



HHS Public Access

Author manuscript

Psychol Addict Behav. Author manuscript; available in PMC 2016 January 11.

Published in final edited form as:

Psychol Addict Behav. 2014 December ; 28(4): 1240–1245. doi:10.1037/a0038352.

Drinking Consequences and Subsequent Drinking in College Students Over 4 Years

Julia A. Martinez

Department of Psychology, Colgate University

Kenneth J. Sher and Phillip K. Wood

Department of Psychological Sciences, University of Missouri and Midwest Alcoholism Research Center

Abstract

There is some evidence that college student drinkers may continue drinking in the face of adverse consequences. We examined 2 hypotheses: (a) that this seemingly pathological behavior is a phenomenon of university life, occurring with consistency throughout the entirety of college, and (b) that individuals accumulate these consequences over multiple semesters in college. A sample of 3,720 students from a large Midwestern university was asked to complete surveys the summer before college and every semester thereafter for 4 years. Results showed that certain drinking-related consequences (e.g., blackouts, regretted sexual experiences) consistently predicted continued frequent heavy drinking in the following semester, even after controlling for sex, race, age, and previous-semester frequent heavy drinking (range of odds ratio = 1.17 to 1.45 across semesters, $p < .01$). Such potent consequences may predict subsequent drinking for a number of possible reasons that may be examined and addressed as they would pertain to specific protective behavioral strategy-related and cognitive interventions. Furthermore, consequences were accumulated over multiple semesters by notable proportions of students. For example, 13.8% of students reported blacking out 5 time-points or more—describing a full half or more of their college careers. Experimental studies which aim to modify students' perceptions of norms associated with these consequences may aid in developing interventions to reduce the burden of harm to students. In the broader context, and given the prevalence of students' accumulation of consequences, future study might aim to determine how and in what ways these findings describe either pathological or normative processes.

Keywords

alcohol; college; heavy drinking; consequences

College students' heavy drinking poses a significant public health problem. For example, an estimated 37.4% of college students in the United States have reported "binge" drinking (i.e., drinking five or more drinks in a row) in the 2 weeks leading up to their assessment (Johnston, O'Malley, Bachman, & Schulenberg, 2013). Further, the prevalence of "heavy"

drinking (i.e., engaging in binge drinking once a month or more over the course of a year) has been estimated at 24% (which is slightly higher than the 20% of noncollege youths who report heavy drinking; Dawson, Grant, Stinson, & Chou, 2004). Such heavy drinking is associated with a number of negative health, legal, social, and psychological consequences for college students, such as death, unintended physical injuries, assaults, property damage, arrests, fines, unwanted sexual experiences, decreased cognitive functioning, decreased academic functioning, and relationship difficulties (World Health Organization, 2011; National Institute on Alcohol Abuse and Alcoholism, 2004).

Problematically, there is some evidence that college student drinkers may continue drinking in the face of adverse consequences, at least over the course of the first 2 years in college (Mallett, Lee, Neighbors, Larimer, & Turrissi, 2006; Park & Grant, 2005; Vik, Carrello, Tate, & Field, 2000). For example, in a 10-week diary study of first-year students, it was found that students' experiencing of negative alcohol-related consequences did not appear to have the desired effect of contributing to subsequent decreases in drinking (Patrick & Maggs, 2008). Moreover, in another study of first-year students' alcohol-related consequences, it was found that approximately half of the sample had reportedly experienced a repeated consequence three or more times (Mallett, Marzell, et al., 2011). Paradoxically, while evidence grows for this general phenomenon—that students drink despite consequences (for a review, see Mallett, Varvil-Weld, et al., 2013)—it should be noted that such behavior is a hallmark indicator of an alcohol use disorder (American Psychiatric Association, 2013).

Nevertheless, a great deal of the research on this topic to date has focused on first- or second-year students, begging the question of whether this seemingly pathological behavior is best described as being mainly limited to these 2 years or whether it is a general college phenomenon (i.e., occurring throughout all of college). Of note, the first and second years of college are ones of transition, carrying many changes and obstacles, which may make this time distinguishable from college as a whole (Pascarella & Terenzini, 2005). However, the ultimate result of the transition is into an environment in which heavy drinking is prevalent and considered part of many campus cultures (Borsari, Murphy, & Barnett, 2007; Jackson, Sher, & Park, 2005). Thus, there is good reason to expect that drinking despite consequences occurs across the entirety of college, particularly because students have been found to view college as being a time that is protected from the “real world” and its consequences (Colby, Colby, & Raymond, 2009). Additionally, students may—via beliefs about social norms or via social reinforcement—perceive some negative consequences (e.g., alcohol tolerance) as being simply the “cost of doing business” or even a “badge of honor” (Borsari & Carey, 2003; see Martinez, Steinley, & Sher, 2010; Sher, Martinez, & Littlefield, 2011), which could result in maintenance of drinking behaviors across college.

Alarming, if drinking despite consequences occurs across the entirety of college, students' *accumulation* of such consequences is likely quite prevalent, given the findings on students' experiencing of repeated consequences in their first year of college alone (Mallett, Marzell, et al., 2011). It should be noted that in clinical contexts, the accumulation of consequences is considered an important mechanism of behavior change (Matzger, Kaskutas, & Weisner, 2005), and this may also hold for general college student populations (Read, Wardell, & Bachrach, 2013) whereby consequence accumulation plays a normative role in individuals'

ultimately “maturing out” of heavy drinking (Arnett, 2006; Schulenberg & Maggs, 2002; Schulenberg, O’Malley, Bachman, Wadsworth, & Johnston, 1996). Both for scholars who approach the accumulation of consequences as a study of pathology and for those who approach it as a study of normative development, it is important to document the full extent of such accumulation during the course of an entire college career.

Thus, we aimed to replicate and further explore findings that students drink despite consequences, extending observation to include a 4-year course of the college experience. That is, in keeping with the idea that the phenomenon might be observed generally throughout the entirety of college, we hypothesized that we would observe some consequences that would consistently predict subsequent drinking throughout college. Identification of these most potent or time-invariant consequences would (a) provide further support for this phenomenon of students’ drinking despite consequences being one that might be descriptive of college in general (and, therefore, setting the stage for future explanatory hypotheses that center on general cultural, social learning-related, and norms processes as they pertain to the overall college experience; Astin, 1993); and (b) inform novel intervention efforts aimed at students’ perceptions, decisions, or behavioral strategies around these particular *types* of consequences (see Martens, Martin, Littlefield, Murphy, & Cimini, 2011; Piasecki, Sher, Slutske, & Jackson, 2005). Not only did we expect to observe specific *types* of consequences that would generally predict subsequent drinking throughout college, but we also hypothesized that individuals would *accumulate* these consequences over multiple semesters over college, such that a notable proportion of many students’ college experience would be described by repeated or accumulated consequences of certain types. Again, this novel second piece of information may be used by scholars to either formulate more specific hypotheses about mechanisms of change in clinical student populations, or to formulate more specific hypotheses about normative mechanisms of development.

Method

Participants

Following approval from the university Institutional Review Board, a sample of 3,720 first-time undergraduate students (88% of the entering class) was asked to complete a paper-and-pencil survey the summer prior to college entry, in 2002. Over the next 4 years, participants were asked to complete an online survey at each successive semester. The baseline sample was 53.6% female, 90.3% White/non-Hispanic, and averaged 17.96 ($SD = .37$) years of age. The sample size fell to $n = 2,250$ by the final time-point; though, note that 90% of students participated in two or more assessment waves, and 82% participated in three or more waves. Retention biases were minimal (see Sher & Rutledge, 2007), though the $n = 383$ individuals who did not continue after baseline were likely to be male (odds ratio [OR] = 1.80, $p < .01$) and frequent heavy drinkers ($OR = 2.77$, $p < .01$) at baseline. Also, these individuals were likely to not be enrolled in college by the fall of the sophomore year measurement period ($OR = 3.93$, $p < .01$), suggesting that this group may be qualitatively different and worthy of separate recruitment and study. For the purposes of this study, participants were excluded if

they reported never engaging in heavy drinking in college ($n = 261$), and such participants were likely to be female ($OR = 2.91, p < .01$).

Measures

Drinking—The criterion (dependent) measure of this study was frequent heavy drinking (i.e., consuming five or more drinks at a single sitting, once a week or more). This measure did not stipulate a sex difference in volume of consumption (Wechsler & Nelson, 2001), though sex was used as a control variable in all analyses.

Consequences—Consequences were assessed from an adapted version of the Young Adult Alcohol Problems Screening Test (Hurlbut & Sher, 1992) an assessment of drinking consequences that is relevant to college students. Specifically, some of the questions were split into parts (e.g., the question that originally asked “Have you ever found that you needed larger amounts of alcohol to feel any effect, or that you could no longer get high or drunk on the amount that used to get you high or drunk?” was split up into two questions, asking first whether “you needed larger amounts” and second whether “you could no longer get high on the [previous] amount”), thus adapting the original 27-item assessment into 37 items. Each semester, students were asked whether they had experienced each of the 37 consequences (0 = *never*, 1 = *yes, but not in the past year*, 2 = *yes, in the past year, but not in the past 3 months*, 3 = *yes, once in the past 3 months*, 4 = *yes, twice in the past 3 months*, 5 = *yes, three times in the past 3 months*, 6 = *yes, four or more times in the past 3 months*). To assess for multiple repeated or *accumulation* of consequences *over* timepoints, the previous ordinal scale was dichotomized to reflect past 3-month endorsement of consequences; then count variables were created to assess the number of times that each consequence was experienced by students across (but not within) precollege and each semester thereafter for a total of 8 semesters. Thus, individuals could score from between 0 and 9, where 9 would indicate that an individual experienced a particular consequence prior to college and across every semester of college; a score of 5 would indicate a repeated consequence for possibly more than half of one’s college experience, though note that this scoring method does not require that consequences be repeated serially. That is, this variable functions as a blunt indicator of students’ repeating of behaviors across time-points. This is of relevance when considering that students experience changes from college entry to semester to semester in terms of their schedules and possibly other areas of their lives (Astin, 1993), and so repeating of behaviors across time-points may indicate some degree of intentional perseverance of behavior.

Additional variables—Four control variables were included in analyses. Specifically, sex (0 = female, 1 = male) and race (0 = White/non-Hispanic, 1 = non-White), where assessed, as they are associated with heavy drinking in college (Wechsler, Dowdall, Davenport, & Castillo, 1995; Sher & Rutledge, 2007). Also, for the analyses examining the effect of consequences on subsequent drinking over college, chronological age was assessed at each semester to account for students’ transition to legal drinking age status. Previous-semester frequent heavy drinking was taken into account at all time-points as well.

Analysis

We used lagged logistic regression models to examine the effect of alcohol-related consequences on subsequent (i.e., next semester) frequent heavy drinking across college, controlling for chronological age at the semester in question, as well as previous-semester frequent heavy drinking, and sex and race. An example of a lagged model in this case would be to predict first-year spring frequent heavy drinking from first-year fall blackout (a *type* of consequence) and first-year fall frequent heavy drinking, as well as first-year spring chronological age, and sex and race (effects of covariates were adjusted synchronously rather than hierarchically). We were particularly interested in examining whether any drinking-related consequences would be associated with subsequent drinking in a consistent direction and at $p < .01$ across all semesters. In recognition of the potential for Type I error, odds ratios were heeded and reported, as they are effect sizes and therefore informative over hypothesis testing alone (Cohen, 1994; Haddock, Rindskopf, & Shadish, 1998). For the consequences that were associated with subsequent drinking across college, we additionally examined whether these consequences differed (in a consistent direction and at $p < .01$ across semesters) as a function of sex and race. Lastly, we documented students' *accumulation* of these consequences across college.

Results

Results showed that frequent heavy drinking rates were consistently high over college: 21.9%, 26.8%, 26.2%, 29.6%, 29.0%, 30.6%, 30.6%, 30.0%; the effect of change in frequent heavy drinking rates over time did not appear to be statistically significant; CATMOD $\chi^2[7] = 8.57$, *ns*, and that, as expected, students continued drinking despite consequences. Indeed, there were only two cases in which odds ratios indicated that a consequence was associated with decreased drinking in the subsequent semester, and neither case was statistically significant. Instead, as shown in Table 1, 14 consequences consistently were associated with frequent heavy drinking in the subsequent semester, even after controlling for age, race, sex, and frequent heavy drinking in the previous semester. Additionally, these consequences ranged in *type*, from social and academic consequences to those that would more normally be consistent with alcohol use disorders (e.g., tolerance, or no longer getting high on the same amount of alcohol). A student that would drink despite getting behind in schoolwork may be doing so as a result of college-related beliefs, norms, or expectancies; a student's drinking despite a consequence that resembles an alcohol use disorder is certainly reflective of pathology. And yet, the somatic, driving-related, and alcohol use disorder-like consequences appear to be experienced across as many or in some cases more semesters than the social and academic consequences, with 8.0% having reported driving while intoxicated at five or more time-points (note that our findings here are arguably comparable to a nationally representative study that found that, overall, 35.5% of students reported driving after consuming alcohol, and 13.3% reported doing so after consuming five or more drinks in a sitting, where these rates varied by subgroups and policy contexts; Wechsler, Lee, Nelson, & Lee, 2003). No less troublingly, though, 4.0% of students reported experiencing a regretted sexual situation five time-points or more—describing a full half or more of their college careers.

With regard to consistent sex differences, males were more likely than females to report acting obnoxious (range of *ORs* = 1.09 to 1.18 across semesters, all at $p < .01$), again suggesting a possible culture- or norm-related effect. In terms of race effects, non-White individuals were consistently less likely than their peers to report blackout (range of *ORs* = .71 to .84 across semesters, all at $p < .01$), headache (range of *ORs* = .74 to .82 across semesters, all at $p < .01$), and passing out (range of *ORs* = .74 to .83 across semesters, all at $p < .01$), which is likely a function of their lower rates of heavy drinking in general (Wechsler et al., 1995).

Discussion

It is not necessarily surprising that the consequences that closely mirror symptoms of alcohol use disorders (i.e., needing larger amounts, no longer could get high on same amount and drank more than intended; American Psychiatric Association, 2013) would predict subsequent drinking across college; also, students' accumulating of consequences is consistent with previous research (Mallett, Marzell, et al., 2011). However, it is notable that a breadth of different types of consequences consistently predicts subsequent drinking during college and that these consequences accumulate across so many semesters for students—and with nontrivial prevalence. From a normative perspective, it is reasonable to expect that students undergo a “learning curve,” where they experience consequences while presumably going about achieving a safe style drinking (Plant, 2001). But although over a third of students reported having had drinking-related headaches for half or more of their college careers, the risks and dangers of these consequences seem to discourage characterizing these findings fully under the umbrella of a normative “learning curve.” It is more likely that these findings are both a function of early stage alcohol use disorders for some, and of social norms, expectancies, and social reinforcement of pathological processes for others. Thus, early identification and differentiation of early stage alcohol use disorders from more normative pathways remains at the forefront of important directions for research.

In the meantime, the “learning curve”—or the accumulation of consequences, as it currently appears to stand—might be expedited through novel interventions that combine harm-reduction (psychoeducational or skills-focused) techniques with expectancy-challenge or norm-based (individual-differences and “college culture”-focused) techniques (Carey, Scott-Sheldon, Carey, & DeMartini, 2007). For example, studies might attempt to train students to better utilize and possibly perceive consequences as learning experiences for behavior change (see Darkes & Goldman, 1993). Also, experimental studies might aim to modify students' perceptions about consequences through media (see Haines & Spear, 1996; Logan, Henry, Vaughn, Luk, & King, 2012; Merrill, Read, & Barnett, 2012) or social media.

While standing at the normative and pathological crossroad, it should be noted that consequences that so consistently predict subsequent drinking and that are accumulated at such rates are somewhat paradoxical in that—if they carry any punishing effect at all—the effect is not apparently strong enough to be consistent with learning and self-regulatory social learning processes (Bandura, 2001), at least at this stage of college, life, or development. However, recent findings have indeed shown that at slightly older ages, the effect of consequences on subsequent drinking occurs in the expected direction; namely, that

the number of consequences one experiences predicts desistance in drinking 7 years later (at ages 25, 28, and 31; White & Ray, 2014). Nevertheless, for college students, these consequences—how they are perceived, as well as their effects on subsequent drinking—are points of public health-related focus.

For example, our findings on regretted sexual situations predicting subsequent drinking across semesters in college is particularly troubling. Regretted sexual situations may include sexual assault and it is possible that this phenomenon is occurring on multiple levels and for multiple reasons. For example, women who are at risk for sexual assault have been found to hold greater tension-reduction related expectancies about alcohol (Corbin, Bernat, Calhoun, McNair, & Seals, 2001) and this may be of importance when considering determinants of onset of drinking in college; yet, traumatized individuals may engage in drinking as an attempt to cope with trauma (Miranda, Meyerson, Long, Marx, & Simpson, 2002), and this may be of importance when considering subsequent drinking. However, regretted sexual experiences need not be traumatic and subsequent drinking may occur for some simply as they utilize drinking venues and drinking as a means of eventually finding an acceptable mate (Hill & Chow, 2002). Regardless, it appears that for screening purposes, a regretted sexual experience is a potent consequence that heralds subsequent drinking-related risk at any time in college and may be a focus for specialized and specific prevention and intervention initiatives.

There are a number of limitations to this study that can inform future work. Importantly, the question of generalizability is a substantial issue when it comes to considering whether and how this phenomenon holds across campuses and communities. The effects that were observed in this sample come from a large and rather ethnically homogeneous Midwestern university; thus, these effects may not be reflective of campuses which differ demographically and in their mission, such as performing arts, women's, or historically black campuses (see Wechsler, Kelley, Weitzman, SanGiovanni, & Seibring, 2000).

Most importantly, although we were able to demonstrate a consistency of effects, this study did not tackle *how*, *when*, and *in what way* change processes could or would occur for students during college, though we know that a notable percentage of students will decrease their drinking in college and beyond (Schulenberg et al., 1996). One question for potential study is whether change processes during college would be more generally similar to those that occur in problematic drinkers (Miller & Rollnick, 2002), or whether such processes would be linked in some way with a type of “maturing out” that would unfold during college, possibly as students change and grow over the college experience (Arnett, 2006; Pascarella & Terenzini, 2005). Of particular note, this study did not examine students' perceptions about the pros and cons of their drinking or consequences, considerations which are relevant to understanding changes in individuals' drinking (see Miller & Rollnick, 2002). This study also did not assess students' general willingness to experience consequences (Mallett, Varvil-Weld, Turrisi, & Read, 2011) or their trait-level responsiveness or sensitivity to consequences (i.e., punishments and also rewards), which may play a role in associations between consequences and subsequent drinking (i.e., where individuals unresponsive to delayed punishment and responsive to immediate reward in delay discounting tasks are at risk for heavy drinking and have been found to engage in

higher levels of heavy drinking than their counterparts, even after brief interventions; Gorenstein & Newman, 1980; MacKillop & Murphy, 2007; Newlin & Thomson, 1990), particularly in young adults who may experience changes in reward and punishment sensitivity as a function of their neurodevelopment (Yi, Mitchell, & Bickel, 2010).

Ultimately, drinking and consequences are inexorably linked, and the relation is multifaceted and complex. It may be the case that the best way to address these relations is by targeting particular subgroups who would be of interest based on their hypothesized reaction to particular consequences (e.g., women at risk for sexual assault). In this vein, any empirically driven attempt to reduce the considerable negative drinking-related impact and harm that students face is worthwhile and needed.

Acknowledgments

This research was supported by National Institute on Alcohol Abuse and Alcoholism Grants AA07231, T32AA013526, and K05AA017242 to Kenneth J. Sher, F31 AA018590 to Julia A. Martinez, and AA11998 to Andrew Heath.

References

- American Psychiatric Association. Diagnostic and statistical manual of mental disorders. 5th. Author; Washington, DC: 2013.
- Arnett, JJ. Emerging adulthood: Understanding the new way of coming of age. In: Arnett, JJ.; Tanner, JL., editors. Emerging adults in America: Coming of age in the 21st century. American Psychological Association; Washington, DC: 2006. p. 3-19. <http://dx.doi.org/10.1037/11381-001>
- Astin, AW. What matters in college: Four critical years revisited. Jossey-Bass; San Francisco, CA: 1993.
- Bandura A. Social cognitive theory: An agentic perspective. Annual Review of Psychology. 2001; 52:1–26. <http://dx.doi.org/10.1146/annurev.psych.52.1.1>.
- Borsari B, Carey KB. Descriptive and injunctive norms in college drinking: A meta-analytic integration. Journal of Studies on Alcohol. 2003; 64:331–341. [PubMed: 12817821]
- Borsari B, Murphy JG, Barnett NP. Predictors of alcohol use during the first year of college: Implications for prevention. Addictive Behaviors. 2007; 32:2062–2086. <http://dx.doi.org/10.1016/j.addbeh.2007.01.017>. [PubMed: 17321059]
- Carey KB, Scott-Sheldon LAJ, Carey MP, DeMartini KS. Individual-level interventions to reduce college student drinking: A meta-analytic review. Addictive Behaviors. 2007; 32:2469–2494. <http://dx.doi.org/10.1016/j.addbeh.2007.05.004>. [PubMed: 17590277]
- Cohen J. The earth is round ($p < .05$). American Psychologist. 1994; 49:997–1003. <http://dx.doi.org/10.1037/0003-066X.49.12.997>.
- Colby SM, Colby JJ, Raymond GA. College versus the real world: Student perceptions and implications for understanding heavy drinking among college students. Addictive Behaviors. 2009; 34:17–27. <http://dx.doi.org/10.1016/j.addbeh.2008.07.023>. [PubMed: 18774233]
- Corbin WR, Bernat JA, Calhoun KS, McNair LD, Seals KL. The role of alcohol expectancies and alcohol consumption among sexually victimized and nonvictimized college women. Journal of Interpersonal Violence. 2001; 16:297–311. <http://dx.doi.org/10.1177/088626001016004002>.
- Darkes J, Goldman MS. Expectancy challenge and drinking reduction: Experimental evidence for a mediational process. Journal of Consulting and Clinical Psychology. 1993; 61:344–353. <http://dx.doi.org/10.1037/0022-006X.61.2.344>. [PubMed: 8473588]
- Dawson DA, Grant BF, Stinson FS, Chou PS. Another look at heavy episodic drinking and alcohol use disorders among college and noncollege youth. Journal of Studies on Alcohol. 2004; 65:477–488. [PubMed: 15378804]

- Gorenstein EE, Newman JP. Disinhibitory psychopathology: A new perspective and a model for research. *Psychological Review*. 1980; 87:301–315. <http://dx.doi.org/10.1037/0033-295X.87.3.301>. [PubMed: 7384345]
- Haddock CK, Rindskopf D, Shadish WR. Using odds ratios as effect sizes for meta-analysis of dichotomous data: A primer on methods and issues. *Psychological Methods*. 1998; 3:339–353. <http://dx.doi.org/10.1037/1082-989X.3.3.339>.
- Haines M, Spear SF. Changing the perception of the norm: A strategy to decrease binge drinking among college students. *Journal of American College Health*. 1996; 45:134–140. <http://dx.doi.org/10.1080/07448481.1996.9936873>. [PubMed: 8952206]
- Hill EM, Chow K. Life-history theory and risky drinking. *Addiction*. 2002; 97:401–413. <http://dx.doi.org/10.1046/j.1360-0443.2002.00020.x>. [PubMed: 11964057]
- Hurlbut SC, Sher KJ. Assessing alcohol problems in college students. *Journal of American College Health*. 1992; 41:49–58. <http://dx.doi.org/10.1080/07448481.1992.10392818>. [PubMed: 1460173]
- Jackson KM, Sher KJ, Park A. Drinking among college students. *Consumption and consequences. Recent Developments in Alcoholism*. 2005; 17:85–117. http://dx.doi.org/10.1007/0-306-48626-1_5. [PubMed: 15789861]
- Johnston, LD.; O'Malley, PM.; Bachman, JG.; Schulenberg, JE. Monitoring the future national survey results on drug use, 1975–2012. Volume II: College students and adults ages 19–50. Institute for Social Research, The University of Michigan; Ann Arbor, MI: 2013.
- Logan DE, Henry T, Vaughn M, Luk JW, King KM. Rose-colored beer goggles: The relation between experiencing alcohol consequences and perceived likelihood and valence. *Psychology of Addictive Behaviors*. 2012; 26:311–317. <http://dx.doi.org/10.1037/a0024126>. [PubMed: 21639598]
- MacKillop J, Murphy JG. A behavioral economic measure of demand for alcohol predicts brief intervention outcomes. *Drug and Alcohol Dependence*. 2007; 89:227–233. <http://dx.doi.org/10.1016/j.drugalcdep.2007.01.002>. [PubMed: 17289297]
- Mallett KA, Lee CM, Neighbors C, Larimer ME, Turrissi R. Do we learn from our mistakes? An examination of the impact of negative alcohol-related consequences on college students' drinking patterns and perceptions. *Journal of Studies on Alcohol*. 2006; 67:269–276. [PubMed: 16562409]
- Mallett KA, Marzell M, Varvil-Weld L, Turrissi R, Guttman K, Abar C. One-time or repeat offenders? An examination of the patterns of alcohol-related consequences experienced by college students across the freshman year. *Addictive Behaviors*. 2011; 36:508–511. <http://dx.doi.org/10.1016/j.addbeh.2010.12.022>. [PubMed: 21276662]
- Mallett KA, Varvil-Weld L, Borsari B, Read JP, Neighbors C, White HR. An update of research examining college student alcohol-related consequences: New perspectives and implications for interventions. *Alcoholism: Clinical and Experimental Research*. 2013; 37:709–716. <http://dx.doi.org/10.1111/acer.12031>.
- Mallett KA, Varvil-Weld L, Turrissi R, Read A. An examination of college students' willingness to experience consequences as a unique predictor of alcohol problems. *Psychology of Addictive Behaviors*. 2011; 25:41–47. <http://dx.doi.org/10.1037/a0021494>. [PubMed: 21219039]
- Martens MP, Martin JL, Littlefield AK, Murphy JG, Cimini MD. Changes in protective behavioral strategies and alcohol use among college students. *Drug and Alcohol Dependence*. 2011; 118:504–507. <http://dx.doi.org/10.1016/j.drugalcdep.2011.04.020>. [PubMed: 21612879]
- Martinez JA, Steinley D, Sher KJ. Deliberate induction of alcohol tolerance: Empirical introduction to a novel health risk. *Addiction*. 2010; 105:1767–1770. <http://dx.doi.org/10.1111/j.1360-0443.2010.03042.x>. [PubMed: 20840199]
- Matzger H, Kaskutas LA, Weisner C. Reasons for drinking less and their relationship to sustained remission from problem drinking. *Addiction*. 2005; 100:1637–1646. <http://dx.doi.org/10.1111/j.1360-0443.2005.01203.x>. [PubMed: 16277625]
- Merrill JE, Read JP, Barnett NP. The way one thinks affects the way one drinks: Subjective evaluations of alcohol consequences predict subsequent change in drinking behavior. *Psychology of Addictive Behaviors*. 2012; 27:42–51. [PubMed: 22985054]
- Miller, WR.; Rollnick, S. *Motivational interviewing: Preparing people for change*. 2nd. Guilford Press; New York, NY: 2002.

- Miranda R Jr, Meyerson LA, Long PJ, Marx BP, Simpson SM. Sexual assault and alcohol use: Exploring the self-medication hypothesis. *Violence and Victims*. 2002; 17:205–217. <http://dx.doi.org/10.1891/vivi.17.2.205.33650>. [PubMed: 12033555]
- National Institute on Alcohol Abuse and Alcoholism. Estimated economic costs of alcohol abuse in the United States, 1992 and 1998. 2004. Retrieved April 7, 2010, from <http://www.niaaa.nih.gov/Resources/DatabaseResources/QuickFacts/EconomicData/cost8.htm>
- Newlin DB, Thomson JB. Alcohol challenge with sons of alcoholics: A critical review and analysis. *Psychological Bulletin*. 1990; 108:383–402. <http://dx.doi.org/10.1037/0033-2909.108.3.383>. [PubMed: 2270234]
- Park CL, Grant C. Determinants of positive and negative consequences of alcohol consumption in college students: Alcohol use, gender, and psychological characteristics. *Addictive Behaviors*. 2005; 30:755–765. [PubMed: 15833579]
- Patrick ME, Maggs JL. Short-term changes in plans to drink and importance of positive and negative alcohol consequences. *Journal of Adolescence*. 2008; 31:307–321. [PubMed: 17651796]
- Pascarella, E.; Terenzini, P. How college affects students: Vol. 2. A third decade of research. Jossey-Bass; San Francisco, CA: 2005.
- Piasecki TM, Sher KJ, Slutske WS, Jackson KM. Hangover frequency and risk for alcohol use disorders: Evidence from a longitudinal high-risk study. *Journal of Abnormal Psychology*. 2005; 114:223–234. <http://dx.doi.org/10.1037/0021-843X.114.2.223>. [PubMed: 15869353]
- Plant, M. Learning by Experiment. In: Houghton, E.; Roche, AM., editors. *Learning about drinking*. Brunner-Routledge; Philadelphia, PA: 2001. p. 129-146.
- Read JP, Wardell JD, Bachrach RL. Drinking consequence types in the first college semester differentially predict drinking the following year. *Addictive Behaviors*. 2013; 38:1464–1471. <http://dx.doi.org/10.1016/j.addbeh.2012.07.005>. [PubMed: 23017734]
- Schulenberg JE, Maggs JL. A developmental perspective on alcohol use and heavy drinking during adolescence and the transition to young adulthood. *Journal of Studies on Alcohol*. 2002; 14:54–70.
- Schulenberg J, O'Malley PM, Bachman JG, Wadsworth KN, Johnston LD. Getting drunk and growing up: Trajectories of frequent binge drinking during the transition to young adulthood. *Journal of Studies on Alcohol*. 1996; 57:289–304. [PubMed: 8709588]
- Sher, KJ.; Martinez, JA.; Littlefield, AK. Alcohol use and alcohol use disorders. In: Barlow, D., editor. *Oxford handbook of clinical psychology*. Oxford; New York, NY: 2011. p. 405-445.
- Sher KJ, Rutledge PC. Heavy drinking across the transition to college: Predicting first-semester heavy drinking from precollege variables. *Addictive Behaviors*. 2007; 32:819–835. <http://dx.doi.org/10.1016/j.addbeh.2006.06.024>. [PubMed: 16860940]
- Vik PW, Carrello P, Tate SR, Field C. Progression of consequences among heavy-drinking college students. *Psychology of Addictive Behaviors*. 2000; 14:91–101. <http://dx.doi.org/10.1037/0893-164X.14.2.91>. [PubMed: 10860108]
- Wechsler H, Dowdall GW, Davenport A, Castillo S. Correlates of college student binge drinking. *American Journal of Public Health*. 1995; 85:921–926. [PubMed: 7604914]
- Wechsler H, Kelley K, Weitzman ER, SanGiovanni JP, Seibring M. What colleges are doing about student binge drinking. A survey of college administrators. *Journal of American College Health*. 2000; 48:219–226. <http://dx.doi.org/10.1080/07448480009599308>. [PubMed: 10778022]
- Wechsler H, Lee JE, Nelson TF, Lee H. Drinking and driving among college students: The influence of alcohol-control policies. *American Journal of Preventive Medicine*. 2003; 25:212–218. [http://dx.doi.org/10.1016/S0749-3797\(03\)00199-5](http://dx.doi.org/10.1016/S0749-3797(03)00199-5). [PubMed: 14507527]
- Wechsler H, Nelson TF. Binge drinking and the American college student: What's five drinks? *Psychology of Addictive Behaviors*. 2001; 15:287–291. <http://dx.doi.org/10.1037/0893-164X.15.4.287>. [PubMed: 11767258]
- White HR, Ray AE. Differential evaluations of alcohol-related consequences among emerging adults. *Prevention Science*. 2014; 15:115–124. <http://dx.doi.org/10.1007/s11221-012-0360-8>. [PubMed: 23412945]
- World Health Organization. *Global status report on alcohol*. Author; Geneva, Switzerland: 2011.

Yi, R.; Mitchell, SH.; Bickel, WK. Delay discounting and substance abuse-dependence. In: Madden, GJ.; Bickel, WK., editors. *Impulsivity: The Behavioral and Neurological Science of Discounting*. American Psychological Association; Washington, DC: 2010. p. 191-211.

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

Table 1Effects of Consequences on Subsequent-Semester Frequent Heavy Drinking (n = 1,669–3,032)^a

| | Range of effects across all semesters <i>OR</i> | Mean number of time-points that consequence was experienced <i>M (SD)</i> | Experienced consequence five or more time-points (%) |
|-------------------------------|---|---|--|
| Somatic and physical | | | |
| Headache | 1.31 to 1.52 | 3.84 (2.58) | 37.2 |
| Felt sick | 1.33 to 1.57 | 3.07 (2.13) | 24.1 |
| Passed out | 1.30 to 1.45 | 2.54 (2.21) | 18.2 |
| Passenger of drunk driver | 1.27 to 1.39 | 2.24 (2.06) | 14.1 |
| Blackout | 1.33 to 1.45 | 2.25 (2.00) | 13.8 |
| Drove while intoxicated | 1.31 to 1.37 | 1.74 (1.69) | 8.0 |
| Got hurt | 1.29 to 1.46 | 1.47 (1.48) | 4.6 |
| Alcohol Use Disorder-like | | | |
| More than intended | 1.19 to 1.36 | 2.38 (1.91) | 14.5 |
| Need larger amounts | 1.22 to 1.47 | 1.69 (1.60) | 7.2 |
| No longer high on same amount | 1.22 to 1.45 | 1.55 (1.56) | 6.1 |
| Social | | | |
| Acted obnoxious | 1.22 to 1.42 | 2.20 (1.92) | 12.4 |
| Regretted sexual situation | 1.17 to 1.38 | 1.46 (1.37) | 4.0 |
| Academic | | | |
| Missed class | 1.24 to 1.42 | 1.86 (1.74) | 9.6 |
| Got behind in schoolwork | 1.19 to 1.49 | 1.32 (1.51) | 5.0 |

Note. *OR* = odds ratio; *SD* = standard deviation. *ORs* were adjusted by sex, race, age, and previous-semester frequent heavy drinking. *ORs* were significant at $p < .01$ across all 8 semesters. Mean number of consequences assessed by a count variable bounded by range from 0 to 9 consequences total—that is, presence or absence of the consequence was counted at precollege and each semester across all 8 semesters, although this does not assess for number of consequences *within* semester. This variable is intended as a blunt assessment of perseverance of behavior across time-points.

^aLarge range of *n* includes all analyses at all time-points; lowest *n* values due to missing values of “age” variable during some middle semesters and also to attrition, as discussed in the Method section.