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The relationship between unplanned drinking and event-level alcohol-related outcomes

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Abstract

Alcohol misuse among college students is a persistent public health problem. Identifying the circumstances which influence alcohol misuse can inform the development of interventions to reduce risk for adverse outcomes in this population. Prior research suggests that people who engage in unplanned drinking report more alcohol-related consequences, and that unplanned heavy drinking is associated with consequences at the within-person level. The present study involved exploration of the within-person relationship between drinking events that were unplanned (vs planned) in the morning and later quantity consumed, negative consequences, and overall event evaluations. College student drinkers (N=96) provided data on their drinking experiences each morning during a 28-day ecological momentary assessment study. Hierarchical linear models revealed that unplanned drinking events were associated with lower alcohol quantity, fewer alcohol-related consequences, and lower ratings on how "worth it" the drinking event was, compared to planned events. In contrast to prior work highlighting the risk associated with unplanned heavy drinking, our findings indicate that drinking events that are planned (vs unplanned) are related to increased consumption and the experience of negative consequences. Additional research is needed to more definitively assess the differences between planned and unplanned drinking events and their relationship to adverse alcohol-related outcomes among college students.

Keywords

alcohol use; college students; unplanned drinking; consequences; intentions

Alcohol misuse is a significant problem, specifically among college students, and heavy episodic drinking (4+/5+ drinks in one occasion for females/males) is especially dangerous and prevalent (SAMHSA, 2014). Each year an average of 1,800 students die, 597,000 are injured, and 97,000 are sexual assaulted as a result of alcohol use (Hingson, Zha, & Weitzman, 2009). Less severe consequences – such as experiencing a hangover or missing classes – are even more common (e.g., Barnett, Merrill, Kahler & Colby, 2015). These consequences can have both short and long-term effects on students, impacting their

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academic performance, personal relationships, and future health (Gruenewald, Johnson, Ponicki, & LaScala, 2010; White & Hingson, 2013). Despite these risks, college students continue to drink heavily (Mallett, Marzell, & Turrisi, 2011; Read, Merrill, Kahler, & Strong, 2007).

Both theory (e.g., Theory of Planned Behavior) and empirical evidence indicate that behavioral intention is one of the most significant and proximal determinants of actual behavior (Ajzen, 1991; Armitage & Conner, 2001). Behavioral intentions are defined as an individual's perceived likelihood to engage in a given behavior (Ajzen, 1991). Intentions represent the probability that - assuming the individual has control over their actions - they will actually engage in the behavior. The more control people have, or perceive themselves to have, the stronger the relationship is between intentions and behaviors (Armitage & Conner, 2001).

In a slightly different conceptualization of the construct of intent, Pearson and Henson (2013) developed the Model of Unplanned Drinking Behavior (MUDB). The model posits individuals are more likely to experience negative alcohol-related consequences as a result of drinking if the drinking was unplanned (no behavioral intent), in part because planned drinking requires a level of forethought not found in unplanned drinking (Pearson & Henson, 2013). Forethought is hypothesized to be linked to protective behavioral strategies (e.g., setting drink limits, avoiding drinking games). Pre-planning protects the individual from engaging in risky drinking behaviors by allotting themselves time to think about the upcoming event, their desired outcomes, and the steps needed to achieve those outcomes safely. Pearson and Henson also discussed the role of drug tolerance as a mechanism to explain why unplanned drinking might result in riskier outcomes. They suggested that the gradual association of internal and environmental cues with alcohol use may lead to increased tolerance and lower intoxication (Pearson & Henson, 2013). Elements of planned drinking events may act as drinking cues resulting in more tolerance, a feeling of less intoxication, and a reduced likelihood of negative alcohol-related outcomes. Contrariwise, unplanned drinking events may be associated with little to no drinking cues, resulting in less tolerance, more intoxication, and an increased likelihood for negative alcohol-related outcomes (Pearson & Henson, 2013).

Using a cross sectional survey design, Pearson and Henson examined unplanned drinking and number of experienced alcohol-related consequences. They developed a seven-item measure to assess unplanned drinking behaviors and administered it to participants during a 1-hour in-person appointment. Example items included: "I drink when I do not plan to drink," "I drink more than I originally planned to," "I begin drinking without really thinking about it," "I find myself drinking 'all of a sudden'" (Pearson & Henson, 2013). Participants scored each item using a 5-point Likert-type scale ranging from 1 = almost never/never to 5 = almost always/always. Participants who scored higher on the measure of unplanned drinking also reported a higher number of negative alcohol-related consequences after controlling for alcohol use (Pearson & Henson 2013). Of note, using cross-sectional data, the researchers examined unplanned drinking as a trait characteristic, but not at the event-level. In other words, the measure used only assessed a participant's prior frequency of unplanned drinking as a correlate of number of alcohol-related consequences experienced

within the past 30 days. Moreover, given that some of the items on this measure map closely onto the DSM-5 alcohol use disorder criterion of "Alcohol is often taken in larger amounts or over a longer period than was intended," it is not surprising that this measure was cross-sectionally related to alcohol consequences. Studies that instead examine unplanned drinking at the event-level, and as a prospective predictor of subsequent consequences, might better highlight whether and how unplanned drinking confers more immediate risk.

Yet, few studies have looked at the link between unplanned drinking or drinking intentions and consequences at the event-level. Among these, Lee, Patrick et al (2017) found that college students who consumed more than they expected to on the heaviest day of spring break also reported more consequences. Similarly, intentions to drink on a given day are associated with higher consumption that same day (Stevens, Littlefield, Talley & Brown, 2017). Most recently, Fairlie and colleagues (2019) conducted an event-level examination of outcomes of unplanned *heavy* drinking. As hypothesized, unplanned heavy drinking events were associated with more negative consequences on that same day. Of note however, this study compared "unplanned heavy drinking" (days where an individual crossed either the heavy episodic or high intensity drinking [8+/10+ drinks for women/men] threshold after having planned to drink less than that threshold) to all other drinking days. In other words, the comparison group included both heavy drinking days where heavy drinking was planned, and light drinking days (regardless of whether light drinking was planned). As such, unplanned drinking may have been confounded with heavy drinking, limiting conclusions about whether it was the unplanned (vs heavy) nature of drinking that conferred risk. To complement this work, the primary goal of the present study was also to conduct a within-person test of the link between whether a drinking event was unplanned and negative alcohol-related consequences; however, we sought to focus on whether *any* drinking on a day when drinking was not planned was associated with more consequences than planned drinking days.

We also sought to test whether unplanned vs planned drinking days were associated with a higher number of drinks consumed. Pearson and Henson (2013) found significant bivariate correlations between their measure of unplanned drinking and four alcohol use indicators over the past 30 days (typical quantity of use, heaviest quantity of use, typical frequency of use, and heaviest frequency of use). These results suggest a relationship between an individual's proneness to engage in unplanned drinking and their reported alcohol use, however it remains unclear whether drinking events that are unplanned that morning result in the consumption of more alcohol than planned drinking days. It is plausible that similar mechanisms through which unplanned *heavy* drinking leads to more consequences (e.g., lack of forethought and planning, lowered tolerance) might also be at play during a drinking event that was unplanned (regardless of how much was consumed). As such, unplanned drinking events could lead to more drinking and/or more consequences.

It is also possible, though not previously examined, that the way in which a drinking event is subjectively evaluated (i.e., how positive or negative the drinking event is rated) may differ between planned and unplanned drinking events. Merrill, Rosen, Boyle, and Carey (2018) found that the expectation of a negative consequence influenced later evaluations: unexpected consequences were evaluated more negatively than expected ones. Additionally,

work by Fairlie, Ramirez, Patrick, and Lee (2016) found experiencing negative consequences while drinking – such as feeling nauseated or vomiting, memory loss, and doing something embarrassing – were associated with less favorable evaluations of the drinking event and perceptions the event was less worth it. Assuming unplanned drinking events result in unplanned negative consequences, it would follow the drinking event may be evaluated more negatively and as less worth it than one which was planned.

Not much is known about unplanned drinking at the event-level and how it predicts event-level outcomes such as negative alcohol consequences, quantity of alcohol use, and the evaluations of the drinking event. Yet, predicting when heavy drinking and consequences occur at such a fine-grained level is important. If we can understand the situational circumstances which lead to undesired outcomes when drinking, we may be able to develop strategies to intervene within those circumstances to lower the risk associated with drinking and reduce negative outcomes.

The Present Study

The following study builds upon existing research to further understand the relationship between drinking that was unplanned by the morning and later-day alcohol-related outcomes at the event-level. We sought to test whether a drinking event that is unplanned (vs planned) that morning is associated with later (a) quantity of alcohol use at the event level, (b) negative (or positive) alcohol-related consequences at the event level, and (c) subjective evaluation of the overall drinking event. To answer these questions, we used data from a 28-day ecological momentary assessment (EMA) study. We hypothesized that days characterized by unplanned drinking would be associated with higher levels of alcohol consumption. Consistent with prior work (Fairlie et al., 2019; Pearson & Henson, 2013) we predicted within-person analyses would show more negative alcohol-related consequences on days in which an individual engaged in unplanned drinking than on days when he/she engaged in planned drinking. In addition, exploratory analyses offered an investigation of a potential within-person relationship between unplanned drinking and positive consequences, which to our knowledge has not be examined in prior research at either the within- or between-person level. Finally, we predicted unplanned drinking would coincide with a more negative evaluation of the overall event than planned drinking, due to the potential for a lack of expectation of negative alcohol-related consequences.

Methods

Participants and procedure

Participants were undergraduate college students (age 18–20) enrolled full-time at a northeastern university in the United States. Interested students were directed to an online screener to assess eligibility, and likely candidates were then redirected to an online baseline survey. Eligible participants reported drinking alcohol within the last 30 days with either (a) weekly heavy drinking episode (4+/5+ drinks in one occasion for females/males) or (b) reported at least 1 (of 10 assessed) negative alcohol-related consequence within the past two weeks. All measures and procedures were approved by the University Institutional Review Board.

A total of 100 participants completed a baseline survey, reported real-time and next day data on their alcohol use over 28 days of EMA, and attended one in-person follow-up interview. Individuals who reported consuming no alcohol during the 28 days of EMA (n=4) were removed from analyses. As such, the final sample for analysis consisted of 96 undergraduate college student drinkers.

During the EMA period, real-time and next-day data were recorded through surveys sent directly to participants' mobile devices via an application. Every day for 28 days participants were instructed to complete a morning report. Of note, on days participants engaged in drinking, they also were asked to complete a start drink report and hourly follow-up drinking reports. However, data for the analyses were taken only from the morning reports, for which we had more complete data and on which the measure of drinking intent was collected.

Measures

Demographic Information.—Demographic data collected in a baseline survey prior to the start of the EMA included gender, age, ethnicity, and year in college.

Alcohol use.—In the morning reports we asked about drinking the day before. We phrased the question in a yes/no format as follows: "Did you drink yesterday?" If yes, we asked respondents "How many drinks did you have yesterday?". All questions regarding alcohol use were based on one standard drink defined as 12oz. of beer; 5 oz. of 12% table wine; 12 oz. of wine cooler; or 1.25 oz. of 80-proof liquor.

Planned vs unplanned drinking.—In the morning reports we asked participants to "Estimate the number of days until your next drink (0=Today)". When a participant responded "0" (planned to drink again that day), and did in fact report drinking in the following morning report, the day was coded as a planned drinking day. When a participant responded with any number other than 0 (no plan to drink that day) but then reported prior-day drinking in the following morning report, the day was coded as an unplanned drinking day. As such, our primary predictor variable was a dichotomous indicator of whether each drinking day was planned or unplanned at the time of the morning report. We also used this variable to calculate a person-level aggregate of the proportion of all drinking days that were deemed as unplanned. The majority of drinking days (469 of 479) were able to be coded as either planned or unplanned. Exceptions included when the morning report of intention was missing (e.g., if prior night drinking was reported on Day 1 of the study, intention was unknown) or the morning report of drinking was missing.

Consequences.—On morning reports where prior day drinking was endorsed, participants were asked to identify any consequences they experienced as a result of their drinking the day before. The question was phrased "during/after drinking yesterday, did you…" followed by a list of 9 negative consequences and 7 positive consequences. Consequence items were derived from a daily study of consequences conducted by Lee, Cronce, et al. (2017), the Brief Young Adult Alcohol Consequences Questionnaire (Kahler Strong, & Read, 2005), the Positive Drinking Consequences Questionnaire (Corbin, Morean, & Benedict, 2008), as well as formative work conducted prior to the EMA study (Merrill et

al., 2018). The negative consequences included: embarrass yourself, become rude or obnoxious, hurt or injure yourself by accident, feel nauseated or vomited, behave aggressively, neglect school-related obligations, forget what you did, have a hangover, and drive a car when you knew you had too much to drink. The positive consequences included: express your feelings more easily than usual, feel more energetic than usual, feel in a better mood than usual, become more sociable than usual, feel more relaxed than usual, feel buzzed, and sleep better. For the purposes of this analysis we used a continuous summed variable of the total number of positive consequences each participant reported during the EMA taken from the morning reports. However, given the preponderance of zeroes on number of negative consequences at the daily level (54.2%), for analyses, we dichotomized this variable into any negative consequence (1) versus none (0).

Overall Evaluation of Drinking Event.—In the morning reports, two items were used to assess overall evaluation of the drinking event, consistent with prior work by Fairlie and colleagues (2016). First, we asked about participants' overall evaluation of the previous drinking event with the question "Thinking about your overall drinking experience yesterday, how would you rate the experience?" Participants rated the event on a 7-point Likert scale from −3 = extremely negative to +3= extremely positive. Second, we asked about participants' overall evaluation of how "worth it" the previous drinking event was for them. The question was phrased "Thinking about the whole drinking experience yesterday, the positive and the negative, how much was it worth it?" Participants answered on a 7-point Likert scale rating "worth it" from 0 = not at all to +6=very.

Survey submission date and time.—The application automatically coded survey submission date and time. This allowed us to calculate variables to be used as model covariates, including day in the study (1–28), morning report submission time, and weekend (Friday, Saturday) versus weekday.

Data Analytic Plan

We used Hierarchical Linear Modeling (HLM) to address our primary research questions examining unplanned drinking as a predictor of five separate outcomes: (a) number of drinks consumed, (b) likelihood of a negative consequence (c) number of positive consequences (d) overall experience ratings, and (e) overall worth it ratings. The HLM approach is ideal given that the data was derived from longitudinal daily measurements nested within persons and spacing between observations (days between drinking events) varied from one participant to the next. Additionally, the multilevel nature of HLM allowed for both Level 1 or within-person predictors of variation (e.g., whether event-level differences between planned and unplanned drinking events determine drinking outcomes), and Level 2 or between-person predictors of variation (e.g., proportion of planned vs unplanned drinking days) in those outcomes to be modeled (Raudenbush & Bryk, 2002). Analyses were conducted using the HLM 7.01 program (Raudenbush, Bryk, & Congdon, 2013), with full maximum likelihood estimation.

Analysis began with a screen for missing data. At the individual level, four participants from the original sample of 100 were deleted listwise from analyses, due to a lack of reported

alcohol use during the 28-day study. Across the final analytic sample (N=96), missing data at the day-level was minimal as 98.7% (2653) of morning reports were submitted. A multilevel person-period dataset was created with observations representing the potential daily occasions of the predictor (planned and unplanned drinking) and outcomes (next day alcohol use, consequences and overall event evaluations), nested within the final sample size of 96 persons. An example HLM model, testing our first hypothesis (unplanned drinking days will be associated with higher alcohol quantity), is depicted below:

$$\text{Level-1 Model Total Drinks}_{ij} = \Pi_0 + \Pi_1 * (\text{Day in Study}_{tj}) + \Pi_{2i} * (\text{Unplanned Day}_{tj}) + \Pi_{3i} * (\text{Weekend}_{ti}) * + \Pi_{4i}(\text{Time Survey Submitted}_{ti}) + E_{ij}$$

$$\text{Level-2 Model } \Pi_0 = B_{00} + B_{01} * (\text{Sex}_i) + B_{02} (\text{Proportion Unplanned Days}_i) + R_{0i}$$
$$\Pi_1 = B_{10}$$
$$\Pi_2 = \mathbf{B_{20}}$$
$$\Pi_3 = B_{30}$$
$$\Pi_4 = B_{40}$$

In the Level-1 model, the dependent variable Total Drinks$_{ij}$ is the individual i's alcohol use quantity on day j. The intercept Π_0 is the average day's quantity for the individual, and the corresponding B_{00} (shown in Level 2 equation) is the grand mean of the outcome (total drinks), across all individuals and time points, controlling for all other variables in the model. Of primary interest is the $\mathbf{B_{20}}$ coefficient (at Level 2, the average of the slope effect at Level 1 of Π_{2i}*(Unplanned Day$_{ij}$)), which represents the difference in number of total drinks consumed between an unplanned and planned drinking day. At Level 1, we covaried for (1) day in study (1–28) to account for potential change in drinking behavior over time, (2) whether each day was a weekend (Friday, Saturday) or weekday given increased drinking on weekends, and (3) the time the survey was submitted as an individual may have more accurate knowledge of drinking plans if reporting later in the day. Additionally, at Level 2, we controlled for sex differences in outcomes. Further, inclusion of the individual's proportion of unplanned drinking days allowed us to covary (and examine effects of) an individual's tendency to engage in unplanned drinking on their level of alcohol use. Inclusion of this between-person effect allowed us to isolate the unique influence of unplanned drinking on alcohol use quantity at the event-level.

We tested for violations of the assumptions of HLM in all final models. We initially included random slopes in all models, but all (with the exception of the slope of total drinks on positive consequences) were non-significant and therefore removed for parsimony; intercept effects were modeled as random to account for mean differences in outcomes across participants. We relied on robust standard errors for significance tests of final reported models. Level 1 and Level 2 residuals of final models were normally distributed. Finally, as noted, we included a person-level aggregate of unplanned drinking at Level 2 to truly isolate the effect of unplanned drinking at the event level.

Results

Descriptive Statistics and Bivariate Correlations

Participant demographics and baseline variable descriptive statistics for all study participants can be found in Table 1. The majority of students were first year students (80.2%), White (71.9%) and female (52.1%). Table 2 shows descriptive statistics for outcome variables during all drinking events as well as separately by whether the drinking event was planned or unplanned. Among the total sample of 96 drinkers, there were 94 reported unplanned drinking events and 375 planned drinking events, accounting for 20% and 80% of total reported drinking events respectively. In other words, most of the time when students drank, they knew earlier that day they were going to drink. Likewise, on the majority (88%) of non-drinking days, participants accurately reported in the morning that they did not plan to drink that day.

While most (78.4%) morning reports were submitted before noon, submission timing ranged from 7:01 am to 10:44 pm, with an average time of 10:39 am. Time that drinking events were reported to have begun also varied, ranging from 9:00 am to after midnight, with an average time of 8:07 pm. On average across all events, there were 10.31 hours between the two assessments. In other words, there was an average of about 10 hours between stating an intention regarding whether to drink that day, and (on drinking days) actually starting to consume alcohol.

Significantly more planned (85%) vs unplanned (60%) drinking days fell on a weekend ($x^2 = 28.21$, $p < .001$; $\Phi = 0.25$). There also were significant differences in the percentage of unplanned (15.67%) vs planned (84.33%) drinking days on which a negative consequence was endorsed ($x^2 = 4.82$, $p < .028$; $\Phi = 0.58$). Additionally, as shown in Table 2, t-tests revealed significant differences between planned and unplanned events in average total drinks and average negative consequences, providing preliminary support for unplanned drinking events as distinct from planned drinking. Using Cohen's d, the effect size for the difference in drinks was medium, and the effect size for the difference in consequences was small (Cohen, 1988). It should be noted t-test values do not account for nesting of repeated days within participants, justifying the need for subsequent multilevel models (below).

Bivariate correlations were first computed among model outcome variables at Level 1 to assess the individual strength and directionality of their relationship with unplanned drinking at the event-level. As can be seen in Table 3, unplanned (vs planned) drinking at the event-level was significantly associated with fewer total drinks, fewer negative consequences, and fewer positive consequences. Using variables aggregated across events for each person, correlations at Level 2 were computed to examine between-person differences in unplanned drinking and outcome variables. As reported in Table 3, a higher proportion of unplanned drinking days was significantly correlated with fewer average number of positive consequences reported during the course of the study. While not significant, there was also a trend between a higher proportion of unplanned drinking days and fewer average number of negative consequences.

Hierarchical Linear Models

The full results of HLMs predicting each of the five study outcomes are presented in Tables 4 and 5. While our primary research questions center on the event-level (Level 1) impact of unplanned drinking, we also examine and comment below on the person-level (Level 2) impact of a higher proportion of unplanned drinking days.

Number of drinks consumed.—At Level 1, contrary to hypotheses, events characterized by drinking that was unplanned that morning were associated with fewer total drinks. At Level 2, there was no association between an individual's proportion of unplanned drinking days and total drinks (Table 4).

Likelihood of a negative consequence.—At Level 1, contrary to hypotheses, events characterized by drinking that was unplanned that morning were associated with a lower likelihood of a negative consequence. Students were 40% less likely to report a negative consequence following an unplanned drinking event than a planned drinking event (Table 5). At Level 2, an individual's proportion of unplanned drinking events was not significantly associated with negative consequences in either model (Table 5).

Once alcohol use (person-centered, to represent deviations from the individual's own average number of drinks over time) was controlled, the effect of unplanned drinking was no longer significant. This, combined with the effect of unplanned drinking on number of drinks described above, suggested that alcohol use may mediate the relationship between unplanned drinking and negative consequences (Krull & MacKinnon, 2001). As such, the magnitude of mediated effects and asymmetric confidence intervals (CIs) were calculated (Tofighi & MacKinnon, 2011) to determine whether mediated effects were significant. However, the indirect effect of unplanned drinking on consequences, through alcohol use, was non-significant ($B = -0.72$, $SE = 0.18$; 95% CI = −1.54, 0.10).

Number of positive consequences.—At Level 1, whether a drinking event was planned versus unplanned that morning was not associated with positive consequences. Conversely, there was a significant effect at Level 2, showing that individuals with a higher proportion of unplanned drinking events reported significantly fewer positive consequences on average. This effect remained significant in a subsequent model controlling for total number of drinks (person-centered) (Table 5).

Overall experience ratings.—At Level 1, whether a drinking event was planned versus unplanned that morning was not associated with overall experience ratings. There also was no association between an individual's proportion of unplanned drinking days and overall experience ratings at Level 2.

Overall "worth it" ratings.—At Level 1, events characterized by drinking that was unplanned that morning were associated with lower overall "worth it" ratings than planned events. However, at Level 2, individuals with a higher proportion of unplanned drinking events reported significantly higher "worth it" ratings (Table 5). We ran an additional exploratory model to isolate whether unplanned drinking influenced perceptions of how worth it an event was even when controlling for negative consequences; both Level 1 (B=

−0.40, *SE*=0.16, *p*=.016) and Level 2 effects of unplanned drinking (*B*=0.69, *SE*=0.36, *p*=.054) remained significant in this subsequent model, suggesting that at increase in negative consequences on unplanned days did not fully explain the observed association.

Discussion

Using event level data, we investigated the comparative risk of drinking events that were unplanned versus planned that morning in relation to quantity consumed and alcohol-related consequences. In addition, we examined whether planned versus unplanned drinking events are subjectively evaluated differently the next morning. The minority (20%) of drinking events were unplanned the morning on which they occurred. Inconsistent with hypotheses based on prior cross-sectional research on this association at the between-person level and event-level research on unplanned heavy drinking, we found that drinking events that were not planned that morning was associated with lower alcohol quantity than planned drinking events. Unplanned drinking events were also characterized by a lower likelihood of a negative alcohol-related consequence (e.g., blackouts, hangovers) than planned events. Furthermore, we found unplanned drinking events were subjectively evaluated by students as less “worth it” than planned events. In contrast, individuals who had more unplanned drinking events over the study rated their drinking events as more “worth it” on average (person-level). We did not see any effects of unplanned drinking at the person-level on either alcohol quantity, likelihood of negative consequences, positive consequences, or overall event evaluations.

Of note, in a subsequent model predicting negative consequences while controlling for drinking, the effect of unplanned drinking events on negative consequences was no longer statistically significant at the event-level. While this was suggestive of mediation (such that the reason unplanned events are associated with a lower likelihood of negative consequences may in part be because of lower levels of alcohol use on those events), the mediation effect was non-significant. As such, future research that examines alternative mechanisms in the link between unplanned drinking events and negative consequences, and/or studies with larger samples more adequately powered to test mediation, are warranted.

This study was initially motivated by Pearson and Henson (2013)’s cross-sectional findings that individuals who engaged in more unplanned drinking also consumed more alcohol and experienced more consequences. This work led to our questions about whether unplanned drinking is a situational circumstance associated with increased risk of negative alcohol-related outcomes. More recent findings from Fairlie and colleagues (2019) highlighted the higher levels of negative consequences on specific events where heavy drinking occurred but was not planned. In the present study, our event-level results suggest that simply engaging in drinking (at any level) when it is not planned that morning does not increase event-level risk for more drinking or negative alcohol related outcomes (e.g., blackouts, nausea) later that day (10 hours later, on average) among college student drinkers.

Inconsistent with Pearson and Henson (2013), even our person-level indicator of unplanned drinking (the proportion of drinking days that were unplanned) was not associated with total drinks or negative consequences. This finding was more consistent with Fairlie et al (2019),

where number of unplanned heavy drinking days also was not associated with negative consequences. In the present study, unplanned drinking events were captured when participants reported no intention to drink in the morning but later endorsed previous-day alcohol use in the following morning report. Pearson and Henson's unplanned drinking measure did not assess unplanned drinking as a concrete event distinct from planned drinking. Rather, their measure captured a mix of unplanned drinking behaviors over the past 30 days, including both drinking more than one originally may have planned at an event, as well as situations in which an individual ended up drinking (at all) despite having planned not to. Such a measure may have been more analogous with the construct of impaired control; Pearson and Henson acknowledge similarities between their measure and the Impaired Control Scale (Heather, Tebbott, Mattick, & Zamir, 1993; Heather, Booth, & Luce, 1998). As it relates to alcohol use, impaired control is defined as an individual's ability - and perceived ability - to control their drinking behavior over time (Heather et.al. 1998). Further research is needed to (a) determine the extent of the similarities between impaired control and the Pearson and Henson unplanned drinking scale, and (b) explore the differences between unplanned drinking as a behavioral pattern versus as a discrete event.

Despite being inconsistent with our expectations based on the prior work that motivated our analysis, our findings that it was the drinking events that were planned by that morning which resulted in heavier drinking and more negative consequences are not too surprising, and do align with other work. We believe there may be two possible explanations for our findings. First, as noted, intention is a strong predictor of behavior (Ajzen, 1991; Armitage & Conner, 2001). Thus, it stands to reason that events organized around a deliberate intention to drink may be more likely to result in higher alcohol consumption and more alcohol-related consequences. In fact, our findings are consistent with a recent daily diary study showing that intentions to drink on a given day are associated with higher consumption that same day (Stevens et al., 2017). It is possible students in our study did not consume as much alcohol or experience as many negative consequences on unplanned days because of differences in their behavioral intention between planned and unplanned events. Unplanned events are not preceded by a deliberate intent to drink, and may rather be a moment-based decision. As a result, this lack of intention to drink at all may lead to less drinking quantity during these events, reducing the risk of adverse alcohol-related outcomes, rather than the previously theorized impulsive excessive consumption leading to increased risk. Additional research is needed to clarify the characteristics of unplanned and planned drinking events and how these characteristics impact alcohol use and consequences.

Another potential reason for our finding that planned events were associated with higher levels of use and consequences may be differences in the nature of drinking events that are planned versus unplanned. Indeed, Fairlie et al (2019) found specific contexts increased the likelihood of unplanned heavy drinking days. While unable to be gleaned from our data, we suspect planned drinking events may have more likely involved larger gatherings such as birthday celebrations and fraternity parties. These types of parties typically encourage alcohol use and are often planned for the purpose of drinking – and drinking heavily. As a result, these events may come with a greater risk for adverse alcohol-related outcomes. On the other hand, unplanned events may instead involve smaller gatherings (such as dinners and movie nights), which may be more relaxed in nature, include smaller groups of people,

and not be organized specifically for drinking. Although speculative, these unplanned events may involve a lack of intention to drink and/or a social context that decreases the risk for adverse alcohol-related outcomes.

There was no effect at the event-level between unplanned drinking events and positive consequences. Relative to negative consequences, positive consequences were reported at higher numbers across the board and at equal levels on both planned and unplanned events. However, we did find an effect of unplanned drinking on positive consequences at the person-level. Students who tended to have more unplanned drinking days reported fewer positive consequences on average. As such, we suspect the link between unplanned drinking and positive alcohol-related consequences may have more to do with the individual and their typical drinking behaviors than the event itself.

Investigating the timing in which participants experience consequences during a drinking event may also help better contextualize these findings. If positive consequences occur earlier in a drinking event while intoxication levels are low, then whether the event was planned or unplanned may have no impact on the number of reported positive consequences. Additionally, if negative consequences occur later in a drinking episode when intoxication levels are higher, the nature of the event as planned or unplanned may then have an impact on reported consequences due to differences in alcohol consumption levels.

Lastly, we examined links between unplanned drinking and two indicators of one's overall perception of a drinking event. We found no association between whether the event was planned or unplanned and a student's overall evaluation (positive vs negative) of a drinking event. However, we saw significant effects of unplanned drinking on ratings of the degree to which the drinking event was "worth it," but in opposite directions at the event vs person-level. Specifically, unplanned drinking events were associated with lower "worth it" ratings at the event-level (negative effect), consistent with our hypothesis. However, at the person-level, individuals with more unplanned drinking events had higher average "worth it" ratings on average across their drinking events (positive effect). It is possible, at the event-level these events were perceived as less "worth it" due to the less exciting or celebratory nature of the unplanned events students were attending compared to the planned events they attended. Alternatively, there may be something about individuals who have a tendency to engage in more unplanned drinking that also leads them to evaluate their drinking events as more "worth it". Whether this is a function of their personality or their perception of the risks for adverse alcohol-related outcomes at different events is unknown. Additional research is needed to explore the direction of, and the potential influencing factors on, the relationship between subjective evaluations and unplanned drinking.

Limitations

This study was not without limitations. First, a particularly important limitation is the timing of assessment used to determine planned vs unplanned drinking in this study. To be defined as an unplanned drinking event, self-report had to involve no intention to drink that day reported on the morning report (on average around 10:30 am), followed by a report the next morning indicating that alcohol was in fact consumed the prior day. This method assumed that intention in the morning (versus later in the day, closer to actual drinking events) is what

matters. Yet, some of the mechanisms by which unplanned drinking is posited to influence heavier drinking and/or negative consequences, such as situation-specific tolerance or planning and forethought, may occur much closer in time and/or even during the actual drinking event. While we controlled for the time that a morning report was submitted, future work would benefit from a more proximal assessment of planned vs unplanned drinking, as well as inclusion of measures of potential mechanisms of the effect of unplanned drinking on heavier use and/or consequences.

Second, we cannot confirm that our method captured unplanned drinking as an event separate from elements of impaired control or impulsivity. Our person-level indicator of unplanned drinking (an aggregate representing the proportion of one's drinking days that were not planned by that morning) was designed to serve as a proxy for Pearson and Henson (2013)'s method of assessment; however, because we did not use their measure of unplanned drinking, our person-level findings are not entirely comparable with theirs. Similarly, we did not measure other person-level characteristics that may be involved in unplanned drinking. For example, Stevens et al (2017) found that intentions to drink mediated links between certain aspects of impulsivity and actual level of drinking. Future work that continues to clarify the types of individuals at greatest risk of the potential consequences of planned vs unplanned drinking is needed.

Yet another limitation lies in our restricted measurement of alcohol consequences. So as not to overburden participants, only a small subset of all possible negative and positive consequences of drinking were included in this study. Further, as none of the negative consequences assessed were endorsed on most drinking days, we were only able to predict presence of any (vs no) negative consequences. Future studies with more detailed consequence assessments may provide opportunities to examine unplanned drinking as a predictor of total number of negative consequences experienced on a drinking event, as well as whether particular types of consequences may be most likely to occur when drinking is unplanned.

Further, whereas unplanned drinking may involve either or both (1) drinking when there was no intention of drinking and (2) drinking beyond one's intentions, the present study was only designed to capture the former. As such, we cannot draw conclusions about the event-level risk of drinking more than planned with our data. Moreover, we may have missed some unplanned events that could not be identified when data were missing, or that occurred further in the future. For example, individual's may have reported days where they planned to drink in 5 days but instead drank in 3 days (unplanned), however these events were not included in our analyses. We also captured a significantly smaller number of unplanned than planned events. This may have limited our ability to compare to the two event types and may have impacted the significance of our findings. Lastly, we used single item measures to assess students' "worth it" ratings and overall evaluations of events. Because we were using frequent (i.e., daily) measures, these single-item measures were necessary to reduce participant burden, but their reliability and validity are unclear.

Conclusion

This study builds upon existing research to further understand the relationship between unplanned drinking and alcohol-related outcomes at the event-level. Alcohol misuse is a serious public health problem among college students; understanding the situational circumstances which increase the risk of adverse outcomes when drinking is essential to developing effective strategies to intervene within those circumstances and lower that risk. Unplanned drinking has been theorized to be one such circumstance in which the likelihood of adverse alcohol-related outcomes may be especially high. Ultimately our findings instead suggested that drinking that is planned by the morning may be a circumstance in which the risk for adverse alcohol-related outcomes is higher in this sample of primarily first-year college drinkers. Future research is needed to more definitively assess the differences between planned and unplanned drinking and their relationship to adverse alcohol-related outcomes among college students.

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Table 1:

Participant Demographics and Baseline Descriptive Statistics (n=96)

DEMOGRAPHICS AND BASELINE VARIABLES	*N (%) / M (SD)*
SEX (FEMALE)	50 (52.1%)
AGE	18.67 (0.66)
YEAR IN COLLEGE	
FIRST YEAR	77 (80.2%)
SECOND YEAR	15 (15.6%)
JUNIOR	3 (3.1%)
SENIOR	1 (1.0%)
RACE	
WHITE	69 (71.9%)
BLACK	7 (7.3%)
ASIAN	22 (22.9%)
NATIVE AMERICAN	1 (1.0%)
NATIVE HAWAIIAN	1 (1.0%)
OTHER	5 (5.2%)
HISPANIC ETHNICITY	14 (14.6%)

Table 2:

Descriptive Statistics, T-tests and Effect Sizes for Outcome Variables on Planned and Unplanned Drinking Days

	ALL DRINKING EVENTS			UNPLANNED	PLANNED			
	Min	**Max**	***M(SD)***	***M (SD)***	***M (SD)***	***t***	***p***	**Cohen's *d***
TOTAL DRINKS	1	17	5.23 (2.85)	3.76 (2.33)	5.61 (2.90)	−5.82	.039	0.70
NEGATIVE CONSEQUENCES	0	6	0.79 (1.10)	0.48 (0.79)	0.88 (1.16)	−3.11	.001	0.40
POSITIVE CONSEQUENCES	0	8	2.49 (1.86)	1.86 (1.80)	2.61 (1.85)	−3.51	.904	0.41
WORTH IT	0	6	4.07 (1.33)	3.89 (1.30)	4.09 (1.35)	−1.27	.709	0.15
OVERALL EVALUATION	−3	3	1.43 (1.17)	1.42 (1.05)	1.43 (1.21)	−.054	.213	0.01

Note: N=96; There was also a significant difference between endorsement of any negative consequence between unplanned (15.67%) and planned (84.33%) drinking days ($x^2 = 4.82$, $p < .028$).

Table 3:

Within Person (below diagonal) and Between Person 2 (above diagonal) Correlations Among Model Variables

	1	2	3	4	5	6	7	8	9
1. **UNPLANNED**	1	−0.20	−0.18	−0.43**	0.10	0.05	-	-	-
2. **TOTAL DRINKS**	−0.26**	1	0.18	0.10	−0.06	−0.05	-	-	-
3. **NEGATIVE CONSEQUENCES**	−0.14**	0.35**	1	0.56**	−0.17	0.23*	-	-	-
4. **POSITIVE CONSEQUENCES**	−0.16**	0.23**	0.35**	1	0.34	0.13	-	-	-
5. **WORTH IT**	−0.06	0.03	−0.18**	0.18**	1	0.75**	-	-	-
6. **OVERALL EVALUATION**	−0.00	0.01	−0.22**	0.21**	0.77**	1	-	-	-
7. **WEEKEND**	−0.25**	0.48**	0.10*	0.13**	0.04	0.01	1	-	-
8. **HOUR SURVEY SUBMITTED**	−0.04	0.07**	0.06	0.02	−0.01	−0.01	0.14**	1	-
9. **STUDY DAY**	0.04	−0.11**	0.05	−0.18**	−0.03	−0.01	−12**	0.07**	1

Note: N=96; At Level 2, Unplanned represents the proportion of all drinking days that were unplanned.

** indicates significance p<.01

Table 4:

Hierarchical Linear Models Predicting Total Drinks, Overall Evaluations, and Worth It Ratings

	Predicting total drinks				Predicting overall evaluation				Predicting worth it			
	B	**SE**	***t***	***p***	**B**	**SE**	***t***	***p***	**B**	**SE**	***t***	***p***
Intercept	3.17	0.45	6.99	<0.001	1.48	0.25	5.90	<0.001	3.97	0.29	13.48	<0.001
Level 1 effects												
Unplanned drinking day	−1.60	0.29	−5.60	<0.001	−0.10	0.13	−0.78	0.439	−0.36	0.16	−2.22	0.027
Study day	−0.00	0.01	−0.28	0.783	−0.00	0.01	−0.32	0.749	−0.00	0.01	−0.41	0.679
Weekend	1.05	0.23	4.53	<0.001	0.07	0.12	0.54	0.588	0.22	0.14	1.63	0.104
Submit time	0.06	0.04	1.60	0.112	0.00	0.02	0.18	0.860	0.01	0.02	0.36	0.722
Level 2 effects												
Sex (male=l, female=0)	1.51	0.40	3.78	<0.001	−0.19	0.14	−1.37	0.174	−0.12	0.17	−0.68	0.500
Proportion unplanned days	0.44	0.76	0.58	0.564	0.32	0.29	1.11	0.272	0.71	0.36	1.98	0.050

Table 5:

Hierarchical Linear Models Predicting Negative and Positive Consequences, with and without Controlling for Drinks

	Negative consequence likelihood		Negative consequence likelihood controlling drinks		Number of positive consequences				Number of positive consequences controlling drinks			
	OR	**95% CI**	**OR**	**95% CI**	**B**	**SE**	***t***	***p***	**B**	**SE**	***t***	***p***
Intercept	0.59	(0.208, 1.701)	0.86	(0.269, 2.756)	1.96	0.37	5.35	<0.001	2.13	0.36	5.91	<0.001
Level 1 effects												
Unplanned drinking day	0.60	(0.370, 0.988)	1.17	(0.691, 1.967)	−0.14	0.20	−0.70	0.485	0.19	0.21	0.92	0.357
Study day	1.00	(0.982, 1.026)	1.01	(0.986, 1.034)	−0.05	0.01	−5.02	<0.001	−0.05	0.01	−5.29	<0.001
Weekend	1.26	(0.764, 2.085)	0.83	(0.474, 1.463)	0.68	0.22	3.15	0.002	0.47	0.20	2.42	0.016
Submit time	1.01	(0.936, 1.092)	0.98	(0.909, 1.065)	0.05	0.03	1.37	0.171	0.04	0.03	1.14	0.257
Total drinks	-	-	1.57	(1.354, 1.813)	-	-	-	-	0.20	0.04	5.10	<0.001
Level 2 effects												
Sex	1.15	(0.656, 2.011)	1.18	(0.621, 2.252)	0.12	0.27	0.47	0.641	0.17	0.26	0.66	0.510
Proportion unplanned days	0.80	(0.214, 2.988)	0.34	(0.077, 1.503)	−1.85	0.60	−3.08	0.003	−2.20	0.59	−3.72	<0.001