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An Applied Test of the Social Learning Theory of Deviance to College Alcohol Use

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Abstract

Several hypotheses about influences on college drinking were derived from the Social Learning Theory of Deviance were tested and confirmed. The impact of ethnicity on alcohol use was completely mediated by differential association and differential reinforcement, while the impact of biological sex on alcohol use was partially mediated. Higher net positive reinforcements to costs for alcohol use predicted increased general use, more underage use, and more frequent binge drinking. Two unexpected finding were the negative relationship between negative expectations and negative experiences, and the substantive difference between non-drinkers and general drinkers compared to illegal or binge drinkers. The discussion considers implications for future campaigns based on Akers's deterrence theory.

An Applied Test of the Social Learning Theory of Deviance to College Alcohol Use

Parents, news agencies, legislators, university administrators, and academics have labeled dangerous college drinking practices an epidemic in our country (Hasch, 2008; Walters, Bennett, & Noto, 2000). Alcohol and drug use increase markedly during the beginning of college, compared to those living at home or getting a job after high school graduation. With college comes a change from parental to peer influence, less control, different roles and social opportunities, exposure to and affiliation with many others who drink, and norms more supportive of drinking (Borsari & Carey, 2001), leading to nearly two-thirds of college students having had alcohol in the past month, and over a third having had five or more drinks in a row in the prior two weeks (The 2011 Monitoring the Future survey, Johnston, O'Malley, Bachman, & Schulenberg, 2012). Excessive alcohol use among college students generates a variety of negative consequences, ranging from littering, missing classes, psychological distress, driving under the influence, property damage, unplanned sex, assault by a drinking study, and injury, to death (Ham & Hope, 2003; Hingson, Heeren, Zakocs, Kopstein, & Wechsler, 2002; Levin et al., 2012; Wechsler, Lee, Hall, Wageneer, & Lee, 2002). However, most excessive college drinkers "mature out" over time as they transition to adult roles and responsibilities (Gmel, Kuntsche, & Rehm, 2010; Ham & Hope, 2003).

Enforcement and Deterrence Approaches
Enforcement Approaches

Researchers, college administrators, law enforcement officers, and local representatives have recommended the use of increased enforcement of alcohol-related laws (Hingson, Heeren, Winter & Wechsler, 2005; Newman, Shell, Major, & Workman, 2006; Saltz, 2004/2005; Snyder

& LaCroix, 2012; Wechsler, Lee, Nelson, & Kuo, 2002). Enforcement campaigns (often referred to as "alcohol control policy" or "environmental management") are being increasingly recommended as one approach to curbing alcohol use on college campuses (Saltz, 2004/2005; Saltz, Welker, Paschall, Feeney, & Fabiano, 2009; Snyder et al., 2004; Toomey, Lenk, & Wagenaar, 2007; Wechsler & Nelson, 2008). Snyder et al.'s (2004) meta-analysis found an average behavior change of 17% for enforcement campaigns, compared to 5% for similar campaigns not using enforcement. Enforcing laws against underage drinking is associated with decreased binge drinking (Wechsler, Lee, Nelson & Kuo, 2002) and DUI accidents (Hingson, et al., 2005). Many of these articles recommend testing the enforcement option more rigorously (Toomey, Lenk & Wagenaar, 2007) on college campuses (Saltz, 2004/2005), and with a focus on increasing enforcement in hard-to-control venues such as off-campus parties (Wechsler, Lee, Nelson & Kuo, 2002). But none discussed why such a campaign would work, other than a general assumption that various controls influence behavioral compliance.

Deterrence Approaches

There is, however, a long tradition of testing theories of enforcement in sociology and criminology (Akers, 1990; Akers & Jensen, 2005). The use of enforcement is generally based on the simple (and critiqued as overly simplistic; Grasmick & Bursik, 1990) rational choice/expected utility model. Individuals have free will, and they rationally break the law when they perceive that the benefits outweigh the costs (Pratt & Cullen, 2005). The proposed solution is then to increase the perceived costs, and/or reduce the perceived benefits, of committing a crime in order to decrease the likelihood of its occurrence. This deterrence model of decreasing criminal deviance has existed in almost the same form since the 1700s (Akers, 1990; Rupp, 2008). Not all the research supports models of deterrence, however. Some researchers have found that the threat of punishment has no effect on future offending (Piliavin, Gartner, Thornton, & Matsueda, 1986), or that personal experience with punishment may actually encourage future offending (Sherman, 1993; Wagenaar & Toomey, 2002). Also, this basic deterrence view fails to account for societal factors that are strong correlates of deviant behavior, such as demographics and socio-economic status (Matsueda, 1988).

Akers's Social Learning Theory of Deviance

Akers subsumed the deterrence model of criminological theory into a larger theory utilizing the tenets of social learning, called the Social Learning Theory of Deviance (SLTD) (Akers, 1990; Rebellon, 2006). SLTD refined previous behavioral and social learning theory concepts of operant conditioning and reinforcement and incorporated those into rational deterrence models (Pratt et al., 2010). SLTD focuses on the social influences of deviant behavior, and the positive as well as negative reinforcements for such behavior. Criminal behavior is encouraged or discouraged as the person experiences positive and negative expectancies, and rewards and punishments (positive and negative reinforcements) from interpersonal relationships, physical consequences, and structural factors (Akers, 1990; Akers & Jensen, 2005; Lee, Akers & Borg, 2004). SLTD stands out as a particularly appropriate theory for this study for two reasons. First, regardless of whether a behavior is legally, socially, or intellectually "wrong", it can be studied using the theory. The only requirements are that it has both costs and benefits, and that it is a learned or socially influenced behavior. Therefore, it can be used to look at general alcohol use as well as illegal or excessive drinking. Second, the essential causal argument and concepts are quite explicit: while prior research shows influences of *demographics* on alcohol use, those relationships are mediated by *differential association and imitation*, and *differential reinforcement* (Matsueda, 1988).

Differential Association and Imitation.

The hypothesized process of learning deviance starts with *differential association*, or the interaction and identification with different social groups and exposure to their norms, which serve as direct and indirect models for both unlawful and lawful behaviors (Perkins, 2003; Sutherland, 1994), for some of the rewards and punishments for behaviors, and as the contexts for learning the social norms surrounding an act. For example, according to the *peer norms* approach, students overestimate the amount that other individuals on their campus drink, and this overestimation (especially for same-sex and for salient others norms) is positively related to how much they themselves consume (Berkowitz, 2004; Borsari & Carey, 2003; Kypros & Langely, 2003; Lederman & Stewart, 2005; Perkins, 2003). Different social groups can agree with or contradict one another, strengthening or tempering beliefs about what is normative behavior (Akers, Krohn, Lanza-Kaduce, & Radosevich, 1979).

Where people live (*living location*) also provides differential exposure to various alcohol use patterns and access to alcoholic beverages (Presley, Meilman, & Leichliter, 2001; Schall, Kemeny, & Maltzman, 1992, p. 134, cited in Borsari & Carey, 2001, p. 392). For example, in the 2001-02 National Epidemiologic Survey on Alcohol and Related Conditions, differences in rates of episodic drinking were greater across living location than across student status (Dawson, Grant, Stinson, & Chou, 2004).

Imitation is the replication of modeled deviant or conforming behavior, through a variety of *sources* (Akers, 1990; Higgins, 2007). We use the single concept *differential association* to refer to the more general construct, composed of social norms, living location, and sources of imitation.

Differential Reinforcement.

In criminal deterrence situations, individuals are thought to weigh the perceived likelihood and severity of legal repercussions against negative and positive past *experiences* and negative and positive future *expectancies* (whether personal or vicarious) (Akers, 1990; Pogarsky & Piquero, 2003). The fear of punishment alone is only weakly related to criminal acts (Paternoster, 2010), because, according to Akers (1990), the negative reinforcements must be weighed against the positive reinforcements. Thus, *differential reinforcement* is the net difference of positive reinforcements to negative reinforcements associated with a behavior. It involves a broad range of factors, including "rewards/costs; past, present, and anticipated reinforcers and punishers; formal and informal sanctions; legal and extra-legal penalties; direct and indirect punishment; and positive and negative reinforcement, whether or not rationally calculated" (Akers, 1990, p. 655).

While the negative experiences and consequences from alcohol use get more publicity, there are also positive expectancies and experiences associated with alcohol use (Lee, Maggs, Neighbors, & Patrick, 2011). These include arousal, sexual enhancement, cognitive/motor functioning, social assertion and sociability, tension reduction, social/physical pleasure, and coping with depression (Ham & Hope, 2003). Students themselves report significantly more positive outcomes after drinking episodes (e.g., feeling relaxed, thinking more creatively) than negative outcomes (e.g., having a hangover, blacking out) (Lee, Maggs, Neighbors, & Patrick, 2011; Murphy, Barnett, & Colby, 2006; Park & Grant, 2005; Park & Levenson, 2002). Furthermore, heavy episodic drinkers may interpret otherwise negative consequences (physical impairment) as a positive bonding ritual or status symbol (Ham & Hope, 2003; Mallett, Bachrach, & Turrisi, 2008; Patrick & Maggs, 2011).

Demographics.

There are three main justifications for including demographics in drinking studies in general and SLTD in particular. The first is to be able to identify goal sub-audiences for message development, campaign implementation, and interventions (Rice & Atkin, 2013). The second is to include known socio-demographic factors influencing propensity to engage in different drinking behaviors. College student alcohol-related behaviors, norms, and expectancies have long been shown to be significantly associated with age, sex, and ethnicity (Berkowitz, 2004; Borsari & Carey, 2003; Kypros & Langely, 2003; LaBrie, Cail, Hummer, Lac, & Neighbors, 2009; Luczak, Wall, Shea, Byun, & Carr, 2001; Perkins, 2003; Wechsler, Dowdall, Davenport, & Castillo, 1995; Wechsler, Lee, Kuo, & Lee, 2000). The third is to account (control) for otherwise unexplained or shared variance in the dependent variables, thus more accurately identifying variance associated with theoretically causal SLTD mediator variables. SLTD suggests that the influence of demographic variables on criminally deviant behavior in general is completely mediated by differential association and differential reinforcement (Lanza-Kaduce, Capece, & Alden, 2006). Fundamentally, SLTD argues that results showing direct effects of socio-demographic factors on (especially illegal or deviant) drinking are misleading, as they do not take into account the mediating roles of differential association and differential reinforcement.

Support for SLTD.

There are many articles applying SLTD to topics ranging from elderly drinking to terrorist violence (see Akers & Jensen, 2005 for review). Across eight studies, SLTD variables predicted a combined variance of 31% to 68% of the dependent measures of adolescent alcohol and drug abuse (as cited in Akers & Jensen, 2005). Full mediation of the influence of demographics was supported by Akers, La Greca, Cochran and Sellers's (1989) study of alcohol use among the elderly. There is only one (that we know of) that applies it to college drinking. Durkin, Wolfe and Clark's (2005) non-random sample consisted of 1,459 undergraduates at four universities located in different regions of the United States. Regression analysis of the complete SLTD model revealed that 45% of the variance in drinking was due to SLTD variables, with *sources of imitation* being the strongest single predictor. However, it was unclear if any of the questions assessed legal aspects of use. Examples of the negative effects of drinking included only health and scholastic issues (i.e., a hangover, missing class). Using a deterrence theory seems less useful when enforcement consequences and criminal behaviors are not addressed.

We do note that, for college alcohol use, the full mediation hypothesis may be overly simplistic. Under-aged drinking, unlike shoplifting or defacement of public property, also involves physiological effects. Differences in body fat between men and women imbibing the same amount of alcohol result in higher blood alcohol levels for a woman – thus sex-specific definitions for binge drinking (Graham, Wilsnack, Dawson, & Vogeltanz, 1998; Zeigler et al., 2005; see below). There are also genetic differences in ability to metabolize alcohol, resulting in variations of alcohol tolerance among different ethnic groups (Eng, Luczak, & Wall, 2007). Age represents a clear (if often breached) boundary between illegal and legal drinking, so may be sufficient to directly affect drinking choices. So the direct influence of some demographics may persist beyond SLTD mediation. We may thus expect a "weak" form of SLTD, with some partial mediations. Further, we propose that differential association affects differential reinforcement, by providing some of the bases for assessing positive and negative reinforcements. Figure 1 portrays the SLTD model with our addition.

--- Figure 1 Goes about Here ---

Hypotheses

We derive several hypotheses from the above review to test the applicability of SLTD to

college drinking. *H1*: Differential association (H1a) and differential reinforcement (H1b) will at least partially mediate the associations of demographics on general alcohol use. *H2*: Differential association supporting alcohol use will be associated with increased positive reinforcements for general alcohol use (H2a) and increased negative experiences of drinking (H2b). *H3*: Net positive differential reinforcements (benefits minus costs) will be associated with greater general alcohol use (H3a), more underage drinking (H3b), and more binge drinking (H3c). *RQ1*: What are the relative and unique influences of differential association, differential reinforcement, and demographics, on the three kinds of alcohol use?

Methods

This study is based on data collected as a part of the Safer California Universities Project (SAFER), whose goal is to conduct an efficacy test of an enforcement approach to alcohol-related public health (Saltz, Paschall, McGaffigan, & Nygaard, 2010). To this end, campaign practitioners and student volunteers are working with local law enforcement and alcohol vendors at 10 universities to restrict the sale of alcohol to minors, promote moderate drinking practices, deter large, noisy, out-of-control parties, and publicly enforce alcohol-related laws (e.g., Drunk in Public, Driving While Intoxicated, etc.). The Project did not seek to deter underage drinking *per se*, and this study does not seek to evaluate aspects of the Project. These data come from the second year of the five year project at this university.

Sample

The study utilized a randomly selected, cross-sectional sample of undergraduate students at *one* of the universities in the SAFER project, contacted first via mail (one pre-notification letter with a $10 incentive check) and then by email (one invitation and two email reminders), using the university student database, from November 2010 through December 31st, 2010. The contacted sample size was 800. Response rate was just under 44%, resulting in 347 participants.

Measures

The questionnaire contained 434 questions, but had extensive skip logic based on whether the respondent had participated in any of six types of venues (60 questions each for fraternity/sorority, party in residence hall, on-campus sporting event, party at a house or apartment off-campus, pub/bar/restaurant nearby, or an outdoor setting such as a park) to minimize the number of questions any single respondent answered. The average participant took approximately 30 minutes to complete the survey, and there was no evidence of response fatigue across the six events or the span of the questionnaire. We combined separate questions into standardized versions, indices, and scales via simple summations or factor analyses. Confirmatory factor analysis (CFA) or principal components analyses (PCA) as appropriate were used to assess dimensionality of the multi-item scales (tables available from authors) and to create factor scores to be able to combine items using different metrics. Table 1 contains the constructs, the final variables, and descriptive statistics. Alpha reliabilities are included in the appropriate sections below for the few multi-item scales.

--- Table 1 Goes about Here ---

Demographics. The demographics analyzed were academic status, race/ethnicity, and biological sex. As both age and academic status (i.e., Freshman, Sophomore, Junior, Senior) were highly correlated ($r = .87$, $p<.001$), only academic status was utilized, except in the case of determining under-age drinking. The various open-ended ethnicity responses were grouped into European descent (47.0%), Latin descent (17.3%), Asian descent (14.1%), dual ethnicities (13.8%), and other ethnicities (6.1%) (coding available from authors). Because of insufficient *n*s in other ethnicities, analyses compared only European, Latin, and Asian descendents.

Differential association. Differential association was indicated by three constructs: social norms, living location, and sources of imitation.

Social norms questions, estimations of others' drinking occasion, frequency, and number of drinks, were first combined to create measures of alcohol use for three separate types of comparison peers (your friends, male students at [university], female students at [university]). Then PCA was utilized to validate the combining of the three normative estimates into one measure (71% variance, $a = .79$). Higher values represent estimations of greater quantity and frequency of drinking as more normative.

As noted above, *living location* may affect drinking attitudes and behaviors due to exposure, access, and local norms. At this university, first year students are not required to live on campus, and housing costs are roughly equivalent whether one lives in a dormitory, an on-campus apartment, or an off-campus rental. Thus many students choose to live in the Student Residential Area (SRA, fictitious name); a dense community next to the university composed of predominately college students. Living location was based on GPS coordinates associated with participants' responses as to where they lived on an interactive map within the survey (not SRA=0, 49%; SRA=1, 51%).

For *sources of imitation*, first, two sum scores were calculated. These scores were the number of intoxicated or of sober associates that the participants encountered at each of the six venues, multiplied by the number of times the participant went to each of those venues. The number of intoxicated associates was then subtracted from sober associates to create one final score of sources of imitation, where negative numbers represent more intoxicated associates, and positive numbers represent more sober associates.

Differential reinforcement. 42 questions asked about a variety of rewards and punishments, and positive and negative alcohol expectancies and experiences. CFA supported two factors underlying 22 items about alcohol expectancies: *positive expectancies* (13 items, variance explained 29.4%, $\alpha = .91$) and *negative expectancies* (9 items, 23.3%, $\alpha = .89$). CFA also supported the two factors of *negative experiences* associated with alcohol use (16 items, 42.7%, $\alpha = .90$), and *social pressure* to use (4 items, 66.8%, $\alpha = .83$). To create a final *differential reinforcement score*, first the factor scores for alcohol use positive reinforcers (positive expectancies and experienced social pressure to use) were summed. Next the factor scores for the alcohol use negative reinforcers or deterrents (negative expectancies and negative past experiences) were summed. Finally, the negative reinforcers total was subtracted from the positive reinforcers total, to create a variable that ranges from many more costs (negative, lower values) to many more benefits or reinforcements (positive, higher values).

Alcohol use (Outcomes). Based on the work of Saltz et al. (2010), a composite variable of *general alcohol use* was created to integrate several types of drinking frequency questions. First, number of drinks per month was tabulated from responses to a series of questions regarding the number of drinks on each day over the past month in which alcohol was imbibed (e.g., greatest number on any one day, how often drank enough to have been drunk, etc.). PCA was conducted on the measures (variance explained 76.4%, $\alpha = .76$), generating a factor score of the single underlying construct of general alcohol use. *Illegal use* is use of alcohol by students under 21 years old (although there are other ways students can break local alcohol laws).

Binge use was determined through an ordinal measure, ranging from never engaging in binge use (4+ in a row for females, 5+ in a row for males) to binging 10 times or more in the past two weeks; this was also dichotomized as never (0) or ever (1). The 2003 National Youth Risk Behavior Survey measured binge drinking as five or more drinks of alcohol in a row within a

few hours (Miller, Naimi, Brewer, & Jones, 2007, p. 77), and the Monitoring the Future survey used five or more drinks in a row (Johnston et al., 2012). The National Institute on Alcohol Abuse and Alcoholism (2004) defined binge drinking as the pattern of drinking resulting in a blood alcohol level (BAC) of .08% or more, consisting of 5 or more consecutive drinks for men and 4 or more for women, and introduced a new time period of two hours. We follow the most common measure: four or more drinks in a row for females, and five or more for males (Hingson et al., 2002; Olthius, Zamboanga, Ham, & Tyne, 2011; Wechsler, Lee, Kuo & Lee, 2000). Many other conceptual and measurement issues surround the notion of binge or risky drinking (Gmel, Kuntsche, & Rehm, 2010; Ham & Hope, 2003; Lange et al., 2002; White, et al., 2005; White, Krause, & Swartzwelder, 2006).

Results

Participants

The demographic data of the 347 final participants matches fairly well with census data of the undergraduate university population in general: 57.6% males vs. 52.6%, 60.2% under 20 years old vs. 66%, similar percentages in ethnic group and academic status, and 71.3% off-campus vs. 69%. Living location data was acquired for 298 respondents, showing a significant difference in general alcohol use among those who live in SRA ($M = .21$, $SE = .08$), and those who do not ($M = -.35$, $SE = .08$), $t(294) = -5.26$, $p < .001$, $r = .29$.

The average number of drinks per 28 days was 26.9 (min $= 0$, max $= 146$, $SD = 30.15$), or slightly less than one per day, though students reported usually having 3.1 drinks at a time when drinking (min $= 0$, max $= 15$, $SD = 2.55$). The greatest number of drinks imbibed in one day averaged 6.6, with a maximum reported 35 drinks ($SD = 4.90$); this range implies diverse drinking patterns. There was no significant difference in general alcohol use between those under 21 ($M = -.06$) and over 21 ($M = -.09$; $t = -1.3$, $p = .19$). Very similar percentages of women and men reported binge drinking (55% and 56% respectively) in the last two weeks $(t(308) = 0.06$, $p = .48)$. There were also no significant differences in binge drinking rates between participants under 21 (60.2%) or at least 21 $(t(308) = -0.16$, $p = .19)$. Consistent with other research (e.g., Romo, 2012), 20% of participants reported not having any alcohol in the past 4 weeks, and 10% of students had never had any alcohol.

Hypothesis 1

As advocated by Baron and Kenny (1986), tests were run to establish the need for mediational analysis by looking at the relationships first between each demographic variable and the outcome (general alcohol use), and then between demographic variables and mediational variables (Table 2).

--- Table Two Goes about Here ---

All demographics correlated with general alcohol use ($p < .001$) except for academic status ($F=1.6$, n.s.) which therefore was not included in mediation analyses. Consistent with past research (Engs, Hanson, & Diebold, 1996; Luczak, et al., 2001; O'Malley & Johnston, 2002), sex and ethnicity correlated with general alcohol use. Men drink more than women ($t=3.1$, $p<.01$), and students of European descent drink more than their Asian and Latin counterparts ($F=4.5$, $p<.001$).

Concerning relationships between demographics and mediators, *social imitation* as well as *negative experience*s were significantly lower, while both *positive* and *negative expectancies* were higher, for women. Students of European descent associate with a higher ratio of partiers (*social imitation*), and have lower *negative expectancies*, but have more *negative experiences* than students of Latin descent. And, compared to students of Asian descent, they have lower

negative expectancies, more *negative experiences*, and higher *positive expectancies*.

We applied Preacher and Hayes's (2003) SPSS macro for the full mediation tests on the bivariate relationships. To be conservative in this calculation where the threat of commiting Type I error outweighs the threat of committing Type II error (for this hypothesis only), a Bonferroni correction was made. Living location could not be included in mediation tests, because the test does not allow binary mediators (Hayes & Preacher, in press).

--- Table 3 Goes about Here ---

Table 3 shows that even though, compared to men, women have *greater negative and positive expectancies*, less *social imitation*, and lower *negative experiences*, only *positive expectancies* (positively) mediated the effect of sex on level of drinking. Even then, because both the direct and indirect effects of sex on alcohol use are significant, this is *partial mediation* only.

For ethnicity tests, European descent was the intercept compared to the other statistically significant ethnicities. The mediation test of the effect of Asian descent versus European descent on alcohol use showed evidence of mediation through *negative expectancies* and *negative experiences* (*differential reinforcement* variables). Latin descent versus European descent also showed evidence of a mediation effect through *negative expectancies*. Because the indirect effects scores are no longer significant after mediation, the results indicate *full mediation* of ethnicity through *differential reinforcement* variables.

These results do not support H1a (differential association mediation via social norms and imitation) but do support H1b (differential reinforcement mediation via positive expectancies by sex, and negative expectancies and negative experiences by ethnicity). And we saw above that neither age nor academic status has either direct or mediated effects.

Hypothesis 2

H2 states that *differential association* supporting alcohol use would correlate with both more *positive reinforcements* (*positive expectancies*, and *social pressure to drink*) for use (H2a) and more *negative experiences* of drinking (H2b). Table 4 shows that the weighted total number of sober associates was uncorrelated with any of the positive or negative reinforcements. However, the weighted total number of intoxicated associates was correlated with more pressure to drink, fewer negative expectancies, and more negative experiences. The net differential association (sober minus intoxicated) was correlated with less pressure to drink and more negative experiences. Interestingly, none of these was correlated with the differential reinforcement score.

More positive perceived social norms toward drinking were correlated with more positive expectancies, more pressure to drink, fewer negative expectancies, more negative experiences, and a higher net differential reinforcement. Living in the SRA followed a similar pattern, except for no relationship with positive expectancies.

--- Table 4 Goes About Here ---

Hypothesis 3

H3 states that net reinforcement (more benefits to fewer punishments) will predict greater and more deviant alcohol use. As the perceived net (differential) reinforcements increase, so do all three alcohol use outcomes (H3a: general alcohol use, $r=.27$; H3b: legal use, $r=.21$; and H3c: binge use, $r=.15$; all $p<.05$). These effects interact completely with sex: They are much stronger for females (respective rs = .50, .30, and .40, all $p<.001$) while non-significant for males (respective rs = .07, .03, and .04), even though the separate positive and negative reinforcements did not pass the mediation test for the effect of gender on alcohol use.

Research Question 1: Regression Results

While the mediation tests indicate the influence of individual SLTD factors, they do not reveal their cumulative and unique effects on the three kinds of alcohol use. We cannot conduct a pure mediation test involving all the mediators and all three outcomes, but we can approximate the analysis using hierarchical regressions on the three outcomes (general, underage, and binge drinking), where the demographics are entered as a third hierarchical block after, first, the differential association measures, and second, the net differential reinforcement measure. For illegal (underage) and binge drinking, separate analyses include and exclude non-drinkers, as non-drinking is substantively different from not drinking illegally and from not binge drinking (Romo, 2012).

--- Table 5 Goes About Here ---

As Table 5 shows, for general alcohol use, all the STLD variables are significant, with only sex a significant demographic influence. *Differential association* factors (social norms, living location, and sources of imitation) play by far the largest role (and social norms the largest of those), followed by *differential reinforcement*, and then *demographics*.

When non-drinkers are considered as zero-level legal drinkers, illegal drinking is explained only by *social norms* and *differential reinforcement*, along with being female and an underclassperson. When considering only drinkers, however, none of the SLTD factors is significant, while sex and academic status become more influential.

However, for binge drinking, all three *differential association* factors are significant influences whether non-drinkers are included or not, while neither *differential reinforcement* nor *demographics* are. As with the illegal drinking distinction, *differential reinforcement* matters only when non-drinkers are included in the non-binge drinking group.

Discussion

Main Results

This study suggests that Akers's Social Learning Theory of Deviance shows qualified promise as a conceptual framework for enforcement campaigns aimed at decreasing drinking on and around college campuses. Three sets of hypotheses were derived and generally supported, but with differing levels in different contexts.

The first hypothesis was the primary test for the mediating role of STLD forces in relationships between demographics and general alcohol use. Based solely on the separate mediation tests (which do not control for other influences), differences between males and females in general alcohol use seem due to biological or perhaps gender role differences, rather than to social (association) or individual (reinforcement) forces. However, the effects of net differential reinforcement are strong and significant for females, while non-significant for males (H1b). The effect of ethnicity on alcohol use was completely mediated by differential reinforcement variables (H1b), in spite of the fact that some biological influences on and impacts of alcohol use vary by race (e.g., lower alcohol-metabolizing enzymes in some people of Asian descent; Eng, Luczak, & Wall, 2007; Tu & Israel, 1994).

The second hypothesis, associating with more intoxicated students would be positively associated with increased pressure to drink and increased negative consequences, was supported. However, more conceptually, the H2 results are an example of either the benefit or disadvantage of combining the questions into a net differential reinforcement score. Both imitation sources and the positive and negative reinforcements were compiled into a net score because the effects of the components within each are relative to each other, as explicitly argued by SLTD theory. For example, separately, sober associates have no influence on reinforcements, while intoxicated associates influence three of the four reinforcements, and in an unexpected way: more pressure

to drink, and lower negative expectancies, but more negative experiences. Hanging around with friends who get drunk frequently seems to create a social and rosy atmosphere conducive to drinking, but whose reality may not be all that pleasant. However, the net sources of imitation influence two of the reinforcers, in a reasonable fashion: a greater number of intoxicated relative to sober associates correlates with more pressure to drink, and more negative experiences. Overall, greater net differential (relatively more positive) reinforcement was associated with higher drinking social norms and living in the SRA, but the sources of imitation cancelled each other out, due to the relative balance between sober and intoxicated associates, not the direct effects of the intoxicated associates.

It appears that the two significant STLD influences (social norms and differential reinforcement) on underage drinking highlight a primary difference between *drinkers* vs. *non-drinkers*: Relative to non-drinkers, drinkers are strongly influenced by social norms and differential reinforcement. However, by themselves, drinkers are unaffected by sources of differential association or differential reinforcement. Yet in both cases sex and academic status influences illegal drinking (academic status largely because all but one freshpersons and sophomores were under 21). That is, for those who drink in the dense context of college campuses, underage drinking seems to be a generic ritual or taken-for granted behavior, rather than an outcome of social (association) or individual (reinforcement) forces. Binge drinking, however, appears to be primarily the result of social forces, without, apparently, much consideration of either positive or negative reinforcements.

The third hypothesis, that a ratio of more benefits to fewer punishments was predictive of heavier alcohol use, was confirmed for women only. While at first this may seem intuitive, it becomes more interesting when we consider the strong positive relationship between alcohol use and negative consequences ($r = .71$), and gender differences in negative consequences of drinking. Women also reported being taken advantage of sexually and being pressured or forced to have sex more than men (not reported here). Nonetheless, for women, the positive consequences supporting use (social pressure and positive expectancies) outweighed the negative experiences and expectations.

Intriguingly, neither academic status nor age had a direct effect on general alcohol use, even though nearly two-thirds (60.2%) of the respondents, and all but one freshperson and sophomore, were under the legal drinking age. So in the hothouse environment of this college campus, there is insufficient alcohol use variance by age/status for SLTD mediators to function. Underage drinking is such a generic, common experience that it is indistinguishable from alcohol use in general, and therefore not much subject to influence through SLTD factors.

An unexpected finding was the disparity between expectations and experiences: as the expectation for negative outcomes *decreased*, negative experiences *increased*. It may be that a frequent heavy drinker has many occasions with no or trivial negative experiences, and yet still has more than an infrequent drinker. That is, the heavy drinker has a lower proportion of negative to positive experiences within his or her own lived experience, and so has lowered expectations for negative consequences, even though the actual number of negative episodes is higher than for lower use drinking peers. While another interpretation is that heavy, episodic drinkers may be more likely simply not to see some of the negative consequences as negative, this was not supported by the factor analyses. Those negative aspects, such as hangovers, that could serve useful symbolic and social purposes, such as a valued ritual, or bonding by commiserating with friends who also have hangovers (Mallett, Bachrach, & Turrisi, 2008), clearly separated out from the self-reported positive aspects, like feeling confident, happy and relaxed. Another more

sobering explanation could be cognitive impairment due to the heavy alcohol use. Heavy episodic drinking, particularly if started early in life, could degrade the areas of the brain responsible for learning and memory (Zeigler et al., 2005). Implications for this unexpected finding would vary depending on the underlying cause. But in either case, an intervention would be challenging. If it is due to a heuristic based on ratio, then the task would be to challenge expectancies even though they are logical from the individual's perspective. If it is based on cognitive development, then intervening prior to that first drink (12 years old) may be more effective.

Limitations

The study applied theory retroactively to an existing appropriate dataset. Thus there were some aspects of STLD that could not be tested, due to a lack of measures. A complete test of STLD would also need to include students' attitudes toward underage drinking; do they perceive it as deviant or just illegal? In addition, many of the behavioral and attitudinal scales, though reliable, were created for this study. While neither of these issues is a fatal flaw in the research design, they do leave the door open for further complete field tests of the theory, using the created scales. Second, these data come from (but are generally representative of) just one university. Although the student sample was appropriate given the campaign context, generalizability would be better established by testing the model at other universities using deterrence tactics. Third, as noted in the methods section, these data were collected early on in a five-year enforcement intervention. While we are assuming that differential reinforcement, especially related to underage drinking, may have become more salient, future publications could test this assumption by comparing pre- and post-intervention.

Implications for Campaigns & Conclusion

Deterrence campaigns may be more effective than traditional persuasion campaigns, due to the importance of relative benefits and the negative association between past experiences of alcohol use and future expectations, but still not as effective as campus authorities might hope. The fact that legal age limits had no effect on general alcohol use, and over half of our respondents engaged in some binge drinking in the prior two weeks, indicates that heavy drinking is perceived as normative and rewarding. Therefore a central challenge of college alcohol campaigns is to attempt to transform both expectancies and norms, as well as explicitly link deterrence consequences to specified behaviors, because both non-drinking and legal deterrence may be considered by drinkers to be deviant social behaviors.

A SLTD campaign could address the perceived benefits by decreasing the expectation of unrealistic positive outcomes, and increasing the expected benefits of moderate, legal use, while increasing the association between current use and the likelihood of future physical and social costs. For women only, campaigns might attempt to reduce their perceived positive expectancies, or the net balance between positive and negative reinforcements, as the one form of STLD influence on variations in general alcohol use by sex. Campaigns could also highlight appropriate negative expectancies and experiences for different ethnic groups.

A campaign could be crafted to increase the salience of previous negative experiences during the drinking episode, meant to last beyond the next morning. For example, a diary-based intervention where students catalog the amount they drank and the negative consequences they experienced may help strengthen a positive association between prior negative experiences and future negative consequences. This could tip the cost/benefit scale in the direction of more normative, safe, and legal use without having to solely rely on expensive enforcement tactics.

An implication of the different significant influences on illegal drinking between drinkers

and non-drinkers is that traditional campaign messages and social interventions might be targeted more at helping people not drink, than decreasing drinking, but probably with only a small likelihood of effect without a radical change in campus college culture. While underage drinking seems generic, except relative to nondrinkers, binge drinking seems much more subject to STLD mediation in the form of differential association, except for differential reinforcement relative to nondrinkers. An intriguing implication here is that STLD interventions should focus only on binge drinking. In conclusion, because of the support for STLD and the importance of positive expectations, particularly for women, the current study suggests that a potential alternative to increasing (and publicizing) punishments in college drinking deterrence interventions would attempt to decrease the expected rewards associated with drinking, decrease positive social norms about drinking, focusing on binge drinking and women college students.

References

Akers, R. L. (1990). Rational choice, deterrence, and social learning theory in criminology: The path not taken. *The Journal of Criminal Law and Criminology*, *81*(3), 653-676.

Akers, R. L., & Jensen, G. F. (2005). Empirical status of social learning theory of crime and deviance: The past, present, and future. In F. Cullen, J. Wright, & K. Blevins (Eds.), *Taking stock: The status of criminological theory* (pp. 37-76). Piscataway, NJ: Transaction Publishers.

Akers, R. L., Krohn, M. D., Lanza-Kaduce, L., & Radosevich, M. (1979). Social learning and deviant behavior: A specific test of a general theory. *American Sociological Review, 44*(4), 636-655.

Akers, R. L., La Greca, A. J., Cochran, J., & Sellers, C. (1989). Social learning theory and alcohol behavior among the elderly. *The Sociological Quarterly*, *30*(4), 625-638. doi:10.1111/j.1533-8525.1989.tb01539.x

Bandura, A. (1999). A social cognitive theory of personality. In L. Pervin & O. John (Eds.), *Handbook of personality* (2nd ed., pp. 154-196). New York: Guilford Publications.

Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, *51*(6), 1173-1182.

Berkowitz, A. D. (2004). The social norms approach: Theory, research and annotated bibliography. Retrieved February, 23, 2012 from www.alanberkowitz.com/articles/social_norms.pdf

Borsari, B. & Carey, K. B. (2001). Peer influences on college drinking: A review of the research. *Journal of Substance Abuse, 13*, 391-424.

Borsari, B., & Carey, K. B. (2003). Descriptive and injunctive norms in college drinking: A meta-analytic integration. *Journal of Studies on Alcohol*, *64*(3), 331-341.

Dawson, D. A., Grant, B. F., Stinson, F. S. & Chou, P. S. (2004). Another look at heavy episodic drinking and alcohol use disorders among college and noncollege youth. *Journal of Studies on Alcohol and Drugs, 65(*4), 477-488.

Durkin, K., Wolfe, T., & Clark, G. (2005). College students and binge drinking: An evaluation of social learning Theory. *Sociological Spectrum*, *25*(3), 255-272. doi:10.1080/027321790518681

Eng, M. Y., Luczak, S. E., & Wall, T. L. (2007). ALDH2, ADH1B, and ADH1C genotypes in Asians: A literature review. *Alcohol Research and Health*, *30*(1), 1-22.

Engs, R. C., Diebold, B. A., & Hanson, D. J. (1996). The drinking patterns and problems of a national sample of college students, 1994. *Journal of Alcohol and Drug Education*, *41*, 13-33.

Gmel, G., Kuntsche, E., & Rehm, J. (2010). Risky single-occasion drinking: Bingeing is not bingeing. *Addiction, 106*, 1037-1045.

Graham, K., Wilsnack, R., Dawson, D. & Vogeltanz, N. (1998). Should alcohol consumption measures be adjusted for gender differences? *Addiction, 93,* 1137-1147. doi: 10.1046/j.1360-0443.1998.93811372.x

Grasmick, H. G., & Bursik, R. J. B. Jr. (1990). Conscience, significant others, and rational choice: Extending the deterrence model. *Law & Society Review*, *24*(3), 837-861. doi:10.2307/3053861

Ham, L. S., & Hope, D. A. (2003). College students and problematic drinking: A review of the literature. *Clinical Psychology Review, 23*, 719-759.

Hayes, A. F., & Preacher, K. J. (in press). Statistical mediation analysis with a multicategorical independent variable. *British Journal of Mathematical and Statistical Psychology*. Retrieved December, 1, 2011 from http://afhayes.com/my-cv.html

Hingson, R. W., Heeren, T., Zakocs, R. C., Kopstein, A., & Wechsler, H. (2002). Magnitude of alcohol-related mortality and morbidity among U.S. college students ages 18-24. *Journal of Studies on Alcohol, 63*(2), 136-144.

Hingson, R. W., Heeren, T., Winter, M., & Wechsler, H. (2005). Magnitude of alcohol-related mortality and morbidity among U.S. college students ages 18-24: Changes from 1998 to 2001. *Annual Review of Public Health*, *26*(1), 259-279. doi:10.1146/annurev.publhealth.26.021304.144652

Johnston, L. D., O'Malley, P. M., Bachman, J. G., & Schulenberg, J. E. (2012). *Monitoring the Future: National survey results on drug use, 1975-2011*. *Vol. II: College students & adults ages 19-50, 2011*. Chapter 8: Prevalence of drug use among college students. Ann Arbor, MI: Institute for Social Research, University of Michigan. *www.monitoringthefuture.org/pubs/monographs/mtf-vol2_2011.pdf*

Kypros, K. & Langely, J. D. (2003). Perceived social norms and their relation to university student drinking. *Journal of Studies on Alcohol*, *64*, 829-834.

LaBrie, J. W., Cail, J., Hummer, J. F., Lac, A., & Neighbors, C. (2009). What men want: The role of reflective opposite-sex normative preferences in alcohol use among college women. *Psychology of Addictive Behavior, 23*(1), 157-162.

Lange, J. E., Clapp, J. D., Turrisi, R., Reavy, R., Jaccard, J., Johnson, M. B., Voas, R. B. & Larimer, M. (2002). College binge drinking: What is it? Who does it? *Alcoholism: Clinical and Experimental Research, 26*(5), 723-730.

Lederman, L. C., & Stewart, L. (2005). *Changing the culture of college drinking*. Cresskill, NJ: Hampton Press.

Lee, C. M., Maggs, J. L., Neighbors, C., & Patrick, M. E. (2011). Positive and negative alcohol-related consequences: Associations with past drinking. *Journal of Adolescence, 34,* 87-94.

Lee, G., Akers, R. L., & Borg, M. J. (2004). Social learning and structural factors in adolescent substance use. *Western Criminology Review, 5*(1), 17-34.

Levin, M. E., Lillis, J., Seeley, J., Hayes, S. C., Pistorello, J., & Bigian, A. (2012). Exploring the relationship between experiential avoidance, alcohol use disorders, and alcohol-related problems among first-year college students. *Journal of American College Health, 60*(6), 443-448.

Luczak, S. E. Wall, T. L., Shea, S. H., Byun, S. M., & Carr, L. G. (2001). Binge drinking in Chinese, Korean, and White college students: Genetic and ethnic group differences. *Psychology of Addictive Behaviors, 15*(4), 306-309.

Mallett, K. A., Bachrach, R. L., & Turrisi, R. (2008). Are all negative consequences truly negative? Assessing variations among college students' perceptions of alcohol related consequences. *Addictive Behaviors, 33,* 1375-1381. doi: 10.1016/j.addbeh.2008.06.014

Matsueda, R. L. (1988). The current state of differential association theory. *Crime and Delinquency, 34,* 277-306.

Miller, J. W., Naimi, T. S., Brewer, R. D., & Jones, S. E. (2007). Binge drinking and associated health risk behaviors among high school students. *Pediatrics, 119*, 76-85.

National Institute on Alcohol Abuse and Alcoholism (2004). NIAAA council approves definition of binge drinking. *NIAAA Newsletter.* Available at:

http://pubs.niaa.nih.gov/publications/Newsletter/winter2004/Newsletter Number3.htm.

Newman, I. M., Shell, D. F., Major, L. J., & Workman, T. A. (2006). Use of policy, education and enforcement to reduce binge drinking among university students: The NU Directions project. *International Journal of Drug Policy, 17*(4), 339-349.

Olthius, J. V., Zamboanga, B. L., Ham, L. S., & van Tyne, K. (2011). The utility of a gender-specific definition of binge drinking on the AUDIT. *Journal of American College Health, 59*(4), 239-245.

O'Malley, P. M., & Johnston, L. D. (2002). Epidemiology of alcohol and other drug use among American college students. *Journal of Studies on Alcohol. Supplement 14,* 23-39.

Park, C. L., & Grant, C. (2005). Determinants of positive and negative consequences of alcohol consumption in college students: alcohol use, gender, and psychological characteristics. *Addictive Behaviors, 30,* 755-765.

Park, C. L., & Levenson, M. R. (2002). Drinking to cope among college students: Prevalence, problems and coping processes. *Journal of Studies on Alcohol, 63*, 486-497.

Paternoster, R. (2010). A century of criminal justice: I. Crimes and punishment: How much do we really know about criminal deterrence? *Journal of Criminal Law & Criminology*, *100*, 101-156.

Patrick, M. E., & Maggs, J. L. (2011) College students' evaluations of alcohol consequences as positive or negative. *Addictive Behaviors, 36,* 1148-1153. doi: 10.1016/j.addbeh.2011.07.011

Perkins, H. W. (2003). *The social norms approach to preventing school and college age substance abuse: A handbook for educators, counselors, and clinicians*. San Francisco: Jossey-Bass.

Piliavin, I., Gartner, R., Thornton, C., & Matsueda, R. L. (1986). Crime, deterrence, and rational choice. *American Sociological Review, 51,* 101-119.

Pogarsky, G., & Piquero, A. R. (2003). Can punishment encourage offending? Investigating the "resetting" effect. *Journal of Research in Crime and Delinquency, 40*(1), 95-120. doi:10.1177/0022427802239255

Pratt, T. C., & Cullen, F. T. (2005). Assessing macro-level predictors and theories of crime: A meta-analysis. C*rime and Justice: A Review of Research, 32*, 373-450.

Pratt, T. C., Cullen, F. T., Sellers, C. S., Thomas Winfree, L., Madensen, T. D., Daigle, L. E., Fearn, N. E., et al. (2010). The empirical status of social learning theory: A meta-analysis. *Justice Quarterly, 27*(6), 765-802. doi:10.1080/07418820903379610

Presley, C. A., Meilman, P. W. & Leichliter, J. S. (2001). College factors that influence drinking. *Journal of Studies on Alcohol and Drugs, S14*, 82-90.

Rebellon, C. J. (2006). Do adolescents engage in delinquency to attract the social attention of peers? An extension and longitudinal test of the social reinforcement hypothesis. *Journal of Research in Crime and Delinquency, 43*(4), 387-411. doi:10.1177/0022427806291259

Rice, R. E. & Atkin, C. K. (2013). *Public communication campaigns* (4th ed.). Thousand Oaks, CA: Sage

Romo, L. K. (2012). "Above the Influence": How college students communicate about the healthy deviance of alcohol abstinence. *Health Communication, 27*(7), 672-681. http://dx.doi.org/10.1080/10410236.2011.629409

Rupp, D. M. T. (2008). *Meta analysis of crime and deterrence: A comprehensive review of the literature*. Unpublished dissertation retrieved March 11, 2011 from

http://deposit.ddb.de/cgi-
bin/dokserv?idn=993857264&dok_var=d1&dok_ext=pdf&filename=993857264.pdf

Saltz, R. F. (2004/2005). Preventing alcohol-related problems on college campuses. *Alcohol Research & Health, 28*(4), 249-251.

Saltz, R. F., Paschall, M. J., McGaffigan, R. P., & Nygaard, P. M. O. (2010). Alcohol risk management in college settings: The Safer California Universities randomized trial. *American Journal of Preventative Medicine, 39*(6), 491-499. doi:10.1016/j.amepre.2010.08.020.

Saltz, R. F., Welker, L. R., Paschall, M. J., Feeney, M. A. & Fabiano, P. M. (2009). Evaluating a comprehensive campus-community prevention intervention to reduce alcohol-related problems in a college population. *Journal of Studies on Alcohol and Drugs, Supplement 16,* 21-27.

Sherman, L. W. (1993). Defiance, deterrence, and irrelevance: A theory of the criminal sanction. *Journal of Research in Crime and Delinquency, 30*(4), 445-473. doi:10.1177/0022427893030004006

Snyder, L. B., Hamilton, M. A., Mitchell, E. W., Kiwanuka-Tondo, J., Fleming-Milici, F., & Proctor, D. (2004). A meta-analysis of the effect of mediated health communication campaigns on behavior change in the United States. *Journal of Health Communication: International Perspectives, 9*(6 supp 1), 71-96.

Snyder, L. B. & LaCroix, J. M. (2012). How effective are mediated health campaigns? A synthesis of meta-analyses. In R. E. Rice & C. K. Atkin (Eds.), *Public communication campaigns* (4th ed., pp. 113-129). Thousand Oaks, CA: Sage.

Sutherland, E. H. (Original work published 1974). Differential association. In J. E. Jacoby (Ed.), *Classics of criminology* (1994, 2nd ed., pp. 225-227). Prospect Heights, IL: Waveland Press.

Toomey, T. L., Lenk, K. M., & Wagenaar, A. C. (2007). Environmental policies to reduce college drinking: An update of research findings. *Journal of Studies on Alcohol and Drugs*, *68,* 208-219.

Wagenaar, A. C., & Toomey, T. L. (2002). Effects of minimum drinking age laws: Review and analyses of the literature from 1960 to 2000. *Journal of Studies on Alcohol, Supplement*(14), 206-225.

Walters, S. T., Bennett, M. E., & Noto, J. V. (2000). Drinking on campus. What do we know about reducing alcohol use among college students? *Journal of Substance Abuse Treatment*, *19*(3), 223-228.

Wechsler, H., Dowdall, G. W., Davenport, A., & Castillo, S. (1995). Correlates of college student binge drinking. *American Journal of Public Health, 85*(7), 921-926.

Wechsler, H., Lee, J. E., Hall, J., Wageneer, A. C. & Lee, H. (2002). Second-hand effects of student alcohol use reported by neighbors of colleges: The role of alcohol outlets. *Social Science & Medicine, 55*, 425-435.

Wechsler, H., Lee, J. E., Kuo, M. & Lee, H. (2000). College binge drinking in the 1990s: A continuing problem. Results of the Harvard School of Public Health 1999 College Alcohol Study. *Journal of American College Health*, *48,* 199-210.

Wechsler, H., Lee, J. E., Nelson, T. F., & Kuo, M. (2002). Under-age college students' drinking behavior, access to alcohol, and the influence of deterrence policies. Findings from the Harvard School of Public Health College Alcohol Study. *Journal of American College Health*, *50*(5), 223-236.

Wechsler, H., Nelson, T., Lee, J. E., Seibring, M., Lewis, C., & Keeling, R. P. (2003). Perception and reality: A national evaluation of social norms marketing interventions to reduce college students' heavy use. *Journal of Studies on Alcohol, 62,* 484-494.

White, A. M., Kraus, C. L., & Swartzwelder, H. S. (2006). Many college freshmen drink at levels far beyond the binge threshold. *Alcoholism: Clinical and Experimental Research, 30*(6), 1006-1010.

White, A. M., Kraus, C. L., Flom, J. D., Kestenbaum, L. A., Mitchell, J. R., Shah, K., & Swartzwelder, H. S. (2005). College students lack knowledge of standard drink volumes: Implications for definitions of risky drinking based on survey data. *Alcoholism: Clinical and Experimental Research, 29*(4), 631-638.

Zeigler, D. W., Wang, C. C., Yoast, R. A., Dickinson, B. D., McCaffree, M. A., Robinowitz, C. B., & Sterling, M. L. (2005). The neurocognitive effects of alcohol on adolescents and college students. *Preventive Medicine*, *40*(1), 23-32. doi:10.1016/j.ypmed.2004.04.044

Table 1

Constructs, Variables, and Descriptive Statistics

Construct	Variable	N	Min	Max	Mean	SD	Response	Freq
Demographics	Sex	347	0	1	.58	.50	0 Male	147
							1 Female	200
	Race	341	1	5	2.17	1.33	1 European	163
							2 Asian	48
							3 Latin	60
							4 Multiple	49
							5 Other	21
	Academic Status	344	1	4	2.73	1.13	1 Freshman	72
							2 Sophomore	62
							3 Junior	98
							4 Senior	112
	Age	347	18	30	20.22	2.08		
Differential association	Sum sober associates	326	0	9553	504	1206.9		
	Sum intoxicated associates	326	0	18000	707.03	1538.0		
	Sources of imitation score	325	-15720	7292	-203.11	1390.3		
	Social norms	313	-2.93	3.83	0	1		
	Living location: SRA	298	0	1	.51	.5	0 No SRA	147
							1 SRA	151
Differential reinforcement								
Reinforcers	Positive expectancies [a]	311	-3.04	1.88	0	1		
	Social pressure to drink [b]	313	-.68	5.73	0	1		
Deterrents	Negative expectancies [c]	311	-1.57	3.18	0	1		
	Negative experiences [d]	310	-.68	6.39	0	1		
Differential reinforcement		306	-4.85	5.29	.02	1.69		
Outcome	Alcohol use	335	-1.27	3.13	0	1		
	Legal use	340	0	1	.45	.50	0 Legal/NonDrk	186
							1 IllegalDrinker	154
	Binge drinking	310	1	6	2.17	1.28	1 None	167
							2 Once	61
							3 Twice	38
							4 3-5 Times	65
							5 6-9 Times	5

| 6 10+ Times | 2 |

Example items
a: Feel relaxed, Feel braver about talking to people, Feel more sexually responsive
b: …drink alcohol because … Your friends pressured you? That was the only activity your friends wanted to do?
c: Do something you'd regret, Get into trouble with your parents, Get into fist fights or shoving matches
d: Do something you later regretted, Argue with friends, Get into trouble with the campus or local police

Table 2
T-test and ANOVA Tests of Demographics and Mediators

	Differential association			Differential Reinforcement		
Demographics	Sources of imitation	Social norms	Positive expectancies	Social pressure	Negative expectancies	Negative experiences
Sex	-.81	1.86*	-2.68**	-.49	-1.71*	1.77*
Ethnicity	1.47	1.18	1.46	1.11	5.32***	2.09
Euro vs. Latin	-3.16***	1.16	1.38	1.87	-2.67**	1.68*
Euro vs. Asian	.30	1.48	1.72*	1.51	-3.64***	3.24***

* $p < .05$,** $p < .01$,*** $p < .001$; one-tailed significance derived from Monte Carlo test.
Note. Levene's test of homogeneity was significant for sources of imitation, social pressure to drink, and negative expectancies.

Table 3
Mediation Tests by Gender and Ethnicity

		Mediators					General alcohol use		
		Social norms	Positive expect	Negative expect	Negative exp		Direct effects		Indirect effects
Constant	i_2	0.13 (0.09)	-0.16 (0.09)	-0.13 (0.09)	.13 (.09)	i_1	.20* (0.08)	i_3	0.11 (0.06)
Gender	a_1	-.22 (0.12)	0.28** (0.11)	0.20 (0.11)	-.22 (.12)	c_1	-0.38** (0.11)	c'_1	-0.21** (0.07)
Social norms								b_1	0.09*** (0.04)
Positive expectancies								b_2	0.11** (0.04)
Negative expectancies								b_3	-0.33*** (0.04)
Negative experiences								b_4	.58*** (.04)
		Sources of imitation	Positive expect	Negative expect	Negative exp		Direct effects		Indirect effects
Constant	i_2	-339.0** (114.3)	-.06 (.08)	-.23** (.08)	.14 (.08)	i_1	.17* (.08)	i_3	-.03 (.05)
Euro v Asian (D1)	a_1	-27.0 (238.7)	-.27 (.17)	.71*** (.17)	-.45** (.17)	c_1	-.50** (.17)	c'_1	.04 (.11)
Euro v Latin (D2)	a_2	417.4 (224.1)	-.27 (.16)	.41** (.16)	-.28 (16)	c_2	-.48** (.16)	c'_2	-.10 (.10)
Sources of imitation								b_1	-.001*** (.000)
Positive expectancies								b_2	.10** (.04)
Negative expectancies								b_3	-.35*** (.04)
Negative experiences								b_4	.58*** (.04)

* $p< .025$,** $p< .01$,*** $p< .001$; one-tailed.
Note. Cell values are B Coefficient and (standard error). a_x are the effects of the demographic variables on the mediating variables, b_x are the effects of the mediating variables on the outcome variable, c_x are the direct effects of the demographic variable on the outcome, and c'_x are the effects of the demographic variable on the outcome when the mediators have been taken into account. A reduction from c_x to c'_x with significant b_x coefficients suggests statistically significant mediation.

Table 4

Correlations and Means of Differential Association with Differential Reinforcement

	Positive expectancies	Pressure to drink	Negative expectancies	Negative experiences	Differential reinforcement score
Sum sober associates	-.02	-.02	-.03	.08	-.07
Sum intoxicated associates	.07	.09*	-.11*	.28**	-.02
Sources of imitation	-.09	-.12*	.09	-.24**	-.04
Social norms	13**	.18**	-.30**	.31**	.18**
SRA					
No (Mean, N)	-.03, 147	-.24, 147	.19, 147	-.21, 143	-.23, 143
Yes (Mean, N)	.08, 149	.21, 151	-.16, 149	.16, 150	.31, 148
t-test	-.96	-4.23***	3.08***	-3.43***	-2.83**

* *p*< .05,** *p*< .01,*** *p*<.001, one-tailed.

Table 5
Hierarchical Regressions of Alcohol Outcomes on SLTD Factors and Demographics

Explanatory variables (within blocks)	Linear hierarchical regression		Logistic hierarchical regression			
	Alcohol Use (all respondents)		Illegal (non-drinkers with legal)	Illegal (non-drinkers excluded)	Binge (non-drinkers with non-binge)	Binge (non-drinkers excluded)
Differential Association						
Sources of imitation	-.16***		.00 (1.0) ns	.00 (1.0) ns	.00 (1.0)**	.00 (1.0)*
Social norms	.46***		.82 (2.3)***	.33 (1.4) ns	1.2 (3.3)***	1.1 (3.0)***
SRA	.20***		.52 (1.7) ns	1.0 (2.8) ns	.83 (2.3)**	.93 (2.5)**
Differential Reinforcement	.18***		.48 (1.6)***	-.09 (.9) ns	.29 (1.3)**	.08 (1.1) ns
Demographics						
Sex (M0 F1)	-.16***		.65 (1.9)*	1.8 (5.8)***	-.26 (.77) ns	-.09 (.92) ns
Academic status	-.04 ns		-1.7 (.19)***	-3.6 (.03)***	-.13 (.88) ns	-.22 (.80) ns
European	.004 ns		.10 (1.1) ns	-.68 (.50) ns	-.33 (.72) ns	-.45 (.64) ns
Latin	-.06 ns		-.45 (.64) ns	-.82 (.44) ns	-.84 (.43) ns	-.61 (.55) ns
Asian	-.08 ns		-.73 (.48) ns	.29 (1.3) ns	-.62 (.54) ns	-.16 (.85) ns
	$F(9,277) = 29.4$***	Constant	3.6 (36.2)***	10.5 (35597)***	.39 (.54) ns	.86 (2.4) ns
	Adj R^2 = .47	Model χ^2	142.8***	192.5***	112.5***	54.0***
		Nagelkerke R^2	.52	.76	.43	.29
		% Predicted	79.6	90.4	75.8	70.3
n	286		289	229	289	229

* $p <.05$;** $p < .01$;*** $p <.001$
Note: Linear hierarchical regression: values are standardized beta coefficients.
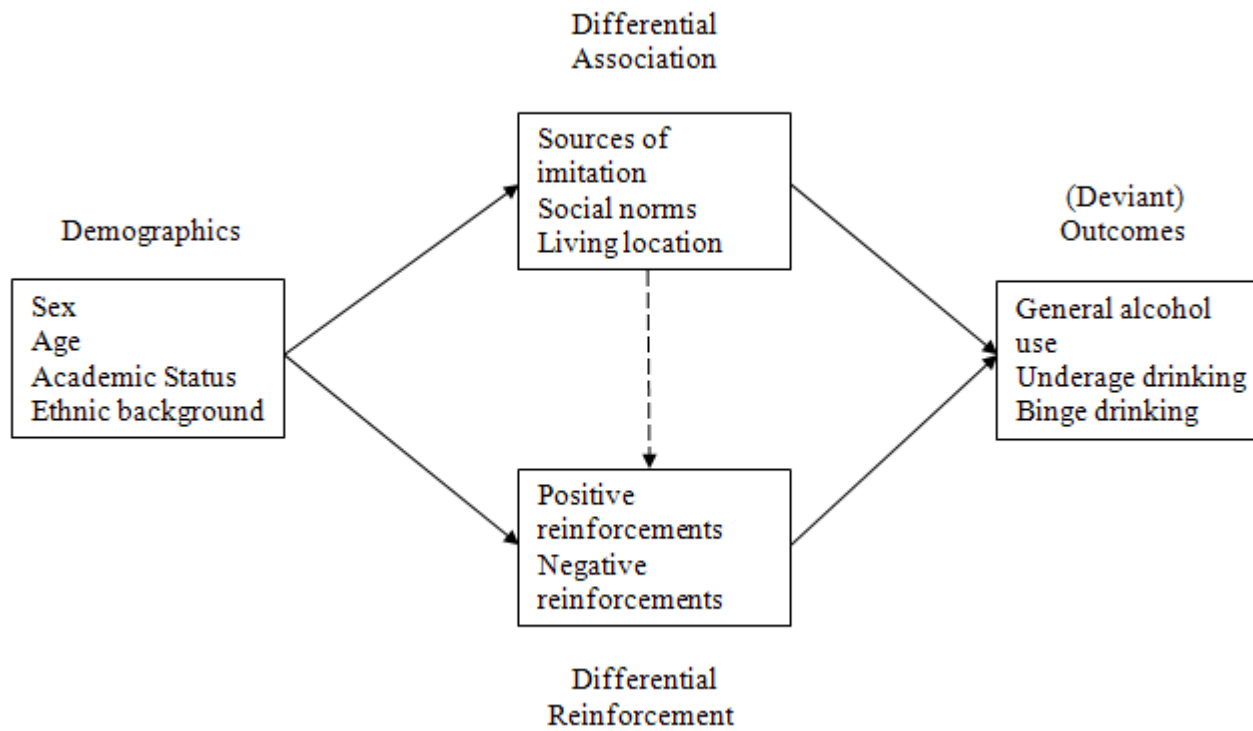Logistic hierarchical regression: values are B coefficients and (Exp(B)).

Figure 1. Social Learning Theory of Deviance applied to college drinking.

Note: Dotted relationship not specified in original SLTD theory, but added in this study.