and lowered immunity; Engs & Aldo-Benson, 1995; Wechsler et al., 1994).

Unfortunately, problem drinkers are not the only individuals who are affected by their drinking behavior. Heavy drinking also endangers other drinking or nondrinking college students and the community in general. In addition to the experience of “secondhand effects” of binge drinking on others (e.g., being insulted or humiliated, experiencing unwanted sexual advances, and having interrupted sleep; Wechsler, 1996), there is an increase in physical or sexual assault or damaging property committed by students when intoxicated (Hingston, Heeren, Zakocs, Kopstein, & Wechsler, 2002; Wechsler et al., 1994). Approximately 32% of college drinkers report driving under the influence of alcohol (Wechsler et al., 1994), putting themselves and others at risk for injury and death.

### 1.1. Defining problem drinking in college students

Previous research has often utilized self-report measures assessing the quantity and/or frequency of drinking behavior. Many have asserted that using quantity and frequency measures of alcohol use is not sufficient to determine the problem status of college student drinkers. For instance, some heavy drinkers may report low levels of alcohol-related problems, while some light or moderate drinkers may experience high levels of alcohol-related problems (White & Labouvie, 1989). As much of the concern with college student drinking deals with the negative alcohol-related consequences, this seems to be a relevant definition. Thus, the current study examined both weekly alcohol consumption and alcohol-related problems.

### 1.2. Social anxiety and college student problem drinking

Social anxiety may be an important motivator for drinking in college students (e.g., Burke & Stephens, 1999). Recent work has found social anxiety disorder to be the third most common psychiatric disorder, with a lifetime prevalence of 13.3% (Kessler et al., 1994). Alcohol problems and social anxiety appear to be related, as many studies have found higher prevalence rates of alcoholism within samples of socially anxious individuals compared with the prevalence for the general population (Davidson, Hughes, George, & Blazer, 1993; Kushner, Abrams, & Borchardt, 2000; Kushner, Sher, & Beitman, 1990; Merikangas & Angst, 1995) and higher rates of socially anxious individuals in alcoholic samples compared with normal control and community samples (Chambless, Cherney, Caputo, & Rheinstein, 1987; Merikangas & Angst, 1995; Schneider et al., 2001). Furthermore, the onset of social anxiety disorder typically precedes the onset of alcohol problems (Davidson et al., 1993; Kushner et al., 1990), indicating that social anxiety disorder may be a risk factor for alcohol problems. This may be particularly relevant to college students, as there are high social demands and frequent promotion of drinking on college campuses (Johnson, Springer, & Sternglanz, 1982; Nathan, 1994). In fact, Lewis and O'Neill (2000) found that college students identified as problem drinkers reported higher social anxiety than non-problem-drinkers did, providing evidence of a high cooccurrence of social anxiety and alcohol-related problems in a college population.

Despite this connection, there has been little attempt made to develop a model of social anxiety and alcohol use in the college student population (Burke & Stephens, 1999). Martin and Hoffman (1993) recommend that future research should focus on developing comprehensive models of drinking behaviors that predict relationships among person and socio-environmental variables using approaches such as path analysis. The creation of such a model, including social anxiety and other correlates of drinking behavior, is essential to improve both the efficacy of prevention as well as treatment efforts.

### 1.3. Expectancies, social anxiety, and drinking

The expectancy theory (Goldman, Brown, & Christiansen, 1987; Goldman, Del Boca, & Darkes, 1999) may help explain how social anxiety could be a risk factor for alcohol problems. “Alcohol expectancies” refer to the beliefs that people hold about the effects of consuming alcohol that are believed to influence drinking behavior. Several studies have supported the relationship between expectancies and increased problematic drinking behavior (e.g., Reis & Riley, 2000; Smith, Goldman, Greenbaum, & Christiansen, 1995). Previous literature has generally demonstrated positive correlations among social anxiety and social and tension reduction alcohol expectancies (Burke & Stephens, 1999; Ham, Hope, White, & Rivers, 2002; O’Hare, 1990).

Bruch et al. (1992) and Bruch, Rivet, Heimberg, and Levin (1997) contended that shy individuals may fear and avoid drinking if they hold the expectancy that alcohol will increase social assertiveness because they fear that social assertiveness would result in negative evaluation for disinhibited behavior. The study of Bruch et al. revealed that social assertiveness alcohol expectancies acted as a “suppressor variable” between shyness and alcohol use. Although shyness and social anxiety are not synonymous, it is possible that the results of the studies of Bruch et al. could partially be explained by a failure to assess the valuations of the expectancies, a criticism of many widely used measures of alcohol expectancies (Fromme, Stroot, & Kaplan, 1993; Leigh, 1989).

According to classic expectancy-value theory (Bandura, 1977), an outcome expectancy will only increase behavior if the person desires or values the expected outcome. For example, there is evidence that heavier drinkers may view negative effects of alcohol as more benign than lighter drinkers do (Williams & Ricciardelli, 1996). Furthermore, Leigh (1989) reported that the desirability of alcohol effects, independent of expectancies, added significantly to the prediction of drinking frequency and quantity. Thus, socially anxious individuals that positively value a particular expectancy (e.g., social assertiveness) would be more likely to engage in problem drinking than one who negatively values the expected outcome. It would be expected that this effect would be greater for those with greater levels of social anxiety, as those with more severe levels of social anxiety would have greater motivation to use alcohol to reduce the social discomfort (e.g., Tran, Haaga, & Chambless, 1997).

### 1.4. Other factors relevant to college student drinking

Gender, living environment, peer influence, and involvement in religion are variables relevant to college student drinking that were important to consider in the model. Although there have been a number of other factors associated with problem drinking, such as genetic influences, often examined in alcohol-related research, the current model focuses on psychosocial, nongenetic variables that are important specifically for college drinking.

**1.4.1. Gender**—Overall, male students tend to drink alcohol more frequently and in larger quantities than female students do (e.g., Clements, 1999; Read, Wood, Davidoff, McLacken, & Campbell, 2002). Additionally, male students are more likely to engage in binge drinking (Wechsler et al., 1994; Wechsler, Dowdall, Davenport, & Castillo, 1995), meet criteria for an

alcohol use disorder (Clements, 1999), and experience more alcohol-related consequences (Read et al., 2002) than women do.

**1.4.2. Living environment**—Students living in on-campus residences, such as fraternities, sororities, or residence halls, tend to drink more, more often engage in binge drinking, and report more alcohol-related negative consequences than do those living with their parents (e.g., Harford, Wechsler, & Muthen, 2002; Martin & Hoffman, 1993), possibly due to peers who encourage drinking as normative behavior. This may be particularly applicable for socially anxious college students, being faced with many new social situations and having the desire to be accepted socially by their peers. Social desirability, combined with more potential social situations (e.g., interactions with roommates and other students in dormitories) and greater availability of alcohol than those living off campus, may lead to even more alcohol consumption for those with higher social anxiety.

**1.4.3. Peer influence**—The influence of peers' attitudes and behaviors about alcohol seems to be related to alcohol consumption (Oetting & Beauvais, 1987; Reis & Riley, 2000). An atmosphere in which heavy drinking is encouraged and perceived as normative and positive tends to have more heavy drinkers than peer groups in which heavy drinking is not encouraged (e.g., Agnostinelli, Brown, & Miller, 1995; Baer & Carey, 1993). The influence of perceived peer drinking norms would appear to be particularly important in the case of socially anxious individuals, as these individuals may have an increased desire to be socially accepted.

**1.4.4. Religious involvement as a protective factor**—Religiosity has generally been found to be negatively related to alcohol use and alcohol problems (e.g., Forthun, Bell, Peek, & Sun, 1999; Wechsler et al., 1995), independent of the negative relationship between religiosity and sensation seeking (Forthun et al., 1999).

In conclusion, the development of a comprehensive model of the role of social anxiety in college student problematic drinking is essential to understanding the interrelatedness among social and environmental variables associated with problematic drinking behavior in this population. This model would also aid in examining the inconsistencies in the literature regarding the alcohol–social anxiety relationship by including expectancies and valuations of drinking outcomes. Additionally, the model will study an important area, namely, that of social anxiety and problematic college drinking, which has been neglected. Social anxiety and drinking is particularly important in college populations, as college students are faced with a variety of novel social situations as well as situations that involve alcohol consumption. Such a model would serve as the basis for future research, further our understanding of the relationship between alcohol and social anxiety, and inform interventions for problematic drinking among college students.

## 1.5. Hypotheses

The following hypotheses involve the path analytic model depicted in Fig. 1.

1. It was hypothesized that expectancies, valuations, and perceived drinking norms would have positive, direct effects on alcohol use and alcohol-related problems. Gender, living environment, and religious involvement were expected to have negative, direct effects on alcohol use and alcohol-related problems, in that being male, living on campus, and lower religious involvement would be related to greater alcohol consumption and problems.
2. It was expected that valuations would moderate the effect of social anxiety on alcohol use and alcohol-related problems, such that those having high social anxiety and high valuations would have even greater levels of the drinking variables than those with

lower social anxiety do. Furthermore, it was hypothesized that living environment and perceived drinking norms would moderate the effect of social anxiety on alcohol use and drinking-related problems, such that those with high social anxiety and living on campus or with high perceived drinking norms would have even greater levels of the drinking variables than those with lower social anxiety would.

3. As demonstrated in Fig. 1, it was hypothesized that social anxiety would have positive, indirect effect on alcohol use and alcohol-related problems through the mediating variables of expectancies, valuations, and perceived drinking norms.

Given previous literature indicating important gender differences in drinking behaviors (e.g., Wechsler et al., 1995), exploratory multiple regression analyses were first conducted to examine whether gender moderated the effects of model variables on drinking behavior and drinking-related problems.

## 2. Methods

### 2.1. Participants

Three hundred forty-three college students who attended the group Alcohol Skills Training Program (ASTP; Fromme, Marlatt, Baer, & Kivlahan, 1994) and agreed to allow their clinical data to be used for research purposes participated in this study. None of the potential participants declined to have their data included. Of the original 343 students, 27 were omitted from analyses, as they were found to be univariate statistical outliers using a standard outlier analysis procedure (Hoaglin, Mosteller, & Tukey, 1983)<sup>2</sup>. Summary demographic data for the sample are presented in Table 1. The final sample of 316 students was 37.7% female with a mean age of 19.26 (S.D. = 1.32). The sample consisted primarily of students who were Caucasian (89.9%) and who had never married (99.4%).

### 2.2. Measures

**2.2.1. Social anxiety**—The Interaction Anxiousness Scale (IAS; Leary, 1983) is a 15-item, commonly used self-report measure developed to assess anxiety in interpersonal situations, intended to measure the tendency to experience subjective social anxiety independently of associated behaviors. The IAS has shown strong evidence of internal consistency ( $\alpha > .87$ ; Leary & Kowalski, 1993) and test-retest reliability (.80; Leary, 1983). The IAS has also been found to have evidence of sound convergent (Leary, 1983) and discriminant validities (Leary & Kowalski, 1993).

**2.2.2. Alcohol-related problems**—The Rutgers Alcohol Problem Index (RAPI; White & Labouvie, 1989) is a 23-item questionnaire designed to assess problems with drinking among individuals aged 12–21. For each item, respondents indicated on a scale of 0–4 (0 = *never*, 4 = *more than 10 times*) the number of times during the past 6 months that they have experienced the particular problem because of their alcohol use. Psychometrics of the RAPI collected via longitudinal data (i.e., adolescents ages 12, 15, 18, and 21) revealed that the RAPI is associated with evidence of high internal consistency ( $\alpha = .92$ ) and convergent validity for all age groups (White & Labouvie, 1989).

**2.2.3. Alcohol use and peer influence**—The alcohol use questionnaire (AUQ; Addictive Behaviors Research Center, 1997) is an eight-item, self-report measure that assesses current alcohol use and perceived drinking norms. Individuals are required to consider a typical week

<sup>2</sup>This procedure involves identifying outliers by computing quartiles for each variable, then the interquartile spread (difference between 25th and 75th percentiles), and defining outliers as any scores that is more than 1.5 fourth spreads beyond the lower or upper bound fourth value. Outlier analyses were conducted after transformations were applied as necessary for distribution normality.



during the past month and estimate the following: the typical number of drinks they consumed for each day, the typical number of drinks that an average college student of his or her same sex consumed for each day, and the typical number of drinks that their best friends usually consumed on each day. A perceived norms composite score was computed by averaging the means for typical drinks by the average college student of the same sex and best friends. Although the timeline follow-back daily drinking estimation method (TLFB; Sobell & Sobell, 1992) may be optimal in providing accurate retrospective self-reporting, the AUQ was a component of the ongoing ASTP established clinical intervention process and included information regarding perceived drinking norms that would not be available with the TLFB.

**2.2.4. Alcohol expectancies and valuations**—The short form of the Comprehensive Effects of Alcohol Scale (B-CEOA; Addictive Behaviors Research Center, 1997) is a brief version of the original 38-item CEOA (Fromme et al., 1993) that assesses both positive and negative expectancies, as well as valuations about these effects. The four B-CEOA expectancy scales consist of risk and aggression/liquid courage/sociability, self-perceptions/cognitive and behavioral impairment, sexuality, and tension reduction. Valuations scales consist of tension reduction/sociability/sexuality, liquid courage/risk and aggression/self-perceptions, and cognitive and behavioral impairment (Ham, Stewart, Norton, & Hope, in press). Recent work demonstrated that the B-CEOA was associated with evidence of adequate internal consistency and construct and criterion validities (Ham et al., in press).

**2.2.5. Negative affectivity**—The positive and negative affect scales (PANAS; Watson, Clark, & Tellegen, 1988) is a 20-item, self-report measure that is intended to assess the relatively independent factors of positive and negative affects. The PANAS has been associated with evidence of acceptable internal consistency, test–retest reliability, and concurrent validity (Watson et al., 1988).

**2.2.6. Demographic information**—Demographic information was obtained from a short demographic sheet, including items regarding gender, living environment (i.e., residence hall, apartment or rented house, fraternity/sorority house, own your own house, or live with parents), participation in religion (1 = *not at all*; 5 = *very often*), and importance of religion (1 = *not at all*; 5 = *very*). A religion scale was created by computing the mean of the two questions assessing religion ( $\alpha = .83-.84$ ), similar with previous work by Oetting and Beauvais (1987).

### 2.3. Procedures

First-time offenders of the campus “no-tolerance” alcohol policy<sup>3</sup> had the option to attend group ASTP, a brief alcohol intervention using a harm reduction approach, to fulfill a portion of the disciplinary consequences. No first-time offenders refused ASTP group over the period of time that the study was conducted. ASTP groups were composed of 4–8 students led by two clinical psychology graduate student therapists. The participants completed the questionnaire packet during the first of the two 90-min ASTP sessions. During the second session, the participants received feedback based on the information obtained from the questionnaire packet. The PANAS was added to the questionnaire packet at a later date, and therefore, only 274 (79.9%) participants completed this measure. This was acceptable, as the PANAS was included as a variable to control for negative affect and was only used in a subset of the analyses. All participants gave informed consent and could participate in ASTP without participating in the research. The methods of data collection in this study were consistent with the

<sup>3</sup>Violations of the campus alcohol policy included drinking or being in the presence of alcohol on campus property or committing any type of alcohol-related legal offense (e.g., minor in possession, driving while intoxicated). Unfortunately, the researchers and clinicians do not have access to information regarding the violation that caused the referral. However, the clinical impression is that the majority of students referred had been drinking on campus property or drinking underage off of campus property.

recommendations of Sobell and Sobell (1990) for reliable and accurate self-report information from alcohol abusers.

## 2.4. Data analysis

The hypothesized path models were tested using path analyses, an extension of multiple regression. This procedure was used rather than structural equation modeling to allow for the inclusion of dichotomous variables and interaction effects in the model (Klem, 1995; Pedhauzer, 1997). Reduced models were developed by removing the links that were insignificant, or “trimming” the model (e.g., Klem, 1995). Social anxiety remained in all reduced models to test for possible mediating effects.

## 3. Results

### 3.1. Preliminary analyses

**3.1.1. Distribution normality**—As the skew for weekly consumption, perceived norms, and the RAPI exceeded the skew tolerances (a priori as skew  $>\pm 0.7$ ), transformations adjusting for values less than one were applied to these three variables until a tolerable skew was reached. A square root transformation was applied to weekly consumption and perceived norms variables, and a logarithmic transformation was applied to the RAPI for the remaining analyses (see Meadows & Stradling, 1996; Osborne, 2002).

**3.1.2. Correlations and gender analyses**—Correlations were conducted to examine the bivariate relations among the variables in the hypothesized path analytic model (see Table 2). As demonstrated in Table 2, correlations among these variables were generally as expected; however, correlations related to expectancies, valuations, and religious involvement were relatively small. Contrary to expectations, there was a small negative correlation between weekly consumption and social anxiety and no significant relations between alcohol-related problems and social anxiety.

Planned independent sample *t* tests revealed partial support for the hypothesis that men would have greater levels of weekly alcohol use and alcohol-related problems than women would, as men ( $M=18.48$ ,  $S.D.=12.64$ ) had greater levels of weekly alcohol consumption than women did [ $M=11.46$ ,  $S.D.=9.37$ ;  $t(314)=5.15$ ,  $P<.001$ ,  $\eta=.28$ ]. However, men ( $M=10.51$ ,  $S.D.=10.91$ ) and women ( $M=9.45$ ,  $S.D.=9.25$ ) did not differ in levels of alcohol-related problems [ $t(314)=1.25$ ,  $P=.38$ ,  $\eta=.07$ ]. As expected, those who live on campus reported more weekly alcohol consumption ( $M=18.99$ ,  $S.D.=14.10$ ) than did those residing off campus [ $M=14.99$ ,  $S.D.=11.24$ ;  $t(314)=1.96$ ,  $P=.05$ ,  $\eta=.11$ ]. However, there were no significant differences in alcohol-related problems between those residing on ( $M=10.55$ ,  $S.D.=11.49$ ) and off campus [ $M=9.99$ ,  $S.D.=9.99$ ;  $t(314)=.31$ ,  $P=.69$ ,  $\eta=.02$ ].

Exploratory multiple regression analyses were conducted to examine whether gender moderated (Baron & Kenny, 1986) the effects of model variables on drinking behavior and drinking-related problems. Each multiple regression consisted of gender, one of the previously listed variables, and the interaction. All interactions entered into the multiple regression analyses were the products of centered (for continuous variables) or dummy-coded variables (for dichotomous variables), as recommended by Aiken and West (1991). The Gender  $\times$  Living Environment interaction was the only significant interaction when alcohol consumption was the criterion. The Gender  $\times$  Perceived Norms and Gender  $\times$  Living Environment were the only significant interactions when alcohol-related problems was the criterion. Graphs plotting the interactions indicated that men living on campus drank more and had more alcohol-related problems than did women living on campus. Women with perceived norms above the mean



tended to have higher alcohol-related problems than did men with perceived norms above the mean. The significant paths discussed above were included in the full path models.

### 3.2. Path model

#### 3.2.1. Hypothesized full path model

**3.2.1.1. Weekly alcohol consumption:** See Fig. 2 for the path model diagram. The regression including all 11 variables and interactions accounted for 51.9% of the variance [ $F(11,297) = 29.17, P < .001$ ]. Next, analyses were conducted to test the indirect effects of social anxiety on weekly alcohol consumption. A second regression, with social anxiety as the independent variable and perceived drinking norms as the dependent variable, accounted for 2.6% of the variance [ $F(1,314) = 8.28, P = .004$ ]. A third regression, with social anxiety as the independent variable and expectancies as the dependent variable, accounted for 1.8% of the variance [ $F(1,314) = 5.63, P = .02$ ]. The fourth regression, with social anxiety as the independent variable and valuations as the dependent variable, accounted for 0.6% of the variance [ $F(1,314) = 1.77, P = .18$ ]. Overall, the model accounted for 54.3% of the variance.

As demonstrated in Fig. 2, perceived drinking norms and valuations were positively related to weekly alcohol consumption, while religious involvement was negatively associated with alcohol use. Although social anxiety did have a direct, positive effect on expectancies, the effect of expectancies on alcohol use was not significant. Contrary to the hypothesis, social anxiety did not have a direct effect on alcohol use. There was some evidence for the indirect effects of social anxiety via perceived drinking norms. The indirect effect of social anxiety on alcohol use was  $-.08$ . The average absolute residual was  $.09$ , indicating that the model may fit the data fairly well given the range of observed correlations ( $-.28$ – $.69$ ).

**3.2.1.2. Alcohol-related problems:** The same analyses were conducted, with alcohol-related problems (as assessed by the RAPI) as the outcome variable (see Fig. 3 the for resulting path model). The regression including all 11 variables and interactions accounted for 30.4% of the variance [ $F(11,297) = 11.70, P < .001$ ]. To test the indirect effects of social anxiety on alcohol-related problems, the same three additional analyses conducted in the alcohol consumption analyses were again conducted. Overall, the model accounted for 34.1% of the variance.

As demonstrated in Fig. 3, perceived drinking norms, expectancies, and valuations were positively related to alcohol-related problems, while religious involvement was negatively associated with alcohol-related problems. Social anxiety did not have a direct effect on alcohol-related problems. There was some evidence for the indirect effects of social anxiety via perceived norms and expectancies. The indirect effect of social anxiety on alcohol use was  $-.08$ . The average absolute residual was  $.07$ , indicating that the model may fit the data fairly well given the range of observed correlations ( $-.13$ – $.40$ ).

#### 3.2.2. Reduced models

**3.2.2.1. Weekly alcohol consumption:** This reduced model tested the indirect effects of social anxiety via perceived drinking norms and the direct effects of valuations and religious involvement on alcohol use (see Fig. 4 for the path model). The regression including all four variables accounted for 50.8% of the variance [ $F(4,304) = 78.61, P < .001$ ]. As demonstrated in Fig. 4, perceived drinking norms and valuations were positively related to weekly alcohol consumption, while religious involvement and social anxiety were negatively associated with alcohol use. There was some evidence that perceived drinking norms served as a mediating variable. The indirect effect of social anxiety on alcohol use was  $-.11$ . The average absolute residual was  $.02$ , indicating that the model appears to fit the data very well given the range of observed correlations ( $-.16$ – $.69$ ). The model accounted for 52.5% of the variance and failed to account for significantly less variance than the full model did [ $\chi^2(9) = 11.89, P > .05$ ].

**3.2.2.2. Alcohol-related problems:** This reduced model tested the indirect effects of social anxiety via perceived drinking norms and expectancies and the direct effects of valuations and religious involvement on alcohol-related problems (see Fig. 5 for the results of the path model). The regression including all five variables accounted for 28.8% of the variance [ $F(5,305) = 24.52, P < .001$ ]. The second and third regressions were identical to those completed in the previous sections. As demonstrated in Fig. 5, perceived drinking norms, expectancies, and valuations positively related to alcohol-related problems, while religious involvement was negatively associated with alcohol-related problems. There was evidence for the indirect effects of social anxiety via perceived drinking norms and expectancies in this model; however, the total indirect effect of social anxiety on alcohol-related problems was only  $-.002$ . The average absolute residual was  $.04$ , indicating that the model appears to fit the data very well given the range of observed correlations ( $-.16$ – $.40$ ). The model accounted for 31.6% of the variance, which did not account for significantly less variance than the full model did [ $\chi^2(7) = 11.64, P > .05$ ].

**3.2.3. Controlling for negative affect—**As previous research has found that social anxiety, as well as other anxiety measures, is positively correlated with negative affect (e.g., Brown, Chorpita, & Barlow, 1998), the analyses were conducted controlling for negative affect to investigate the specificity of the social anxiety construct and its relation to drinking behavior and consequences. As the measure of negative affect, the PANAS, was administered to 78.5% of the participants, this limitation should be considered in the following analyses. Although social anxiety positively correlated with negative affect, there was some evidence supporting the construct validity of social anxiety (see Table 2 for bivariate correlations).

To control for negative affect in the reduced path models, the PANAS negative affect variable was entered into the previous analyses prior to the other variables for a subset of the participants. For weekly alcohol consumption, the overall model predicting accounted for 51.0% of the variance and was quite similar with the previous reduced path model. However, social anxiety no longer had a significant association with alcohol use (path coefficient  $= -.09, P = .07$ ). For alcohol-related problems, the regression model with only negative affect accounted for a significant portion of the variance [ $R^2 = .08, F(1,247) = 20.32, P < .001, \beta \text{ weight} = .28$ ; see Fig. 6]. The regression analysis consisting of social anxiety as the independent variable and expectancies as the dependent variable did not account for significantly more variance [ $R^2_{\text{change}} = .044, F_{\text{change}}(1,252) = 1.14, P = .29$ ]. For perceived drinking norms, the regression model with only negative affect did not account for a significant portion of the variance [ $R^2 = .003, F(1,253) = .68, p = .41$ ]. The regression analyses consisting of social anxiety as the independent variable and perceived drinking norms as the dependent variable accounted for an additional 3.9% of the variance [ $F_{\text{change}}(1,252) = 9.54, P = .002$ ]. The overall model predicting the alcohol-related problems accounted for 25.5% of the variance. The indirect effect of social anxiety on alcohol-related problems was  $-.03$ . As shown in Fig. 6, many of the relations in the model were similar with the reduced path model when controlling for negative affect. However, social anxiety no longer had an indirect effect on alcohol-related problems through expectancies, and social anxiety had a significant, negative association with alcohol-related problems. A comparison of implied and observed correlations indicated that the model fit very well with the data (average absolute residual  $= .03$ ).

## 4. Discussion

The goal of the current study was to develop a comprehensive model of problematic college drinking incorporating social anxiety. Because both social anxiety and problem drinking among college students are significant public health problems, and the study of the relations among these variables have been neglected, the current study was an important step forward

in explicating these relationships. The study examined a sample of students referred to the ASTP due to a campus alcohol violation.

The results obtained in this study provide partial support for the hypothesized relations and a college problem drinking model incorporating social anxiety. As hypothesized, correlational and regression analyses revealed that perceived drinking norms and valuations had positive relations with both alcohol outcome variables, while religious involvement had negative relations with both alcohol use and alcohol-related negative consequences. However, contrary to hypotheses, social anxiety consistently had either no relationship or a negative relationship with drinking variables. In fact, social anxiety had negative relations with alcohol use and only had a significant (inverse) relationship with alcohol-related problems when controlling for the other variables. In this sample of referred students, social anxiety seemed to actually serve as a protective factor against problem drinking rather than as a risk factor.

Overall, perceived norms had the most consistent positive relationship and largest effect size estimates in relation to the drinking variables. It may be that although expectancies and valuations play a role in drinking behaviors, the influence of the peers and social networks during college may be a greater influence, particularly to socially anxious individuals who generally desire acceptance from peers. This is consistent with the concept of “developmentally limited alcoholism” that is often seen in college students (Zucker, 1987).

Expectancies generally had positive relations with the alcohol outcome variables; however, this was not the case in the path models for alcohol use, in which the effects were small. These results are not likely due to insufficient power, as the sample size exceeded the recommendations of Tabachnick and Fidell (1989) based on the ratio of cases to independent variables (i.e., 20:1;  $N=220$  in current study). It is possible that expectancies did not emerge as a significant influence in the models, as this variable combines both theoretically positive and negative expectancies (see Fromme et al., 1993). This could have been more adequately explored if the sample had been administered the full version of the expectancy questionnaire. However, exploratory correlations among the positive and negative expectancy variables, consisting of the eight items identified as positive expectancy and seven items identified as negative expectancies by the original CEOA, indicated that the positive and negative expectancies both positively correlated with both alcohol use [positive expectancies:  $r(316)=.27$ ,  $P<.001$ ; negative expectancies:  $r(316)=.14$ ,  $P=.02$ ] and alcohol-related problems [positive expectancies:  $r(316)=.34$ ,  $P<.001$ ; negative expectancies:  $r(316)=.34$ ,  $P<.001$ ]. Thus, expectancies do not appear to have a relationship with alcohol use in our data.

All hypothesized moderating relations were not supported in the models. Contrary to hypotheses, men and women generally did not differ on the alcohol use measures, with the only exception being that the  $t$  tests indicated that men drank more weekly than women did. This finding lends some support for the speculation that women are becoming more like men in their drinking (Goodwin, 1989; Maney, 1990).

There was partial support for the mediating relations in the models. Overall, social anxiety consistently demonstrated a negative, indirect effect on drinking behavior through perceived drinking norms. Within these analyses, social anxiety had a consistent, small negative direct effect or no effect on alcohol outcome variables. Contrary to the hypotheses, valuations did not mediate the relations between social anxiety and the alcohol outcome variables for either sample. However, consistent with hypotheses, social anxiety had a positive, indirect effect on alcohol-related problems via expectancies. This finding supports the notion that expectancies are the missing link in the social anxiety–alcohol relationship.

The current study controlled for negative affect to investigate the specificity of the social anxiety construct and its relation to drinking behavior and consequences. Negative affect did

have an impact on the relations among variables, but the impact was relatively small. In some cases, controlling for negative affect changed an effect of social anxiety from significant to nonsignificant (or, sometimes, vice versa) when the significance value was near the .05 cutoff.

Although there was the advantage of having the somewhat clinical “referred” group of students (i.e., these students were in a clinical setting—the alcohol intervention), this sample was not “clinical” in the sense that the students necessarily have *DSM-IV* diagnoses and/or were voluntarily seeking treatment. Eleven percent of the participants reported no drinking during a typical week in the past month. When removing the nondrinkers, the mean increases from < 16 to 18 drinks per week (*S.D.* = 11.18). In fact, most of the outliers removed were the heavier drinkers (mean weekly alcohol consumption of outliers = 21.69, *S.D.* = 25.40). This problem could be remedied by only including drinkers and/or oversampling heavier drinkers. However, additional analyses conducted including only drinkers did not appear to greatly alter the findings, and the mean for the current sample was much greater than typically seen in samples of college drinkers (e.g., 10.9 drinks/week; Engs, Diebold, & Hanson, 1996). In addition, most participants (*M*=37.08) scored in the subclinical range for social anxiety on the IAS (nonclinical college student IAS means=38.6–40.6; Leary & Kowalski, 1993). Therefore, the current results do not likely speak to alcohol use in noncollege populations and diagnosed socially anxious individuals, and also may not be representative of college students in general.

The archival nature of the data is another limitation of the study. This limited the comprehensiveness and quantity of measures administered, resulting in shortened versions of measures and limited demographics. Although the study had the strength of controlling for negative affect, this was limited, as there were a substantial portion of participants that did not complete the measure of negative affect. Despite strategies employed to gain the maximal accuracy of reporting (Sobell & Sobell, 1990), the causal interpretability of the results may be limited due to the use of self-report.

Regarding the path models, there were large error variances, and thus, alternative models should be tested and compared with these models (Klem, 1995). There may be variables omitted that are important to the theoretical model. Given the findings supporting the strong effects related to perceived norms, perhaps, more variables related to social networks and social interactions, such as social support and self-efficacy to refuse drinks, should be included in the model. Better measures of drinking, including blood alcohol concentration, drinking monitoring, and collateral sources, may also reduce the error variance. Follow-up studies utilizing structural equation modeling (e.g., Leohlin, 1987) involving the reduced models would also reduce error variance problems.

Given the support for a portion of the hypotheses and somewhat surprising or mixed findings regarding other hypotheses, it is clear that further research is warranted. First, it is recommended that more studies on perceived norms and other related social constructs (e.g., social support, self-efficacy for drink refusal, and response to drinking modeling) for college students are undertaken. Second, future research could improve on the data collected (e.g., longitudinal), study samples (i.e., more cultural diversity), and measures used (e.g., blood alcohol concentration using actual breathalyzer tests or calculating with weight and gender, more comprehensive measures). Given the slight, but important, differences in the models predicting alcohol use versus alcohol-related problems, it is clear that the inclusion of both types of variables should be considered in future research.

Another important future direction would be to study only drinking college students, and/or college students with clinical levels of alcohol problems and social anxiety. Perhaps, stronger relations among expectancies, valuations, social anxiety, and drinking would be found among students with greater levels of problems related to alcohol and social anxiety. It would also be

important to examine the social networks of socially anxious college students, as it seems that socially anxious college students would not be exposed to social settings in which drinking takes place. There may be a subset of socially anxious individuals with larger social networks who could be at risk for problem drinking. In addition, it would be interesting to have comparisons of clinical and nonclinical populations to examine the possible differences in the effect of social anxiety on drinking based on social anxiety severity level.

There are, however, important implications of the current research for social anxiety and college student drinking. First of all, the influence of peers for both socially anxious and non-socially-anxious college students appears to be an essential link in problem alcohol use. These findings regarding the role of perceived peer norms in drinking for college students are consistent with theories proposing that the college environment supports risky drinking (Johnson et al., 1982; Nathan, 1994), and the drinking remits once college has ended (Zucker, 1987). According to the role socialization theory of Kandel (1980), making role transitions (i.e., marriage, parenthood, and entering the workforce) may help to decrease future problem alcohol involvement in college students. Given that socially anxious individuals tend to have impairment in the areas of social and vocational functioning (Davidson et al., 1993; Schneier et al., 1994; Stein, 1995), individuals with high levels of social anxiety may be at a greater risk for problems during postcollege years. That is, socially anxious individuals may not mature out of college problematic drinking, as they are less likely to experience the same social role transitions that non-socially-anxious students might. Furthermore, socially anxious individuals may be more vulnerable to future alcohol problems after college due to the reinforcing effects of using alcohol repeatedly to cope with social situations.

Second, social anxiety, on its own, was generally negatively related to problem drinking. Examination of studies finding inverse relations between drinking and social anxiety revealed that they involve college populations (e.g., Eggleston, Woolaway-Bickel, & Schmidt, 2004; Holroyd, 1978; Rohsenow, 1982; Tran et al., 1997). Therefore, it may be that college students are a unique population in terms of the interplay among social anxiety and drinking. For college students, social situations may be the primary source for alcohol, particularly due to the minimum drinking age, while those in clinical and community samples can generally obtain alcohol legally. Many socially anxious college students would not be exposed to drinking due to an avoidance of social situations. On the other hand, clinical levels of social anxiety have had a positive relationship with drinking problems in the literature, and it seems as though there is a risk for socially anxious individuals that do drink and have high perceived drinking norms. It is possible that social anxiety only serves as a risk factor for problem drinking when the social anxiety has reached severe clinical levels, while high subclinical social anxiety may lead one to drink less due to concerns about possible negative evaluation by others due to disinhibited behavior (Bruch et al., 1992, 1997). In relatively healthy populations, such as the college student samples examined in the current study, lack of social anxiety appeared to predict problem drinking.

Finally, expectancies and valuations had some effects on social anxiety and drinking, but more research is needed to clarify these relationships. It is possible that those having strong expectancies and valuations that outlast the college years (i.e., the influence of perceived drinking norms) will have more serious drinking problems after college.

Overall, these results have implications for the prevention and intervention of college student problem drinking as well as the prevention of the continuation of problems after college has ended. First of all, it seems that there should be prevention/intervention programs targeting inaccurate perceived drinking norms in college students (e.g., ASTP; Fromme et al., 1994), possibly before college has begun. Interventions, including an expectancy challenging component (e.g., Darkes & Goldman, 1993), may be helpful in reducing problem drinking



during, as well as after, college. As there are some connections regarding social anxiety and problem drinking, students would clearly benefit from screenings aimed at identifying individuals with severe levels of social anxiety. Social anxiety could be targeted in cognitive-behavioral treatment (e.g., Hope & Heimberg, 1993; Turk, Fresco, & Heimberg, 1999) to prevent the conditioning of alcohol use to reduce severe social anxiety in social situations. In addition, social skills training (e.g., Bedell & Lennox, 1997) would be helpful in providing all students with the skills necessary to develop social relationships and gain employment to aid in role transition.

In conclusion, results from the study indicated that perceived drinking norms had important direct effects on weekly alcohol use and alcohol-related problems. Furthermore, social anxiety had indirect effects on the alcohol variables via perceived drinking norms as well. There was a minimal amount of evidence supporting a positive, indirect effect of social anxiety on alcohol-related problem through expectancies. Contrary to hypotheses, social anxiety tended to be negatively related to drinking and alcohol-related problems and appeared to serve as a protective factor against problem drinking. In general, social anxiety maintained the same relations with the remaining variables when controlling for negative affect. The findings have implications for the development of prevention and intervention programs for college student problematic drinking, particularly by targeting social influences related to drinking, social anxiety, and social skills. Further research is needed to explicate these relationships, including optimal measures, diverse samples, and longitudinal methodology.

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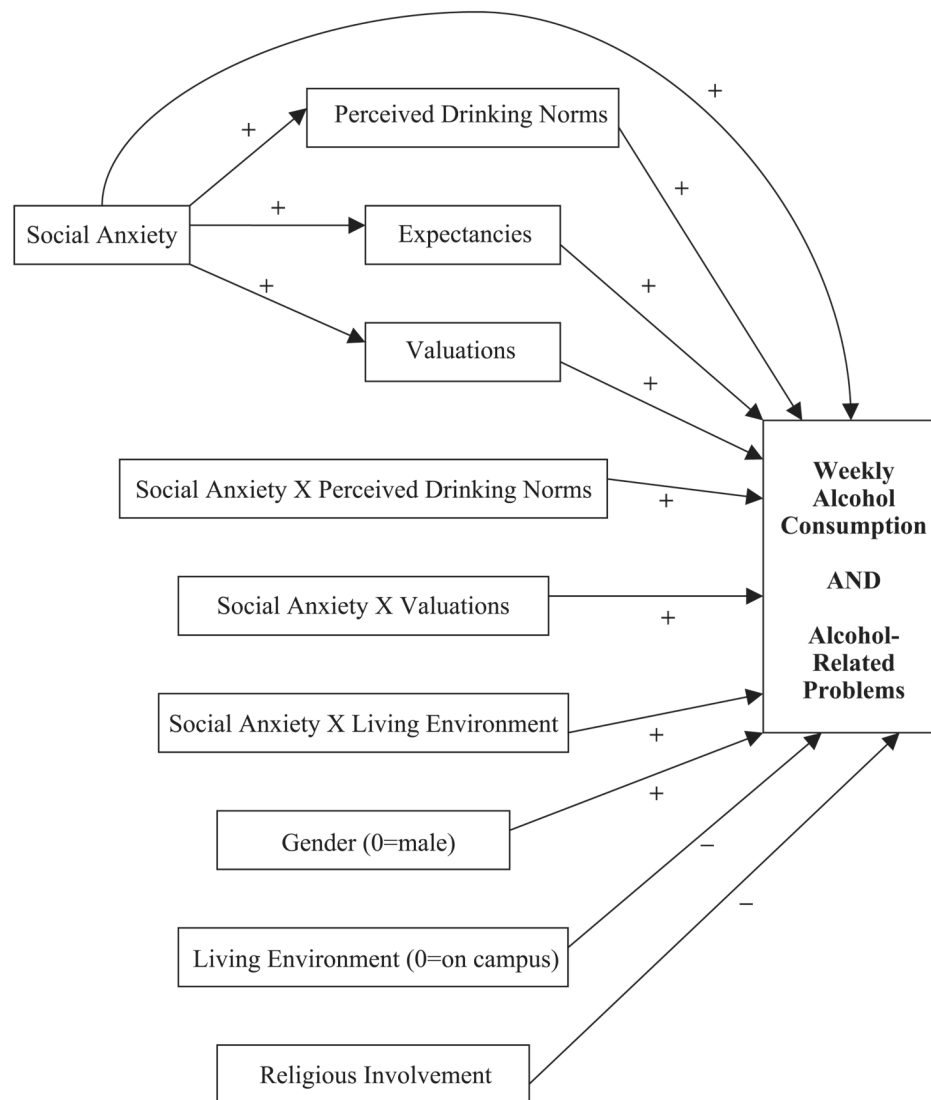


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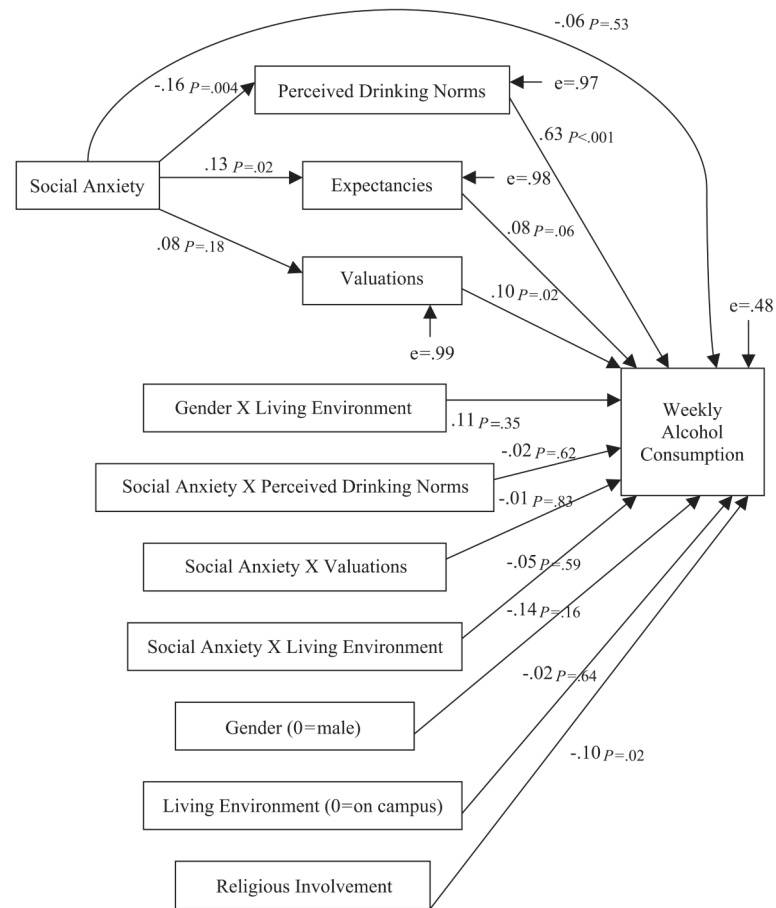
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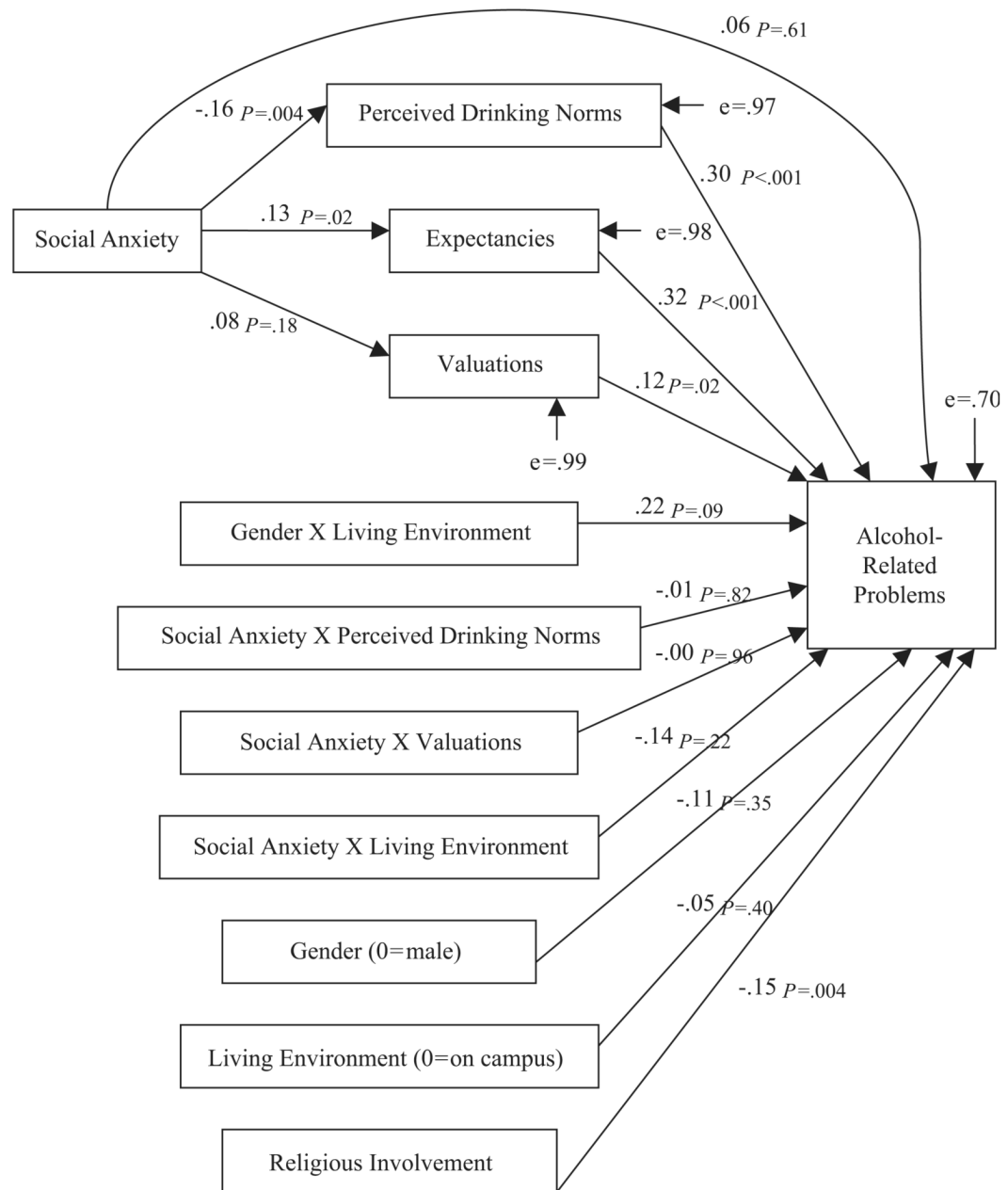


**Fig. 1.** Hypothesized pathways among alcohol use, alcohol-related problems, valuations, expectancies, perceived drinking norms, social anxiety, gender, and living environment.

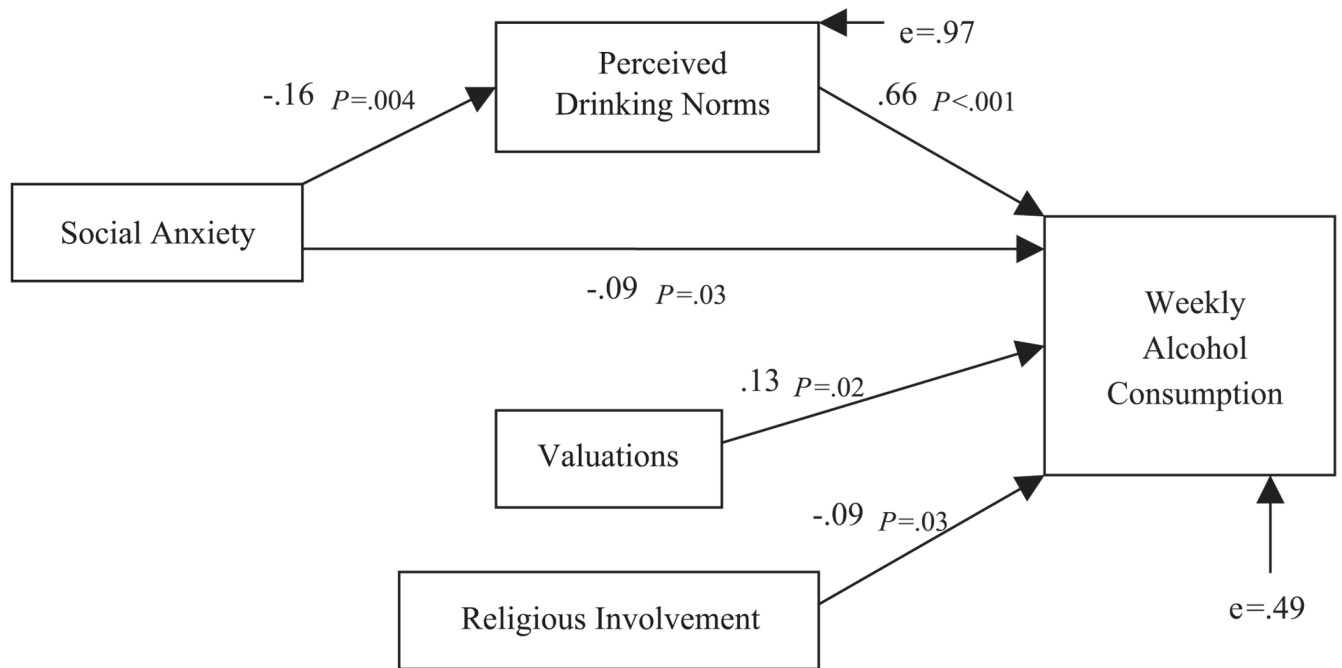


**Fig. 2.**  
Full path model with weekly alcohol consumption as the outcome variable.

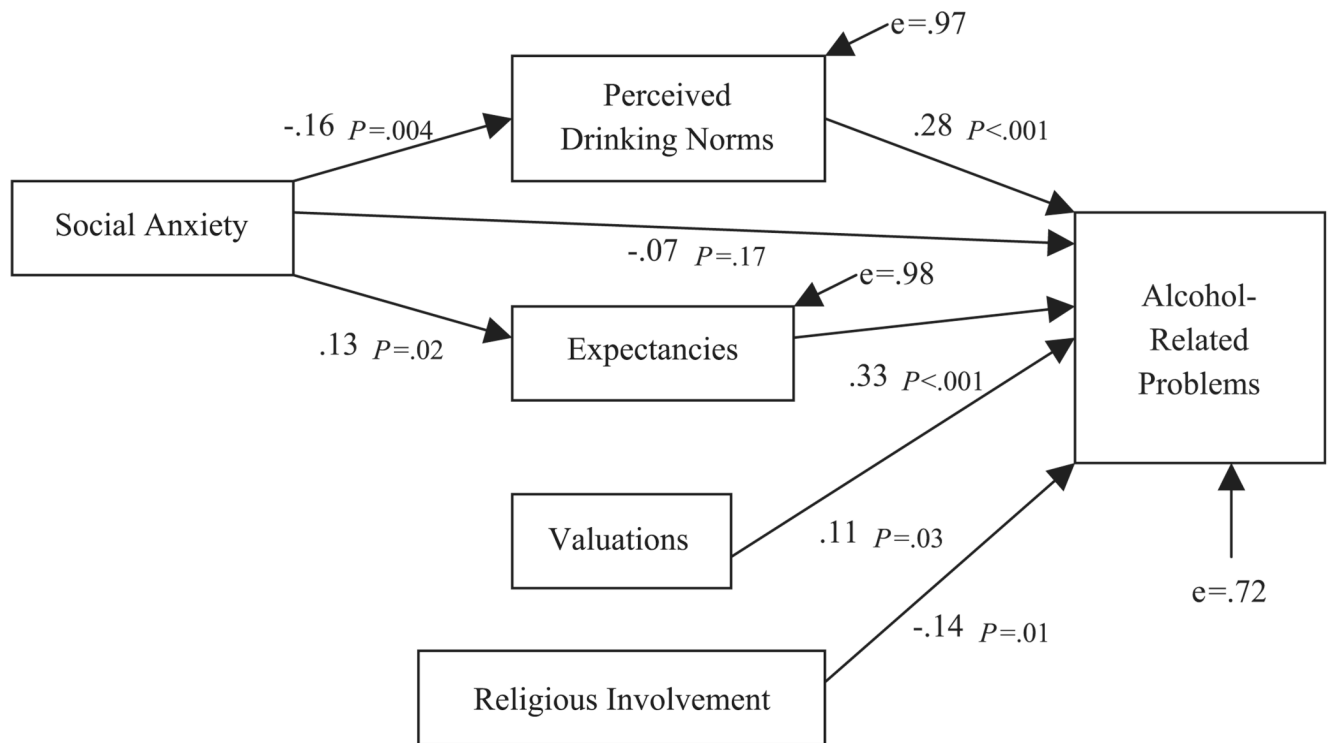




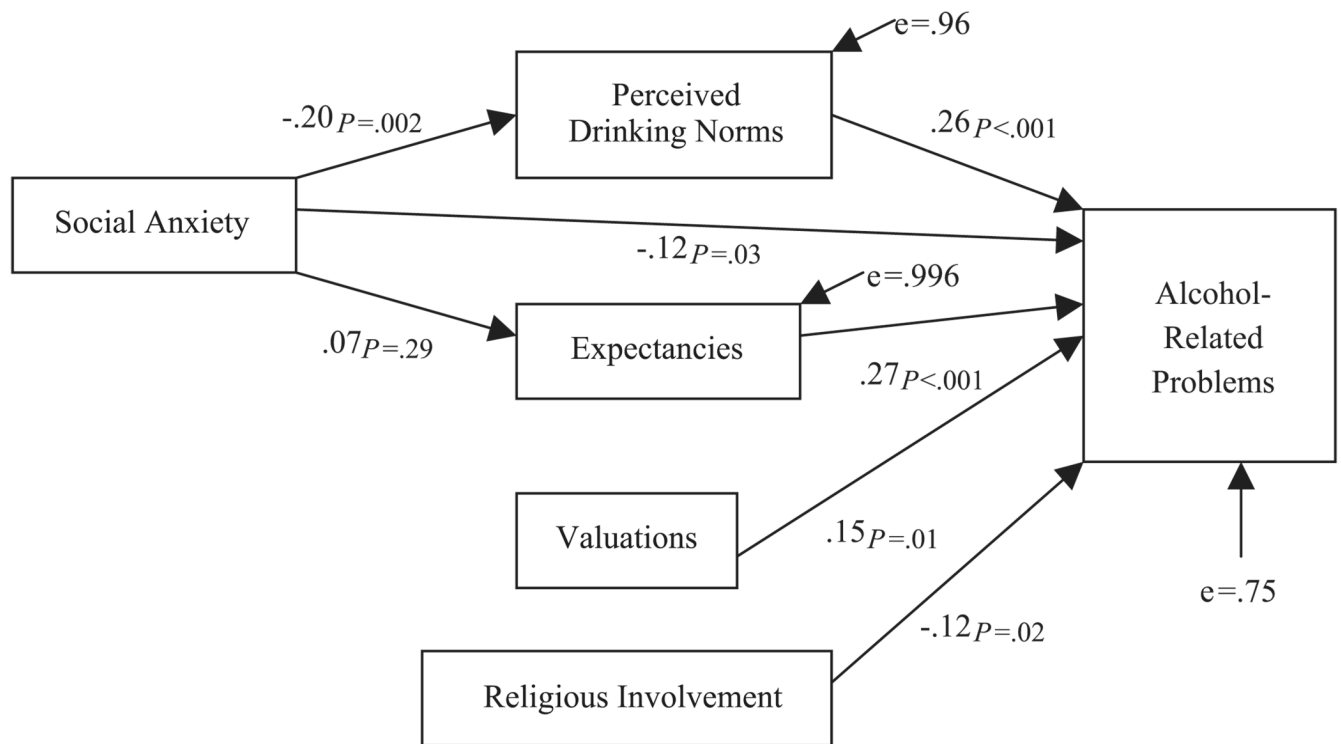
**Fig. 3.** Full path model with the Rutgers Alcohol Problem Index as the outcome variable.



**Fig. 4.**  
Reduced path model with weekly alcohol consumption as the outcome variable.



**Fig. 5.**  
Reduced path model with the Rutgers Alcohol Problem Index as the outcome variable.



**Fig. 6.**  
Reduced path model with the Rutgers Alcohol Problem Index as the outcome variable controlling for negative affect.

**Table 1**Univariate summaries (without transformations;  $N=316$ )

Variable		
Age	19.26 (S.D.=1.32)	Range=18–26
Gender		
Men	197 (62.3%)	
Women	119 (37.7%)	
Marital Status		
Single	314 (99.4%)	
Married	1 (.3%)	
Divorced	1 (.3%)	
Ethnicity		
Caucasian	284 (89.9%)	
African American	3 (.9%)	
Hispanic	1 (.3%)	
Asian American/Middle Eastern	3 (.9%)	
Other	10 (3.2%)	
Not reported	15 (4.7%)	
Year in college		
First	184 (58.2%)	
Second	68 (21.5%)	
Third	36 (11.4%)	
Fourth or higher	27 (8.6%)	
Not reported	1 (.3%)	
Living environment		
On campus		
Residence Hall	210 (66.5%)	
Fraternity/sorority	39 (12.3%)	
Off campus		
Apartment/house rental	58 (18.3%)	
Own house	3 (.9%)	
Live with parents	6 (1.9%)	
Weekly alcohol consumption <sup>a</sup>	15.83 (S.D.=11.99)	Range=0–53
Rutgers Alcohol Problem Index	10.11 (S.D.=10.31)	Range=0–76
Weekly drinking by typical student	19.65 (S.D.=9.89)	Range=0–61
Weekly drinking by best friends	20.24 (S.D.=13.26)	Range=0–91
Religious participation	2.92 (S.D.=1.06)	Range=1–5
Religious importance	3.52 (S.D.=1.18)	Range=1–5
B-CEOA expectancies	2.53 (S.D.=.43)	Range=1.4–3.6
B-CEOA valuations	2.81 (S.D.=.53)	Range=1.0–4.3
Interaction Anxiousness Scale	37.08 (S.D.=10.97)	Range=15–65
PANAS: positive affect	35.42 (S.D.=5.73)	Range=14–49
PANAS: negative affect	16.58 (S.D.=4.58)	Range=10–31

<sup>a</sup>Number of standard drinks per week. B-CEOA=Brief Comprehensive Effects of Alcohol questionnaire. PANAS=Positive And Negative Affectivity Scales.



Table 2

Correlations among typical weekly drinking, alcohol-related problems, perceived drinking norms, religious involvement, social anxiety, expectancies, valuations, and negative affect ( $N=316$ )

	1 <sup>a</sup>	2 <sup>b</sup>	3 <sup>a</sup>	4	5	6	7	8
1. Typical weekly drinking <sup>a</sup>	—							
2. Alcohol-related problems (RAPI) <sup>b</sup>	.55***	—						
3. Perceived drinking norms <sup>a</sup>	.69***	.38***	—					
4. Religious involvement	-.14*	-.13*	-.06	—				
5. Social anxiety (IAS)	-.19**	-.06	-.16**	-.04	—			
6. B-CEOA expectancies	.23***	.40***	.23***	.09	.13*	—		
7. B-CEOA valuations	.15**	.21***	.05	-.09	.08	.31***	—	
8. PANAS negative affect scale	.05	.29***	.05	.05	.26***	.23***	.15*	-.04

For religious involvement,  $n=309$ ;  $n=248$  for negative affect according to the PANAS. RAPI = Rutgers Alcohol Problem Index. B-CEOA = Brief Comprehensive Effects Of Alcohol Questionnaire. IAS = Interaction Anxiousness Scale. PANAS=Positive And Negative Affectivity Scales.

<sup>a</sup>Weekly consumption and the perceived norms composite variables underwent a square root transformation prior to conducting correlation analyses.

<sup>b</sup>The RAPI variable underwent a logarithmic transformation prior to conducting correlation analyses.

\*  $P < .05$ .

\*\*  $P < .01$ .

\*\*\*  $P < .001$ .