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## The Way One Thinks Affects the Way One Drinks: Subjective Evaluations of Alcohol Consequences Predict Subsequent Change in Drinking Behavior

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### Abstract

Heavy alcohol use and related consequences are common during the college years, and are associated with deleterious outcomes for both the students themselves and the college community. Some college students make self-initiated changes to their drinking to avoid such outcomes, but little is known about how such adjustments occur, or characteristics that are associated with making these adjustments. Based on Social Learning Theory (SLT), one cognitive factor that may predict within-person changes in drinking is the subjective evaluations of alcohol consequences (i.e., the extent to which consequences are perceived as negative, aversive or severe). The aim of the present study was to investigate whether subjective evaluations of recently experienced consequences influence within-person changes in drinking behavior. In ten weekly, web-based surveys, regularly drinking college students (N=96, 50 female) reported on their previous week alcohol use and experience of 24 alcohol-related consequences, as well as their subjective evaluations of those consequences. Results demonstrated that evaluations across the consequences varied, and that in addition to differing from one another, students' evaluations of consequences differed at the within-person level over time. Most importantly, hierarchical linear model tests revealed that students drank less and experienced fewer consequences following weeks in which they rated their consequences as more negative (relative to their own typical subjective evaluations), suggesting that viewing one's recent consequences as aversive prompts self-initiated behavior change. Findings of the present study have potential to inform interventions for college drinking, particularly those that target how individuals think about their behavior and its consequences.

### Keywords

alcohol consequences; college students; subjective evaluations

### Introduction

Heavy alcohol use and its associated consequences are a problem during the college years (e.g., Cooper, 2002; Wechsler, Lee, Kuo, & Lee, 2000). Though problematic drinking is transitory for many college students, resolving as individuals take on adult roles (Muthen &

Muthen, 2000), not all students “mature out”, and some progress to alcohol abuse or dependence (Schuckit & Smith, 1996; Schulenberg, O’Malley, Bachman, Wadsworth, & Johnston, 1996). Moreover, many alcohol consequences (e.g., drunk driving, academic impairment, sexual assault) have effects that can extend well beyond the college years.

Some individuals, both college students (Baer, Kivlahan, & Marlatt, 1995) and adults (Sobell, Sobell, Toneatto, & Leo, 1993; Watson & Sher, 1998) reduce or modify their drinking on their own, without formal treatment. The experience of negative consequences from drinking can be an important catalyst for motivation to change (e.g., Barnett et al., 2003; Barnett, Goldstein, Murphy, Colby, & Monti, 2006; Miller & Rollnick, 2002; Morgan, White, & Mun, 2008; Read, Merrill, Kahler, & Strong, 2007). Accordingly, interventions seeking to motivate change often include feedback on consequences that a student has experienced (Baer, Kivlahan, Blume, McKnight, & Marlatt, 2001; Barnett, Murphy, Colby, & Monti, 2007; Borsari & Carey, 2001; Murphy et al., 2001). Yet, many students do not view all consequences as negative (e.g., Mallett, Bachrach & Turrisi, 2008), in which case providing general feedback about consequences may not have the desired effect. In recent years, there has been more of an effort to understand how individuals *personally evaluate* the consequences of alcohol use. Consequences determined through evaluation to be salient and aversive may be most likely to elicit behavior change.

### Subjective Evaluations as Predictors of Change: Theoretical and Empirical Support

**Theoretical grounding**—Social Learning Theories (SLT, Bandura, 1986) of alcohol use behavior suggest that cognitions (e.g., motivations, expectancies, interpretations) represent the most proximal influences on maladaptive alcohol use behavior, mediating the effects of a variety of more distal environmental and individual difference variables (Maisto, Carey, & Bradizza, 1999). From this perspective, although salient alcohol-related events have been linked to subsequent motivation to change in adults (Apodaca & Schermer, 2001; Dunn et al., 2003; Perreira & Sloan, 2001) and college students (Reis, Harned, & Riley, 2004), it likely is not the consequences themselves that prompt change, but one’s cognitive appraisal (i.e., subjective evaluation) of those consequences (Sobell et al., 1993).

From a learning framework, if an individual does not perceive an alcohol consequence as particularly negative (or perceives it as positive), drinking behavior may be reinforced. In contrast, when an individual evaluates a recent consequence as being particularly aversive or negative, subsequent drinking may decline. As such, these perceptions – or subjective evaluations – of consequences serve as a putative mechanism of action affecting future drinking. Further, the timing of such evaluations is important. Immediately following an event, perceived drawbacks of drinking are most salient and thus perhaps most likely to catalyze change (Ramsey et al., 2000), yet this salience may diminish with time. Thus, in the present study, we conducted weekly examinations of the subjective evaluations temporally proximal to the occurrence of the consequences themselves, and modeled these as predictors of future drinking behavior.

**Empirical support**—Research supports the idea that there is individual variability in the subjective experience of the same alcohol-related event. Mallett and colleagues (2008) demonstrated that some consequences, such as hangovers, waking up in someone else’s bed after a night of drinking, and not eating properly because of drinking were infrequently perceived as negative in a college sample, and in fact were rated as neutral or positive by the majority of students. A number of other studies have demonstrated that the extent to which consequences are rated aversively contributes to whether an individual is ready to make changes to his or her drinking (Barnett et al., 2002; 2003; 2006; Longabaugh et al., 1995). Such findings may shed light on why some students continue to drink despite significant

consequences (Mallett, Lee, Neighbors, Larimer, & Turrisi, 2006); perhaps the students themselves do not perceive the consequences to be a problem and therefore are not motivated to adjust their drinking behavior.

However, only a few studies have examined the association between subjective evaluations and actual alcohol consumption. Among these, in a sample of college students, Gaher and Simons (2007) assessed evaluations (positive – negative, rated on a 9-point scale) of 45 alcohol consequences, as well as alcohol use and problems. College students who evaluated potential future alcohol problems less negatively had higher rates of past 30-day binge drinking. In addition, individuals with less negative evaluations experienced more alcohol problems, after controlling for both gender and alcohol consumption. Mallett et al. (2008) assessed evaluations across a broad range of consequences experienced by freshmen college students, and examined whether evaluations were related to typical weekly drinking over the prior three months. Less negative evaluations of several of the consequences assessed (e.g., vomiting, blackouts, regretted sex) were associated with higher weekly drinking (past 3 months). Findings from both studies support the link between students' perception of their consequences and their drinking patterns.

### Unanswered Questions

Despite the significance of the studies reviewed above, there are a number of additional issues that need to be resolved. Measurement of evaluations in prior work has tended to be cross-sectional, retrospective and not personalized. For example, Gaher and Simons (2007) assessed evaluations of consequences in general, regardless of whether the individual actually experienced them him/herself (i.e., “Missing days of work or school because of drinking is.... [extremely good....extremely bad]”). This distinction has implications for the potency of the consequence evaluation as a mechanism predicting behavior. Mallett et al. (2008) examined only the most recent experience of any consequence endorsed over the past year, and as an event recedes in memory, so too may its cognitive impact (Longabaugh et al., 1995). Moreover, in both of these studies, only retrospective reports of alcohol use were analyzed as an outcome, and the cross-sectional nature of the data leave it unclear as to whether differences in subjective evaluations predict change in drinking behavior across time.

Moreover, while prior studies examined between-person differences in subjective evaluations and their associations with alcohol use behavior, subjective evaluations also may vary *within* an individual. Consequences may be perceived more negatively on one occasion than another depending on different factors (e.g., nature of the experience, context, mood state, level of intoxication). Such within-person variability in how recent consequences are subjectively evaluated may predict subsequent drinking behavior. To our knowledge, no study has examined how within-person differences in subjective evaluations may be a *change mechanism* guiding actual drinking behavior.

### Study Objective

The primary goal of this study was to test whether subjective evaluations (the extent to which consequences are viewed as negative, aversive and severe), proximal to the consequences themselves, prompt prospective change in drinking behavior (i.e., week-to-week). Using a prospective design, subjective evaluations and short-term changes in alcohol use and consequences were measured using weekly assessments conducted over a 10-week period. We hypothesized that greater deviations above an individual's typical subjective negative evaluation of recent consequences would be associated with lower levels of both alcohol use and alcohol consequences in the following week.

## Method

### Participants and Recruitment Procedures

Participants were 96 college students, sampled from an ongoing longitudinal study examining traumatic stress and substance use among college students (Read, Colder, Merrill, Ouimette, White, & Swartout, 2012). For this larger study, incoming students ( $N=773$ ) at a university in the Northeastern U.S. were recruited in the summer prior to matriculation. At the time of data collection for the present study (Feb–Apr 2010), these students were in their third and fourth years post-matriculation. Out of the 773 participants in the larger study, 169 met eligibility criteria for regular drinking (at least once/week) and experience of at least one alcohol consequence over the past month. We sought to ensure sufficient variability in number and severity of alcohol consequences over the 10 weeks of assessment with good representation of high consequence drinkers. However, due to a focus on day-to-day within-person variation, and so as not to restrict the range of alcohol consequences, low consequence drinkers were needed as well. Thus, we oversampled high consequence drinkers from the eligible subsample at a 2:1 ratio.

Personalized e-mails describing the study and inviting participation were sent to eligible prospective participants until we achieved our desired sample of 100 participants (based on power analysis). Through this process, 150 of the 169 eligible participants received invitations to be in the study. Sixty-seven percent of the 150 who were invited agreed to participate ( $N=100$ ). Ninety-six of the 100 participants provided enough data to be included in data analytic models. Participants in the final sample did not differ from those who were eligible but who were not invited ( $N=19$ ) or did not agree to participate ( $N=50$ ) on past-year consequences, typical weekly alcohol use, gender or age (all  $ps>.05$ ). The final sample was comprised of 65 high consequence drinkers (i.e., reported past-month alcohol consequences at least equal to the mean in the overall sample [ $2.84$ ,  $SD = 3.76$ ]) and 31 low consequence drinkers (below the mean). See Table 1 for sample descriptives.

### Web-based Assessment

With approval from the Institutional Review Board, a passive consent procedure was used; participants viewed an “Information Sheet” describing risks and benefits of the study. Using commercially available web-based assessment software, data were collected once per week for ten weeks in the Spring semester. Participants had access to web surveys each week between Sunday morning and Monday night. For each weekly survey (10–15 minutes), participants earned \$2.50 (i.e., \$25 over 10 weeks) in gift cards to local retailers, and a bonus of up to \$40 depending on the number of weekly surveys completed. Spring Break occurred during Week 5 of the present study, and therefore was statistically controlled (see below).

### Measures

With the exception of demographics, which were collected at recruitment, all measures were administered at each weekly survey.

**Demographics**—Gender, age, race and ethnicity, GPA, and educational status were assessed.

**Past-week alcohol use**—Participants reported the number of standard drinks consumed on each day in the past week, starting with Saturday and working backwards to the previous Sunday, using a format modeled after the Daily Drinking Questionnaire (Collins, Parks, & Marlatt, 1985). The web survey page included a Standard Drink Conversion chart indicating

what constitutes a standard alcoholic drink. From this, average alcohol quantity (drinks per drinking day) was calculated.

**Past-week alcohol consequences**—Using the Brief Young Adult Alcohol Consequences Questionnaire (B-YAACQ; Kahler, Strong, & Read, 2005), participants reported whether they had experienced any of 24 alcohol-related consequences in the past week. The B-YAACQ was modified from the 48-item YAACQ (Read, Kahler, Strong, & Colder, 2006) to best represent a subset of consequences that span the severity spectrum. Dichotomously scored items were summed such that weekly consequence count variables represented the total number of *different* consequences that were experienced over the past week. Across the ten weeks, alphas for this measure ranged from .90 to .95.

**Item (consequence)-level subjective evaluations**—Subjective evaluation items were designed to tap a unified construct of how negative, severe, and/or aversive a student perceived an experienced consequence to be, while making an effort not to have too much item overlap<sup>1</sup>. Upon endorsement of a consequence, a series of follow-up questions about that consequence was presented. This included two items from previous work (Barnett et al., 2006; Longabaugh et al., 1995) to reflect the aversiveness of alcohol-related incidents (“To what extent did the experience upset you?”, “How badly do you feel about the experience?”), and three additional items (“How negative was the experience for you?”, “Given the range of problems that may result from alcohol use, how severe do you think this type of experience is?”, “How bad do you think it is that you had this experience?”). Responses ranged from 1 (not at all) to 7 (extremely), and for each consequence reported, scores across the five items were summed. The average alpha across consequences for each of the 10 weeks was .83 to .91.

Students often experienced more than one single consequence in a given week. To create weekly evaluation scores to be used in analyses, the highest subjective evaluation sum score across consequences on each week was taken. This variable essentially represents one’s “worst” consequence over the past week, i.e., the most negatively evaluated consequence among those experienced (Park, 2004).

## Data Analytic Plan

Hierarchical Linear Modeling (HLM) was used to address the primary aim of the proposed study—to examine the prediction of next-week drinking behavior from previous-week subjective evaluations of consequences. This approach was ideal given that longitudinal data were weekly measurements nested within persons, and spacing between observations (weeks on which an alcohol consequence was reported) differed from one participant to the next. Further, as HLM is a multilevel technique; both Level 1 or within-person predictors of variation (e.g., whether week-to-week differences in subjective evaluations of consequences determine subsequent level of drinking) and Level 2 or between-person predictors of variation (e.g., gender) in the outcomes could be modeled (Raudenbush & Bryk, 2002). Analyses were conducted using the HLM 6.0 program (Raudenbush, Bryk, Cheong, Congdon, & Toit, 2004), with full maximum likelihood estimation.

## Data Screening and Preparation

Analysis began with a screen for missing data and tests for violations of the assumptions of HLM. Four participants were deleted listwise from analyses, due to either a lack of two

<sup>1</sup>Pilot testing was conducted on the five final items chosen based on face validity, in order to determine how dropping any given item would affect alpha. Alpha for all five items was .94, and dropping any given item resulted in alphas ranging from .92 to .96. As pilot testing on the overall web-survey revealed that the time burden was not substantial, all five items were utilized.

consecutive weeks of data or a lack of consequences at any week. Across the final sample (N= 96), data were missing due to failure to complete surveys on 66 out of 960 potential weekly assessments (7%). Less than .01 percent of items were skipped. An advantage of HLM is its flexibility in handling missing data at the within-person level.

Outcome variables were lagged, such that Week 2 Alcohol Use was re-coded as Week 1 “Next Use,” for example<sup>2</sup>. Next a multilevel person-period dataset was created with observations representing the ten potential weekly occasions of the predictor (past-week subjective evaluation), controls (past week alcohol use, consequences, week number, Spring Break week), and outcome (next week alcohol use, consequences), nested within the final sample size of N = 96 persons. As alcohol consequences was not normally distributed, a square-root transformation was applied, which resolved both the non-normality and a violation of the homogeneity of Level 1 variances assumption in consequence models. In models with alcohol use as the outcome, there was a violation of normality of Level 2 (between-person level) errors and heterogeneity of Level 1 variances. Thus, robust standard errors were used (Zeger, Liang, & Albert, 1988) and are reliable given the large number of Level 2 units (N=96).

### Descriptive Examination of Subjective Evaluations

First, means and ranges of subjective evaluation scores across each of 24 consequences were examined. Next, fully unconditional (i.e., no predictors) hierarchical linear models (HLM) were run, in order to determine intraclass correlations (ICCs) for subjective evaluations. ICCs provided information on the percentage of variation in the subjective evaluations at both the between- and within-person level.

### Evaluations as Predictors of Change

Fully unconditional models predicting both alcohol use and consequences to determine ICCs allowed a test of whether multilevel models were appropriate (i.e., whether there was between- and within-person variation in use and consequences; Raudenbush & Bryk, 2002). Subsequently, Level 1 (within-person) and Level 2 (between-person) variables were added to models consistent with hypotheses. In substantive models, at Level 1, the predictor of interest was previous week subjective evaluation score, person-centered (by subtracting from each weekly score the mean of the individual’s score on that variable across the weeks on which consequences were reported). At Level 1, we controlled for previous week alcohol use or consequences. Although the literature is mixed (Neighbors et al., 2011), some research demonstrates that Spring break is a time of relatively heavier drinking and consequences (Grekin, Sher, & Krull, 2007; Lee, Lewis, & Neighbors, 2010). Further, students may naturally increase or decrease their drinking behavior over the course of the semester (e.g., Barnett et al., 2010; Hoepfner et al., in press). Thus, data analytic models included controls for week of the semester and a dummy coded variable for Spring Break week specifically at Level 1. Finally, gender was included as a Level 2 predictor of the intercept in models predicting alcohol use, given that male college students typically consume more than females (Johnston, O’Malley, & Bachman, 2003; O’Malley & Johnston, 2002), but not in models predicting alcohol consequences as males and females experience

<sup>2</sup>It was necessary that individuals provide data on two subsequent weeks in order for their data to be considered in analytic models. Before importing data into the HLM program, variables were lagged in the SPSS program. For example, Week 2 Use was copied into a new variable named “Week 1 NEXT use.” Similarly, Week 5 Use was copied into a new variable named “Week 4 NEXT use.” When data were restructured into the person-period data set format necessary for the HLM program, the outcome variable of “Week 1 Next Use” and the independent variables of “Week 1 Use” and “Week 1 Evaluation” all corresponded to Week 1 assessments (even though Week 1 Next Use was actually collected at Week 2). If a participant had missing data at Week 2, he/she would have missing data for the Week 1 Next Use variable as well and therefore would not have a slope calculated and contributing to the results for that week.

consequences at similar levels (e.g., Nolen-Hoeksema, 2004; Perkins, 2002; White, Jamieson-Drake & Swartzhelder, 2002). Intercept effects were specified as random, to allow for individual differences in mean levels of use and consequences. Slope effects were fixed, as we did not expect variation between participants in the associations between variables of interest and drinking behavior<sup>3</sup>. Finally, effect sizes for all effects were calculated (Rosenthal & Rosnow, 1991). Effects of  $r = 0.1 - 0.23$  are considered small,  $r = 0.24 - 0.36$  are medium, and  $r = 0.37$  are large (Cohen, 1988).

## Results

### Retention and Response Rates

The average number of weekly surveys completed was 9.36 ( $SD=1.67$ ). Seventy-seven participants (79%) completed all ten weekly surveys, another 12 (12%) completed at least seven surveys. Across a possible 960 points of data collection (96 participants  $\times$  10 weeks of surveys), 894 (93%) were completed.

### Descriptives

Sample demographics and descriptive statistics for variables assessed weekly are presented in the top and bottom half of Table 1, respectively. As can be seen in Table 2, participants experienced the full range of consequences, with all but two having been experienced at least once by 20% or more of our sample. In addition, participants who experienced each consequence tended to experience it more than once over the 10-week period, as indicated by the average number of weeks each consequence was reported. The mean evaluation score observed across all consequences ( $M=14.90$ ,  $SD=5.19$ ) indicates that on average participants rated the consequences as “somewhat negative/severe/upsetting.” The ranges show that there is much variability in the evaluation scores within each consequence type. In the fully unconditional model predicting subjective evaluations, the intraclass correlation (ICC) for evaluations was .42, suggesting that 42% of the variability was between-persons.

Our sampling strategy involved recruiting both “high” ( $N=65$ ) and “low” consequence ( $N=31$ ) drinkers in order to ensure representation of a range of drinker types. High consequence drinkers drank significantly more on average per week ( $M=5.97$ ,  $SD=3.34$ ) than low consequence drinkers ( $M=4.34$ ,  $SD=2.73$ );  $p=.01$ . There were no differences between high and low consequence drinkers on mean subjective evaluation scores across the 10-week study ( $p>.10$ ). In HLM models, consequence level did not predict the intercept of weekly use, consequences, or subjective evaluation scores, nor did it influence the effect of evaluations on future drinking behavior. Thus, it was not included as a predictor in final models.

### Evaluations as Predictors of Change

In the fully unconditional model of alcohol use, the ICC indicated that 55% of the variance in alcohol use was at Level 2 (between individuals). The ICC for consequences suggested that 28% of variance in consequences was at Level 2. Results of final multilevel models are presented in Tables 3 (alcohol use) and 4 (alcohol consequences). Of primary interest is the coefficient corresponding to evaluations, which represents the change in amount of alcohol consumed for each unit change in the last week’s evaluations from the individual’s average

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<sup>3</sup>To prevent misspecification problems in terms of random components, we tested whether each of the Level 1 slopes varied across Level 2 units (by entering slopes as random effects). In most cases, the slopes did not have significant variation, as hypothesized. One exception was the slope of last week use on next week use. However, it was left as fixed in final models, given that including it as random resulted in high correlation (.93) with the intercept, suggesting that it was not necessary to include as a random effect, and given that this additional random effect could “overtax” the data.

evaluation score. When controlling for previous week alcohol use, week of semester, Spring Break week, and gender, higher deviations on a given week above one's own average subjective evaluation score across weeks were associated with lower alcohol consumption ( $p=.01$ ) and fewer alcohol consequences ( $p=.002$ ) the following week (Table 3). Thus, on weeks in which a student rated his/her worst consequence as particularly negative, he or she drank less and experienced fewer consequences the following week<sup>4</sup>. Effect sizes of evaluations for alcohol use ( $r=.11$ ) and consequences ( $r=.14$ ) were small.

## Discussion

This study offers a theory driven test of naturalistic change mechanisms in college students, and adds to an understanding of subjective evaluations as mechanisms of actual short-term changes in drinking. In providing a descriptive examination of subjective evaluations of 24 unique alcohol-related consequences, this study forwards understanding of how college students think about the problems related to their drinking. A major strength of this study was the measurement of evaluations close in time to the occurrence of the consequences, and examination of subsequent proximal behavioral changes. Results clearly suggest the influence of subjective evaluations in the prospective prediction of drinking behavior.

The main objective of this study was to assess whether students would drink less and/or experience fewer consequences in weeks after they reported more negative evaluations of recently experienced consequences, compared to their own typical negative evaluations. Our hypothesis was supported, as students who reported a consequence that they perceived as *relatively more* upsetting or severe than usual were more likely to report short-term reductions in alcohol use and/or consequences the following week. These results are consistent with literature that has examined subjective evaluations of drinking as a predictor of *readiness to change* (Barnett et al., 2002; 2003; 2006; Longabaugh et al., 1995; Migneault, Pallonen, & Velicer, 1997; Ramsey et al., 2000). The findings of the present study also converge with the limited body of previous research examining cross-sectional associations between the way individuals perceive the effects of their drinking and either intentions to drink (Park, 2004; Patrick & Maggs, 2008) or actual (but retrospectively reported) drinking (Gaher & Simons, 2007; Mallett et al., 2008). The present study provides a necessary extension of the extant literature by examining actual *prospective* outcomes.

Our descriptive examination of subjective evaluations assessed across this broad range of consequences and proximal to the events themselves demonstrated that a substantial portion (58%) of the variance in subjective evaluations was within-person, that is, was attributable to the way students differ from themselves across time in their evaluations. This suggests that students can and do change in their evaluations of drinking consequences over time, a finding which has important implications for understanding the natural evolution of drinking in this population. This finding also highlights the importance of looking beyond between-person influences of evaluations on alcohol use behavior that has been the exclusive focus of prior work. It is yet unclear whether intra-individual variation in evaluations is due to the experience of different consequences over time, or different contextual factors surrounding the same consequences. Future work, to examine variability in evaluations of the same

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<sup>4</sup>We ran a follow-up set of analyses after removing the experience of those consequences less suitable for asking within one-week time periods (those that are dependence related, that may develop over time, or that are not necessarily a consequence of drinking). Evaluations and consequence variables were rescored after removing the following items: Ended up drinking on nights when planned not to, harmed physical appearance with drinking, was overweight because of drinking, drove a car when knew had too much to drink, spent too much time drinking, needed a drink after I'd gotten up (that is, before breakfast), needed larger amounts of alcohol to feel any effect, and found it difficult to limit how much drank. Rerunning HLM models with these new variables generally did not substantially alter our findings. The effect of negative evaluations on alcohol use was  $B = -.05$  ( $p=.05$ ). The effect of negative evaluations on alcohol consequences was  $B = -.08$  ( $p < .001$ ).



consequence across time and to test inter- and intra-individual factors that predict this variability, is warranted.

Our findings regarding the evaluation scores across and within consequence items suggest that many of the consequences typically deemed severe by researchers and clinicians are not also viewed negatively by the students who experience them (consistent with Mallett et al., 2008). Further, some of the consequences determined through Rasch modeling analysis to be more infrequent and/or severe in Kahler et al.'s (2005) college student sample (e.g., spent too much time drinking, physical appearance harmed) were not *personally* viewed as aversive by students in our sample. Some of the most negatively rated consequences in this study included driving drunk, impaired quality of work/school work, and conflict with a partner or parents. In contrast, some of the least negatively rated consequences among students in our sample were needing a drink first thing in the morning (i.e., withdrawal), tolerance, and drinking on nights when one planned not to. Though these consequences are associated with greater severity (i.e., physiological dependence, loss of control), they were not perceived by students as especially deleterious. Indeed, these consequence types were evaluated on average as even less than “somewhat negative”. Findings suggest that those students most in need of making a change to their drinking (i.e., those experiencing withdrawal, tolerance, and impaired control) may be least likely to acknowledge that need.

Some of the consequences assessed in the present study may not actually represent a direct effect of one's drinking over the past week. For example, “needed a drink after I'd gotten up” is a dependence symptom that develops over time. Though problematic, “drove a car when knew had too much to drink” may represent an additional risky behavior that is not necessarily a function of one's proximal drinking. In follow-up analyses with these and other items removed (see Footnote 4), findings did not change. Whether we examined all 24 consequences, or those most acutely tied to a given night's drinking, subjective evaluations predicted future use and consequences. Still, future work may benefit from separating out “risk behaviors” from “consequences” or separating “immediate” from “delayed” consequences.

Our findings are in line with the emphasis placed by SLT on *cognitions* in the proximal prediction of behavior. Results suggest that students do evaluate the outcomes of their drinking, and may make downward adjustments to their drinking – at least in the short term – in accordance with these evaluations. With respect to learning, the experience of consequences that are evaluated *more* negatively may serve to “punish” drinking behavior, perhaps by influencing expectations of the significant costs of engaging in similar behavior in the future. Conversely, the experience of consequences evaluated *less* negatively (and that likely occur in combination with other, positive consequences of drinking) may serve to reinforce continued alcohol use.

### Measurement of Subjective Evaluations

Although validated measures exist for examining evaluations for *potential future* alcohol-related consequences (e.g., Comprehensive Effects of Alcohol Scale; Fromme, Stroot, & Kaplan, 1993), currently, there is no well-validated measure of subjective evaluations for consequences that have been already been experienced. In this study, we used five items, three of which have been used previously (Barnett et al., 2006; Longabaugh et al., 1995) to capture student perceptions of consequences experienced over the previous week. This measure demonstrated good internal consistency, and is in part validated by its predictive association with future drinking behavior. Still, more work is needed to validate this or other measures of the subjective evaluation construct.

## Limitations and Future Directions

There are several limitations to this study, many of which point to future directions for research. The sample was comprised solely of junior and senior college students who were regular and primarily high consequence drinkers. Future work should examine the processes demonstrated here in younger college students and in those with different levels of drinking. Weekly assessment of drinking and consequences provides more detailed analysis of the associations of interest than has been done before, yet it still lacks precision of an even more fine-grained prospective daily process design. Future work could benefit from use of ecological momentary assessment to examine links between cognitions regarding consequences and changes in drinking behavior, as they occur in the moment. Such a design could also allow for examination of contextual variables that might influence evaluations (e.g., mood, level of intoxication, setting).

Although this study represents a step forward from previous cross-sectional research with a short-term prospective design, studies examining evaluations as predictors of change in drinking in the longer-term still are called for. Such work may clarify whether changes in drinking behavior are simply cyclical in the short term (e.g., one week of increased drinking followed by one of decreased drinking) versus being sustained long term. Further, though some research demonstrates that repeated experience of the same consequences reflects one high-risk pattern of drinking behavior (Mallett et al., 2011) we were not powered to examine whether evaluation of one's worst consequence predicted lower likelihood of experiencing that *same* consequence subsequently. In addition, our analyses leave unknown whether some consequences drive change more readily than others, despite similarities in negative evaluations.

The present study did not allow for inclusion of all variables that might influence naturalistic changes in drinking. Most notably, we did not assess positive consequences of alcohol use (e.g., social enhancement, tension reduction). Research has demonstrated that positive consequences can influence one's overall perception of a drinking occasion (Lee, Patrick, Neighbors, Lewis, Tollison, & Larimer, 2010), and therefore may offset the effect of negative consequences on self-change in drinking. It is possible that the small effect sizes of negative evaluations on future drinking are due to a positive correlation between positive and negative consequences (Park, 2004), and the unmeasured role of positive consequences in this study. Finally, in this study we did not examine full mediated pathways that might be posited by SLT, whereby individual differences (e.g., personality, norms, past drinking experience) may influence cognitive evaluations, which in turn influence behavior.

## Clinical Implications

Some of the most effective interventions for reducing problematic drinking among college students include personalized feedback and motivational interviewing techniques (e.g., Baer et al. 2001; Borsari & Carey, 2001; Larimer & Crouce, 2002; Murphy et al., 2001). These interventions seek to alter what students think about their drinking behavior, and our findings suggest that interventions should emphasize personal cognitive appraisals of one's consequences. Exploring students' perceptions of consequences and encouraging them to think about the severity of those consequences during a personalized feedback intervention may be more effective than simply listing them to the student. It may be important to focus primarily on those consequences viewed as negative by the student during motivational interviewing. However, it also may be important to provide education on the dangers of certain alcohol-related problems, with the intention of increasing students' subjective negative evaluations of those problems. For example, for those students who do not view blackouts as particularly negative, education on the effects of blackouts on the brain could

be provided. For those who do not view tolerance and withdrawal as severe consequences, education on the course of alcohol dependence could prove fruitful.

One caveat to the above-mentioned clinical implications is the small effect sizes of subjective evaluations across models. It is possible that stronger effects might be observed with even more proximal assessment of evaluations and subsequent drinking (e.g., day-to-day rather than week-to-week) or in a sample of drinkers who indicate an interest in changing their drinking. Still, even when controlling for gender, subjective evaluations – when not manipulated through intervention and in those not explicitly seeking to modify their drinking – did predict alterations in drinking.

## Conclusion

This study addresses significant gaps in the extant literature on alcohol misuse in college students, and may inform both theory and intervention efforts. Examination of evaluations across consequence types revealed both between- and within-person variability in evaluations, with some of the most concerning consequences rated least negatively by the students experiencing them. Our findings suggest that the manner in which one personally evaluates and comes to understand his or her consequences is of primary importance. This research has important implications for shaping theoretical understanding of processes of naturalistic change. Consistent with SLT, cognitions (evaluations) are proximal predictors of short-term changes in drinking behavior. In addition to informing theory, findings may help guide the refinement of effective and focused preventive substance use interventions for college students.

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**Table 1**

## Descriptive Information for the Final Sample (N=96)

<b>Demographics</b>	
	<b>N (%)</b>
Gender	
<i>Female</i>	50 (52.1)
<i>Male</i>	46 (47.4)
Race/Ethnicity	
<i>White</i>	79 (82.3)
<i>Hispanic/Latino</i>	5 (5.2)
<i>Black</i>	2 (2.1)
<i>Asian</i>	7 (7.3)
<i>Multiracial</i>	3 (3.1)
Year in School	
<i>Junior</i>	38 (39.6)
<i>Senior</i>	58 (60.4)
	<b>Mean (SD)</b>
Age	20.92(0.52)
G.P.A.	3.29 (0.46)
<b>Weekly Variable Averages</b>	
	<b>Mean (SD)</b>
Subjective Evaluation	17.13 (7.85)
Alcohol Consequences	2.15 (2.63)
Alcohol Use Quantity (drinks per drinking day)	5.42 (4.04)
Alcohol Use Frequency (days per week)	2.24 (1.48)

**Table 2**

Endorsement Rates and Subjective Evaluation Descriptives for Each of the 24 Alcohol Consequences Assessed

Consequence	Alcohol Consequence Items		Negative Evaluation Scores <sup>b</sup>	
	% (N) endorsed at least once over 10 weeks	Mean (SD) weeks endorsed <sup>a</sup>	Mean (SD) <sup>a</sup>	Range <sup>a</sup>
Ended up drinking on nights when planned not to	69% (66)	2.62 (1.61)	8.71(5.17)	5.00–33.75
Needed a drink after I'd gotten up (that is, before breakfast)	6% (6)	1.83 (.98)	10.75(3.34)	6.33–14.00
Needed larger amounts of alcohol to feel any effect	43% (41)	2.24 (1.58)	11.78(5.99)	5.00–34.00
Said or did embarrassing things	60% (58)	2.48 (1.71)	12.80(5.92)	5.00–31.00
Had less energy or felt tired because of drinking	77% (74)	3.04 (2.07)	13.62(5.34)	5.00–35.00
Gotten into sexual situations that later regretted	22% (21)	1.57 (.98)	13.92(6.11)	5.00–25.00
Passed out from drinking	38% (36)	2.28 (1.80)	14.03(7.04)	5.00–35.00
Spent too much time drinking	32% (31)	1.48 (0.81)	14.37(6.22)	5.00–35.00
Woke up in an unexpected place after heavy drinking	15% (14)	1.93 (1.33)	14.70(11.48)	5.00–35.00
Harmed physical appearance with drinking	21% (20)	1.40 (0.82)	14.78(7.01)	5.00–29.33
Had a hangover (headache, sick stomach)	89% (85)	3.16 (2.01)	14.86(6.03)	6.86–35.00
Found it difficult to limit how much drank	44% (42)	1.67 (0.90)	15.18(7.35)	5.00–35.00
Not able to remember large stretches of time	44% (42)	2.33 (1.71)	15.34(5.88)	5.00–28.33
Felt very sick to stomach or threw up	64% (61)	1.75 (1.30)	16.23(5.38)	5.00–35.00
Took foolish risks when drinking	46% (44)	1.93 (1.09)	16.29(7.04)	6.00–35.00
Became very rude, obnoxious or insulting	38% (36)	1.61 (0.90)	16.97(7.24)	6.00–35.00
Missed work or classes at school	28% (27)	1.41 (1.08)	17.49(7.53)	5.00–35.00
Did impulsive things that regretted later	30% (29)	2.00 (1.25)	18.60(8.67)	6.00–35.00
Neglected obligations to family, work, or school	31% (30)	1.50 (1.01)	19.26(7.81)	5.00–35.00
Felt badly about self because of drinking	27% (26)	1.77 (1.07)	19.51(6.00)	10.00–35.00
Was overweight because of drinking	28% (27)	2.07 (1.36)	19.65(7.01)	9.00–35.00
Had quality of your work or schoolwork suffer	35% (34)	1.50 (0.90)	20.26(7.58)	9.00–35.00
Had problems with boyfriend/girlfriend/spouse/parents	20% (19)	1.37 (0.96)	20.34(5.44)	11.00–33.00
Drove a car when knew had too much to drink	40% (38)	1.66 (1.02)	21.31(7.17)	6.00–35.00

Note:

<sup>a</sup> among those who endorsed the consequence ever,

<sup>b</sup> Sum of 5 evaluation items for each consequence each week it was experienced, Higher ratings denote greater consequence severity; a score of 5 indicates that all 5 items were rated “not at all” and a score of 35 indicates that all 5 items were rated “extremely.”



**Table 3**

Within-Person Deviations in Subjective Negative Evaluations as Predictors of Next Week Alcohol Use and Consequences

<b>Model Predicting Alcohol Use</b>				
	<b>Fully Unconditional</b>		<b>Final Multilevel Model</b>	
<b>Level 1 Fixed Effects</b>	<b>B (SE)</b>	<b>ES</b>	<b>B (SE)</b>	<b>ES</b>
Intercept of Next Use	5.41(.32)***	.87	2.89(.61)***	.44
Last Use			.24(.11)*	.10
Week of Study			.04 (.05)	.04
Spring Break Week			1.16 (.51)*	.10
Evaluations <sup>a</sup>			-.06(.02)*	.11
<b>Level 2 Fixed Effects</b>	<b>B (SE)</b>	<b>ES</b>	<b>B (SE)</b>	<b>ES</b>
Gender			1.83(.52)***	.34
<b>MODEL FIT</b>				
Deviance	4132.30 (3)		2608.93(8)	
Change in Deviance			X <sup>2</sup> (5)=1523.37***	
AIC	4138.30		2624.93	
BIC	4145.99		2645.44	
<b>Model Predicting Alcohol Consequences</b>				
	<b>Fully Unconditional</b>		<b>Final Multilevel Model</b>	
<b>Level 1 Fixed Effects</b>	<b>B (SE)</b>	<b>ES</b>	<b>B (SE)</b>	<b>ES</b>
Intercept of Next Cons	1.03 (.06)***	.87	.89 (.13)***	.59
Last Cons			.12(.02)***	.29
Week of Study			-.04 (.02)**	.12
Spring Break Week			.43 (.12)***	.15
Evaluations <sup>a</sup>			-.02(.01)**	.14
<b>MODEL FIT</b>				
Deviance (parameters)	2104.33(3)		1288.59(7)	
Change in Deviance			X <sup>2</sup> (4)=815.74***	
AIC	2110.33		1302.59	
BIC	2118.02		1320.54	

Note: B = unstandardized beta, SE = standard error, ES = effect size; Change in deviance is from fully unconditional model; Next Use = Next week average quantity of alcohol use, Last Use = Past week average quantity of alcohol use; Next Cons = Next week number of consequences (outcome variable square root transformed), Last Cons = Past week number of consequences;

<sup>a</sup>Evaluation scores were person-centered, such that they represent the deviation between a given week's highest evaluation score and the person's mean highest evaluation score across all 10 weeks,

\*  
p .05,

\*\*  
p .01,

\*\*\*  
p .001;

**bold** = effect of primary interest