Social Influence Processes and College Student Drinking: The Mediation role of Alcohol Outcome Expectancies*

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ABSTRACT. Objective: Social influences are among the most robust predictors of adolescent substance use and misuse. Studies with early adolescent samples have supported the need to distinguish among various types of social influences to better delineate relations between social factors and alcohol use and problems. Method: The first major goal of the present study (N = 399, 263 women) was to examine unique relations between particular facets of social influence and alcohol use and problems in a relatively heavy-drinking population (i.e., college students). We hypothesized that active social influences (offers to drink alcohol) and passive social influences (social modeling and perceived norms) would demonstrate positive associations with measures of alcohol use and problems. We also tested the hypothesis that alcohol outcome expectancies would mediate associations between social influences and drinking behaviors. Results: Structural equation modeling analyses provided strong support for the first hypothesis. Social modeling demonstrated the strongest association with alcohol use and problems, and active social influences demonstrated significant associations with both use and problems. Perceived norms were related to alcohol use, but not directly with alcohol problems. Support for the second hypothesis was positive but limited to one type of social influence. Strong evidence for a mediational role of outcome expectancies was found for relations between social modeling and alcohol use and problems. Conclusions: Together, these findings demonstrate the unique and relative contribution of active and passive social influences and provide limited support for a hypothesized process by which social factors influence cognitions and alcohol-related behaviors. (J. Stud. Alcohol 62: 32-43, 2001)

THE PREVALENCE of heavy drinking and drinking-related consequences among college students has been documented in at least three national studies (Johnston et al., 1999; Presley et al., 1996; Wechsler et al., 1994, 1998, 2000). The recent literature on alcohol use has indicated that approximately 40% of college students engage in an alcohol use pattern known as “heavy episodic drinking,” which is defined as the consumption of five or more drinks in one sitting (four or more for women; Wechsler et al., 1998). These and other studies have repeatedly documented the myriad negative consequences associated with heavy alcohol consumption, including high risk sexual behavior (Donovan and McEwan, 1995; Strunin and Hingson, 1992), diminished academic performance (Montgomery and Haemmerlie, 1993; Perkins and Berkowitz, 1986; Presley et al., 1996; Wood et al., 2000), physical aggression (Presley et al., 1996; Scott et al., 1999) and sexual victimization (Abbey, 1991).

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The passage from high school to college is commonly marked by an increased opportunity for peer interaction and, perhaps as a consequence, by increased alcohol consumption and alcohol related problems (Baer et al., 1995; Nezlek et al., 1994). The identification of factors that may promote excessive drinking during this developmental period of enhanced risk is essential for developing and refining interventions to decrease heavy drinking and its associated negative consequences.

Social influences

Social influence variables have been observed to be among the strongest correlates of adolescent substance use and misuse (Hawkins et al., 1992; Jacob and Leonard, 1994). As noted by Jacob and Leonard (1994), there is little doubt that others’ substance use, particularly that of close friends, is among the strongest predictors of adolescent substance use. Some research in the area of alcohol use and misuse among underage drinkers has suggested the utility of distinguishing among various types of social influences in order to parse out differing effects on drinking behaviors and suggest optimal intervention strategies (De Vries et al., 1995; Flay and Petrakis, 1993; Oostveen et al., 1996). To this end, Graham and colleagues (1991) proposed a framework that delineated two distinct mechanisms by which social reference groups might influence drinking and labeled these “active” and “passive” social influences.
Active social influences refer to explicit invitations to use a substance (e.g., being offered or given a drink). This type of social pressure is quite direct and requires an immediate response. Preventive interventions designed to address active social influences focus therefore on bolstering refusal skills. Passive types of social influences (see Oostveen et al., 1996) relate to an individual’s perception and interpretation of the drinking and reinforcement patterns of others within a particular reference group. Graham et al. (1991) proposed two types of passive social influences: social modeling and misperception of peer norms. Social modeling is a process by which observation of others performing a behavior (e.g., heavy drinking) is thought to increase the likelihood of the observer adopting that behavior. Experimental studies of drinking behavior have supported the robustness of the modeling effect (Caudill and Marlatt, 1975; Collins and Marlatt, 1981; Collins et al., 1985). Correlational studies examining relations between social modeling (e.g., friends’ drug use) and participants’ own drug use have also provided consistent support for the importance of social modeling (Ary et al., 1993; Curran et al., 1997; Graham et al., 1991; Webb and Baer, 1995). It has also been suggested that social modeling may be particularly important in understanding mechanisms underlying college student drinking behaviors (Collins et al., 1985; Costa et al., 1999). From a social modeling perspective, preventive interventions to reduce alcohol abuse would need to focus on decreasing the occurrence of heavy drinking in the proximal environment.

Another, presumably more distal, type of passive social influence is perceptions about what is normative or “normal” drinking behavior within a particular reference group. Research has demonstrated that college students consistently overestimate the frequency and severity of alcohol consumption, with perceptions of “typical” drinking exceeding average levels of drinking as assessed by self-report (Perkins et al., 1999). Such estimation inflation has been found especially when individuals are asked to describe alcohol use behaviors of more distal reference groups (e.g., students in general) as compared to those of close friends (Baer and Carney, 1993; Baer et al., 1991). Misperception of norms has been suggested to influence drinking by serving as a benchmark by which students gauge their own alcohol use, providing justification to continue heavy drinking, and by preventing individuals from recognizing hazardous or aberrant drinking patterns (Baer et al., 1991). Students may also alter their drinking behavior to conform to perceived drinking norms in an effort to fit in with their social group (Baer et al., 1992).

Findings from Graham et al.’s (1991) longitudinal study of 526 seventh-grade boys and girls (mean age = 12.5 years) revealed that both active and passive influences accounted for unique variance in alcohol use. In additional analyses, Graham et al. found that relations between active and passive social influences and alcohol use were more robust among participants with some prior drinking experience. These findings suggest that independent assessment of each of these social influence domains may be increasingly important as experience with alcohol increases. However, no study to date has examined the unique and relative contribution of active and passive social influences in a sample of college students. Such an examination would be informative with respect to optimal intervention strategies for a population demonstrating high levels of alcohol use and problems.

Social learning theory and alcohol use and problems

The processes by which social influence factors contribute to drinking behavior have been described in social learning theory (SLT) models of alcohol use (Abrams and Niaura, 1987; Maisto et al., 1999). The key constructs of SLT include socioenvironmental factors (e.g., stress, social modeling, perceived norms), coping skills and cognitive variables (e.g., self-efficacy, outcome expectancies). As noted by Maisto et al. (1999), research examining two or more SLT relevant constructs with multivariate analyses is fairly common, yet relatively few studies have directly tested the validity of SLT-based predictions of alcohol use behavior. Important exceptions to this tendency include studies examining SLT principles of reciprocal determinism (Curran et al., 1997; Sher et al., 1996; Smith et al., 1995) and relations between coping skills and alcohol use (Cooper et al., 1988; Evans and Dunn, 1995).

One of the major tenets of SLT is that cognitive factors play an important mediating role in relations between socioenvironmental factors and behavior. Indeed, in their review of SLT and alcohol use and abuse, Abrams and Niaura (1987) note that “youthful drinking behaviors, beliefs, attitudes and expectancies concerning alcohol are formed mainly through the social influences of culture, family, and peers…” and “this influence [on drinking] is exerted indirectly by attitudes, expectancies, and beliefs and directly by modeling alcohol consumption, media portrayals of drinking, and social reinforcement for drinking” (p. 137; emphasis added). Consistent with the observations, above, regarding direct tests of SLT-based predictions, relatively few studies have examined this central principle of SLT. Scheier and Botvin (1997) investigated the mediational role of social facilitation alcohol outcome expectancies in relations between social influences (perceived norms, friends’ use) and alcohol use, and found that alcohol outcome expectancies mediated 14% of the effect of friends’ drinking on alcohol use in cross-sectional analyses and 11% of the peer influence-alcohol use relation in prospective analyses. In another early-adolescent sample, Webb et al. (1993) also found support for partial mediation of the social influence-alcohol use relation, but relatively large direct
effects from social influences to alcohol use remained when indirect (mediational) paths were included in analyses. Grube and Agostinelli (1999) observed significant direct effects between friends’ drinking and both alcohol outcome expectancies and alcohol use, and found that friends’ and parents’ attitudes toward drinking were mediated by outcome expectancies. However, they found no evidence for mediation of the social influence-alcohol use relation by social facilitation expectancies in their early-adolescent sample.

In addition to the findings reviewed above, alcohol outcome expectancies have consistently been viewed as a mediator of relations between a number of psychosocial variables and alcohol use and problems (Scheier and Botvin, 1997). For example, it has been suggested that outcome expectancies are a “common pathway that may serve as a vehicle (mediational process) by which the influence of other factors is carried forward to influence the initiation and maintenance of alcohol use and to increase risk for abuse” (Goldman, 1994, p.132). Despite strong conceptual consensus, empirical evidence for mediation is fairly sparse, as most studies have not included strict tests of mediational hypotheses (e.g., Baron and Kenny, 1986; MacKinnon, 1994).

In sum, there is a strong conceptual basis, combined with some empirical support, to suggest that social influences may affect drinking by altering expectations of alcohol’s effects. Nonetheless, several critical issues remain largely unexamined. First, despite the demonstrated importance of social influence factors in college student alcohol use and problems (Baer and Carney, 1993; Baer et al., 1991), the hypothesis that outcome expectancies mediate relations between social influence factors and alcohol use and problems has not, to our knowledge, been tested in a college student sample. The extension of theory and previous research to a population with more extensive alcohol involvement could further understanding of the etiology of alcohol use through an explicit test of one of the central tenets of SLT. Second, the inclusion of a well-validated measure of alcohol-related problems allows for examination of the direct and indirect effects of social influence factors and alcohol outcome expectancies after controlling for the effects of alcohol use. Much of the literature on adolescent drinking has not differentiated alcohol use from alcohol problems and instead frequently has treated alcohol use and negative consequences as if they were a single construct. Yet, there is evidence to suggest that there are multiple yet distinct dimensions of underage drinking (see Bailey and Rachal, 1993; Stice et al., 1998) and that the association between alcohol use and alcohol-related problems is not as strong as is commonly believed (Baumrind, 1991; Sadava, 1985). Thus, it appears that the amalgamation of alcohol use and related problems in research on adolescent drinking may serve to obscure identification of variables that are particularly important in understanding alcohol-related problems. A clearer delineation of alcohol use versus alcohol-related problems may result in the identification of unique and specific correlates of target drinking behaviors. Third, studies to date have largely focused on social facilitation expectancies and have not used broad and well-validated measures of outcome expectancies. Other expectancy domains (e.g., tension reduction, performance enhancement) are presumably influenced by social factors. Thus, the inclusion of broader and psychometrically refined expectancy measures of alcohol expectancies is needed to provide a test of the generalizability of the mediational role of the construct.

The current study

The purposes of the present study were twofold. First, we sought to examine unique relations between particular types of social influences and the separate constructs of alcohol use and alcohol-related problems. It was hypothesized that both active and passive social influences would demonstrate significant, positive associations with measures of alcohol use and problems. Second, we sought to directly test one of the central principles of SLT by investigating whether alcohol outcome expectancies mediate associations between social influence factors and alcohol use and alcohol-related problems.

Method

Participants

Participants (N = 399) were currently drinking college students recruited from introductory undergraduate psychology classes at two universities in the northeastern United States. The sample was predominantly white (88.1%, n = 351). The remainder of the sample identified themselves as Asian/Pacific Islander (4.2%, n = 17), Hispanic (3.0%, n = 12), black (2.2%, n = 9), Native American/Alaskan Native (0.5%, n = 2) or other (2.0%, n = 8). Approximately 66% (n = 263) of the present sample was female and the mean (SD) age of the sample was 18.8 (1.1) years and ranged from 18 to 25. Freshmen (62.6%) and sophomores (25.9%) were overrepresented; juniors (8.0%) and seniors (3.5%) were underrepresented in the current sample.

Procedure

Students were invited by campus postings and in-class announcements to participate in a study of “attitudes, perception and personality.” Participants provided signed informed consent and then completed a battery of questionnaires, in exchange for academic credit. Questionnaires were administered during the fall and winter semesters by
two of the researchers and research assistants. The sessions took approximately 40 minutes. Participants were given an educational debriefing form, and any additional questions pertaining to the study were addressed. The following measures were used in the current study.

**Measures**

**Alcohol offers (Offers).** Following Graham et al. (1991), active social influences were represented by a single survey item that asked, “In the past year, how many times have you been offered an alcoholic drink?” Responses regarding offers were based on a continuous, 10-point scale ranging from 0 (never) to 9 (40 or more times in the past year).

**Social modeling (SM).** Social modeling was assessed by six items adapted from measures previously used by Jessor et al. (1981), and queried participants on drinking by close friends (Friends’ Drinking Behavior; FRB), close friends’ attitudes toward drinking (Friend’s Attitudes toward Drinking; FRA) and perceived pressure from peers to drink (Environmental Influences; ENV). For example, respondents were asked to indicate “How do most of your friends feel about getting drunk?” Responses were rated on five-point continuous response scales. A number of correlational studies of social modeling support the validity of this construct as a predictor of alcohol use and problems (Ary et al., 1993; Curran et al., 1997; Graham et al., 1991; Webb and Baer, 1995). Coefficient alpha for the social modeling variable in this sample was 0.79.

**Perceived norms (PN).** Perceived peer norms were represented by three variables, which included perceived norms for quantity-frequency of alcohol use (PNQF), heavy drinking (PNHV) and alcohol problems (PNPR) adapted from those previously used by Baer et al. (1991). These items required that participants estimate frequency, quantity and degree of heavy drinking among college students (e.g., “In the past year, how often do you think that the typical college student of your gender drank alcohol?”). Perceived norms for alcohol problems were assessed with 10 items adapted from the Young Adult Alcohol Problems Screening Test (YAAPST; Hurlbut and Sher, 1992) and required participants to estimate how often, in the past year, the “typical” student of the same university and gender experienced, because of drinking, such alcohol-related problems as driving under the influence of alcohol or missing classes or work. Evidence for the validity of similar items as predictors of college student drinking can be found in studies by both Baer and colleagues (Baer and Carney, 1993; Baer et al., 1991) and Perkins et al. (1999). Responses to all perceived norm items used continuous response options. Coefficient alpha for this latent variable was 0.72.

**Alcohol outcome expectancies (EXP).** Alcohol outcome expectancies were assessed using a scale developed by Sher et al. (1991). Previous confirmatory and exploratory factor analyses (Kushner et al., 1994) resulted in a four-factor solution with subscales interpreted as representing: Tension Reduction (TR; e.g., “Drinking helps me relax”), Social Lubrication (SL; e.g., “Drinking helps me fit in better with people around me”), Activity Enhancement (AE; e.g., “Drinking makes any celebration more enjoyable”) and Performance Enhancement (PE; e.g., “Drinking makes me more creative”). These four subscales were used as indicators for the latent variable of alcohol outcome expectancies. Previous research with this scale has demonstrated the validity of the measure in cross-sectional (e.g., Sher et al., 1991) and prospective (e.g., Sher et al., 1996) research. Response options for the expectancy items ranged from 0 (not at all) to 4 (a lot). Coefficient alpha for this construct was 0.86.

**Alcohol use (Use).** Three separate domains of alcohol use were assessed with measures previously used by Sher et al. (1991). Past 30 days’ alcohol use quantity-frequency (QFM) was measured with two items assessing typical quantity and frequency of alcohol consumption. Total alcohol consumption (beer, wine, wine coolers and hard liquor) was assessed and converted into an overall past year’s quantity-frequency index (QFY). Last, a heavy drinking composite measure for the past 30 days (HVY) was calculated to indicate the number of days per week that the participant engaged in heavy drinking (five or more drinks in a single sitting), how many times the participant had gotten high or light-headed from alcohol, and the number of times that the participant had been drunk. Coefficient alpha for the alcohol-use factor in this sample was 0.89.

**Alcohol-related consequences.** Consequences associated with alcohol consumption were assessed using the YAAPST (Hurlbut and Sher, 1992). Response options are continuous for the 36-item scale and enable multiple scoring options: lifetime occurrence (yes, no), past year occurrence (yes, no) and the frequency of occurrence in the past year. For the current study, past year’s frequency of alcohol-related consequences (problems) was used (Prob). The measure assesses both general consequences (e.g., hangovers, blackouts, driving under the influence of alcohol) and consequences believed to be more specific to college students (e.g., missing class, getting involved in regrettable sexual situations). Response options were continuous. Principal components analysis was conducted on the YAAPST to form indicators for the latent variable of alcohol-related negative consequences. Factorially complex (i.e., cross-loading) items and those with low (less than 0.30) loadings were eliminated, leaving 30 items from the scale. Based on examination of the scree plot and eigen values, the principal components analysis suggested three factors that were labeled “alcohol abuse” (ABU; e.g., hangovers, nausea, things said that were later regretted), “social/occupational consequences” (SOC; e.g., fired from job or suspended from school, been arrested for alcohol-related incident, lost friends
from drinking) and “alcohol-related sexual consequences” (SXC; e.g., involvement in regrettable sexual situations, been pressured or forced to have sex). Coefficient alpha for the reduced-item YAAPST was 0.91.

Results

Descriptive statistics for drinking behaviors

According to participants’ self-report of drinking behaviors, the average (SD) number of drinks consumed per week over the month prior to assessment was 12.5 (17.7). The frequency of drinking five or more drinks in a row was 1.1 (1.4) per week over the last month, indicative of just over one heavy-drinking episode per week, on average. Participants reported a range of negative consequences associated with alcohol use. A majority (73.7%) of respondents reported having been hung over at least once in the past year, 37.6% reported involvement in regrettable sexual situations and 30.8% reported driving while intoxicated. In sum, alcohol use and problems were fairly common in this college student sample and appear to be similar to those reported by college students in national studies (Wechsler et al., 1998, 2000).

Overview of data analytic approach

Two-step structural equation modeling approach. Structural equation modeling (SEM) analyses were conducted according to an approach suggested by Anderson and Gerbing (1988). First, an initial measurement model (see Figure 1), with all variables intercorrelated, was specified and tested to assess the construct validity of the proposed model. As can be seen in Table 1, the overall fit of the measurement model indicated a close fit between the data and the specified model (Comparative Fit Index [CFI] = 0.94). In the second step of this process, structural relations among five exogenous (source of sample, gender, alcohol offers, social modeling and peer norms) and three endog-

![Figure 1. Measurement model. Values are standardized path coefficients and all factor loadings are significant at p < .001. As depicted, the first indicator of each latent variable was set to equal 1. Covariances (not depicted) were estimated between latent variables, gender, alcohol offers and source of sample (note source of sample—one of two northeastern universities—is not depicted in the figure).](image-url)
enous variables (alcohol outcome expectancies, alcohol use, alcohol problems) were examined in two nested models.

Model specification. All structural equation models were estimated from covariance matrices using maximum likelihood estimation procedures. In addition, all exogenous variables (latent and manifest) were covaried (see Table 2) and the first indicator for each latent variable was set to 1.0 (MacCallum, 1995). For each model, the source of the sample (dummy coded) and gender were included as exogenous manifest variables with covariances estimated with other exogenous variables, and paths estimated to all endogenous variables.

Evaluation of fit. Model fit for each of the nested structural equation models was evaluated using omnibus chi-square tests, goodness-of-fit (GFI) indices, nonnormed fit indices (NNFI) and comparative fit indices (CFI) from the family of Type-2 and Type-3 indices. Models were compared by examination of chi-square difference scores and Type II indices of incremental fit (Marsh et al., 1988).

Examination of distributions. Prior to SEM analyses, descriptive statistics were calculated to examine univariate distributions of the variables to be included in the structural models. Four subscales to be included in the models showed significant skewness and kurtosis. Following procedures detailed by Tabachnick and Fidell (1996), we adjusted scores for “far outliers” to equal one value greater than the largest nonfar-outlying value. Examination of univariate statistics for three of the four adjusted subscales (performance enhancement expectancies, past year and past month quantity-frequency) indicated skew and kurtosis levels within acceptable limits (less than 2.0 and 4.0, respectively). Because the items comprising Indicator 2 for the alcohol-related negative consequences latent variable were highly skewed and kurtotic, this variable was log transformed. Subsequent analyses indicated that skewness and kurtosis were within acceptable limits (2.3 and 5.3, respectively) for analyses using maximum likelihood estimation procedures, which are known to be robust to violations of normality (West et al., 1995).

Structural models

Model 1: Direct effects. The first structural model (Figure 2) was designed to test the hypothesis that active and passive social influences would demonstrate significant, positive associations with college student alcohol use and problems. Accordingly, in this model, direct paths from social influence factors to alcohol use and alcohol problems were estimated. To enable later examination of our second (mediational) hypothesis, the initial model did not include path estimates to or from alcohol expectancies, with the exception of paths from source of sample (not shown in figure) and gender (sex).

Overall fit of the initial model was good. Standardized loadings for latent factor indicators ranged from 0.42 to 0.95 (all p’s < .01). As can be seen in Figure 2, with one exception (the path from perceived norms to alcohol problems), all hypothesized structural paths demonstrated significant associations with alcohol use and alcohol problems. There were significant, positive associations between each of the social influence factors and alcohol use, although the path between alcohol offers and alcohol use was only marginally significant (β = 0.09, p < .05, one-tailed). The largest effect on alcohol use was observed for social modeling (β = 0.45, p < .001). Sex (gender) was also positively associated with the latent factor of alcohol use, such that male gender was associated with greater use. Significant, positive effects were observed between alcohol problems and both alcohol offers and social modeling after controlling for the effects of alcohol use. Perceived norms did not demonstrate significant direct relations with alcohol problems, but were associated with alcohol problems indirectly (through alcohol use). In this model, 47.1% of the variance in alcohol use and 70.2% of the variance in alcohol problems were explained.

Model 2: Mediation effects. Our second structural model (Figure 3) tested the hypothesis that alcohol outcome expectancies would mediate relations between social influences and alcohol use and problems. As displayed in Table 1, the overall fit of this model to the obtained data was quite good. Standardized loadings for latent factor indicators ranged from 0.42 to 0.96 (all p’s < .01). In addition, the second model demonstrated significantly better model fit than the initial model, as assessed by both chi-square difference tests and a Type II index of incremental fit (Δχ² [5] = 170.0, p < .0001; Relative Type II NNFI = 0.391). Our approach in testing mediation followed procedures detailed by Baron and Kenny (1986) and MacKinnon

### Table 1. Traditional fit indices for measurement and structural models

<table>
<thead>
<tr>
<th>Model</th>
<th>χ² (df)</th>
<th>NFI</th>
<th>NNFI</th>
<th>CFI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measurement model</td>
<td>360.20 (127)</td>
<td>.91</td>
<td>.91</td>
<td>.94</td>
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<tr>
<td>Model 1</td>
<td>530.08 (132)</td>
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<td>.86</td>
<td>.89</td>
</tr>
<tr>
<td>Model 2</td>
<td>360.09 (127)</td>
<td>.91</td>
<td>.91</td>
<td>.94</td>
</tr>
</tbody>
</table>

Notes: NFI = Bentler-Bonett Normed Fit Index; NNFI = Bentler-Bonett Nonnormed Fit Index; CFI = Comparative Fit Index; *p < .0001.

### Table 2. Correlations among exogenous variables from measurement model

<table>
<thead>
<tr>
<th>Variables</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
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<td>1. Source of sample</td>
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<tr>
<td>2. Gender</td>
<td>.06</td>
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</tr>
<tr>
<td>3. Alcohol offers</td>
<td>-1.3</td>
<td>.04</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Social modeling</td>
<td>-1.3</td>
<td>.16</td>
<td>.58</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Perceived norms</td>
<td>-2.1</td>
<td>.09</td>
<td>.41</td>
<td>.54</td>
<td></td>
</tr>
</tbody>
</table>

*p < .05; †p < .01; ‡p < .001.
Baron and Kenny (1986) propose that support for a mediational effect is dependent upon three criteria: (1) significant direct relations between independent and dependent variables; (2) significant relations between independent variable(s) and a putative mediator; (3) a reduction in the direct path from the independent to the dependent variable(s) when analyzed in conjunction with the indirect (mediated) effect. MacKinnon (1994) adds a fourth criterion of statistical significance for the mediated effect, and provides formulae for testing the significance of mediated effects and determining the proportion of an effect that is mediated. As can be seen in the initial model (Figure 2), support for the first criterion for mediation was observed for each of the social influence variables for alcohol use, and for social modeling and alcohol offers for alcohol problems. Support for the second criterion was observed in the second model (Figure 3) for social modeling (via significant relations between social modeling and alcohol expectancies). Support for the third criterion was obtained by comparison of the direct paths from social modeling to alcohol expectancies, the direct paths from social modeling observed in Model 1 (see Figure 2) were reduced from 0.45 to 0.37 for alcohol use and from 0.29 to 0.19 for alcohol problems. We computed a $t$ test of the mediated effect and found it to be significant for both the social modeling-alcohol use ($t = 3.25, p < .01$) and the social modeling-alcohol problems ($t = 4.01, p < .001$) relations. We also computed the proportion of the social modeling-alcohol use and social modeling-alcohol problems relations that were mediated through expectancies and found these to be 23.2% and 39.5%, respectively. There was no evidence for a mediational role for alcohol outcome expectancies in the relation between perceived norms and alcohol use. Likewise, outcome expectancies did not mediate relations between active social influences and alcohol use and problems.

In the final model (Model 2), in addition to the mediated effects already described, we observed significant direct effects from active social influences (alcohol offers) to alcohol problems, as well as a significant direct effect from perceived norms to alcohol use. Also, sex (gender) was positively associated with alcohol use such that male gender
was associated with higher levels of alcohol use. In this mediational model, 51.2% of the variance in alcohol use and 69.3% of the variance in alcohol problems were explained.

**Discussion**

The current study was designed to test the hypotheses that both active and passive social influence factors would be significantly associated with college student alcohol involvement (use and problems), and that alcohol outcome expectancies would mediate the relationship between social influence and alcohol outcome variables. Our findings provided strong support for the first hypothesis, whereas evidence for the second was positive but limited to one type of social influence, social modeling.

Consonant with the empirical literature (Graham et al., 1991; Hawkins et al., 1992; Jacob and Leonard, 1994; Marks et al., 1992), both active and passive social influence variables in this study demonstrated consistent associations with alcohol use and problems. Although the social influence constructs demonstrated fairly strong interrelations, indicative of conceptual overlap, each also demonstrated unique relations with alcohol use and either direct or indirect (in the case of perceived norms) relations with alcohol problems. Our findings, consistent with those of Graham et al. (1991), demonstrate that different types of social influences have unique associations with alcohol use behaviors. Thus, these findings answer a question posed by Graham and colleagues regarding the generalizability of their findings to older and more experienced drinkers and further extend previous findings by demonstrating the relations between active and passive social influences and alcohol-related problems. Graham and colleagues noted that the pattern of effects for social influence factors differed as a function of experience with alcohol use in their early adolescent sample. For those without prior drinking experience, perceived norms was the only predictor of future use, whereas for those with drinking experience, each of the social influence factors was related to future alcohol use. These latter findings mirror those we observed in our college sample and together suggest that interventions for those who are already

![mediational model diagram](image-url)
drinking should include attention to each of these social influence domains.

The structural model that included both social influences and alcohol expectancies (Model 2, Figure 3) provided significantly better overall model fit than the model that included only social influence variables. Moreover, the positive association between alcohol outcome expectancies and alcohol use and problems in the present study is consistent with a large expectancy literature demonstrating robust associations between outcome expectancies and drinking behaviors (Fromme et al., 1993; Goldman et al., 1997; Leigh and Stacy, 1993; Wood et al., 1992). Thus, our findings regarding social influence factors and alcohol outcome expectancies provide additional support for conceptual models of college student drinking that take both social and cognitive factors into account, and suggest that preventive interventions with college students may profit from addressing both social influences and alcohol outcome expectancies.

Results of our mediational analyses were largely consistent with the findings of Scheier and Botvin (1997). Social modeling met each of the four criteria used for explicit mediational testing for both alcohol use and problems (Baron and Kenny, 1986; MacKinnon, 1994), and outcome expectancies accounted for a substantial proportion of relations between social modeling and alcohol use and problems (approximately 23% and 40%, respectively). Also consistent with previous studies examining mediational hypotheses (Scheier and Botvin, 1997; Webb et al., 1993), significant direct effects between social influences and alcohol use remained even when indirect paths through expectancies were modeled. Together, these findings suggest that while outcome expectancies are influenced by social factors, they do not serve as a unique final common pathway through which social influences affect drinking. It is important to note that the longitudinal nature of the Scheier and Botvin (1997) study allows for much stronger inferences about how social relations may influence the development of alcohol outcome expectancies and future drinking as compared to both the current cross-sectional study and previous ones (Webb et al., 1993). Nonetheless, our findings are consistent with this pattern of effects and provide evidence for a broad range of positive outcome expectancies as important mediators of relations between passive social influences and drinking behaviors.

In contrast to our expectations, outcome expectancies did not mediate relations between drinking behaviors and two other hypothesized sources of drinking outcomes, perceived norms and active social influences. The ability to control for interrelations while examining unique effects is a strength of multivariate analytic approaches (e.g., those used in the current study). However, it is possible that the shared variance among the social influence factors precluded demonstration of mediation for all but the strongest correlate of both expectancies and drinking behaviors (i.e., social modeling; see Scheier and Botvin, 1997, for similar findings and conclusions). Another explanation may be that active pressures to drink and perceived norms simply do not influence beliefs about alcohol’s effects, but rather have a direct influence on drinking behavior. Consistent with this interpretation, we found that active social influences were directly associated with alcohol use and problems and peer norms demonstrated direct relations with use and indirect relations (through use) with problems. In either case, these findings have implications for the role of various types of social influences in interventions with college student drinkers. Specifically, our data suggest that explicit offers and perceived norms still appear to play a critical role in influencing both alcohol use and alcohol-related negative consequences. As such, we believe that both of these social influence domains should continue to be targeted in preventive interventions with college students. With regard to active social influences, preventive interventions could focus on skills training related to moderating drinking (e.g., refusal skills, strategies for limiting or avoiding heavy drinking). For perceived norms, universal interventions attempting to correct misperceptions regarding peer alcohol use are being widely implemented in university settings with some promising results (Haines and Spear, 1996).

Consistent with a large existing literature base, our findings suggest that expectancies may be a critical variable of focus for those seeking to develop preventive interventions for college student populations. Cognitions (e.g., alcohol expectancies) may be modifiable and thus potentially lend themselves well to cognitive-behaviorally oriented, campus-based prevention efforts. One such approach is the alcohol expectancy “challenge” (Darkes and Goldman, 1993, 1998) which is designed to alter existing beliefs about alcohol’s effects in order to decrease alcohol abuse. Two studies have examined the effects of alcohol expectancy challenges on subsequent drinking behavior and have found them to decrease alcohol use over brief follow-up periods (Darkes and Goldman, 1993, 1998).

With respect to the measures of drinking behavior, alcohol use and problems, it is interesting to note that all of the paths leading from exogenous variables to alcohol use were significant; however, only two of the exogenous variables (i.e., alcohol offers, social modeling) consistently demonstrated significant direct associations with alcohol problems. This suggests that these types of social influences may be particularly etiologically relevant in the developing of problem drinking. The need for a clear delineation between alcohol use and alcohol problems has been noted previously in the literature (see Bailey and Rachal, 1993; Sadava, 1985; Stice et al., 1998). Many studies to date, however, have examined only correlates of alcohol use without also...
examining alcohol problems (Grube and Agostinelli, 1999; Kidorf et al., 1995; Scheier and Botvin, 1997). Our findings suggest the importance, in research, of differentiating use from problems, to effectively isolate factors that may be indicative of more pathologic drinking patterns.

The prevalence of alcohol use and alcohol-associated consequences in this sample of college students highlights the need for continued, theory-based research on correlates of college student drinking and related consequences. Our mediational findings, although limited to one type of social influences, were consistent with one of the central principles of social learning theory as applied to alcohol use (Abrams and Niaura, 1987). These findings support the contention that socioenvironmental factors influence alcohol-related cognitions that, in turn, influence alcohol use and problems. However, findings from this and other studies with younger samples (Grube and Agostinelli, 1999; Scheier and Botvin, 1997; Webb et al., 1993) clearly indicate that the majority of the influence of social factors is not channeled through positive expectancies. These findings do not, nonetheless, discount the utility of the aspect of social learning theory tested in the current study in furthering our understanding of the etiology of alcohol abuse and in developing more effective intervention approaches. They suggest, instead, the need for preventive interventions to address the full range of factors with demonstrated etiologic relevance.

The current study has several limitations. Foremost among these is the study’s cross-sectional design, which precludes inferences about the temporal nature of the observed associations. Future longitudinal studies will better facilitate understanding of how expectancies and social influence factors affect subsequent alcohol use and consequences. The lack of representativeness and the ethnic homogeneity of the current sample also potentially limit the generalizability of the findings from this study. Our sample was predominantly comprised of underclassmen (88.5%), with black students underrepresented and male students somewhat underrepresented. Previous research with early adolescents has suggested that the effects of social influences may differ as a function of race, with peers exerting a stronger influence among white than black adolescents (Barnes et al., 1994). Research with more representative and ethnically diverse samples is needed to see whether and how these differences may be manifested in college student populations. Furthermore, although we controlled for gender differences in our models, sample size limitations precluded tests of gender invariance, limiting our ability to draw conclusions about whether our models are equally viable for men and women. The use of a single-item measure of alcohol offers, although consistent with earlier research (Graham et al., 1991), also constitutes a weakness in the current study. The unknown reliability of our measure of alcohol offers, and the somewhat modest (i.e., $\alpha = 0.72$) reliability of our measure of perceived norms could have served to attenuate relations between these variables and alcohol use and problems and precluded determination of the mediational role of expectancies for these social influence factors.

Despite these limitations, the current study replicates and extends previous research in multiple ways. First, in response to a question posed by Graham et al. (1991), our findings provide support for the utility of distinguishing between particular types of social influences in a population with substantially higher levels of alcohol use and problems than those previously studied. Second, our mediational findings replicate those of Scheier and Botvin (1997) and extend them to include broader ranges of alcohol outcome expectancies as well as to alcohol-related problems. Third, the inclusion of a well-validated measure of alcohol-related problems in our study provides unique information about the specific social influence correlates of problematic use in a relatively heavy-drinking population. Last, as noted earlier, the present study represents a relatively infrequently applied effort to directly test one of the central postulates of social learning theory as applied to alcohol use. Such explicit tests of theory are needed to offer insight into the processes by which social and cognitive variables may influence alcohol misuse in college student populations. Replication of findings from the present study with longitudinal samples will facilitate a clearer understanding of the complex etiological processes that contribute to college student drinking. These and other findings ultimately may serve to inform the development and refinement of interventions to decrease heavy drinking and its associated negative consequences.

References


BAER, J.S., TAPERT, S. AND MARLATT, G.A. Biases in the perception of normative alcohol use over time: Perceived norms predict future drinking. Poster presented at the annual meeting of the Association for the Advancement of Behavior Therapy, Boston, MA, 1992.


