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ORIGINAL ARTICLE

Drink monitoring for self and others: precollege drinkers and the *Bad-Habit-Formation Hypothesis*

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ABSTRACT

Background: Past research has demonstrated that precollege alcohol consumption is related to college alcohol consumption. But whether precollege drinking is also related to drinking-related behaviors, such as drink monitoring, is unknown. Some have argued that precollege drinking, as a form of experience, should be related to the performance of positive drinking-related behaviors (*learning-from-experience hypothesis*) whereas others have argued that, given the environment of precollege drinkers, it should be related to negative drinking-related behaviors (*bad-habit-formation hypothesis*).

Methods: A cross-sectional survey of college students ($n = 284$) at a large Midwestern university in the U.S. Participants completed measures of precollege drinking, college drinking, fraternity membership, and responsible drinking behaviors.

Results: Precollege drinkers were more likely to engage in college drinking; the former explained 12% of the variance in the College Drinking Scale, above and beyond other predictors. Precollege drinkers were less likely to monitor their own alcohol consumption or the consumption of their friends.

Conclusions: Precollege drinkers were less likely to monitor their own drinking and the drinking of friends, consistent with the *bad-habit-formation hypothesis*; that is, the notion that early drinking experiences cultivate the formation of irresponsible drinking behaviors.

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Precollege drinking; high school drinking; bad-habit-formation hypothesis; learning-from-experience hypothesis; drink monitoring

To better understand college drinking behaviors and beliefs, Wechsler and colleagues (Wechsler et al. 1995) surveyed approximately 18,000 undergraduates across 140 American colleges and universities. They found that younger, White, male students were more likely to binge drink, as were those living in dormitories, marijuana users, and smokers (Wechsler et al. 1995). Yet the three biggest predictors of college binge drinking were (1) the belief that parties were important, (2) living in a fraternity, and (3) precollege binging.

Knowing that drinking increases during college, many universities target first-year students with intervention approaches in order to reduce drinking and problems associated with drinking (e.g., Grossbard et al. 2016). However, these programs are often based on assessments of current drinking behavior, while less is known about how to engage with students based on precollege behaviors (Cleveland et al. 2012; Mallett et al. 2011; Scaglione et al. 2015; Varvil-Weld et al. 2013). The current study focuses on precollege drinking behavior – notably, drinking during high school – as a risk factor for college binge drinking.

The relationship between precollege and college drinking is intriguing as it highlights that college binge drinking is, in part, a continuation or transitional behavior (see, e.g., Baer et al. 1995; Stappenbeck et al. 2010). Drinking is a behavior that unfolds over time in somewhat predictable trajectories (Chassin et al. 2002). Studying transitional periods can illuminate potential changes in an individual's life that have the power to influence behavior. One of the reasons college students binge drink is because they were engaged in that behavior prior to college, and the college environment may foster or exacerbate these prior drinking habits (Mallett et al. 2011). For example, past research suggests that precollege drinkers are more likely to join fraternities (Borsari and Carey 1999).

Past research suggests that precollege drinking is related to college drinking, but one source of tension in the literature is the extent to which prior drinking experience shapes responsible, or safe, drinking behaviors. On the one hand, precollege drinking constitutes a form of experience, and, in other domains, that can translate to optimal decision making and superior performance (Ahissar and Hochstein 2004; Collins and Evans 2002; Gobet et al. 2001; Plomin et al. 2014). Consistent with this *learning-from-experience hypothesis*, Howard and colleagues (Howard et al. 2007) noted that college drinkers referenced high school drinking experiences as a key to the adoption of responsible behaviors in college. Likewise, Nguyen and colleagues (Nguyen et al. 2013) found that heavy drinkers who had recently experienced harm had intentions to engage protective drinking behaviors. On the other hand, past research also suggests that adolescent drinkers often do not learn from mistakes (Mallett et al.

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2006) and underage drinkers have less intention to drink responsibly (Barry et al. 2014). If adolescent/underage drinkers are less likely to engage in responsible drinking, then that could be consistent with a *bad-habit-formation hypothesis*. Early drinking experiences actually work against the adoption of responsible drinking behaviors, perhaps because aspects of the environment facilitate the formation of bad or unsafe habits.

To better understand the relationship between precollege drinking, college drinking, and responsible drinking behaviors, a survey was conducted to (1) replicate the previously reported relationship between precollege and college drinking and (2) examine whether precollege drinking is related to responsible drinking behaviors (e.g., Barry et al. 2014; Barry & Goodson, 2014; Collins et al. 1996; Howard et al. 2007).

Methods

Participants and procedure

A cross-sectional survey was developed to measure students' attitudes and current behaviors regarding alcohol consumption. All participants accessed and completed the survey online. Participants received extra credit for completing the study. The protocol was reviewed, approved, and monitored by a university institutional review board (IRB).

The sample consisted of students enrolled in communication classes at a large, Midwestern university. Sampling communication classes represents an adequate cross-section of the student body, as almost all of the departments at the university require at least one communication class for degree completion.

Initially, 331 students completed the survey. Of those, 47 students reported being abstainers in college; those students were removed from this analysis as their responses to current drinking questions would not be meaningful. Thus, the final sample was 284.

Eight variables were measured and included as controls to account for known predictors of drinking behavior. Age, sex, race, grand point average (GPA), year in school, whether parents graduated from college, number of close friends, participation in intercollegiate sports have all been identified as predictors of college drinking behavior (Wechsler et al. 1995). In addition, individuals involved in fraternities and sororities are likely to drink more than those who are not in a fraternity or sorority (Cashin et al. 1998; Wechsler et al. 1995). Finally, students reported whether they had a traumatic drinking experience in their past.

The mean age was 19.61 ($SD = 1.44$), ranging from 18-26. The participants were predominantly female ($n = 160$; 56.1%) and Caucasian ($n = 251$; 88.1%). Other race/ethnicities represented in the sample were Asian ($n = 15$; 5.3%), African American, ($n = 6$; 2.1%), Latino ($n = 6$; 2.1%), Native American/American Indian ($n = 1$; 0.4%), and other ($n = 11$; 3.9%). The mean GPA was 3.08 ($SD = .45$). The U.S. Census estimates that approximately 50.8% of Americans are female and 76.9% are Caucasian (U.S. Census Bureau 2017); thus, in addition to education differences, our sample is more female and more Caucasian than U.S. adults in general. Most participants ($n = 207$; 72.6%) had at least one parent who had graduate from college. The mean number of close friends was 13.43 ($SD = 17.67$). Fraternity/sorority members and pledges accounted for 29.5% of all participants. Thirty-one students (10.9%) reported that they spent 6 or more hours a week participating in intercollegiate sports. Approximately one-third of participants ($n = 85$; 29.8%) reported a prior drinking experience they would label as traumatic. By year in school, the sample was freshman ($n = 117$; 41.1%), sophomore ($n = 76$; 26.7%), junior ($n = 37$; 13.0%), senior ($n = 51$; 17.9%), and did not report year in school ($n = 4$; 1.4%).

Measures

Controls

Eight variables were included as controls: Age, sex, race, GPA, year in school, whether parents graduated from college, number of close friends, participation in intercollegiate sports, fraternity/sorority affiliation, and prior traumatic drinking experience. The latter was included as past research has shown a correlation between traumatic drinking experiences and drinking behavior (e.g., Saunders et al. 1993).

Precollege Drinking

Drinking behavior in high school has been found to predict drinking in college (Wechsler et al. 1995). In line with Huang et al. (2006), drinking behavior in high school was measured on a 4-point scale with response options *abstainer* (scored 1), *light drinker* (2), *moderate drinker* (3), and *heavy drinker* (4). Per Wechsler et al. (1995), participants were instructed that abstainers were individuals who did not consume alcohol whereas heavy drinkers were those who consumed 5 or more drinks in single sitting (for males) or 4 or more drinks (for females).

Composite Drinking

The composite drinking scale (CDS) was developed to reliably gauge an individual's drinking habits (Dejong et al. 2006; Huang et al. 2006). Items include: "During the past 30 days, on how many occasions did you use alcohol?" (response options: *never, 1–2 times*, *3–5 times*, *6–9 times*, *10–19 times*, *20-39 times*, and *40 or more times*), "What is the average number of drinks you consume in a week?" (response option: response box with 0 – 99 as options), and "When you party, how many drinks do you usually have?" (response option: response box with 0 – 99 as options), and "Think back over the last two weeks. What was the greatest number of drinks you consumed at one sitting? For how many hours did you drink?" (response option: response box with 0 – 99 as options and a response box to enter the duration of the drinking episode). In line with past work (Huang et al. 2006) responses are converted into a *z*-score and then summed to form a score.

The CDS can also be transformed into a categorical measure with four levels (referred to as Q1 – Q4; Huang et al.

Table 1. Hierarchical regression predicting college student drinking.

	β	$R^2\Delta$	Total R^2
Block 1		.17***	.17***
Age	.01		
Sex	.25***		
Race (white vs. non-white)	.05		
Parents graduate college	−.02		
Fraternity/sorority membership	−.24***		
GPA	−.13*		
Number of close student friends	.11		
Intercollegiate sports activities	−.09		
Alcohol-related trauma	−.05		
Year in school	−.03		
Block 2		.12***	.30***
Precollege drinking	.37***		
Block 3		.00	.30
Precollege drinking × sex	.06		

Standardized betas, R^2 change, and Total R^2 are listed at each block.
*$p < .05$.
***$p < .001$.

Table 2. Association between precollege drinking and categorical CDS.

	Categorical CDS				
	Q1	Q2	Q3	Q4	Total *n*
Abstainer	16	26	18	8	68
Light drinker	11	48	30	25	114
Mod/heavy drinker	3	15	38	46	102
Total *n*	30	89	86	79	284

Numbers represent the number of participants in each cell. For example, 16 participants were abstainers in the first quartile (Q1) of the Categorical CDS. Past research has shown that individuals classified in higher quartiles are more likely to experience alcohol-related problems.

2006). Past research has demonstrated that individuals in the 3rd and 4th quartiles (Q3, Q4) are far more likely to have experienced alcohol-related problems and to binge drink (Huang et al. 2006).

Responsible Drinking

Past research has examined whether individuals engage in responsible drinking behaviors (e.g., Barry and Goodson 2011; Barry et al. 2014; Collins et al. 1996; Howard et al. 2007). To that end, participants responded to six questions (1 = *not important*, 7 = *very important*) including how important it was, while drinking, to "pay attention to the number of drinks I have" ($M = 5.30$, $SD = 1.71$), "pay attention to the number of drinks my friends have" ($M = 5.14$, $SD = 1.64$), "be safe when I drink" ($M = 6.45$, $SD = .98$), "make sure friends are safe" ($M = 6.75$, $SD = .65$), "not get into trouble" ($M = 6.48$, $SD = 1.02$), and "keep my friends out of trouble" ($M = 6.36$, $SD = .99$). It is possible to combine all six drink responsibly items into a single scale with acceptable reliability ($\alpha = .79$), but we are interested in how participants respond to each item so they are examined separately in this study.

Results

Precollege & college drinking behavior

For the precollege drinking scale, participants were distributed as follows: abstainers ($n = 68$; 23.9%), light drinkers ($n = 114$; 40.0%), moderate drinkers ($n = 91$; 31.9%), and heavy drinkers ($n = 12$; 4.2%). Given the small number of respondents in the heavy drinking category, the moderate and heavy category were collapsed for analysis ($n = 102$; 35.8%).

For the CDS, z-scores of the four drinking items were combined into a single scale ($M = .75$, SD =3.14; $\alpha = .86$). The CDS can also be treated as a categorical variable with four quartiles (Huang et al. 2006). In the current sample, participants were distributed by quartile as follows: Q1 ($n = 30$; 10.5%), Q2 ($n = 89$; 31.2%), Q3 ($n = 86$; 30.2%), and Q4 ($n = 80$; 28.1%).

Relationship between precollege & college drinking

Are precollege drinkers heavier drinkers in college? A hierarchical linear regression was utilized to explore the relationship between college student drinking and participant characteristics. Known predictors were entered in the first block (see controls in method section), precollege drinking in the second, and interactions between precollege drinking and sex in the third. The regression was significant at blocks 1 and 2 (reported at the second block): $R = .54$, $R^2 = .30$, $F(1, 268) = 46.52$, $p < .001$ (see Table 1). College students consumed more alcohol if they were male, a member of a fraternity/sorority, or a student with a lower GPA. Precollege drinking was positively related to college drinking. In fact, precollege drinking explained approximately 12% of the variance in college drinking, above and beyond other known predictors. Thus, precollege drinking was the single best predictor of college student drinking.

The relationship between precollege drinking and the categorical CDS was also examined. A chi-square revealed a positive linear association between precollege drinking and the categorical CDS: $\chi^2(6) = 52.00$, $p < .001$ (see Table 2). Precollege drinkers were more likely to be classified in higher quartiles (the 3rd and 4th quartile) compared to abstainers.

Precollege drinking and responsible drinking behavior

What is the relationship between precollege drinking and responsible drinking behaviors? ANCOVAs were conducted for each drinking behavior (monitor drinks, monitor friend's drinks, being safe, make sure friends are safe, not getting into trouble, and keeping friends out of trouble) with precollege drinking as a fixed factor, and known predictors as covariates (identical to the hierarchical regression). Precollege drinking was significantly related to two items: self-monitoring, $F(2, 267) = 4.70$, $p = .01$ and friend monitoring, $F(2, 267) = 3.64$, $p = .03$ (see Table 3). Bonferroni post-hoc tests revealed that high school abstainers were more likely to self-monitor their drinking in college compared to light and moderate/heavy drinkers. For monitoring friends drinking, moderate/heavy drinkers were less likely to monitor as compared to light drinkers and abstainers.

Table 3. Relationship between precollege drinking and responsible drinking behaviors.

	Abstainers	Light drinkers	Mod/heavy drinkers	*F*
Monitor own drinks	5.74 (1.60)	5.24 (1.76)	5.09 (1.69)	4.70*
Monitor friends drinks	5.40 (1.56)	5.20 (1.66)	4.91 (1.67)	3.64*
Being safe when I drink	6.56 (.95)	6.47 (.97)	6.37 (.97)	1.19
Making sure my friends are safe	6.79 (.48)	6.70 (.73)	6.77 (.60)	.52
Not getting into trouble	6.65 (.77)	6.34 (1.25)	6.56 (.86)	1.63
Keeping my friends out of trouble	6.46 (.91)	6.35 (1.08)	6.35 (.92)	1.30
n	68	113	99	

Means and standard deviations (in parentheses). All responsible drinking behaviors were measured on a 7-point scale ranging from 1 = not important, 7 = very important.
*$p < .05$.

Discussion

The findings of the current study are consistent with past claims that college drinking is a continuation or transition behavior (Stappenbeck et al. 2010) strongly influenced by precollege drinking (Wechsler et al. 1995). This pattern was replicated in a different sample with a robust measure of drinking behavior (DeJong et al. 2006). Moreover, precollege drinking was found to be related to both self and friend drink monitoring such that precollege abstainers were more likely to monitor than precollege drinkers.

A valuable next step would be to study the transition from high school to college using a longitudinal design. Tracking a cohort of high school students from the 9th grade (typically the beginning of high school in the U.S.) through their second or third year of college would allow researchers to examine the evolution of drinking behavior through the transition and possibly identify factors that moderate the relationship between precollege and college drinking. It would also provide researchers with insight about the transition process itself (Lac and Donaldson 2016; Lee et al. 2007; Read et al. 2002; Schulenberg and Maggs 2002).

Precollege drinkers were less likely to monitor drinking behavior. In some ways, this is surprising as one might expect more experienced drinkers to develop or cultivate protective behaviors, what might be called the *learning-from-experience hypothesis*. However, the current data is more consistent with the idea that early drinking experience cultivates bad habits – the *bad-habit-formation hypothesis* – as the least experienced drinkers (precollege abstainers) were more likely to endorse drink monitoring. Future research should examine how behaviors related to drinking – such as monitoring – develop and how the environment of precollege drinking magnifies or reduces the likelihood that certain self-protective habits form. For instance, parental monitoring is related to lower alcohol use and problems in the U.S. (Carroll et al. 2016); a relationship that raises the possibility that monitoring behavior could have negative or paternalistic connotations for precollege drinkers. Are precollege drinkers less likely to endorse monitoring because early experiences triggered reactance to that idea (Brehm and Brehm 1981; Van Petegem et al. 2015)? Researchers should also continue to study the impact of various forms of monitoring using longitudinal designs (e.g., Donaldson et al. 2016). If students are taught to monitor drinking in high school, then does that equate to less alcohol use and problems across the lifespan?

In addition to lower intentions to self-monitor, moderate/heavy precollege drinkers were less likely to monitor their friend's drinking behavior. It is tempting to view that as a lack of concern for others, but, inconsistent with that interpretation, precollege drinkers were just as likely to endorse other responsible drinking items that specifically mentioned the well-being of friends (making sure friends are safe, keeping friends out of trouble). Why does the desire to keep friends safe and out of trouble not translate to monitoring their drinks? Howard and colleagues (Howard et al. 2007) found that college students identified a predetermined number of drinks for the night, and that sober peers often monitored friends to keep them at or below this number. In other words, there is evidence that college students view drink monitoring as a way to protect friends. Yet, moderate/heavy precollege drinkers seemed to demonstrate a different attitude toward the behavior.

In a larger sense, the findings of the current study are consistent with past work examining the age of drinking onset (e.g., Hingson and Zha 2009; Brown et al. 2008). Researchers have found that earlier initiation of drinking behavior is related to a number of outcomes, including increased likelihood of unintentional injury (Hingson et al. 2000; Hingson and Zha 2009), drinking and driving (Hingson et al. 2002), unplanned and unprotected sex (Hingson et al. 2003), and alcohol dependency (Hingson et al. 2006). The relationship between earlier onset of drinking behavior and increased risky or dangerous behaviors has been attributed to possible developmental delays or decrements (Hingson et al. 2006) and negative impact on social functioning (Brown et al. 2008). In other words, the findings of the current study could be contextualized as further evidence that earlier drinking experiences are related to increased risky behavior and social functioning deficits.

The current study has several limitations. First, the sample represents a single college campus in the U.S. and the results may not generalize to other locations. Second, monitoring behaviors were measured with single-item scales. The development of multi-item monitoring scales would be a valuable addition to research. Put differently, the current study provided participants with a small set of items designed to assess responsible drinking behaviors. But future research should carefully consider how to measure learning-from-experience especially as it relates to drinking behavior.

The current items captured one behavior (drink monitoring) where precollege drinking seemed to hinder rather than facilitate desirable actions; however, it is still possible that experience does translate to increased responsible drinking behaviors that were simply not captured by this measurement pool. A first step would be qualitative research with college students who were precollege drinkers. The goal of that research should be to identify if and how precollege drinkers relate prior experience to current responsible behavior, and then translate those responses into possible close-ended questions. Relatedly, future research should utilize multi-dimensional measures of responsible drinking (Barry et al. 2014). Third, participants completed the survey at a single point in time. Fourth, several risk factors for alcohol-related problems were not measured, including family history of alcoholism, family household income, and adverse childhood events. Fifth, the current study did not measure a number of individual difference measures that could be related to precollege drinking and responsible drinking behavior. For instance, both precollege drinking and responsible drinking behavior could be a byproduct of personality (Park et al. 2009) or executive functioning (Day et al. 2015).

The current study further strengthens the research base suggesting precollege drinking is important to understanding college drinking behavior, and perhaps drinking behavior outside or beyond college years. That precollege drinking is related to 12% of the variance in college drinking, above and beyond other known risk factors, supports continued research focused on early drinking and the transition to college.

Disclosure statement

No potential conflict of interest was reported by the authors.

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