Learning From Experience? The Influence of Positive and Negative Alcohol-Related Consequences on Next-Day Alcohol Expectancies and Use Among College Drinkers

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ABSTRACT. Objective: The purpose of the present study was to examine daily-level associations between alcohol-related consequences and next-day expectancies and alcohol use among frequently drinking college students using a measurement-burst daily diary study. **Method:** College students ($N = 327$; mean age = 19.7 years, $SD = 1.26$; 53.4% female) participated in a yearlong study in which they completed computerized interviews daily via mobile phones for 2 weeks in each academic quarter. Multilevel modeling was used to examine whether positive and negative consequences were associated with next-day alcohol expectancies and alcohol consumption. **Results:** Experiencing positive consequences from drinking was significantly associated with higher positive

expectancies and a greater number of drinks consumed on the following day. The within-person association between daily consequences and next-day positive expectancies was stronger for those who were in fraternities/sororities compared with those who were not. Negative consequences were significantly associated with higher negative expectancies the next day but were not associated with number of drinks consumed the next day. **Conclusions:** Results of this study highlight the role of direct drinking experiences in influencing future expectations and drinking behavior using a method that enables analysis of both between- and within-person associations. (*J. Stud. Alcohol Drugs*, 79, 465–473, 2018)

ONE THIRD (32%) OF COLLEGE STUDENTS report at least one occasion of heavy episodic alcohol consumption (unisex 5+ drink cutoff) in the past 2 weeks (Johnston et al., 2016). Although heavier drinking increases the likelihood of both positive and negative consequences (e.g., Park, 2004; White & Hingson, 2013), both can occur at all levels of drinking.

From a learning theory perspective (Bandura, 1977), desired and undesired consequences are important in understanding and predicting drinking behavior. Learning may occur explicitly (the person experiences or sees a consequence and draws the conclusion to alter their behavior) or implicitly (they experience or see a consequence, do not consciously process it, yet still change their behavior). Negative effects of alcohol (e.g., vomiting) may decrease drinking behavior,

whereas positive effects (e.g., feeling buzzed) may increase drinking (Park et al., 2013; Patrick & Maggs, 2008; White et al., 2004). These associations may also differ by type of consequence and sex (Read et al., 2013).

Expectancies are beliefs about how alcohol will affect one's behavior or experience (Goldman et al., 1999). Alcohol expectancies predict frequency and quantity of alcohol consumption and risk of consequences (Jones et al., 2001). Those expecting to feel relaxed when drinking may be motivated to drink to relax (Leigh, 1999). Expectancies are shaped through observational learning and continue to be influenced by direct experience (e.g., Patrick et al., 2016). Learning theories suggest that expectancies fluctuate within individuals over time. Both expectancies and consequences shape each other, which influences drinking in a feed-forward process (Lee et al., 2015).

Learning theory posits that experiences of negative and positive consequences affect subsequent cognitions, expectancies, and drinking. Using a cross-sectional design, Logan and colleagues (2012) found that experiencing more past-year positive consequences was associated with perceptions that positive consequences were more likely to occur. Experiencing more negative consequences was associated with perceptions that negative consequences were more likely to occur, but only at high levels of experienced consequences. Controlling for expectancies, Park and colleagues (2013) found that positive—but not negative—consequences in the

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past 3 months were positively associated with heavy drinking 1 month later. No support was found for associations between positive or negative consequences and expectancies. Martinez and colleagues (2014) showed that negative consequences predicted frequent heavy drinking the subsequent semester.

Processes in which students interpret and learn from positive and negative drinking experiences may require proximal reports of behavior to test learning theory hypotheses directly. Daily reports allow for a direct test of within-person relationships, such as whether drinking-related consequences predict next-day expectancies and drinking. Moreover, person-level characteristics (e.g., baseline drinking, fraternity/sorority membership, sex) can be examined as moderators of these within-person relationships.

Heavier drinkers perceive negative consequences as less aversive than do lighter drinkers and nondrinkers; however, the relationship between aversiveness and motivation to reduce drinking is stronger for lighter drinkers (Barnett et al., 2002, 2006). Lighter drinkers may experience more negative consequences than heavier drinkers at similar intoxication levels because of less experience or tolerance (Neal & Carey, 2007). The relationship between negative consequences and subsequent drinking may be stronger for lighter than for heavier drinkers. Given the limited literature examining daily associations, it is not yet known whether baseline drinking moderates the association between consequences and next-day expectancies.

Fraternity/sorority membership is a risk factor for increased alcohol use and consequences (Borsari et al., 2009; Capone et al., 2007; Ragsdale et al., 2012; Seo & Li, 2009). This is partially self-selection, with those more prone to heavy drinking seeking out membership, and is also reinforced by increased injunctive and descriptive drinking norms that likely influence expectancies (Borsari et al., 2009).

Male sex is a risk factor for increased alcohol use and consequences (Read et al., 2013; Seo & Li, 2009), with males in fraternities being at greatest risk (Capone et al., 2007; Iwamoto et al., 2011). Although Patrick and Maggs (2008) found no differences by sex in associations between experienced consequences and subsequent drinking intentions, studies examining associations between experienced consequences and subsequent expectancies or drinking have not typically tested demographic variables as moderators of these associations (Martinez et al., 2014; Park et al., 2013).

Based on broader literature, fraternity/sorority membership and sex may moderate the within-person associations, such that consequences may exert a greater effect on next-day expectancies and drinking among non-fraternity/sorority students and women. In conjunction with lower prevalence rates of drinking and lower perceived norms, non-fraternity/sorority students and women may adjust their expectancies and drinking in response to negative consequences.

Current study

This study examined the short-term impact of experienced consequences on next-day alcohol expectancies and use. We examined different paths of a feed-forward process to elucidate patterns of high-risk alcohol use among college students, including the associations between experienced consequences on a given day and next-day alcohol expectancies and alcohol use. Further, we examined whether person-level characteristics (i.e., sex, fraternity/sorority status, baseline drinking) may moderate these within-person associations. We hypothesized that experiencing more positive consequences on a given day (independent of individuals' average number of positive consequences) would be associated with greater positive expectancies and alcohol use the following day. Second, experiencing more negative consequences on a given day would be associated with higher negative expectancies, but less alcohol consumed, the following day. Finally, we expected differences in daily within-person associations based on baseline drinking, fraternity/sorority membership, and sex.

Method

Participants and procedures

Undergraduate freshmen, sophomores, and juniors ages 18–24 years ($N = 8,923$) were randomly selected from the university registrar's enrollment list at a large public university and invited via email to participate in an online screening survey to determine eligibility for a longitudinal study of alcohol use and consequences. A total of 3,210 students completed the screening survey (compensation = \$10). Eligibility criteria included owning a mobile phone with a service contract and text messaging, being 18–24 years old, and drinking at least twice a week over the past month. Participants who met the criteria ($n = 539$) were invited to complete a 30- to 45-minute baseline survey online (compensation = \$30). Of participants not meeting the criteria, the majority did not meet drinking criteria ($n = 2,067$), with 327 not meeting age or class eligibility and 277 not meeting other criteria (e.g., no service contract or text messaging). A total of 516 students completed the baseline survey and scheduled in-person training to provide consent, receive instructions on daily reporting procedures, and review standard drink definitions. Of the 516, 352 completed training ($n = 352$; $M_{age} = 19.7$ years, $SD = 1.26$; 53.4% female; 74.2% White, 8.5% Asian American, 11.1% multiracial, 6.2% other) and were enrolled in the study. No significant differences were found between those enrolled and not enrolled in age, sex, and baseline alcohol-related behaviors.

During the study, participants used their mobile phones to call a toll-free number to complete three daily automated telephone interviews (<10 minutes each; morning 9 A.M.–

noon; afternoon 3–6 P.M.; evening 9 P.M.–midnight) for 2 weeks in each quarter across one year (including summer). The first quarter began the day after the training session. For the three subsequent quarters, participants were randomly assigned 2 weeks during the quarter. Morning interviews assessed prior-day alcohol use/consequences, and afternoon interviews assessed alcohol expectancies for the upcoming evening. Participants were paid \$2 for each interview and a “bonus” of \$16 if they completed 36 of the 42 interviews for each quarter.

The full data set includes 352 participants and 18,364 days. Across assessments, 84.9% of the morning and 86.7% of the afternoon interviews were completed. The mean number of days participants had at least one completed/partial interview was 47.7 days ($SD = 13.3$, median = 54; range: 1–56); the mean number of interviews for which participants provided any data was 141 out of 168 possible interviews (84%, $SD = 40.8$, range: 2–168). No participants were excluded from the larger study for noncompliance. The university institutional review board approved procedures, and a federal Certificate of Confidentiality was obtained from the National Institutes of Health. No adverse events were reported.

Measures

Baseline demographics. Sex was coded as 0 = male and 1 = female. Fraternity/sorority status was coded as 0 = no membership and 1 = membership.

Baseline drinking. The Daily Drinking Questionnaire (Collins et al., 1985) assessed the number of standard drinks consumed on each day of a typical week in the 3 months preceding the study. Days of the week were summed to create a typical number of drinks per week variable.

Daily measures of alcohol use. In the morning, participants reported on the number of standard drinks consumed the previous day.

Daily measure of alcohol expectancies. Alcohol expectancies were assessed using a 13-item scale of positive and negative alcohol effects (see Table 1 for items). For each item, participants were asked, “If you were to drink tonight, how likely would you be to feel or do the following things?” from 1 = *very unlikely* to 9 = *very likely*. The mean of the positive and negative items, respectively, were computed to create one daily positive and one daily negative expectancy score. As described elsewhere, the expectancy measures showed strong psychometric properties in this sample (Lee et al., 2015). Generalizability coefficients (GCs), which assess internal consistency in a multilevel framework and are analogous to Cronbach’s alpha, were .91 and .92 for positive and negative expectancies, respectively, at the between-person level and .79 and .87 at the within-person level.

Daily measure of alcohol-related consequences. Participants who reported drinking the previous day were shown

TABLE 1. Characteristics of the study sample

Variable	<i>n</i> (%) or <i>M</i> (<i>SD</i>)
Level 2, person-level, <i>N</i> = 327	
Fraternity/sorority membership	181 (55.4%)
Female sex	176 (52.7%)
Baseline typical drinks per week	18.8 (11.6)
Person-mean positive consequences	3.1 (1.2)
Person-mean negative consequences	0.8 (0.5)
Level 1, daily-level, <i>N</i> = 4,442	
Any next-day drinking	2,128 (47.9%)
Drinks on a drinking day (i.e., next-day drinking)	5.4 (3.5)
Daily report of positive consequences	3.0 (1.9)
Daily report of negative consequences	0.8 (1.1)
Positive expectancies	5.5 (1.6)
Negative expectancies	2.7 (1.2)

Notes: Analyses included 327 individuals who drank on at least 1 day; there was an average of 13.6 ($SD = 8.1$) drinking days across the study per person, with a total of 4,442 observations. Positive expectancies included “feeling more relaxed, be more sociable, feel more relaxed, be in a better mood, get a buzz, feel more energetic, be able to express your feelings more easily.” Negative expectancies included “have a hangover, become aggressive, feel nauseated or vomit, hurt or injure yourself by accident, be unable to remember what you did while drinking, be rude or obnoxious, do something that embarrassed you.” Positive and negative consequences included the same expectancy items, reworded for past tense, for example, “I was more sociable” and “I had a hangover.”

13 alcohol-related consequences (6 positive and 7 negative) that matched the list of expectancies, reworded in the past tense (see Lee et al., 2017, for description). Participants indicated whether each consequence had occurred yesterday (from when they woke up to when they went to sleep). The sums of the positive and negative items were used to create two separate scale scores. As described by Lee et al. (2017), there was excellent reliability at the between-person level for both positive ($GC = .91$) and negative ($GC = .89$) consequences. At the within-person level, there was high internal consistency for positive consequences ($GC = .78$) but weaker consistency for negative consequences ($GC = .66$), which may be reflective of the somewhat infrequent nature of these consequences.

Plan of analysis

Three multilevel (mixed effects) models were conducted where daily observations (Level 1) were nested within persons (Level 2). First, a linear multilevel model estimated associations of positive and negative consequences with next-day positive expectancies. Second, a linear multilevel model estimated associations of positive and negative consequences with next-day negative expectancies. Third, because number of drinks is a count variable with excess zeros, we used a multilevel hurdle model that examined associations between consequences and two aspects of next-day drinking: (a) odds of any versus no drinking using logistic regression and (b) number of drinks consumed when drinking, using truncated overdispersed Poisson regression (Atkins et al., 2013). Odds ratios (ORs) for any versus no drinking were

estimated for the logit part of the model. For the count portion, the covariate is connected to the outcome via a log link and coefficients are commonly exponentiated to yield rate ratios (RRs) that describe the proportional change in the count associated with a one-unit increase in the covariate.

To disentangle the between- from the within-person effects of consequences on the outcomes, two separate variables for consequences were included in models (Curran & Bauer, 2011). First, for each person, i , a Level 2 time-fixed covariate for the mean of consequences over all days during the study (e.g., $\text{pos_consequences}_i$) was created. The second variable was a Level 1 time-varying covariate for each person's consequences on a given day, t , centered on his or her mean across days (e.g., $\text{pos_consequences}_{it} - \text{pos_consequences}_i$). The between- and within-person versions of both the positive and negative consequences were standardized as z scores ($M = 0$, $SD = 1$). All models included Level 2 covariates for fraternity/sorority status and sex, z score for baseline typical drinks per week, and Level 1 covariates for study period (0–3) and weekends (1 [Thursday, Friday, Saturday]) versus weekdays (0 [all other days]).

The intercept and effects of weekend and daily positive and negative consequences were allowed to vary across individuals. Additional models examined moderators of Level 1 associations between consequences and the outcomes by sex, weekend, fraternity/sorority status, and baseline drinking. We also explored whether the timing of the assessment in relation to point in the academic quarter (early, middle, or late) moderated associations between consequences and drinking. Summer assessments were excluded for these analyses.

For post hoc analyses, we examined the extent to which associations between alcohol consequences and next-day drinking were explained by expectancies by adding covariates for Level 2 person-mean and Level 1 daily deviation from one's mean for positive and negative expectancies to the multilevel hurdle models. To understand the influence of the expectancies on the consequences and drinking association, we examined how estimates for consequences were altered in a model with the expectancies covariates included compared with the model without the expectancies covariates.

We used a Bayesian Markov chain Monte Carlo (MCMC) approach with noninformative priors for model estimation that yields similar estimates to maximum likelihood approaches. This approach uses MCMC sampling to yield vectors of values, the posterior distribution of coefficients and variance terms, rather than a single, point estimate for each parameter in the model (Gelman & Hill, 2006). Such MCMC methods are advantageous when running complex and computationally demanding models (i.e., multilevel hurdle) performed across the current longitudinal data (Atkins et al., 2013; Hamra et al., 2013). Multilevel hurdle models did not achieve convergence when using a frequentist maximum likelihood version of the model. Thus, the Bayesian

MCMC version of the model was used for all outcomes for consistency. Models were performed in R statistical software, Version 3.0 (R Development Core Team, 2014), using the MCMCglmm packages (Hadfield, 2010).

Results

Of the 352 original students, 3 did not report any drinking across reported days and were not asked about alcohol-related consequences, and 22 were excluded from present analyses because of missing daily-level data. Analyses included 327 individuals who drank on at least 1 day; there was an average of 13.6 ($SD = 8.1$) drinking days across the study per person, with a total of 4,442 observations.

As shown in Table 1, over the sampled drinking days, individuals' average number of positive consequences per drinking day was higher than the average number of negative consequences per drinking day. Next-day drinking occurred on 47.9% of the days that followed those on which participants had reported experiencing consequences. Intraclass correlation coefficients (ICCs) were .35 for positive consequences, .14 for negative consequences, .43 for positive expectancies, and .40 for negative expectancies. The ICCs for the expectancies in the subsample of observations following drinking days used in these analyses were similar to those using all observations.

Alcohol-related consequences predicting next-day expectancies and moderators

Positive alcohol-related expectancies. Table 2 shows the results of the first model examining associations of drinking consequences with next-day positive expectancies. Between-person (Level 2) results indicated that there were no statistically significant differences in positive expectancies based on sex, fraternity/sorority membership, or baseline alcohol use. Students who experienced more positive consequences on average across the study period had higher positive expectancies, and students who experienced more negative consequences on average across the study period had lower positive expectancies.

Within-person (Level 1) results indicated that positive expectancies decreased across the study periods. Students had higher positive expectancies on weekend days than on weekdays. Following days when students experienced more positive consequences than usual, they had higher next-day positive expectancies (i.e., they expected that positive consequences were more likely the next day). Following days when students experienced more negative consequences than usual, positive expectancies did not significantly differ.

When examining moderators of potential associations, we did not observe any statistically significant interactions between daily reports of consequences and sex, baseline drinking, or weekend. However, there was a statistically sig-

TABLE 2. Multilevel models predicting next-day positive and negative expectancies

Variable	Positive expectancies			Negative expectancies		
	<i>b</i>	[95% CI]	<i>p</i>	<i>b</i>	[95% CI]	<i>p</i>
Level 2, person level						
Intercept	5.35	[5.17, 5.54]	<.001	2.62	[2.49, 2.80]	<.001
Fraternity/sorority membership	0.08	[-0.14, 0.28]	.474	0.14	[-0.04, 0.30]	.124
Female sex	0.10	[-0.10, 0.29]	.302	0.03	[-0.12, 0.20]	.724
Baseline typical drinks per week	<0.01	[-0.10, 0.11]	.940	0.08	[-0.01, 0.16]	.072
Person-mean positive consequences	0.72	[0.61, 0.84]	<.001	-0.07	[-0.15, 0.03]	.170
Person-mean negative consequences	-0.14	[-0.26, -0.03]	.010	0.32	[0.22, 0.42]	<.001
Level 1, daily level						
Study period	-0.14	[-0.18, -0.11]	<.001	-0.04	[-0.06, -0.01]	.004
Weekend	0.38	[0.29, 0.47]	<.001	0.36	[0.29, 0.43]	<.001
Daily report of positive consequences	0.23	[0.18, 0.28]	<.001	-0.03	[-0.08, 0.01]	.162
Daily report of negative consequences	-0.05	[-0.10, <.01]	.070	0.11	[0.07, 0.16]	<.001

Notes: CI = credible interval, which describes the 2.5th and 97.5th percentile values from the posterior distribution and is analogous to a confidence interval; *p* = posterior probability that *b* < 0 if *b* is positive or *b* > 0 if *b* is negative, which is analogous to a *p* value.

FIGURE 1. Model-predicted positive alcohol expectancies according to prior-day positive alcohol consequences by fraternity/sorority status

nificant interaction between fraternity/sorority membership and daily reports of positive consequences (*b* interaction = 0.13, *p* = .006). As shown in Figure 1, this interaction showed that the within-person association between daily consequences and next-day positive expectancies was stronger for those in a fraternity/sorority (*b* = 0.15, *p* < .001) compared with those who were not (*b* = 0.28, *p* < .001).

Negative alcohol-related expectancies. Table 2 also shows the results of the second model examining next-day negative expectancies based on drinking consequences experienced the day before. Between-person (Level 2) results indicated that there were no statistically significant differences in negative expectancies based on sex, fraternity/sorority status, baseline alcohol use, or person-mean positive consequences. Students who experienced more negative consequences on average across the study period had higher negative expectancies.

Within-person (Level 1) results indicated that negative expectancies decreased across the study period. Students

had higher negative expectancies on weekend days compared with weekdays. Following days when students experienced more negative consequences than usual, they had greater next-day negative expectancies; that is, they believed they would be more likely to experience negative consequences the next day. Following days when students experienced more positive consequences than usual, negative expectancies did not significantly differ.

There were no statistically significant interactions by fraternity/sorority, sex, baseline drinking, or weekend.

Alcohol use. Table 3 shows results of the hurdle multilevel model predicting alcohol use. The first part of the model indicates whether covariates were associated with increased odds of reporting any next-day drinking versus no drinking. The second part of the model indicates whether covariates were associated with consuming a greater number of drinks on drinking days.

Between-person (Level 2) results indicated that students in a fraternity/sorority had lower odds of any drinking on a

TABLE 3. Hurdle mixed models predicting next-day alcohol use: Odds ratios for any drinking and rate ratios for number of drinks when drinking

Variable	Any vs. no drinking			Count of drinks when drinking		
	OR	[95% CI]	<i>p</i>	RR	[95% CI]	<i>p</i>
Level 2, person level						
Intercept	0.39	[0.32, 0.49]	<.001	4.36	[3.96, 4.77]	<.001
Fraternity/sorority membership	0.57	[0.44, 0.7]	<.001	1.17	[1.07, 1.28]	<.001
Female sex	1.07	[0.84, 1.34]	.582	0.86	[0.79, 0.94]	<.001
Baseline typical drinks per week	1.04	[0.93, 1.18]	.496	1.21	[1.16, 1.28]	<.001
Person-mean positive consequences	0.94	[0.81, 1.06]	.332	1.05	[1.00, 1.11]	.060
Person-mean negative consequences	0.96	[0.89, 1.04]	.332	1.01	[0.99, 1.04]	.294
Level 1, daily level						
Study period	1.08	[1.01, 1.15]	.014	0.96	[0.93, 0.98]	<.001
Weekend	2.06	[1.78, 2.41]	<.001	1.24	[1.17, 1.31]	<.001
Daily report of positive consequences	0.86	[0.75, 0.98]	.020	1.10	[1.05, 1.16]	<.001
Daily report of negative consequences	0.92	[0.85, 1.01]	.060	0.99	[0.97, 1.02]	.644

Notes: OR = odds ratio; RR = rate ratio; CI = credible interval; *p* = posterior probability that OR/RR < 1 if OR/RR > 1, or OR/RR > 1 if OR/CR < 1.

given day but consumed a greater number of drinks when they did drink. There were no statistically significant differences by sex in the likelihood of any drinking, but women consumed fewer drinks when drinking compared with men. Baseline drinking was not significantly associated with likelihood of any drinking, but students who reported a greater number of typical drinks per week also consumed a greater number of drinks when drinking. Person-means of positive and negative consequences experienced across the study period were not associated with likelihood of any drinking on a given day or number of drinks consumed on a drinking day.

Within-person (Level 1) results indicated that across the study periods, the likelihood of any drinking increased and number of drinks when drinking decreased. Students were more likely to drink and consumed a greater number of drinks when drinking on weekend days compared with weekdays. To address one of the main questions, following days when students experienced more positive consequences than usual, they had lower odds of next-day drinking but consumed a greater number of drinks when they did drink. There were no statistically significant associations between negative consequences reported the previous day and next-day alcohol use.

In post hoc analyses that further included positive and negative expectancies in the model (Table 4), person-mean positive expectancies were associated with a higher likelihood of any drinking whereas person-mean negative experiences were associated with a lower likelihood. For the count portion of the model, higher levels of person-mean negative expectancies—but not positive expectancies—were associated with a greater number of drinks consumed. When examining daily-level expectancies, both daily positive and negative expectancies were associated with a higher likelihood of any drinking as well as number of drinks when drinking. Of particular interest are the OR and RR for daily positive consequences. Compared with the model above without inclusion of expectancies covariates, the RR for number of drinks was greatly attenuated and no longer statistically significant, whereas the OR for any drinking remained statistically significant. This attenuation and the observed association between daily positive consequences and daily positive—but not negative—expectancies suggest that the association between positive consequences and count of drinks when drinking was explained by positive expectancies.

There were no significant interactions for fraternity/sorority, sex, weekend, or time during the quarter. Baseline

TABLE 4. Hurdle mixed models predicting next-day alcohol use with inclusion of positive and negative expectancies: Adjusted^a odds ratios for any drinking and rate ratios for number of drinks when drinking

Variable	Any vs. no drinking			Count of drinks when drinking		
	OR	[95% CI]	<i>p</i>	RR	[95% CI]	<i>p</i>
Level 2, person level						
Person-mean positive consequences	0.82	[0.82, 0.72]	.012	1.04	[0.98, 1.09]	.226
Person-mean negative consequences	0.97	[0.85, 1.14]	.668	1.05	[0.99, 1.11]	.086
Person-mean positive expectancies	1.22	[1.03, 1.39]	.002	1.03	[0.99, 1.08]	.140
Person-mean negative expectancies	0.76	[0.68, 0.86]	<.001	1.11	[1.07, 1.15]	<.001
Level 1, daily level						
Daily report of positive consequences	0.90	[0.84, 0.97]	.006	1.01	[1.01, 0.99]	.364
Daily report of negative consequences	0.92	[0.86, 0.99]	.022	0.98	[0.95, 1.00]	.078
Daily report of positive expectancies	1.45	[1.33, 1.57]	<.001	1.10	[1.07, 1.13]	<.001
Daily report of negative expectancies	1.08	[1.01, 1.17]	.030	1.13	[1.10, 1.16]	<.001

Notes: OR = odds ratio; RR = rate ratio; CI = credible interval; *p* = posterior probability that OR/RR < 1 if OR/RR > 1, or OR/RR > 1 if OR/CR < 1. ^aAdjusted for fraternity/sorority membership, sex, baseline typical drinks per week, study period, and weekend.

FIGURE 2. Model-predicted number of drinks consumed if drinking according to prior-day negative alcohol-related consequences by levels of baseline typical drinks per week

drinking moderated the association between daily negative consequences and next-day drinking ($b = 0.03$, $p = .034$). As shown in Figure 2, those reporting lower levels of drinking at baseline (1 *SD* below the mean) showed a marginally significant negative association ($RR = 0.96$, $p = .070$), whereas those at high levels of baseline drinking (1 *SD* above the mean) showed no association ($RR = 1.02$, $p = .36$).

Discussion

Understanding the role of alcohol-related consequences on short-term changes in cognitions and drinking behavior has important implications. Alcohol-related consequences are key constructs in psychological theories of behavior. From a learning theory perspective (Bandura, 1977), effects experienced from alcohol should influence anticipation of experiencing those same effects. A feed-forward process among expectancies, alcohol use, and consequences has been demonstrated both cross-sectionally and longitudinally, although rarely at the daily level, especially for the less studied path between consequences and subsequent alcohol expectancies.

The present article focuses on alcohol-related consequences and associations with next-day alcohol expectancies and drinking. Examining short-term processes allows better understanding of whether there are immediate changes in expectancies and behaviors, whether these daily within-person associations are similar for positive and negative consequences, and for whom these associations are stronger.

Findings indicate that positive and negative consequences are associated with next-day expectancies and drinking in the hypothesized directions, even after between-person effects are controlled for, although findings are nuanced with respect to associations between consequences and subsequent alcohol use. It is evident that positive consequences

(regardless of true or perceived effects) are influential and consistently associated with increases in next-day positive expectancies and drinking (on drinking days), even while including both positive and negative consequences simultaneously in all models. For days when a student had a higher than average number of positive consequences, he or she had a 10% increase in drinks consumed the next day if drinking; further, post hoc analyses indicated that positive expectancies explained the association between positive consequences and amount of alcohol consumed the next day and may be a worthwhile target of intervention.

At the daily level, negative consequences were associated with greater next-day negative expectancies. However, there was no statistically significant association with alcohol use, which may indicate that experiencing negative consequences is not a deterrent for next-day alcohol use in this high-risk sample of college students, particularly in light of the co-occurring positive consequences. For lighter drinkers, negative consequences were marginally associated with less next-day drinking, whereas for heavier drinkers there was no association. Lighter drinkers may have less experience with consequences and may be more readily influenced by experience, yet heavier drinkers who have more drinking experience may be less influenced by the experience of consequences on a given day.

The within-person links between consequences and next-day expectancies and drinking were relatively consistent, with notable exceptions. The association between positive consequences and next-day positive expectancies was stronger for fraternity/sorority members. Prior research has documented that those in fraternities/sororities are at higher risk for heavy drinking and negative consequences. Consistent with research demonstrating a strong expectancy effect for subjective positive consequences (Jones et al., 2001; Leigh, 1999), fraternity/sorority members may already have

higher positive expectancies because of increased alcohol consumption.

The present research has limitations. Given the inclusion criteria, results may not generalize to lighter drinkers. Although we focused on immediate effects of experienced consequences on next-day expectancies and drinking, learning experiences are cumulative and not restricted from day to day (Martinez et al., 2014). We did not include subjective evaluations of alcohol consequences, which have been shown to predict future drinking and consequences (Barnett et al., 2015; Merrill et al., 2013). Our alcohol expectancy measure asked students to rate the likelihood of each effect if they were to drink that evening; findings may differ if a generic time frame were used. We analyzed data for consequences only on drinking days, which limited the number of observations per person, particularly those who were less frequent drinkers. Thus, statistical power may have been limited, particularly for cross-level interactions testing person-level moderators. However, there was fairly substantial within-person variability for consequences and expectancies (ICCs all < .43), which should improve the power to detect daily-level associations.

There are implications for alcohol expectancy theory (Jones et al., 2001), as we demonstrated that expectancies vary across days and are related to consequences, and positive expectancies explained the association between positive consequences and next-day drinking. Prior research has shown that alcohol expectancies can be malleable, especially in the context of in vivo alcohol expectancy challenge (e.g., Darkes & Goldman, 1993, 1998; Scott-Sheldon et al., 2012) and brief motivational interventions with college students (e.g., Black et al., 2012; Turrise et al., 2009; Yurasek et al., 2015). Interventions may alter the daily-link between consequences and subsequent or future drinking expectancies, especially positive expectancies, by providing real-time feedback to weaken the link between positive consequences and subsequent positive expectancies or increase the salience of negative consequences to increase negative expectancies.

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