A Prospective Investigation of Relations between Social Influences and Alcohol Involvement during the Transition into College*

JENNIFER P. READ, PH.D.,† MARK D. WOOD, PH.D.,† AND CHRISTY CAPONE, M.A.†

Department of Psychology, 224 Park Hall, State University of New York at Buffalo, Buffalo, New York 14260-4110

ABSTRACT. Objectives: The present study used structural equation modeling to test whether prospective relations between prematriculation social influences and alcohol involvement in college were most consistent with peer selection, peer socialization or reciprocal determinism explanations and to determine if observed relations varied according to measurement interval. We tested the hypotheses that “active” (alcohol offers) and “passive” (social modeling, perceived norms) social influences would be uniquely and reciprocally associated with alcohol use and alcohol-related consequences across two and three waves of assessment. Method: Prospective undergraduates (N = 388) completed self-report assessments in the summer before matriculation (Wave 1), in the spring of their freshman year (Wave 2) and in the spring of their sophomore year (Wave 3). Results: Reciprocal effects were observed between social influences and alcohol use in both two- and three-wave models. Some evidence was observed for reciprocal associations for social modeling with alcohol use and alcohol problems. Overall, however, only modest support was found for a reciprocal influence conceptualization of social influences in alcohol problems. For alcohol problems, the results were more consistent with selection effects. No significant reciprocal associations were observed for perceived norms. Conclusions: Findings generally support the Social Learning Theory concept of reciprocal determinism but suggest the relationship between individual drinking behaviors and the social environment varies when distinguishing between alcohol use and alcohol problems. These findings also point to the importance of distinguishing among different types of social influences when delineating processes that result from and lead to heavy drinking in college. (J. Stud. Alcohol 66: 23-34, 2005)

ALCOHOL MISUSE during the college years has received much recent attention in both the popular and professional literatures. Collegiate alcohol misuse has been linked to numerous negative health and social consequences (e.g., O’Malley and Johnston, 2002; Perkins, 2002; Wechsler et al., 2000). Although drinking trajectories vary (Gotham et al., 1997; Jackson et al., 2001; Schulenberg et al., 1996), the transition into college has been identified as a period of distinct vulnerability, as the prevalence of increased alcohol use and related problems during this period indicates (Baer et al., 1995, 2001). Theory-driven, etiological research is needed to identify the processes underlying the adoption and perpetuation of drinking behaviors during this at-risk transition period and to inform the development and refinement of preventive interventions.

Some evidence was observed for reciprocal associations for social modeling with alcohol use and alcohol problems. Overall, however, only modest support was found for a reciprocal influence conceptualization of social influences in alcohol problems. For alcohol problems, the results were more consistent with selection effects. No significant reciprocal associations were observed for perceived norms. Conclusions: Findings generally support the Social Learning Theory concept of reciprocal determinism but suggest the relationship between individual drinking behaviors and the social environment varies when distinguishing between alcohol use and alcohol problems. These findings also point to the importance of distinguishing among different types of social influences when delineating processes that result from and lead to heavy drinking in college. (J. Stud. Alcohol 66: 23-34, 2005)

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Social Learning Theory (SLT; Bandura, 1977, 1986) is one theoretical framework by which college drinking may be conceptualized. SLT proposes, among other things, mechanisms of association among socio-environmental influences and drinking behavior (Maisto et al., 1999). One central SLT tenet that is hypothesized to explain relations between socio-environmental influences and behavior is the process of reciprocal determinism.

Bandura (1969) coined the term “reciprocal determinism” to describe the dynamic and interactive associations among environmental and individual variables and behavior over time. Simply stated, reciprocal determinism suggests that behavior is shaped by environmental and individual-level factors, which, in turn, shape subsequent behavior. For example, heavier drinking adolescents transitioning into a new social environment may seek friends with similar substance use proclivities, with the result that their new peers influence their subsequent drinking behavior. Two other relevant explanations for social-influence/alcohol-use relations can be disaggregated from reciprocal determinism. The first is the notion of social, or peer, selection by which alcohol-involved adolescents seek out heavier drinking peers. The second is the idea that social, or peer, modeling of drinking behavior influences future drinking behavior.
Socio-environmental factors

Socio-environmental influences are among the strongest correlates of college drinking behavior (Baer, 2002). SLT posits that learning and reinforcement of drinking behaviors occur through both direct and indirect experiences with the social environment. These distinct types of social influences can be either active or passive, and they have demonstrated unique relations with alcohol use and problems in our previous cross-sectional research with college students (Wood et al., 2001) and with alcohol use in one longitudinal study of early adolescents (Graham et al., 1991).

Active social influences. According to SLT, different environmental conditions may facilitate drinking to a greater or lesser degree. A situation in which alcohol is actively offered, for example, is obviously more conducive to alcohol use than one in which no such offer is made. Active social influences that facilitate drinking may be especially relevant for college students, who may frequently be in settings where both drinking and overt offers to drink are socially normative (Baer, 2002; Rabow and Duncan-Schill, 1995).

Passive influences. Graham et al. (1991) theorized that other types of social influence are passive, such as when an individual perceives and interprets the drinking patterns of others as reinforcement of his or her own drinking and then behaves in accordance with that perception. The learning of behaviors by observing the behaviors of others (i.e., social modeling) is one example. Social modeling is a type of vicarious learning that has been shown to be an important passive social influence on the drinking behaviors of college students (Collins et al., 1985; Costa et al., 1999; Wood et al., 2001). Theoretically, by observing a relevant peer group engaging in particular drinking behaviors (e.g., heavy drinking), an individual may model his or her own drinking behavior after those of the observed peers, with a greater likelihood of adoption and maintenance of heavy drinking as a result. Social modeling is likely to be intensified in relatively novel settings (e.g., a freshman at a college party) for which the individual has less experience and fewer behavioral scripts (Abelson, 1981).

A second facet of passive social influence, perceived norms, is consistent with the notion of descriptive norms (Cialdini et al., 1991). Applied to alcohol use, descriptive norms refer to perceptions or misperceptions of how much and how often other students drink. College students typically overestimate both alcohol use and its related consequences in their peers (Baer and Carney, 1993; Baer et al., 1991; Perkins et al., 1999). Although the nature of relations between perceived norms and alcohol use and misuse is unresolved, such misperceptions may influence an individual’s drinking behavior by providing a justification for heavy drinking patterns or by providing a model of presumably normative drinking behavior to which students may attempt to conform.

Previous examinations of reciprocal effects have noted the challenges of identifying the “ideal” measurement interval for assessing late adolescent and early adult substance use and related variables (see Sher et al., 1996). Drinking in college has been shown to be a relatively stable behavior (see Gotham et al., 1997; Schulenberg et al., 1996) and therefore presents a challenge to the accurate measuring of changes in this behavior over time. As a consequence of high autoregressivity, measurement intervals too close together may result in the obfuscation of meaningful associations (Gollob and Reichardt, 1991). Conversely, measurement intervals that are too far apart may fail to capture critical periods of developmental change in variables of interest, such as environmental influences (Sher et al., 1996). It has been suggested, accordingly, that modeling data across multiple measurement intervals is perhaps the optimal approach to capturing meaningful associations among drinking and related variables over time in samples of still-developing young adults (Gollob and Reichardt, 1987; Sher et al., 1996).

The present study

As noted by Maisto et al. (1999), although multivariate investigations that incorporate multiple SLT-based constructs are to be found in the alcohol literature, very few studies have included explicit, theoretically derived tests of SLT-based predictions. Fewer still have done so using longitudinal designs combined with such advanced statistical methods as structural equation modeling to test prospective associations. Longitudinal studies that span important developmental milestones, such as the transition from high school to college, represent an ideal opportunity to disentangle relations between social influences and alcohol use and problems.

The purpose of the present study, therefore, was to investigate whether associations between two types of social influences and measures of alcohol use and problems are best characterized by a reciprocal determinism explanation, as SLT would suggest, or by unidirectional influences, such as peer selection or peer socialization alone.

As environmental influences have been consistently linked to drinking by college students and have been increasingly targeted in preventive interventions for this population, enhanced understanding of dynamic associations between these factors and college student alcohol use and problems could inform both future etiologic and preventive intervention research. We sought, in addition, to model these prospective associations across two and three waves of assessment in an attempt to explicate more fully the nature of these relationships.
Method

Participants

Participants in our study were college students at a public university in the northeastern United States who were invited to participate in a longitudinal study of college student health behaviors and attitudes in the summer before matriculation. In Wave 1 at matriculation, 388 students participated, 384 (90.4% of the 425 targeted students) participated at Wave 2 in the spring of their freshman year, and 352 (82.8% of those targeted) participated at Wave 3 in the spring of their sophomore year. At Wave 1, the mean (SD) age of participants was 18.1 (0.22) years. The majority (88%, n = 338) of participants were white; of the remainder, 4.6%, (n = 18) were Asian, 3.1%, (n = 12) were Hispanic, 2.6%, (n = 10) were black and 0.5%, (n = 3) were Native American. Comparison of race and ethnicity data of the sample with the university’s population of incoming freshmen for the same academic year indicates that whites were somewhat overrepresented in the sample (88% vs 77.5%), whereas Hispanics (3.1% vs 3.6%) and blacks (2.6% vs 3.6%) were slightly underrepresented. University data indicated that 10.4% of incoming freshmen did not provide race or ethnicity data, which may account for the overrepresentation of whites in our sample. Women constituted 56% of both the sample and the population of incoming freshmen. In our sample, 53.9% of students were out-of-state students compared with 50% of the total population of incoming freshmen.

On the basis of data collected during summer orientation from incoming students (n = 2,117, 96% of the incoming class), we were able to make comparisons between our sample and a larger university sample on three measures of alcohol use, drinking status (e.g., regular drinker to lifetime abstainer), typical week’s quantity-frequency and past 2 weeks’ heavy episodic drinking. T tests indicated a non-significant difference in regular drinking status (t = -0.63, n = 2,011), with significant differences for typical week’s quantity-frequency (t = 2.93, n = 2,003, p < .005) and past 2-weeks’ heavy episodic drinking (t = 2.70, n = 1,983, p < .01). Effect sizes for these group differences were small, with an average d (pooled SD) of 0.13. Significant mean differences were in the direction of slightly lower levels of drinking in our sample, suggesting that any modest biases in estimates of association in our sample would likely be underestimates of population associations.

Over the course of follow-up, the original sample (N = 388) diminished by approximately 10%. Using t tests, we compared attriters and completers across demographic (age, gender) and drinking outcome (all manifest variables for use and consequences) variables. No significant differences between these groups were observed (all p’s > .05), suggesting that attriters did not differ from the rest of the sample in any way that would be likely to affect the outcome of model testing.

Procedure

Participants were recruited from a sample of 2,117 incoming freshmen (96% of the incoming class) attending an orientation program in the summer preceding their freshman year. During this orientation, students viewed an online announcement inviting 18- and 19-year-old first-time freshmen to participate in a study of “college student health behaviors and attitudes.” From this announcement we received 970 email inquiries about the project. Prospective participants were mailed a cover letter, consent form and baseline questionnaire packet. Follow-up recruitment efforts were composed of two rounds of follow-up phone calls, postcard reminders and a resending of mail surveys, which resulted in completed questionnaires from 589 respondents. Of these, 11 were eliminated because they were outside of the study’s 18- to 19-years-old age requirement. From this pool, 425 (all 202 men and 223 randomly selected women) participants were targeted for the longitudinal arm of the study. All participants provided informed consent and completed a battery of questionnaires at each wave—by mail at Wave 1 and typically on site, but in some cases by mail (21 at Wave 2, 48 at Wave 3) at follow-up waves. Participants received cash remuneration for their participation.

Measures

Self-report measures were administered in a fixed order as described below.

Alcohol use. The Alcohol Use factor comprised three manifest variables. The first was a weighted quantity-frequency composite derived by multiplying two items assessing typical quantity and frequency of alcohol consumption per week during the past 3 months (Wood et al., 2001). The second consisted of the weekly equivalent of how often the student consumed five or more drinks in a row over the past 2 weeks, thus representing the frequency of heavy episodic drinking. The third indicator was the total number of drinks consumed in a typical week as assessed by the Daily Drinking Questionnaire (DDQ; Marlatt et al., 1998). Alpha coefficients for the Alcohol Use factor in this sample were 0.88 at Wave 1, 0.89 at Wave 2 and 0.92 at Wave 3.

Alcohol problems. The Alcohol Problems factor was composed of three manifest indicators derived from a shortened (24-item) version of the Young Adult Alcohol Problems Screening Test (YAAPST; Hurlbut and Sher, 1992). This scale assesses negative consequences of drinking rated on a continuous scale. Items queried negative consequences in the past year (Wave 1) and, to ensure nonoverlapping response intervals at the shorter (Wave 2) interval, for the past 6 months at Waves 2 and 3. In our earlier work (Wood...
et al., 2001), principal components analysis yielded a three-factor solution, which was interpreted to represent “Alcohol Misuse,” “Social/Occupational Consequences” and “Alcohol-Related Sexual Consequences.” These factors were used as indicators for the latent construct of alcohol problems. Alpha coefficients for the YAAPST in this sample were 0.92 at Wave 1, 0.93 at Wave 2 and 0.93 at Wave 3.

Alcohol offers. A four-item measure assessed how frequently in the past year the participant had been offered a drink, bought a drink, been given a drink without asking for one or been provided with unsolicited drink refills. In both our own previous work and that of others (Graham et al., 1991; Wood et al., 2001), single item indicators of alcohol offers have demonstrated significant associations with alcohol involvement. The present four-item scale broadens our assessment of this construct. Response options were rated on a five-point scale ranging from 0 (never) to 4 (10 or more times in the past year). Each item on this measure was used as a single-item, manifest indicator, representing the Alcohol Offers latent factor. Alpha coefficients for the items comprising this factor were 0.86 at Wave 1, 0.88 at Wave 2 and 0.89 at Wave 3.

Social modeling. The Social Modeling factor was a composite of four items, with each item serving as a manifest variable. These self-report items were adapted from measures previously used by Jessor et al. (1981) and Wood et al. (2001). Items queried participants on drinking by close friends and on the attitudes of close friends toward drinking, including heavy drinking. Responses were rated on a five-point continuous response scale ranging from 0 (never) to 4 (3 or more times in the past year). Alpha coefficients for these items in this sample were 0.89, 0.85 and 0.84 at Waves 1, 2 and 3, respectively.

Perceived norms. Perceived peer norms were represented by four manifest variables, which included perceived norms for alcohol frequency, alcohol quantity, heavy episodic drinking and alcohol problems. These items were developed by Baer and colleagues (Baer and Carney, 1993; Baer et al., 1991) and adapted by Wood et al. (2001). They required participants to estimate frequency, quantity, degree of heavy drinking and alcohol-related problems among college students (e.g., “In the past year, how often do you think that the typical college student of your gender drank alcohol?”). Responses to all perceived norm items used continuous response options ranging from 0 (never) to 9 (40 or more times in the past year). Alpha coefficients for these items were 0.73, 0.70 and 0.69 at Waves 1, 2 and 3, respectively.

Results

Overview of data analyses

Examination of distributions. Examination of univariate distributions revealed significant skewness and kurtosis (e.g., >2.0 and 4.0, respectively) in several of the manifest alcohol involvement variables (alcohol quantity-frequency at Waves 1 and 3, heavy episodic drinking at Wave 1, social/interpersonal consequences at Wave 1 and sexual consequences at Waves 1 and 3). Consistent with procedures detailed by Tabachnick and Fidell (2000), we adjusted scores for “far outliers” to equal one value greater than the largest non-far outlying value. These adjustments resulted in acceptable skewness and kurtosis values (e.g., <2.0 and 4.0, respectively).

Model specification. Structural equation models consisted of the three latent social influence factors and one latent alcohol involvement (either Alcohol Use or Alcohol Problems) factor at either two or three waves of assessment. Gender was included as an exogenous manifest variable, with paths estimated to endogenous Alcohol Use or Alcohol Problems factors. All structural equation models were estimated separately for alcohol use and problems from covariance matrices using maximum likelihood estimation procedures. In addition, all exogenous factors were covaried (see Table 1), and the first indicator for each latent variable was set to 1.0 (MacCallum, 1995). As measurement errors of repeated indicators are often associated across time points, error covariances for each like indicator were estimated across waves (Farrell, 1994). Cases with missing data (n = 52) were dropped from the analyses. T tests conducted with model social and drinking variables as the dependent variables, to compare those with and without missing data, revealed no significant differences between groups (all p’s < .05).

The major aims of the current study were to investigate whether prospective relations between prematriculation social influences and collegiate alcohol involvement were most consistent with peer selection, peer socialization or reciprocal determinism explanations and to determine whether observed relations varied according to measurement interval. To this end, direct paths from social influence factors to alcohol involvement and from alcohol involvement to social influences were estimated in two sets of separate models, one for alcohol use and one for alcohol problems. In each model, paths were estimated from Wave 1 social influence factors to Waves 2 and 3 alcohol use (or problems). Paths also were estimated from Wave 1 alcohol use (or problems) to social influence factors in Waves 2 and 3. To control for associations between like constructs across

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time, autoregressive paths were estimated between each Wave 1 factor and its corresponding Wave 2 and Wave 3 factors.

Two-wave models

Alcohol use. Overall fit of the two-wave model predicting alcohol use was good according to global indices of model fit ($\chi^2 = 760.10$, 337 df, comparative fit index [CFI] = 0.94, normal fit index [NFI] = 0.89, [NNFI] = 0.92, root mean square error of approximation [RMSEA] = 0.06). Standardized loadings for all latent factor indicators ranged from 0.43 to 0.95 (all $p$’s < .001). As can be seen in Figure 1, autoregressive effects over the interval from prematriculation (Wave 1) to spring of the sophomore year (Wave 3) were robust, with standardized path coefficients ranging from 0.36 ($p < .001$) (for perceived norms) to 0.59 ($p < .001$) (for alcohol use). Despite these strong autoregressive effects, significant prospective relations of a reciprocal nature were observed. Specifically, Wave 1 alcohol offers ($\beta = 0.14$, $p < .05$) and Wave 1 social modeling ($\beta = 0.13$, $p < .05$) significantly predicted Wave 3 alcohol use. Paths from Wave 1 alcohol use to Wave 3 alcohol offers ($\beta = 0.20$, $p < .01$) and social modeling ($\beta = 0.17$, $p < .01$) also were significant. Male gender was significantly associated with Wave 3 alcohol use ($\beta = 0.13$, $p < .01$). In this model, 56% of the variance in alcohol use was explained.

Alcohol problems. The two-wave reciprocal effects model predicting alcohol problems also demonstrated a relatively good fit to the data according to global fit indices ($\chi^2 = 765.35$, 337 df, CFI = 0.93, NFI = 0.88, NNFI = 0.91, RMSEA = 0.06). Standardized loadings for all latent factor indicators ranged from 0.44 to 0.96 (all $p$’s < .001). Again, as can be seen in Figure 2, substantial autoregressivity was

![Figure 1](image-url)
observed, ranging from 0.38 for perceived norms to 0.78 for alcohol problems (all p’s < .001). In this model, the observed pattern of effects was most consistent with environmental selection, in that we observed strong prospective relations from prematriculation alcohol problems to sophomore year alcohol offers (β = 0.29, p < .001) and social modeling (β = 0.21, p < .001) but only marginal prospective prediction from prematriculation social modeling to sophomore year alcohol problems (β = 0.08, p < .05, one-tailed). Gender was not significantly associated with alcohol problems in this model, and 68% of the variance in alcohol problems was explained.

Three-wave models

To extend our investigation of the pattern of prospective relations between prematriculation social influences and college alcohol involvement to include additional 6- and 12-month measurement intervals, we next constructed and tested models incorporating our freshman year data (Wave 2) in that of Wave 1 and Wave 3. Specification mirrored that which was described above for the two-wave models, with single interval (i.e., Wave 1-Wave 2, Wave 2-Wave 3) autoregressive and cross-lagged paths estimated from social influence factors to alcohol involvement and from alcohol involvement to social influences. Again, alcohol use and problems were modeled separately.

Alcohol use. Overall fit of the three-wave alcohol use model was good according to global indices of model fit (χ² = 1507.74, 778 df, CFI = 0.93, NFI = 0.87, NNFI = 0.92, RMSEA = 0.05). Standardized loadings for factor indicators ranged from 0.44 to 0.95 (all p’s < .001). As can be seen in Figure 3, autoregressive effects were substantial at both 6-month (Wave 1-Wave 2) and 12-month (Wave 2-
Wave 3) intervals, ranging from 0.54 for Wave 2-3, social modeling, to 0.76 for Wave 1-2, alcohol use (all p’s < .001). Modest evidence for prospective reciprocal effects between social influences and alcohol use was demonstrated. Specifically, from Wave 1 to Wave 2, social modeling was significantly and prospectively associated with alcohol use ($\beta = 0.10, p < .05$), and Wave 2 alcohol use in turn prospectively predicted both Wave 3 social modeling ($\beta = 0.11, p < .05$, one-tailed) and alcohol offers ($\beta = 0.12, p < .05$, one-tailed). Additional prospective effects were observed from both Wave 2 alcohol offers ($\beta = 0.16, p < .01$) and social modeling ($\beta = 0.10, p < .01$) to Wave 3 alcohol use. Male gender was also significantly associated with both Wave 2 ($\beta = 0.08, p < .01$) and Wave 3 ($\beta = 0.07, p < .001$) alcohol use. In this model, 63% of the variance in alcohol use at Wave 2 and 70% of the variance in alcohol use at Wave 3 were explained.

*Alcohol problems.* The three-wave alcohol problems model (Figure 4) also demonstrated an acceptable fit to the data according to global fit indices ($\chi^2 = 1611.61, 778$ df, CFI = 0.92, NFI = 0.85, NNFI = 0.90, RMSEA = 0.06). Standardized loadings for all latent factor indicators ranged from 0.44 to 0.95 (all p’s < .001). Again, substantial autoregressivity was observed and ranged from 0.52 between Wave 2 and 3 social modeling to 0.85 between prematriculation (Wave 1) and freshman year (Wave 2) alcohol problems (all p’s < .001). In this model, as with the two-wave alcohol problems model, observed effects were most consistent with environmental selection, with modest prospective prediction from prematriculation (Wave 1) alcohol problems to freshman year (Wave 2) alcohol offers ($\beta = 0.14, p < .05$, one-tailed) and more robust prospective effects observed over a longer but environmentally consistent measurement interval freshman year alcohol problems to both sophomore year alcohol offers ($\beta = 0.19, p < .01$) and social modeling ($\beta = 0.24, p < .01$). The only social environment variable to be a significant prospective predictor of alcohol problems was Wave 2 social modeling.

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**Figure 3.** Three-wave reciprocal effects model: Use. W1 = Wave 1, W2 = Wave 2, W3 = Wave 3. An additional exogenous variable, gender, was included in the model, but is not depicted here. Only significant paths are shown in this model. $^p < .05$ one-tailed; $^* p < .05$; $^{**} p < .01$; $^{***} p < .001$. 
which was significantly associated with Wave 3 alcohol problems ($\beta = 0.10$, $p < .01$). This association was not significant from Wave 1 to Wave 2. Gender was not significantly associated with alcohol problems. In this model, 71% of the variance in alcohol problems at Wave 2 and 80% of the variance in alcohol problems at Wave 3 were accounted for.

Disaggregating influences

A number of ways of disaggregating social influences on drinking behavior have been identified. In the present study, we tested a model based on the Graham et al. (1991) framework, which focuses on the differentiation of passive versus active types of influence. An alternative conceptualization is one that delineates between descriptive and injunctive norms (e.g., Borsari and Carey, 2001, 2003). Our models generally do distinguish between descriptive and injunctive norms; however, our Social Modeling factor contained both descriptive (peer drinking) and injunctive (peer approval of drinking behavior) peer information, resulting in a somewhat complex factor that may obscure associations among variables of interest. We therefore tested a “purer” social modeling factor by removing the peer drinking (i.e., descriptive) variable and rerunning the three-wave models. No substantive differences in any of the reciprocal influence paths between alcohol involvement and social modeling factors were observed.

Discussion

The major purpose of this study was to investigate whether prospective associations among distinct social influences and alcohol use and problems are most consistent with environmental selection, peer socialization or reciprocal influence patterns. We also tested whether prospective associations would replicate over varying measurement intervals by taking advantage of the transition into college, a new social environment typified by increased heavy drinking and alcohol-related problems.

Interesting differences between models examining alcohol use and alcohol problems emerged. Across our two-
and three-wave alcohol use models, our findings suggest that social influence-alcohol use relations are best characterized as a reciprocally determined process unfolding over time. In both our two- and three-wave models examining alcohol problems, however, a pattern most consistent with environmental selection relations was observed.

Alcohol use

After controlling for strong baseline associations among social influences and alcohol use as well as for robust autoregressive effects, we observed reciprocal prospective effects for both active and passive social influences and alcohol use. Specifically, both prematriculation alcohol offers and social modeling predicted sophomore year alcohol use, and prematriculation alcohol use predicted sophomore year alcohol offers and social modeling. Prospective reciprocal effects were also observed between alcohol offers, social modeling and alcohol use in three wave models but were of reduced magnitude in comparison with Wave 1 to Wave 3 reciprocal effects.

Across two- and three-wave models, we observed prospective associations between two of three social influences and alcohol use. For the first time with prospective analyses in a college sample, these findings underscore the utility of differentiating among different types of social influences. Although strong positive correlations between these two constructs suggest some conceptual overlap, both active and passive influences demonstrated unique associations with alcohol use and alcohol problems, after controlling for past drinking behavior. These findings build not only on our own previous cross-sectional work (Wood et al., 2001) but also on a growing literature that emphasizes the need to distinguish among types of social influences for the purpose of isolating etiologically relevant mechanisms in drinking behavior (Borsari and Carey, 2001; Graham et al., 1991; Jacob and Leonard, 1994).

In contrast to our expectations, no significant prospective associations between perceived norms and alcohol use were observed. Possibly the weak associations observed between perceived norms and drinking variables reflect the lower reliability of the items constituting this factor in comparison with the other socioenvironmental factors. The wording of questionnaire items may also have contributed to this finding. Although students were asked about the alcohol attitudes and behaviors of their close friends on the social modeling measures, they were asked about those of the “typical student” on the perceived norms measures. Work by Baer et al. (1991) has demonstrated that perceived norms of close friends are more closely linked to drinking behaviors than are the perceived norms of more distant peer groups. It is thus possible that weaker associations between peer norms and alcohol outcome variables in our study reflect this difference in peer reference group rather than difference in different types of social influence. Socio-environmental factors more proximal to the individual (e.g., alcohol availability, drinking patterns of friends) exert stronger influences on college students’ drinking over time than do perceptions of typical students’ drinking. Indeed, in our cross-sectional study (Wood et al., 2001), perceived norms demonstrated a consistently weaker (albeit statistically significant) association with alcohol use in a college sample.

Although our study was not intended to be a comprehensive test of SLT, in the case of alcohol use, our findings support one of SLT’s central tenets. They suggest that at least some associations between perceptions of the social environment and drinking are reciprocal, with alcohol offers and social modeling being influenced by as well as influencing alcohol use (Farrell, 1994; Maisto et al., 1999). These findings are consistent with the observation of reciprocal influence patterns between peer influences and drinking behavior in younger adolescents (Curran et al., 1997) and highlight the importance of considering both selection and socialization effects in preventive interventions for college students. To our knowledge, this is the first study to examine reciprocal associations between distinct social influences and alcohol use and problems in a college student sample.

Alcohol problems

As noted, our findings in both the two- and three-wave models of alcohol problems were consistent with an environmental selection interpretation of social influence-alcohol problems relations. Significant prospective effects from alcohol problems were observed across both short (6-month), intermediate (12-month) and longer (18-month) measurement intervals for both active (alcohol offers) and passive (social modeling) social influences. It is noteworthy that prospective prediction of social influences was stronger over the longer measurement interval of freshman to sophomore year than in the shorter interval, prematriculation to freshman year, a circumstance that has potential implications for the college environment because it supports a more problematic alcohol involvement. The high stability of alcohol problems both prematriculation and postmatriculation, however, also suggests that greater alcohol-associated consequences are more prognostic of selection into alcohol supportive environments than is alcohol use per se. These findings point to the need for indicated interventions that take place very early in the college experience, a suggestion consistent with recent recommendations from the National Institute on Alcohol Abuse and Alcoholism’s (2002) Task Force on College Drinking.

It is possible that a bias in reporting peer influences among those with greater drinking problems contributed to the robust peer selection effect we observed in the alcohol
problems models. Our social influence variables represent only the respondents’ perception of peer drinking behaviors rather than actual peer reports of their own behavior. Those who were more problematically involved in alcohol were possibly more inclined to normalize their own drinking behaviors by overreporting peer alcohol involvement and peer influences to drink.

Limitations

A number of limitations should be considered when interpreting findings from this study. Perhaps chief among these is the fact that the current sample was recruited from a single, ethnically homogenous public university and comprises those who responded to an on-line announcement during prematriculation orientation. Comparisons of the current sample with the population from which it was drawn (96% of incoming freshmen, N = 2,117) are consistent across demographic variables, although some modest differences across two of the three drinking variables were noted. Thus, despite some evidence to suggest that this sample is largely representative of the original target population of interest, it may be that characteristics unique to our sample contributed to the present findings. Furthermore, these results may be limited in their generalizability to gender and ethnicity. Reciprocal and mediational models of alcohol use have been shown to differ according to both gender and ethnicity in younger adolescents (e.g., Chassin et al., 1993; Farrell, 1994). As our sample size was not large or ethnically diverse enough to conduct tests of gender and ethnic invariance, the extent to which these findings are equally applicable across gender or ethnic groups is unknown. We also did not analyze in-state versus out-of-state student status. Students moving from a different state to attend their first year of college may demonstrate a different vulnerability to peer influences from students who may still be connected to a local peer group and familiar with both their physical and social environs. These data presented here are thus limited in that they do not address how the association between peer environment and drinking may vary as a function of residential status.

Although the distinct associations between Wave 1 alcohol use, alcohol offers, social modeling and perceived norms with dependent variables suggest that these factors represent related but distinct constructs, the measurement of any of the three social influence variables poses another potential limitation because each could represent simply a proxy for alcohol consumption and thus be susceptible to contamination by the alcohol consumption variables. This possibility may be especially relevant for heavier drinkers, as the exclusive reliance on respondents’ perceptions of peer drinking (rather than assessing peer reports of drinking attitudes and behavior) may have resulted in overestimation of peer drinking that, in turn, may partly account for the environmental selection effects observed in these models.

In our study, different time intervals were assessed for alcohol problems (i.e., past 6 months, past year), whereas a single time interval was assessed for alcohol use (i.e., past 3 months). Studies suggest that reports of alcohol use are relatively consistent over time periods as long as a year and that reliability does not necessarily vary according to the length of time between the measurement points and actual drinking behavior (e.g., Grant et al., 1997; Searles et al., 2000). Although these studies have focused on alcohol use (rather than on alcohol problems), the data do seem to suggest that the different time frames asked about in our study were unlikely to have significantly impacted our findings. Still, the issue cannot be resolved definitively here and remains an open question for future research.

Finally, the present article sought to examine only one component of the SLT model, reciprocal determinism. It has been noted that the notion of reciprocal associations between the environment and behavior is a hallmark feature of SLT and one that distinguishes it from other explanatory theories of social behavior (see Maisto et al., 1999). Other aspects of the SLT model were not tested here, and factors such as alcohol-relevant cognitions (e.g., expectancies), self-efficacy and coping have all been suggested by SLT to contribute to alcohol use behaviors.

Implications and conclusions

Explicit, theoretically derived associations between social influences and behavior have seldom been tested empirically (Maisto et al., 1999; Williams and Clark, 1998). Rarer still are prospective tests of these etiological associations. Data presented here may help to shape thinking about social psychological theory and its applicability to college student and other late adolescent drinking. These findings also suggest potential focal points for preventive interventions, which are strengthened considerably by strong etiological and theoretical foundations (Hawkins et al., 2002).

The present data have implications for both individual- and environmental-level interventions. The majority of preventive intervention research in the area of college drinking has focused on individual-level interventions, with motivational enhancement and cognitive-behavioral skill-based approaches garnering the most empirical support (Larimer and Cronce, 2002). Motivational enhancement approaches typically include presentation and discussion of normative perceptions of alcohol use, with one study demonstrating that changes in perceived norms mediated intervention outcomes (Borsari and Carey, 2000). Given the greater magnitude of prospective relations for alcohol offers and social modeling in our study, assessment and integration of these social influences may serve to enhance the efficacy of motivational interviewing approaches with
college students. Also likely to be particularly beneficial are cognitive-behavioral, skill-based approaches that recognize the ubiquity and influence of alcohol offers and social modeling in the college environment and that therefore appropriately incorporate specific refusal or moderation strategies (e.g., Kivlahan et al., 1990).

Environmental-level interventions have been undertaken much less frequently, yet our findings of reciprocal influence between socio-environmental factors and alcohol use concur with recent reviews that argue for a more comprehensive community-based perspective (DeJong and Langford, 2002; Hingson and Howland, 2002) and further underscore the promise of environmentally based preventive interventions with college students. It is clear from these and other data (e.g., Bullers et al., 2001; Curran et al., 1997; Kahler et al., 2003) that both selection (into heavier drinking groups and situations) and socialization processes are important determinants of alcohol use and that these processes are operative during the transition into college. These findings highlight the importance of environmental management approaches to preventive interventions (DeJong and Langford, 2002) that may decrease alcohol offers and social modeling influences by limiting access to alcohol or heavier drinking environments. In light of the current popularity of “social norms” approaches that attempt to reduce alcohol use through dissemination of actual (lower than perceived) norms for campus drinking (Haines and Spear, 1996), the lack of prospective predictive from perceived norms to alcohol involvement in our sample deserves comment. As noted, our findings suggest that social influence factors proximal to the individual (e.g., close friends) may more strongly influence drinking behavior than the norms of less intimate peer groups do.

This conclusion does not preclude the efficacy of social norms approaches, which are as yet untested in methodologically rigorous designs (DeJong and Lanford, 2002), but it does suggest their efficacy may be limited in settings and groups where other facets of social influence support alcohol use. Such normative approaches may need to be tailored to specific student groups (e.g., close friends, those of the same Greek affiliation, etc.) rather than referencing “typical students” as the relevant peer group for normative comparison.

Although data presented here may be useful in furthering our understanding of college student drinking and informing preventive interventions to reduce the harmful effects of heavy drinking, studies augmenting the “variable-centered” approach taken here with “pattern-centered” approaches that include consideration of developmental trajectories (e.g., Schulenberg et al., 1996) and the individual difference factors that may enhance or diminish these developmental trajectories (O’Neill et al., 2001) are needed.

In conclusion, this study offers both practical and conceptual contributions to the college drinking literature. The present findings further our understanding of the etiology of college student drinking and suggest implications for the continued development and refinement of individual and environmental-level preventive alcohol interventions for college students. These findings also help shape our thinking about etiological theory and its appropriateness for, and application to, real-world drinking behavior.

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References


