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Examining the relationship between typical drinking behavior and 21st birthday drinking behavior among college students: implications for event-specific prevention

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Abstract

Aims—The purpose of this research was to: (i) compare 21st birthday drinking with typical drinking; (ii) assess the prevalence of negative consequences and risk behaviors experienced during the 21st birthday week; and (iii) examine the role of typical drinking and 21st birthday drinking in explaining 21st birthday week negative consequences and risk behaviors.

Setting and participants—Participants (*n* = 306; 50% male) included college students turning 21 at a Midwestern public university in the United States.

Design and measurement—Approximately 1 week prior to their 21st birthday, students completed measures of typical past 3-month alcohol consumption via a web-based survey. Following their birthday, students (*n* = 296; 50% male) completed measures of 21st birthday week drinking as well as negative consequences and risk behaviors.

Findings—Findings indicated that students consumed considerably larger amounts of alcohol during the week of their 21st birthdays in comparison to typical weekly consumption. Additionally, students experienced a variety of negative consequences and risk behaviors during the week of their 21st birthday, including hangovers, vomiting and not remembering part of the previous evening. Negative binomial regression results indicated that those most likely to experience more negative consequences and risk behaviors associated with 21st birthday drinking were those who consumed heavy amounts of alcohol the week of their birthday, but who did not typically drink excessively.

Conclusions—Findings underscore the need to develop event-specific prevention approaches for occasions associated with extreme drinking and provide direction for considering who may be at greatest risk for problems associated with celebratory drinking.

Keywords

Alcohol; alcohol-related problems; college students; event-specific drinking; event-specific prevention; 21st birthday

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Declarations of interest
None.

INTRODUCTION

Recent research evaluating college student drinking has focused on critical days in students' lives (e.g. 21st birthdays) and/or in the academic calendar (e.g. Spring Break, homecoming, holidays) that are associated with increased alcohol consumption [1–4]. The present research was conducted to: (i) compare 21st birthday drinking with typical drinking; (ii) assess the prevalence of negative consequences and risk behaviors experienced during the 21st birthday week; and (iii) examine the role of typical drinking and 21st birthday drinking in explaining 21st birthday week negative consequences and risk behaviors.

Research suggests that, rather than being consistent, college drinking tends to fluctuate. Studies using latent growth modeling [5,6] have found that there are different, reliable trajectories among college drinking and that college drinking is contingency driven. For example, college students have been found to drink more during national and local holidays and school vacations, and to drink less during examinations and the beginning of the week [5,6]. Studies focusing on specific events (e.g. 21st birthday) have found that the quantity of drinks consumed is quite high, leading to high blood alcohol concentrations [3,4]. Moreover, the quantity of drinks consumed during specific events (21st birthday [4]; Spring Break [1]) is higher than typical drinking quantity during the semester. While previous research has focused on event-specific alcohol consumption in relation to typical alcohol consumption, little research has evaluated event-specific negative consequences and risk behaviors in relation to typical alcohol consumption.

Students who consume heavy amounts of alcohol consistently are at risk for experiencing negative consequences associated with specific events [6]. For example, Greenbaum and colleagues [6] found that first-year students who consumed stable, heavy amounts of alcohol (i.e. heavy-stable drinkers) during the academic year increased their consumption from an average of 17.19 [standard deviation (SD) = 6.92] standard drinks per week to an average of 26.56 (SD = 10.84) standard drinks during holiday weeks (e.g. Thanksgiving, Spring Break). They suggested that drinking at consistently heavy levels increases risk for not only experiencing the same consequences in the future, but also for chronic long-term consequences. However, it is also important to consider that some individuals drink heavily only during special events/occasions. For example, Greenbaum and colleagues [6] found that first-year students who drank heavily primarily on special occasions but drank at light levels otherwise (i.e. light-stable plus high holiday drinkers) consumed an average of 6.14 (SD = 2.49) standard drinks during Thanksgiving, Christmas, New Year and Spring Break weeks compared to 1.54 (SD = 3.10) standard drinks per typical week. The increase in standard drinks by the special occasion drinkers appeared to result from an increase in heavy drinking occasions, not from an increase in light or moderate drinking occasions, over holiday weeks. Greenbaum and colleagues [6] suggested that lower tolerance in light drinkers may place them at increased risk for negative consequences on the occasions when they drink heavily. These findings suggest that both light and heavy drinkers might be at risk for experiencing negative consequences associated with heavy event-specific drinking. However, research suggests that this may be especially true for lighter drinkers. For example, Neal and colleagues [7,8] found that average intoxication moderated the association between alcohol consumption and negative consequences such that lighter drinkers were at greater risk for negative consequences than heavier drinkers.

21st birthday drinking behavior

Extreme drinking associated with turning 21 and associated rituals (e.g. the 'power hour' and '21 for 21') that lead to dangerous, often potentially lethal, blood alcohol concentrations has received increasing attention in the US literature because this is the age when young adults can legally purchase alcoholic beverages with proper identification [9–11]. To our knowledge, how 21st birthday drinking and related consequences compare to typical patterns of consumption

has not been considered. Thus, the present study aimed to: (i) compare 21st birthday drinking with typical drinking; (ii) assess the prevalence of negative consequences and risk behaviors experienced during the 21st birthday week; and (iii) examine the role of typical drinking and 21st birthday drinking in explaining 21st birthday week negative consequences and risk behaviors.

METHODS

Participants and procedure

Participants included 306 students (50% male) from a midsized Midwestern US university who were turning 21 the week after being invited to participate in the study. Ethnicity of the sample was 93% Caucasian; 7% reported other ethnicities.

Lists of all students who were turning 21 during the fall and spring semesters of the 2006–07 academic year were obtained from the registrar's office. Students whose birthdays were in late September to mid-April from the registrar's list ($n = 497$) were invited to participate in a larger, 21st birthday preventative intervention study. Students whose birthdays fell over finals week and the holiday break were not invited to participate. E-mail and mailed invitations for the larger study were sent to participants 1 week prior to their 21st birthday. All students were provided with a link to a web-based pre-birthday survey and a personalized identification number used to log onto the survey. After reading a description of the study, students indicated their consent by clicking on the 'I accept. I want to participate in this study' link. Students who completed the pre-birthday survey ($n = 306$; 61.6%) were paid $50.

Within 10 days after their 21st birthday, 296 (97%) participants completed the post-birthday survey and were paid $50. All study procedures were approved by the university's institutional review board. Participants were randomized by gender to one of three conditions: (i) to receive the brief intervention via the internet ($n = 106$); (ii) to receive the brief intervention in the study laboratory ($n = 104$); or (iii) to the control condition where they did not receive the intervention but completed all measures in the study laboratory ($n = 96$). Students in the two intervention conditions received a brief, one-page personalized normative feedback intervention [12] prior to their 21st birthday. The feedback provided personalized information about how much the participant intended to drink on their 21st birthday, how much the participant thought the typical student drinks on his/her 21st birthday, and how much the typical student actually drinks on his/her 21st birthday. Details regarding intervention results will be reported in a subsequent manuscript and were controlled for statistically in results reported below.

Measures

Typical weekly alcohol consumption was assessed with the Daily Drinking Questionnaire (DDQ) [13] in the pre-birthday survey. The DDQ has been used in previous studies of college student drinking demonstrating good convergent validity [14] and high test–re-test reliability (2 months $r = 0.87$) [15]. Participants were asked, 'Consider a typical week during the *last 3 months*. How much alcohol, on average (measured in number of drinks), do you drink on each day of a typical week?'. Typical weekly drinking was the sum of the standard number of drinks for each day of the week. In previous research examining quantity measures of alcohol consumption, typical weekly consumption has been suggested to be among the best predictors of alcohol-related problems [16]. A modified version of the DDQ was used to assess participants' drinking specifically during the week of their 21st birthday (i.e. the 3 days prior to, on, and the 3 days following their 21st birthday). It is possible that some students celebrate their birthday not just on the actual birthday but also on the days prior to or following their birthday. Thus, we assessed drinking 3 days before and 3 days after the birthday in order to assess a full week of drinking on and surrounding the 21st birthday. Responses were provided

during the post-birthday survey and represent the number of drinks consumed during the 21st birthday week.

A modified version of the Young Adult Alcohol Problems Screening Test (YAAPST) [17] assessed 21st birthday alcohol-related negative consequences and risk behaviors ($\alpha = 0.74$). In previous research evaluating typical alcohol-related negative consequences and risk behaviors, the YAAPST has demonstrated good internal consistency and test–re-test reliability, as well as support for criterion validity, concurrent validity and construct validity [17,18]. In the present study, participants were asked to rate the occurrence of 27 specific problems on a scale ranging from 0 (no, never) to 5 (yes, five or more times during my 21st birthday week). Six items that assessed problems that may not result from excessive 21st birthday drinking (i.e. involvement in drinking games and symptoms of dependence) were excluded in the final analyses. However, it should be noted that findings were essentially unchanged when data were analyzed with all 27 items. The final 21 items were summed, representing 21st birthday alcohol-related negative consequences and risk behaviors. Birthday negative consequences and risk behaviors were based on responses provided during the post-birthday survey.

RESULTS

Typical drinking versus 21st birthday drinking

Preliminary analyses revealed that 21st birthday week drinking did not vary significantly throughout the academic year ($F_{(3, 295)} = 1.55$, $P = 0.22$). As expected, students reported heavier drinking the week of their 21st birthday (mean = 15.10, SD = 13.21) compared to a typical week (mean = 7.18, SD = 8.43) in the previous 3 months ($t_{(295)} = 15.03$, $P < 0.001$). On average, students consumed 7.92 standard drinks more during the week of their 21st birthday compared to a typical week in the previous 3 months. Further examination of 21st birthday week drinking revealed that over half of the drinks were consumed on one's birthday (Fig. 1). It is important to note that there was no overlap in the assessment of typical drinking and drinking during the week of students' 21st birthdays. Overall, students who were typically heavier drinkers drank more than lighter drinkers on their 21st birthday ($r_{(306)} = 0.69$, $P < 0.001$). Finally, students reported experiencing 2.19 (SD = 3.00) negative consequences and risk behaviors during their 21st birthday week.

What negative consequences and risk behaviors are students experiencing during 21st birthday celebrations?

A majority of students (56.8%) reported experiencing at least one negative consequence during the week of their 21st birthday. Table 1 presents the percentage of students who experienced individual alcohol-related negative consequences and risk behaviors during the 21st birthday week. Findings indicated that college students experienced a variety of alcohol-related negative consequences and risk behaviors related to 21st birthday drinking. The most frequently reported consequences were hangover, vomiting and blackouts, respectively.

Who is likely to experience 21st birthday consequences?

Preliminary analyses revealed extreme non-normality of 21st birthday alcohol-related negative consequences and risk behaviors (i.e. positively skewed). Because of the violation of normality assumption and because we were interested in examining 'how many' 21st birthday problems students experienced rather than 'whether or not' they experienced 21st birthday problems, we did not analyze the data with traditional regression or logistic regression. Because the variance was substantially greater than the mean, 21st birthday alcohol-related negative consequences and risk behaviors followed closely a negative binomial probability distribution. Thus, we used the generalized linear modeling approach with the distribution specified as negative binomial (i.e. negative binomial regression) to evaluate 21st birthday alcohol-related negative

consequences and risk behaviors as a function of sex, typical drinking behavior (i.e. typical number of drinks per week) and 21st birthday drinking. We also evaluated the potential interaction between 21st birthday week drinking and typical drinking behavior. Two dummy coded variables were included as covariates representing intervention effects for the larger study (intervention = 1; control = 0) and sex (men = 1, women = 0). Typical number of drinks per week and 21st birthday week drinks were mean centered to facilitate interpretation of parameter estimates [19].

Assessment of fit for the negative binomial distribution was adequate, as the values of Pearson's χ^2 test ($\chi^2_{(290,\ n=296)} = 355.92$) and deviance ($\chi^2_{(290,\ n=296)} = 277.62$) divided by the number of degrees of freedom were close to 1. When examining main effects, results presented in Table 2 indicated that there was a modest increase for women having (i.e. 1.60%) greater alcohol-related negative consequences and risk behaviors during the week of their 21st birthday. In addition, for each unit increase in number of drinks consumed during the week of one's 21st birthday, there was an expected 6.91% increase in negative consequences and risk behaviors over the 21st birthday week. However, typical drinking did not account for significant variance in alcohol-related problems over and above drinking during the 21st birthday week. Although the validation of the 21st birthday version of the YAAPST was not the purpose of this paper, findings indicate that 21st birthday drinking was associated with 21st birthday negative consequences and risk behaviors.

When examining the interaction model, results revealed that the two-way interaction was significant. Figure 2 presents the predicted cell means, which were derived from the regression equation with higher and lower values represented as 1 SD above and below the respective centered means [19]. Results indicated that the association between the number of drinks consumed during the week of one's 21st birthday and experienced alcohol-related consequences during the 21st birthday week was stronger among students who reported consuming fewer drinks in a typical week. While significant for both lighter drinkers and heavier drinkers, examination of simple slopes revealed that 21st birthday alcohol consumption was associated more strongly with 21st birthday negative consequences and risk behaviors for those who typically consume less alcohol ($\chi^2 = 68.22$, $P < 0.001$) than those who typically consume more alcohol ($\chi^2 = 30.80$, $P < 0.001$). Supplementary analyses examining the intervention effects on 21st birthday week drinking and 21st birthday week negative consequences and risk behaviors were unrelated to typical weekly drinking. Thus, it is unlikely that the intervention altered the present findings.

DISCUSSION

This research expands on the growing literature related to event-specific drinking by considering whether event-specific drinking is associated uniquely with negative consequences and risk behaviors. Findings demonstrated that, on average, students drank considerably more during the week of their 21st birthday and on their 21st birthday in particular than they did typically. A striking proportion of students reported experiencing several types of negative consequences and risk behaviors during this week, including hangovers (44%), vomiting (36%) and blackouts (31%). Results also indicated that 21st birthday drinking and negative consequences and risk behaviors were associated strongly with typical drinking patterns, which suggests that the pattern of individual differences in typical drinking is mirrored but magnified on specific events associated with excessive drinking.

The extent to which 21st birthday drinking is problematic depends not only on how much alcohol students consume around this event, but also on their typical drinking behavior. Individuals who were usually lighter drinkers but who consumed heavy amounts the week of their birthday appeared to be at greater risk for experiencing 21st birthday drinking

consequences. It is important to note that the stronger relationship between 21st birthday drinking and problems among lighter drinkers was not because lighter drinkers drank more than heavier drinkers in celebrating their 21st birthday. Rather, these results provide empirical evidence for suggestions by Greenbaum and colleagues [6], that those who do not normally drink heavily and have lower tolerance may be especially at risk on occasions where they drink much more than they would normally. The present findings are also consistent with Neal & Carey's [7] findings that average intoxication moderated the association between daily drinking and negative consequences, such that lighter drinkers were at greater risk for negative consequences than heavier drinkers. Furthermore, Neal & Fromme [8] found that the association between alcohol use and behavioral risks increased among college students as their level of intoxication reached above their average level of intoxication. It should be noted that an additional explanation for this effect in the present study is that lighter drinkers may be more likely than heavier drinkers to report alcohol-related problems. For example, lighter drinkers may be more likely to report having a headache or feeling sick simply because such effects may be more prominent to an inexperienced drinker in comparison to a heavier or experienced drinker.

Implications for prevention interventions

Results of this research have several implications for considering the development and appropriate targets for event-specific prevention efforts. Many existing college drinking interventions can be classified as indicated prevention approaches, targeting students who have already begun to experience problems [20,21]. The current findings suggest that targeting only heavy drinkers for event-specific prevention interventions may miss out on an important group of students (i.e. typical light drinkers who drink heavily during specific events) who are at risk for experiencing negative consequences and risk behaviors. Moreover, results suggest that tolerance may be a useful and important content domain in event-specific interventions, especially for those with low tolerance. Related to this, individuals who have less drinking experience may not have had the opportunity to develop strategies that help to prevent consequences [22,23]. Students with little or no drinking experience may place themselves at risk when consuming relatively excessive amounts of alcohol on a 'special occasion'; thus, intervention components that focus not only on how to reduce drinking, but also on blood alcohol content, tolerance, protective tips, etc. are likely to be effective.

The strong relationships between typical drinking behavior and 21st birthday drinking behavior beg the question of whether prevention efforts targeting a specific event might generalize to other specific events and more generally to typical drinking and consequences. More research evaluating variability in drinking behavior as it relates to contextual and temporal factors, such as 21st birthdays, is clearly warranted. Research assessing alternative prevention paradigms that effectively incorporate atypical drinking associated with specific events would be of considerable value.

Future directions and limitations

We took several steps to mitigate concern regarding use of self-report measures, such as assuring students that all responses were confidential and using standardized measures of typical alcohol use that have demonstrated good reliability and validity in past research with student populations. These steps have been found to increase the reliability and validity of self-report in a variety of populations [14,24]. Future research examining event-specific drinking should validate measures used for typical drinking when applied to event-specific drinking. Moreover, the YAAPST is one of several measures of alcohol-related consequences and risk behaviors, each of which have pros and cons. Like a number of other measures, the YAAPST includes items that assess symptoms of dependence and/or risk-amplifying behaviors rather than consequences alone [25]. While involvement in drinking games and symptoms of

dependence items were not included in the present analysis, future research that examines event-specific drinking should take into consideration whether these alcohol-related problems could result from excessive event-specific drinking. In addition, research examining event-specific consequences should consider assessing and controlling for typical alcohol-related problems. Assessing typical problems and event-specific problems would shed light on how base rates of consequences from the typical week differ from weeks with specific events as well as if the type of consequences typically experienced varies from weeks with specific events.

It is possible that some students' birthdays fell around events related to usually high or unusually low drinking, such as Spring Break or mid-term examinations [5], thus these events may not have been considered typical by students when estimating typical drinking for the last 3 months. Future research should assess perceptions of typical drinking prior to turning 21, and how this relates to 21st birthday drinking behavior.

While we report drinking behavior for the 3 days prior to and following participants' birthdays, it should be noted that students may not have actually celebrated their 21st birthday on their actual birthday and that students may have celebrated their birthdays outside these 7 days. Future research should use methodology that would capture which days drinking and/or consequences occurred, such as daily-diary methodology. Moreover, although the time-frame used in the present study is similar to time-frames used in previous research on 21st birthday drinking [3,26] retrospective recall is a concern, especially where the amount of alcohol consumed in relation to turning 21 was higher than amounts consumed typically. For typical drinking behavior, which was assessed prior to and did not overlap with 21st birthday drinking, retrospective recall was longer. However, these time-frames are common when assessing college student drinking and were consistent with the time-frames used for relevant scale development [13]. Future research should consider using ecological sampling methods [27] for 21st birthday drinking, and college student drinking in general, to lessen concerns about retrospective recall.

In addition, while we controlled for the intervention in the analyses, additional research is needed to replicate findings in a non-intervention sample. A final limitation to the present sample is that it was comprised of college students from a single institution with high ethnic homogeneity in the United States. Generalizability of the findings may be limited by the unique characteristics of US universities and colleges, and may not generalize to students in other countries and cultures. Future research should determine if the relationships found in the present study generalize to samples from multiple college campuses and to non-college individuals turning 21.

Conclusions

These findings extend our knowledge of the relationship between event-specific drinking and typical drinking behavior. Additional research examining how contextual and temporal drinking relate to drinking behavior more generally is needed to aid in developing event-specific prevention interventions.

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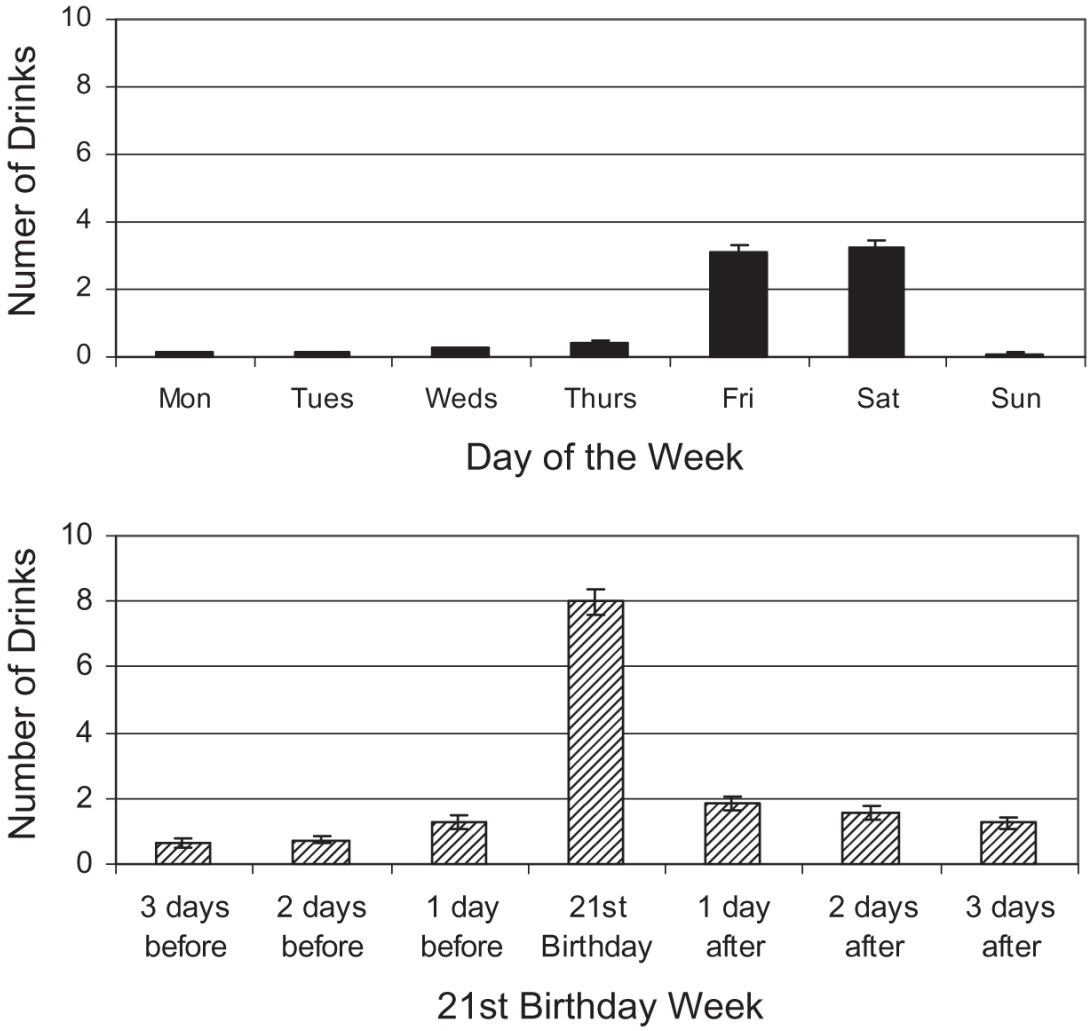

Figure 1.
Means and standard errors for typical and 21st birthday daily drinking behavior

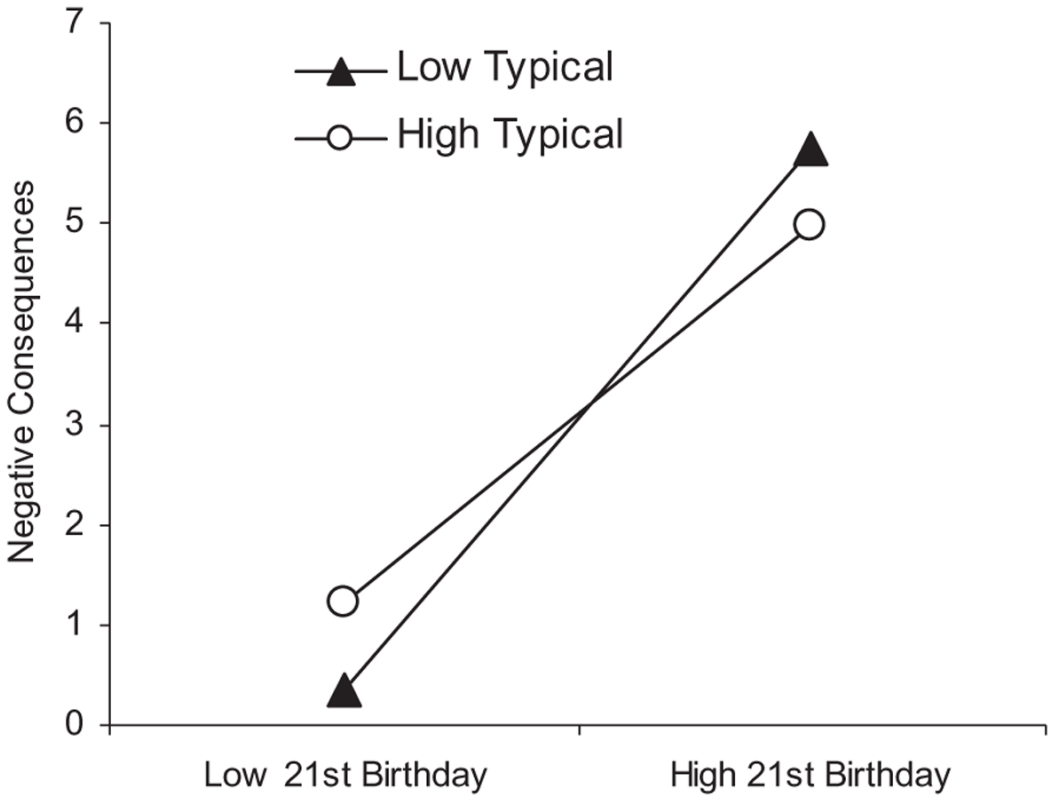

Figure 2.
Twenty-first birthday negative consequences and risk behaviors as a function of typical weekly drinking and 21st birthday week drinking

Table 1

Percentage of students who experienced negative consequences and risk behaviors during the 21st birthday week.

Negative consequences and risk behaviors	21st birthday week
Have you ever had a headache (hangover) the morning after you had been drinking?	44.3%
Have you felt very sick to your stomach or thrown up after drinking?	35.5%
Have you awakened the morning after a good bit of drinking and found that you could not remember a part of the evening before?	31.4%
Have you shown up late for work or school because of drinking, a hangover or an illness caused by drinking?	14.5%
Have you ever skipped an evening meal because you were drinking?	10.1%
Have you become rude, obnoxious or insulting after drinking?	9.1%
Have you ever felt guilty about your drinking?	8.8%
Have you ever received a lower grade on an examination or paper than you should have because of drinking?	6.8%
Have you driven a car when you knew you had too much to drink?	3.7%
Has drinking ever led you into sexual situations which you later regretted?	3.4%
Because of your drinking, have you ever neglected to use birth control or neglected to protect yourself from sexually transmitted diseases?	2.7%
Because you had been drinking, have you ever had sex with someone you would not ordinarily have sex with?	1.0%
Because you had been drinking, have you ever had sex when you did not really want to?	1.0%
Have you got into physical fights when drinking?	1.0%
Have you damaged property, set off a false alarm or other things like that after you had been drinking?	1.0%
Have you ever been pressured or forced to have sex with someone because you were too drunk to prevent it?	0.7%
Have you ever been fired from a job or suspended or expelled from school because of drinking?	0.3%
Have you ever been arrested, even for a few hours, because of other drunken behavior?	0.3%
Have you ever pressured or forced someone to have sex with you after you had been drinking?	0.3%
Have you ever been in trouble at work or school because of drinking?	0.0%
Have you ever been arrested for drunk driving, driving while intoxicated or driving under the influence?	0.0%

Table 2

Summary of negative binomial regression analysis predicting 21st birthday week results for negative consequences and risk behaviors.

Predictor	B	SE	Z-statistic	Odds ratio	95% CI for odds ratio	
					Lower	Upper
Main effects model						
In-laboratory intervention	0.090	0.188	0.481	1.095	0.757	1.582
Internet intervention	−0.087	0.184	−0.472	0.917	0.639	1.315
Sex	− 0.469	0.159	− 2.956**	0.626	0.459	0.854
Typical week	0.004	0.013	0.345	1.005	0.979	1.030
Birthday week	0.067	0.009	7.324***	1.069	1.050	1.088
Interaction model						
Typical week × birthday week	−0.003	0.001	− 5.100***	0.997	0.996	0.998

n = 296.

** P <0.01,

*** P <0.001. Typical week: typical number of drinks per week; birthday week: 21st birthday week drinks.