Published in final edited form as:

Psychol Addict Behav. 2008 June ; 22(2): 176–185. doi:10.1037/0893-164X.22.2.176.

21st Birthday Celebratory Drinking: Evaluation of a Personalized Normative Feedback Card Intervention

Melissa A. Lewis,

Department of Psychiatry and Behavioral Sciences, University of Washington

Clayton Neighbors,

Department of Psychiatry and Behavioral Sciences, University of Washington

Christine M. Lee, and

Department of Psychiatry and Behavioral Sciences, University of Washington

Laura Oster-Aaland

Orientation and Student Success, North Dakota State University

Abstract

This research was designed to evaluate a personalized normative feedback birthday card intervention aimed at reducing normative perceptions, alcohol consumption, and negative consequences associated with 21st birthday celebrations among college students ($N = 281$; 59.15% women). Students were randomly assigned to receive or not receive a birthday card about 1 week prior to their 21st birthday. Approximately 1 week following their birthday, students were asked to complete a brief survey concerning their birthday celebration activities. Findings indicated that the birthday card intervention was not successful at reducing drinking or consequences; however, the card did reduce normative misperceptions. Additional findings indicated that many students experienced negative consequences, such as passing out or driving after consuming alcohol. Combined, these findings suggest that prevention is needed for drinking associated with turning 21. However, prevention efforts should consist of more than a birthday card.

Keywords

21st birthday; alcohol; alcohol-related problems; social norms; personalized normative feedback

Heavy drinking among college students has been associated with a wide range of consequences (Hingson, Heeren, Winter, & Wechsler, 2005; Hingson, Heeren, Zakocs, Kopstein, & Wechsler, 2002; Johnston, O'Malley, Bachman, & Schulenberg, 2004). Recently, investigators have begun to document a number of specific events where drinking appears to be elevated (Neighbors et al., 2007). Events being evaluated include holidays (e.g., Thanksgiving, New Year's), spring break, and sporting events (Del Boca, Darkes, Greenbaum, & Goldman, 2004; Greenbaum, Del Boca, Darkes, Wang, & Goldman, 2005; Lee, Maggs, & Rankin, 2006; Neighbors, Oster-Aaland, Bergstrom, & Lewis, 2006; Oster-Aaland & Neighbors, 2007), as well as 21st birthday celebrations (Hembroff, Atkin, Martell, McCue, & Greenamyre, 2007; Neighbors, Oster-Aaland, et al., 2006; Neighbors, Spieker, Oster-Aaland, Lewis, & Bergstrom, 2005; Smith, Bogle, Talbott, Gant, & Castillo, 2006). The present research aimed

to evaluate the efficacy of a personalized normative feedback (PNF) 21st birthday card in reducing normative misperceptions, drinking, and related consequences. In addition, the present research was designed to extend previous examinations of extreme drinking associated with 21st birthday celebrations by exploring drinking context (e.g., at a bar) and alcohol-related consequences in connection with this milestone event.

For the purpose of this research, PNF refers to an approach in which individuals are provided with information that explicitly presents feedback regarding report of one's own drinking, one's perception of the drinking norm, and the actual drinking norm (Lewis & Neighbors, 2006, 2007; Lewis, Neighbors, Oster-Aaland, Kirkeby, & Larimer, 2007; Neighbors, Larimer, & Lewis, 2004; Neighbors, Lewis, Bergstrom, & Larimer, 2006). The birthday card used in the present research provided feedback on one's perception of the 21st birthday drinking norm, as well as the actual 21st birthday drinking norm for the typical student. However, it should be noted that, as the intervention aimed to prevent high-risk 21st birthday drinking, feedback was provided prior to participants' birthday celebrations. As such, feedback was based on participants' reports of their behavioral drinking intentions, rather than reports of past drinking behavior.

21st Birthday Drinking

Turning 21 represents the transition to legal drinking age in the United States. Many young adults mark this day by ordering their first legal drink at a bar or restaurant. Previous research (Neighbors et al., 2005) found that approximately three out of four students visited a bar on their 21st birthday. More striking was the finding that 72% of these women and men consumed at least four or five standard drinks on this occasion and reached an average estimated blood alcohol concentration (eBAC) of .17, more than double the legal driving limit in most states. Other research has found that students drink an average of 3.81 drinks more on their 21st birthday than they consume on a typical drinking day and 1.73 standard drinks more than on their peak drinking day in the month prior to their 21st birthday (Smith et al., 2006). Thus, it seems clear that drinking levels are considerably elevated on this occasion relative to other drinking occasions.

Deaths related to attempts to consume 21 shots—"the Power Hour" or "the 21 Run"—have been publicized in the media; however, it is less clear whether and what specific alcohol-related consequences are typically associated with turning 21. Additionally, while a majority of students celebrate their 21st birthday at a bar (Neighbors et al., 2005), it is unclear if the bar context is related to students' consuming more alcohol and experiencing more problems. Drinking at a bar may relate to greater consumption because of low pricing (Clapp & Stanger, 2003) or promotions (e.g., two-for-one drink specials, free drinks on birthday). Moreover, celebrating at a bar may relate to experiencing more problems. For example, prior research has found that drinking in a bar is related to drinking to intoxication (Kypri, Paschall, Maclennan, & Langley, 2007) and aggressive behavior (Buddie & Parks, 2003; Graham, Osgood, Wells, & Stockwell, 2006; Parks, 2000; Parks & Miller, 1997).

Prevention of Risky 21st Birthday Drinking

Previous efforts have centered on, in addition to documenting alcohol consumption associated with 21st birthdays, developing effective strategies for reducing drinking on this occasion. A number of published intervention efforts targeting 21st birthday drinking to date have been at least partly inspired by the Be Responsible About Drinking (BRAD) Foundation (McCue, Greenamyre, Atkin, & Martell, 2006; Neighbors et al., 2005). The BRAD Foundation was created following the death of a Michigan State student, Bradley McCue, from alcohol poisoning related to celebrating his 21st birthday. In addition to other materials, 21st birthday cards that include a brief story about Bradley McCue and a message encouraging celebrants

to drink responsibly have been disseminated to students on over 100 campuses (Smith et al., 2006). Efforts to evaluate the efficacy of these and other birthday cards promoting safe drinking on 21st birthday celebrations have been equivocal, and it is not clear that birthday cards alone are sufficient to reduce alcohol consumption (McCue et al., 2006; Neighbors et al., 2005; Neighbors, Spieker, Oster-Aaland, Lewis, & Bergstrom, 2006; Smith et al., 2006). Recent evidence suggests that birthday cards can reduce drinking among those who read and remember the content of the cards (Hembroff et al., 2007).

In the most comprehensive peer-reviewed published evaluation of 21st birthday card interventions to date, Smith and colleagues (2006) evaluated four different 21st birthday cards (two social norms marketing messages and two harm reduction messages) encouraging responsible drinking versus a control card presenting no alcohol-related message in two cohorts. One of the cards presented social norms marketing-type information indicating that “26% of students on campus did not drink at all when celebrating their 21st birthdays” or that “95% did not drink 21 drinks when celebrating.” In contrast to a recent evaluation of the BRAD card (Hembroff et al., 2007), results of this study suggested no preventive effects of any of the cards, including the social norms marketing card, in reducing drinking or alcohol-related problems. Potential effects of the cards on perceived norms were not evaluated. In addition, while this study evaluated alcohol-related problems as an outcome measure, no details were provided regarding prevalence rates for specific problems, nor was the relationship between 21st birthday drinking and alcohol-related problems discussed.

Social Norms Approaches

Research has consistently found that young adults tend to overestimate the drinking of their peers and that normative perceptions are associated with subsequent drinking rates (Borsari & Carey, 2003; Neighbors, Dillard, Lewis, Bergstrom, & Neil, 2006; Perkins, 2002). Normative misperceptions have also been documented specifically for 21st birthday drinking (Neighbors, Oster-Aaland, et al., 2006). Social norms interventions (i.e., social norms marketing and PNF) are designed to correct normative misperceptions and thereby reduce drinking.

Social Norms Marketing Approaches

Universal social norms marketing interventions (e.g., DeJong et al., 2006; Perkins & Craig, 2006; Perkins, Haines, & Rice, 2005) attempt to correct peer norm misperception *implicitly* by presenting accurate norms messages on a large scale (e.g., “85% of students on this campus drink 0-1-2-3 or at most 4 drinks when they party”; “77% of students reported that they have not engaged in risky drinking recently”; “68% of students reported turning down a drink at a party”), often through campus newspaper ads, emails, posters, and/or flyers. As mentioned previously, with two of the four cards, Smith and colleagues (2006) provided general campus statistics about 21st birthdays to students who were turning 21 in an attempt to reduce the normative perception of excessive drinking on 21st birthdays; however, efficacy of this type of card for preventing high-risk drinking and consequences was not established. Research on social norms marketing has produced equivocal support. Some findings demonstrate support for social norms marketing as an effective intervention for reducing alcohol consumption (e.g., DeJong et al., 2006; Mattern & Neighbors, 2004; Perkins & Craig, 2006; Perkins et al., 2005), and other research concludes that there is partial or no support (e.g., Clapp, Lange, Russell, Shillington, & Voas, 2003; Thombs & Hamilton, 2002; Wechsler, Lee, Nelson, & Lee, 2003; Werch et al., 2000).

Personalized Normative Feedback Approaches

An alternative approach to social norms marketing is PNF, which attempts to correct normative misperceptions *explicitly* by presenting individual feedback regarding the student’s own drinking, the student’s perception of others’ drinking, and others’ actual drinking (Lewis &

Neighbors, 2007; Lewis et al., 2007; Neighbors et al., 2004; Neighbors, Lewis, et al., 2006). Personalized feedback interventions that include a normative component have been utilized in a number of different formats, including in-person (Borsari & Carey, 2000, 2005; Larimer et al., 2001; Marlatt et al., 1998; Murphy et al., 2001), mailed (Agostinelli, Brown, & Miller, 1995; Collins, Carey, & Sliwinski, 2002; Larimer et al., 2007; Walters, Bennett, & Miller, 2000), and computerized (Lewis & Neighbors, 2007; Lewis et al., 2007; Neighbors et al., 2004; Neighbors, Lewis, et al., 2006) formats. Personalized intervention strategies using normative comparisons have generally yielded promising results showing reductions in normative misperceptions of peer drinking and reductions in drinking behavior (Carey, Scott-Sheldon, Carey, & DeMartini, 2007; Larimer & Cronce, 2007; Walters & Neighbors, 2005). However, some studies have found reductions in only perceptions of peer drinking, with no reductions in actual subsequent drinking (e.g., Stamper, Smith, Gant, & Bogle, 2004), suggesting a spurious relationship between norms and drinking behavior. It is important to note that personalized feedback interventions have often incorporated other components, such as review of risk factors, expectancy challenge, and blood alcohol content (BAC) information (Carey et al., 2007; Larimer & Cronce, 2007); thus evaluation of single-component personalized feedback interventions are necessary. To date, only a handful of studies have evaluated the effects of a single-component PNF intervention (Lewis & Neighbors, 2007; Lewis et al., 2007; Neighbors et al., 2004; Neighbors, Lewis, et al., 2006). These studies have all demonstrated that PNF is effective at reducing both normative perceptions *and* drinking behavior. Moreover, findings from these studies reveal reductions in normative perceptions as the mechanism of change for reduced drinking behavior. To date, PNF targeting 21st birthday drinking has not been evaluated.

Present Research

The primary aim of this research was to evaluate the efficacy of a 21st birthday-specific PNF card in reducing 21st birthday-specific normative perceptions and test whether reduction of these perceptions was associated with reductions in drinking and related problems on 21st birthdays. This research employed a randomized trial evaluating the impact of the birthday card on 21st birthday perceived norms, drinking, and related consequences, as compared with an assessment-only control condition.

None of the peer-reviewed published research to date has documented specific consequences associated with 21st birthday drinking. This is a relatively critical gap in understanding where 21st birthday drinking falls on the spectrum somewhere between being considered a relatively harmless night of fun and being considered an important public health concern. The secondary aim of this research was to address two important questions related to 21st birthday drinking: (1) What problems are associated with 21st birthday drinking? and (2) How does context of birthday celebrations (e.g., bar context) relate to actual 21st birthday drinking behavior?

Method

Power Analyses

For the present research, power analyses focused on evaluating the effect of the birthday card intervention on drinking behavior (i.e., drinks, hours, eBAC, and problems). Power was estimated based on the least powerful analysis, univariate mean differences between two groups (intervention and control) with equal variances assumed, and *p* value of .05. Walters and Neighbors (2005) recently reviewed literature evaluating personalized feedback interventions for college student drinking and found that across 13 studies the majority of effect sizes were in the small to medium range. We anticipated that, based on this consideration, the present card intervention would have effects in the small to medium ($d = 0.20$ – 0.50) range.

Power analyses indicated that a sample size of 232 would yield .80 power to detect differences between two groups with an effect size of $d = 0.37$.

Participants and Procedure

The registrar's office provided names of and contact information for students turning 21 ($N = 1,313$) during one academic year (fall and spring semester) at a mid-sized midwestern university. We randomly assigned all potential participants (i.e., students with current local addresses) to receive ($n = 430$) or not receive ($n = 410$) a birthday card approximately one week prior to the date of their 21st birthday. The slight variation in group sizes was due to returned cards with incorrect local addresses. At baseline, card condition did not vary by gender, $\chi^2(1, N = 840) = 2.96, p = ns$, or ethnicity, $\chi^2(1, N = 840) = 0.15, p = ns$.

Approximately one week after their birthday, students were sent a brief anonymous survey concerning their birthday celebration activities and a letter containing all elements necessary for informed consent. With the survey, students received a coupon good for one free taco at a local business and a chance to enter a random drawing for one of three \$50 gift certificates to the university bookstore as incentives for participation. Students were provided with two return envelopes, one to return the survey and one to return the drawing entry form. Students were asked not to return the survey and the entry form in the same envelope in order to keep their survey anonymous. Surveys were color coded, such that they were printed on green paper for those who were sent the card and printed on blue paper for those who were not sent the card. This served as a means to determine which condition students were assigned to yet still keep the survey anonymous. The university's institutional review board approved all study procedures. The survey response rate ($N = 281$) was 34.0% for those who received the card and 32.9% for those who did not receive the card.

Prior to analyses, data were screened for normality and outliers. The majority of students (86.8%) reported consuming alcohol while celebrating their 21st birthday. Because some students did not consume alcohol, drinking variables and alcohol-related problems were positively skewed. In order to decrease skewness, and because certain outcome variables were dependent on participants' having some level of alcohol consumption (i.e., alcohol-related problems), we included in analyses only those students who reported consuming at least one drink while celebrating their 21st birthday ($n = 244$).¹ The drinking data for these students exhibited no extreme departures from normality (i.e., greater than 1.5 for skewness, 1.5 for kurtosis; Curran, West, & Finch, 1996) for drinks, hours, eBAC, or alcohol-related problems. Three univariate outliers (Tabachnick & Fidell, 2001) for alcohol-related problems were Winsorized (B. H. Cohen, 2001), such that outliers were replaced with the next highest value that was not determined to be an outlier.

Of those students who received the card and returned the survey, 98.6% said they received the birthday card and 92.3% reported reading the birthday card. Consequently, only students who reported receiving and reading the card were included in analyses evaluating intervention efficacy ($n = 235$).² Due to missing data (i.e., gender and/or weight), eBAC information was available for only 187 of these 235 students. Thus, participants in the primary outcome analyses included only those students (1) who reported consuming at least one typical drink on their birthday, (2) who reported receiving and reading the card, and (3) whose eBAC information could be determined. Among these students (64.7% women, 94.2% Caucasian), the final survey response rate was 20.9% for those who received the card and 23.7% for those who did not

¹Results did not differ when analyses were conducted with the entire sample versus the sample excluding nondrinkers.

²Results did not differ when analyses were conducted with the entire sample versus the sample excluding those who reported not receiving and reading the card.

receive the card. Survey response rates did not vary by gender, $\chi^2(1, N = 187) = 1.73, p = ns$, or ethnicity, $\chi^2(1, N = 187) = 0.05, p = ns$, for either condition.

Materials and Measures

Birthday card—The birthday card was designed to present PNF (Lewis & Neighbors, 2006). The front of the card read “Happy 21st Birthday!” At the top left of the card was an eyelet next to this question: “How many alcoholic drinks do you think the typical [university name] student consumes while celebrating his or her 21st birthday?” At the bottom right of the card was a second eyelet next to this question: “How many alcoholic drinks do you intend to consume while celebrating your 21st birthday?” Students were able to write their answers in the eyelets next to these two questions. The card had a bottom section, removable at the perforation, with the message: “Wait! Don’t forget to write your answers.” The center of the inside of the card had the following message: “How do you compare? 6.95 drinks is the actual norm for [university name] students celebrating their 21st birthdays.” There was also a sentence indicating that this norm was based on the 2005 [university name] Core Alcohol and Drug Survey. At the top left inside the card was the following: “You think that the typical [university name] student consumes ___ drinks while celebrating his or her 21st birthday.” The blank space had the number that the student wrote in the eyelet from the corresponding question on the front of the card. At the bottom right inside the card was the following: “The amount you intend to drink on your 21st birthday is ___ drinks.” The blank space had the number that the student wrote in from the corresponding eyelet from the question on the front of the card. The back of the card stated, “Have a safe and great birthday!” and was signed by [university name] Wellness Education Leaders.

Comparable to previous PNF interventions (e.g., Lewis & Neighbors, 2007; Lewis et al., 2007; Neighbors et al., 2004; Neighbors, Lewis, et al., 2006), the card presented three key pieces of information: (1) perceptions of the number of drinks consumed by the typical student while celebrating his or her 21st birthday, (2) the actual number of drinks consumed by the typical student while celebrating his or her 21st birthday, and (3) the number of drinks the student intended to consume while celebrating his or her own 21st birthday. This information was intended to show two important discrepancies: normative misperception and deviation from the drinking norm. The card was designed to inform students that the typical student does not consume as many drinks on his or her 21st birthday as students may think (i.e., normative misperception). In addition, the card was expected to point out to a student that he or she intended to consume more drinks than the typical student did while celebrating his or her 21st birthday (i.e., deviation from the norm).

Blood alcohol concentration card and information—Students received, in addition to the birthday card, a wallet-sized BAC card with instructions and a BAC calculator that highlights the number of drinks that would result in reaching the legal driving limit of .08.

Assessment instrument—The survey included questions regarding demographics (i.e., ethnicity, gender, weight), number of drinks consumed during 21st birthday celebration, hours spent drinking during 21st birthday celebration, perceived number of drinks consumed by the typical student during 21st birthday celebration, and 21st birthday negative consequences. Drinking and perceived drinking item responses ranged from 0 (*0 drinks*) to 25 (*25 or more drinks*). Responses to the hours spent drinking item ranged from 0 (*0 drinks*) to 10 (*10 or more hours*). We calculated students’ eBACs using a standard formula based on gender, weight, the number of drinks they consumed, and the hours they spent consuming alcohol (National Highway Traffic Safety Administration, 1994).

Alcohol-related problems were assessed with a modified version of the Rutgers Alcohol Problems Index (RAPI; White & Labouvie, 1989). Students reported the number of times they experienced any of 23 alcohol-related consequences (e.g., “passed out or fainted suddenly”) as a result of consuming alcohol on their 21st birthday. Two items related to drinking and driving (i.e., “drove shortly after having more than two drinks” and “drove shortly after having more than four drinks”) were added. Participants rated responses on a scale from 0 (*never*) to 4 (*more than 10 times*). Responses greater than 0 were rescored as 1 in order to create a dichotomized response of 0 (*never*) or 1 (*yes*) for each of the 25 items. Final binary responses were then summed, with possible scores ranging from 0 to 25 (Kahler, Strong, Read, Palfai, & Wood, 2004; Read, Kahler, Strong, & Colder, 2006). Internal reliability for the RAPI was .86. Although the validation of the 21st birthday version of the RAPI was not the purpose of this article, concurrent validity is reported. Problems were positively associated with drinks, $r = .49, p < .001$; hours, $r = .43, p < .001$; and eBAC, $r = .46, p < .001$.

Finally, the survey instructed students to indicate whether they received the birthday card, whether they read the card, and whether they liked the card. Four additional questions assessed the extent to which students thought the card had an impact on their birthday celebration (Neighbors et al., 2005). Responses for these items ranged from 1 (*not at all*) to 7 (*very much*). For example, “The birthday card reduced the amount I ACTUALLY drank when celebrating my 21st birthday,” and “The birthday card had an impact on me.” Internal reliability for these four items was .84.

Results

Analysis Strategy

Because baseline drinking was not assessed, it is unknown whether the two groups differed in terms of typical drinking behavior. Although both groups were demographically comparable, gender was included in all analyses since previous research has shown gender to be related to drinking behavior among college students (Ham & Hope, 2003).

For analyses of covariance (ANCOVA) and multivariate analyses of variance and covariance (MANOVA; MANCOVA), partial eta squared (η_p^2) describes the proportion of total variability in the dependent variable(s) attributable to an effect. According to J. Cohen’s (1988) definition of effect sizes, the following values of η_p^2 are described as the minimum: for a small effect, .01; for a medium-sized effect, .06; and for a large effect, .14. For multiple regression analyses, J. Cohen’s d was included as an index of effect size using the formula $d = 2t / \sqrt{df}$ (Rosenthal & Rosnow, 1991). By convention, effect sizes of .2, .5, and .8 are typically considered small, medium, and large, respectively (J. Cohen, 1988, 1992).

Is 21st Birthday Drinking Related to Specific 21st Birthday Consequences?

Findings indicated that 21st birthday drinking was associated with a number of consequences (see Table 1). Especially problematic was the percentage of students who reported driving shortly after consuming alcohol and the percentage of students who reported passing out. These findings are particularly worrisome, as they represent relatively high percentages for a single drinking occasion.

Effect of Birthday Card and Bar Context on Drinking Behavior

A MANOVA was conducted to determine whether those who received and read the card reported less drinking behavior (i.e., drinks, hours, eBAC, problems) compared with those who did not receive the card. Additionally, we wished to determine whether gender and celebrating in a bar related to 21st birthday drinking behavior. Results are presented in Table 2. Contrary

to expectations, students who received the birthday card did not report less drinking behavior compared with students who did not receive the card. This finding is consistent with participants' perceptions of the effect of the card on their birthday drinking behavior. Participants reported that they liked the card ($M = 4.41$, $SD = 1.45$) but that the card had little impact on their birthday drinking plans ($M = 3.14$, $SD = 1.72$).

Results demonstrated gender differences in 21st birthday drinking behavior. Univariate findings demonstrated that women reached higher eBACs than men did. There were no gender differences in drinks, hours, or negative consequences. Additionally, findings demonstrated that students who celebrated their 21st birthday at a bar reported heavier drinking behavior. Univariate findings demonstrated that students who celebrated in a bar were more likely to consume more drinks, spend more hours drinking, reach higher eBACs, and experience more negative consequences.

Additionally, all two-way interactions were evaluated for card intervention, gender, and bar. Results indicated that there was a significant two-way interaction between gender and bar, $\Lambda = 0.91$, $F(4, 177) = 4.46$, $p < .001$, $\eta_p^2 = .09$. Univariate findings were significant for eBAC, such that women who celebrated in a bar reached higher eBACs than did men who celebrated in a bar, $F(1, 180) = 4.73$, $p < .05$, $\eta_p^2 = .03$.

Correction of Normative Misperceptions

Multiple regression analyses were conducted to evaluate the relationship between norms and drinking behavior. Consistent with social norms literature, having greater normative perceptions for 21st birthday drinking was associated with consuming more drinks, $t(191) = 9.77$, $p < .001$, $d = 1.41$; spending more hours drinking, $t(191) = 6.45$, $p < .001$, $d = 0.93$; reaching a higher eBAC, $t(183) = 9.84$, $p < .001$, $d = 1.45$; and experiencing more problems, $t(191) = 1.96$, $p < .05$, $d = 0.28$, even when taking gender and the intervention into account.

An ANCOVA was conducted to examine differences in perceived typical student drinking between students who received and read the card and those who did not receive the card. Gender was included as a covariate. Consistent with expectations, students who received the card ($M = 8.65$, $SE = 0.43$) had more accurate perceptions of the number of drinks the typical student consumed while celebrating his or her 21st birthday compared with those who did not receive the card ($M = 11.62$, $SE = 0.43$), $F(1, 192) = 23.76$, $p < .001$, $\eta_p^2 = .11$. Thus, although the birthday card had no effect on drinking behavior, it was related to reporting lower normative perceptions of the number of drinks the typical student consumed while celebrating his or her 21st birthday.

To further examine how the card was associated with the perceived number of drinks, we categorically recoded students' perceptions of the number of drinks to reflect a lower perception, accurate perception, or higher perception. The actual norm presented on the card was 6.95; therefore if students reported the norm as 6 or 7, it was recoded as accurate. Perceived drinks less than 6 were recoded as lower perceptions, and perceived drinks greater than 7 were recoded as higher perceptions. Results indicate that more students who received the card had accurate or lower perceptions than did those who did not receive the card, $\chi^2(2, N = 235) = 40.79$, $p < .001$. Only 48.7% of students who received the card had higher perceptions, compared with 82.0% of students who did not receive the card. Moreover, there were significantly more students who received the card who reported accurate perceptions (41.6%) compared with those who did not receive the card (6.6%).

In order to determine whether accuracy of perceived 21st birthday drinking norms was associated with drinking behavior, we conducted a MANCOVA in which categorically coded perceptions (higher, accurate, and lower) were specified as the independent variable.

Dependent variables included number of drinks, hours spent drinking, eBAC, and problems score, each of which represented a continuous variable. Gender was included as a covariate. At the multivariate level, drinking behavior varied significantly as a function of whether perceived norms were higher, accurate, or lower, $\Lambda = 0.77$, $F(8, 360) = 6.26$, $p < .001$, $\eta_p^2 = .12$. Univariate results are presented in Table 3. Pairwise comparisons indicated that students with lower or accurate perceptions consumed less alcohol and reached lower eBACs compared with students with higher perceptions. Additionally, students with lower perceptions spent fewer hours drinking compared with students with higher perceptions. Accuracy of perceptions was not associated with negative consequences.

Discussion

The current research contributes to the growing literature on event-specific drinking and associated problems (Neighbors et al., 2007). This research extended previous research (Smith et al., 2006) by showing that a 21st birthday PNF card can change 21st birthday perceived norms. In addition, this is the first research to demonstrate that students not only consume excessive amounts of alcohol during 21st birthday celebrations, but they also experience negative consequences associated with this event. This was particularly true of students celebrating their 21st birthday in a bar. These findings suggest that targeting event-specific drinking behavior is necessary and warrants additional research.

Implications for Interventions

The present findings indicated that a PNF birthday card was not effective at reducing 21st birthday drinking or problems. However, results revealed that those students who received the card had more accurate perceptions of peer 21st birthday drinking behavior. Moreover, students who had more accurate perceptions consumed fewer drinks and reached lower eBACs. This may suggest that to some extent individuals' perceptions of the 21st birthday drinking norm is a reflection of their own drinking behavior on their 21st birthday.

Coupled with previous research (Neighbors et al., 2005; Smith et al., 2006), the present findings indicate that 21st birthday-specific interventions may need to include more than a birthday card to reduce problematic drinking for such a traditional drinking event. These findings indicate that although event-specific prevention utilizing personalized normative information is effective at reducing normative perceptions, changing these perceptions may not be sufficient to change 21st birthday drinking behavior, and development and evaluation of more comprehensive approaches is warranted (Neighbors et al., 2007).

Alternatively, the manipulation for PNF may need to be stronger than can be achieved with a birthday card. It might be more effective to provide detailed PNF using computerized or in-person formats (Lewis & Neighbors, 2006; Walters & Neighbors, 2005) where responses are more directly tailored and more clearly present discrepancies related to normative misperceptions and drinking behavior. On a social norms approach spectrum, with social norms marketing on the low explicit (high implicit) end and traditional PNF on the high explicit (low implicit) end, the birthday card falls midrange. For instance, the card evaluated in this study provided students with information regarding perceptions of peer drinking behavior and their own personal drinking *intentions* (rather than their own actual drinking behavior, as has typically been provided in PNF interventions). Providing personal information in conjunction with actual norms information makes the card more explicit than social norms marketing. However, because the card did not provide this information in paragraph and graphic form, as typically provided in PNF for typical drinking behavior (Lewis & Neighbors, 2007; Lewis et al., 2007; Neighbors et al., 2004; Neighbors, Lewis, et al., 2006), the normative feedback was less explicit (more implicit) and required students to process more information.

Additionally, the birthday card used a socially distal referent (i.e., typical college student). Both theory—that is, social comparison theory (Festinger, 1954) and social impact theory (Latane, 1981)—and recent research (Lewis & Neighbors, 2004; Lewis et al., 2007) have indicated that normative referents that are closer in social proximity (e.g., same-sex peers) are more strongly associated with drinking behavior and intervention efficacy compared with more socially distal referents (e.g., typical student). However, there are a few points to consider when using more specific normative referents in social norms approaches. First, it is important that the normative referent group not be too proximal, because students may be accurate in regard to the normative referents' drinking behavior, resulting in an absence of normative misperceptions. If the aim of an intervention is to reduce normative misperceptions as a means of reducing high-risk behavior, then misperceptions for the normative referent must be present to be targeted in the intervention (Lewis & Neighbors, 2006). Second, it is important to identify a normative referent that is central to one's identity, yet is not associated with extreme drinking norms (Lewis & Neighbors, 2006). Finally, as normative referents get closer in proximity, the feasibility of assessing norms increases in difficulty. For example, assessing actual norms for individual peer groups would be difficult. With these considerations in mind, one should evaluate the use of a specific, socially proximal normative referent in future social norms approaches for 21st birthday drinking, other event-specific drinking, and typical drinking.

It is also possible that the absence of a baseline drinking assessment in this study limited the ability to detect changes in drinking behavior among students who received the card. Finally, because the 21st birthday is such a milestone event with respect to drinking, PNF may need to be incorporated in the context of a more comprehensive multicomponent prevention intervention that is event-specific (Neighbors et al., 2007).

Because little is known about 21st birthday drinking prevention, and because interventions using birthday cards have not been very successful in producing changes in drinking behavior, it may be best to start with multicomponent interventions to determine whether a prevention intervention can be effective for specific high-risk drinking events. For example, it may be useful to modify an already efficacious multicomponent brief intervention to specific events where high-risk drinking is likely to occur. In-person brief motivational interviewing (MI) interventions have been found to be efficacious in reducing alcohol use and negative consequences in college students (e.g., Carey et al., 2007; Larimer & Cronce, 2007). Intervention components often include normative comparisons (i.e., PNF), alcohol expectancy challenges, personalized BAC information, and safe drinking tips. Brief MI interventions for alcohol use, such as the Brief Alcohol Screening and Intervention for College Students (BASICS; Dimeff, Baer, Kivlahan, & Marlatt, 1999; Marlatt et al., 1998), may be good choices to modify for event-specific drinking. If a multicomponent intervention can reduce 21st birthday drinking behavior, future steps would then be to evaluate individual intervention components and possible mechanisms of change. Moreover, development and identification of an efficacious intervention is a prerequisite for examining possible mechanisms of change.

Finally, because of the tradition associated with this event, it may be difficult to modify exclusively on an individual level. Specifically, environmental factors may contribute to 21st birthday drinking behavior. The current findings indicated that students engaged in more drinking behavior if they celebrated at a bar. It is likely that bars promote free drinks on 21st birthdays. Future research should investigate efforts to modify environmental factors, such as policy changes or public media campaigns (Clapp & Stanger, 2003).

Limitations

The primary limitation of the present research was the lack of a baseline assessment. We were unable to control for possible baseline differences between the control and birthday card conditions in typical drinking behavior and 21st birthday drinking intentions. In addition,

because we did not assess how much students intended to consume prior to their birthday, we were unable to identify possible detrimental iatrogenic effects the card may have had for those students who intended to consume fewer drinks than the norm presented on the card. Students who had intentions to consume fewer than 6.95 drinks may have increased the number of drinks they consumed in order to conform to the norm for typical student 21st birthday drinking. While further research needs to examine possible iatrogenic effects on low- or non-drinking students, Larimer and colleagues (2007) found that providing a mailed multicomponent personalized feedback intervention for alcohol use among college students (which included a normative component regarding the average number of drinks and frequency of drinking of the typical college student) did not produce iatrogenic effects. Findings suggested that among abstainers at baseline, those in the control group were more likely to drink at follow-up compared with those who received personalized feedback.

Moreover, the present study did not have exclusion criteria. Thus, it is possible that students in the control group replicated the norm presented on the card and that students who received the intervention conformed to the norm presented on the card. If so, this would appear to be approximately the quantity that would have been consumed if no normative information had been provided. Future research should consider screening for students whose 21st birthday drinking intentions are higher than the actual 21st birthday drinking norm. Screening for participants who have higher 21st birthday drinking intentions would reduce concerns regarding potential iatrogenic effects and allow for better examination of between-group differences in 21st drinking behavior.

Another limitation of this study was the low response rates. Response rates may have been low due to the anonymity of the survey or small incentives (i.e., lottery and coupon). The present response rates (34.0% card, 32.9% no card) were higher than one-time mailed survey research without compensation (20.7%; James & Bolstein, 1992). Response rates for mail and Web-based surveys generally range from 40% to 60% (Bongers & Van Oers, 1998; McCabe, Boyd, Couper, Crawford, & d'Arcy, 2002) when including incentives for participation and reminders to complete the survey (Helgeson, Voss, & Terpening, 2002; James & Bolstein, 1992). In addition, having a mailed survey may have biased the present sample, with the heaviest drinkers choosing not to respond. More accessible modes of data collection (e.g., phone or Internet), confidential data collection, and completion reminders would likely have increased response rates.

A final limitation of the present research is that all drinking measures were self-report, which causes concern regarding reliability and validity, especially related to BAC estimation (Clapp et al., 2006; Hustad & Carey, 2005). Students may have had difficulty remembering the number of drinks they consumed or the number of hours they spent consuming alcohol. Furthermore, participants may have found the multioption responses for the measure of alcohol-related problems confusing. Although responses were recoded as dichotomous responses, it is recommended that these options (i.e., yes, no) be presented to participants for future use. Finally, the two items related to driving after consuming alcohol are inherently related to one another. In particular, if a student reported consuming four or more drinks before driving, then they likely reported driving after consuming two drinks.

Conclusions

These findings extend our knowledge of event-specific drinking. Findings do not lend support for a PNF birthday card intervention to reduce 21st birthday drinking behavior. Furthermore, the present research is the first to demonstrate that 21st birthday drinking is associated with negative consequences, and that drinking behavior is riskier for those who celebrate in a bar.

Additional research is necessary to determine an effective prevention intervention for 21st birthday drinking.

Acknowledgments

Article preparation was supported by National Institute on Alcohol Abuse and Alcoholism Grants K01AA016966, U18AA015885, and U01AA014742.

References

- Agostinelli G, Brown JM, Miller WR. Effects of normative feedback on consumption among heavy drinking college students. *Journal of Drug Education* 1995;25:31–40. [PubMed: 7776148]
- Bongers IMB, Van Oers JAM. Mode effects on self-reported alcohol use and problem drinking: Mail questionnaires and personal interviewing compared. *Journal of Studies on Alcohol* 1998;59:280–285. [PubMed: 9598708]
- Borsari B, Carey KB. Effects of a brief motivational intervention with college student drinkers. *Journal of Consulting and Clinical Psychology* 2000;68:728–733. [PubMed: 10965648]
- 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, Carey KB. Two brief alcohol interventions for mandated college students. *Psychology of Addictive Behaviors* 2005;25:296–302. [PubMed: 16187809]
- Buddie AM, Parks KA. The role of the bar context and social behaviors on women's risk for aggression. *Journal of Interpersonal Violence* 2003;18:1378–1393. [PubMed: 14678612]
- 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. [PubMed: 17590277]
- Clapp JD, Lange JE, Russell C, Shillington A, Voas RB. A failed norms social marketing campaign. *Journal of Studies on Alcohol* 2003;64:409–414. [PubMed: 12817831]
- Clapp JD, Min JW, Shillington AM, Reed MB, Lange JE, Holmes MR. Environmental and individual predictors of error in field estimates of blood alcohol concentration: A multilevel analysis. *Journal of Studies on Alcohol* 2006;67:620–627. [PubMed: 16736083]
- Clapp JD, Stanger L. Changing the college AOD environment for primary prevention. *Journal of Primary Prevention* 2003;23:515–523.
- Cohen, BH. Explaining psychological statistics. Vol. 2nd ed.. New York: Wiley; 2001.
- Cohen, J. Statistical power analysis for the behavioral sciences. Hillsdale, NJ: Erlbaum; 1988.
- Cohen J. A power primer. *Psychological Bulletin* 1992;112:155–159. [PubMed: 19565683]
- Collins SE, Carey KB, Sliwinski MJ. Mailed personalized normative feedback as a brief intervention for at-risk college drinkers. *Journal of Studies on Alcohol* 2002;63:559–567. [PubMed: 12380852]
- Curran PJ, West SG, Finch JF. The robustness of test statistics to nonnormality and specification error in confirmatory factor analysis. *Psychological Methods* 1996;1:16–29.
- DeJong W, Schneider SK, Towvim LG, Murphy MJ, Doerr EE, Simonsen NR, et al. A multisite randomized trial of social norms marketing campaigns to reduce college student drinking. *Journal of Studies on Alcohol* 2006;67:868–879. [PubMed: 17061004]
- Del Boca FK, Darkes J, Greenbaum PE, Goldman MS. Up close and personal: Temporal variability in the drinking of individual college students during their first year. *Journal of Consulting and Clinical Psychology* 2004;72:155–164. [PubMed: 15065951]
- Dimeff, LA.; Baer, JS.; Kivlahan, DR.; Marlatt, GA. Brief alcohol screening and intervention for college students. New York: Guilford Press; 1999.
- Festinger L. A theory of social comparison processes. *Human Relations* 1954;7:117–140.
- Graham K, Osgood DW, Wells S, Stockwell T. To what extent is intoxication associated with aggression in bars? A multilevel analysis. *Journal of Studies on Alcohol* 2006;67:382–390. [PubMed: 16608147]

- Greenbaum PE, Del Boca FK, Darkes J, Wang CP, Goldman MS. Variation in the drinking trajectories of freshmen college students. *Journal of Consulting and Clinical Psychology* 2005;73:229–238. [PubMed: 15796630]
- Ham LS, Hope DA. College students and problematic drinking: A review of the literature. *Clinical Psychology Review* 2003;23:719–759. [PubMed: 12971907]
- Helgeson JG, Voss KE, Terpening WD. Determinants of mail-survey response: Survey design factors and respondent factors. *Psychology and Marketing* 2002;19:303–328.
- Hembroff L, Atkin C, Martell D, McCue C, Greenamyre J. Evaluation results of 21st birthday card program targeting high-risk drinking. *Journal of American College Health* 2007;56:325–336. [PubMed: 18089516]
- Hingson R, Heeren T, Winter M, Wechsler H. Magnitude of alcohol-related mortality and morbidity among U.S. college students ages 18–24: Changes from 1998 to 2001. *Annual Review of Public Health* 2005;26:259–279.
- Hingson RW, Heeren T, Zakocs RC, Kopstein A, Wechsler H. Magnitude of alcohol-related mortality and morbidity among U.S. college students ages 18–24. *Journal of Studies on Alcohol* 2002;63:136–144. [PubMed: 12033690]
- Hustad JT, Carey KB. Using calculations to estimate blood alcohol concentrations for naturally occurring drinking episodes: A validity study. *Journal of Studies on Alcohol* 2005;66:130–138. [PubMed: 15830913]
- James BM, Bolstein R. Large monetary incentives and their effect on mail survey response rates. *Public Opinion Quarterly* 1992;56:442–453.
- Johnston, LD.; O'Malley, PM.; Bachman, JG.; Schulenberg, JE. College student and adults ages 19–45. Vol. Vol. 2. Bethesda, MD: National Institute on Drug Abuse; 2004. Monitoring the future national survey results on drug use, 1975–2003.
- Kahler CW, Strong DR, Read JP, Palfai TP, Wood MD. Mapping the continuum of alcohol problems in college students: A Rasch model analysis. *Psychology of Addictive Behaviors* 2004;18:322–333. [PubMed: 15631604]
- Kypri K, Paschall MJ, MacLennan B, Langley JD. Intoxication by drinking location: A Web-based diary study in a New Zealand university community. *Addictive Behaviors* 2007;32:2586–2596. [PubMed: 17582691]
- Larimer ME, Cronce JM. Identification, prevention, and treatment revisited: Individual-focused college drinking prevention strategies 1999–2006. *Addictive Behaviors* 2007;32:2439–2468. [PubMed: 17604915]
- Larimer ME, Lee CM, Kilmer JR, Fabiano PM, Stark C, Geisner IM, et al. Personalized mailed feedback for college drinking prevention: A randomized clinical trial. *Journal of Consulting and Clinical Psychology* 2007;75:285–293. [PubMed: 17469886]
- Larimer ME, Turner AP, Anderson BK, Fader JS, Kilmer JR, Palmer RS, et al. Evaluating a brief alcohol intervention with fraternities. *Journal of Studies on Alcohol* 2001;62:370–380. [PubMed: 11414347]
- Latane B. The psychology of social impact. *American Psychologist* 1981;36:343–356.
- Lee CM, Maggs JL, Rankin L. Spring break trips as a risk factor for heavy alcohol use: Does risk vary by gender? *Journal of Studies on Alcohol* 2006;67:911–916. [PubMed: 17061009]
- Lewis MA, Neighbors C. Gender-specific misperceptions of college student drinking norms. *Psychology of Addictive Behaviors* 2004;18:334–339. [PubMed: 15631605]
- Lewis MA, Neighbors C. Social norms approaches using descriptive drinking norms education: A review of the research on personalized normative feedback. *Journal of American College Health* 2006;54:213–218. [PubMed: 16450845]
- Lewis MA, Neighbors C. Optimizing personalized normative feedback: The use of gender-specific referents. *Journal of Studies on Alcohol and Drugs* 2007;68:228–237. [PubMed: 17286341]
- Lewis MA, Neighbors C, Oster-Aaland L, Kirkeby BS, Larimer ME. Indicated prevention for incoming freshmen: Personalized feedback and high-risk drinking. *Addictive Behaviors* 2007;32:2495–2508. [PubMed: 17658695]
- Marlatt GA, Baer JS, Kivlahan DR, Dimeff LA, Larimer ME, Quigley LA, et al. Screening and brief intervention for high-risk college student drinkers: Results from a 2-year follow-up assessment. *Journal of Consulting and Clinical Psychology* 1998;66:604–615. [PubMed: 9735576]

- Mattern JL, Neighbors C. Social norms campaigns: Examining the relationship between changes in perceived norms and changes in drinking levels. *Journal of Studies on Alcohol* 2004;65:489–493. [PubMed: 15376823]
- McCabe, SE.; Boyd, CJ.; Couper, MP.; Crawford, S.; d'Arcy, H. Mode effects for collecting alcohol and other drug use data: Web and US mail; *Journal of Studies on Alcohol*. 2002. p. 755-761.
- McCue C, Greenamyre J, Atkin C, Martell D. Reaction to “Celebration intoxication: An evaluation of 21st birthday alcohol consumption.”. *Journal of American College Health* 2006;54:305–306. [PubMed: 16539224]
- Murphy JG, Duchnick JJ, Vuchinich RE, Davison JW, Karg RS, Olson AM, et al. Relative efficacy of a brief motivational intervention for college student drinkers. *Psychology of Addictive Behaviors* 2001;15:373–379. [PubMed: 11767271]
- Computing a BAC estimate. Washington, DC: Department of Transportation; 1994. National Highway Traffic Safety Administration.
- Neighbors C, Dillard AJ, Lewis MA, Bergstrom RL, Neil TA. Normative misperceptions and temporal precedence of perceived norms and drinking. *Journal of Studies on Alcohol* 2006;67:290–299. [PubMed: 16562412]
- Neighbors C, Larimer ME, Lewis MA. Targeting misperceptions of descriptive drinking norms: Efficacy of a computer-delivered personalized normative feedback intervention. *Journal of Consulting and Clinical Psychology* 2004;72:434–447. [PubMed: 15279527]
- Neighbors C, Lewis MA, Bergstrom RL, Larimer ME. Being controlled by normative influences: Self-determination as a moderator of a normative feedback alcohol intervention. *Health Psychology* 2006;25:571–579. [PubMed: 17014274]
- Neighbors C, Oster-Aaland L, Bergstrom RL, Lewis MA. Event- and context-specific normative misperceptions and high-risk drinking: 21st birthday celebrations and football tailgating. *Journal of Studies on Alcohol* 2006;67:282–289. [PubMed: 16562411]
- Neighbors C, Spieker CJ, Oster-Aaland L, Lewis MA, Bergstrom RL. Celebration intoxication: An evaluation of 21st birthday alcohol consumption. *Journal of American College Health* 2005;54:76–80. [PubMed: 16255318]
- Neighbors C, Spieker CJ, Oster-Aaland L, Lewis MA, Bergstrom RL. Response to the reaction to “Celebration intoxication: An evaluation of 21st birthday alcohol consumption.”. *Journal of American College Health* 2006;54:307–308.
- Neighbors C, Walters ST, Lee CM, Vader AM, Vehige T, Szigethy T, et al. Event-specific prevention: Addressing college student drinking during known windows of risk. *Addictive Behaviors* 2007;32:2667–2680. [PubMed: 17616260]
- Oster-Aaland L, Neighbors C. The impact of a tailgating policy on students’ drinking behavior and perceptions. *Journal of American College Health* 2007;56:281–284. [PubMed: 18089510]
- Parks KA. An event-based analysis of aggression women experience in bars. *Psychology of Addictive Behaviors* 2000;14:102–110. [PubMed: 10860109]
- Parks KA, Miller BA. Bar victimization of women. *Psychology of Women Quarterly* 1997;21:509–525.
- Perkins HW. Social norms and the prevention of alcohol misuse in collegiate contexts. *Journal of Studies on Alcohol* 2002;164–172.
- Perkins HW, Craig DW. A successful social norms campaign to reduce alcohol misuse among college student athletes. *Journal of Studies on Alcohol* 2006;67:880–889. [PubMed: 17061005]
- Perkins HW, Haines MP, Rice R. Misperceiving the college drinking norm and related problems: A nationwide study of exposure to prevention information, perceived norms and student alcohol misuse. *Journal of Studies on Alcohol* 2005;66:470–478. [PubMed: 16240554]
- Read JP, Kahler CW, Strong DR, Colder CR. Development and preliminary validation of the Young Adult Alcohol Consequences Questionnaire. *Journal of Studies on Alcohol* 2006;67:169–177. [PubMed: 16536141]
- Rosenthal, R.; Rosnow, RL. *Essentials of behavioral research: Methods and data analysis*. Vol. 2nd ed.. New York: McGraw-Hill; 1991.
- Smith BH, Bogle KE, Talbott L, Gant R, Castillo H. A randomized study of four cards designed to prevent problems during college students’ 21st birthday celebrations. *Journal of Studies on Alcohol* 2006;67:607–615. [PubMed: 16736081]

- Stamper GA, Smith BH, Gant R, Bogle KE. Replicated findings of an evaluation of a brief intervention designed to prevent high-risk drinking among first-year college students: Implications for social norming theory. *Journal of Alcohol and Drug Education* 2004;4:53–72.
- Tabachnick, BG.; Fidell, LS. Using multivariate statistics. Vol. 4th ed.. Boston: Allyn & Bacon; 2001.
- Thombs DL, Hamilton MJ. Effects of a social norm feedback campaign on the drinking norms and behavior of Division I student-athletes. *Journal of Drug Education* 2002;32:227–244. [PubMed: 12379053]
- Walters ST, Bennett ME, Miller JH. Reducing alcohol use in college students: A controlled trial of two brief interventions. *Journal of Drug Education* 2000;30:361–372. [PubMed: 11092154]
- Walters ST, Neighbors C. Feedback interventions for college alcohol misuse: What, why and for whom? *Addictive Behaviors* 2005;30:1168–1182. [PubMed: 15925126]
- 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. [PubMed: 14507527]
- Werch CE, Pappas DM, Carlson JM, DiClemente CC, Chally PS, Sinder JA. Results of a social norm intervention to prevent binge drinking among first-year residential college students. *Journal of American College Health* 2000;49:85–92. [PubMed: 11016132]
- White HR, Labouvie EW. Towards the assessment of adolescent problem drinking. *Journal of Studies on Alcohol* 1989;50:30–37. [PubMed: 2927120]

Table 1
Percentage of Students Who Experienced Negative Consequences

Negative consequence	Percentage of students
Missing a day (or part of a day) of school or work	27.8
Neglected responsibilities	27.2
Not able to do homework or study for a test	17.4
Suddenly found themselves in a place they could not remember getting to	16.5
Passed out or suddenly fainted	16.1
Drove shortly after having more than two drinks	16.0
Caused shame or embarrassment to someone	15.2
Had a fight, argument, or bad feelings with a friend	14.5
Drove shortly after having more than four drinks	6.6
Had a fight, argument, or bad feelings with a family member	6.2

Note. $n = 244$.

Multivariate and Univariate Analysis of Variance for 21st Birthday Drinking Behavior

Univariate results															
Multivariate results			Drinks			Hours			eBAC			Problems			
	Λ	F^a	η_p^2	F^b	η_p^2	$M (SE)$	F^b	η_p^2	$M (SE)$	F^b	η_p^2	$M (SE)$	F^b	η_p^2	$M (SE)$
Dependent variable															
Intervention	.99	0.45	.01	0.42	.01		0.01	.01		0.93	.01		0.36	.01	
Gender (n = 90)						6.97 (0.53)			3.37 (0.26)			0.12 (0.01)			2.33 (0.39)
Age (n = 66)	.63	26.71***	.37	1.67	.01	6.51 (0.55)	1.13	.01	3.34 (0.28)	8.93**	.05	0.11 (0.01)	0.09	.01	2.64 (0.41)
Context (n = 136)	.67	22.43***	.33	72.17***	.28	6.26 (0.47)	49.13***	.21	3.55 (0.24)	73.41***	.29	0.14 (0.01)	13.70***	.07	2.40 (0.35)
Gender (n = 136)						7.22 (0.62)			3.16 (0.31)			0.09 (0.01)			2.56 (0.46)
Intervention															
Gender (n = 136)						3.40 (0.68)			1.97 (0.34)			0.05 (0.01)			1.40 (0.51)
Age (n = 136)						10.08 (0.42)			4.73 (0.21)			0.19 (0.01)			3.57 (0.32)

η_p^2 = partial eta squared.

Univariate dfs = 4,180.

Univariate dfs = 1,183.

.01.

.001.

Table 3
21st Birthday Drinking Behavior by Accuracy of Perceived 21st Birthday Drinking Norm

Variable	Higher perception		Accurate perception		Lower perception		Univariate results	
	M	SE	M	SE	M	SE	F (2, 183)	η_p^2
Drinks	9.52	0.47	6.69	0.79	2.56	1.16	17.36***	.16
Hours	4.60	0.22	3.82	0.38	1.04	0.55	17.91***	.16
eBAC	0.18	0.01	0.13	0.02	0.05	0.03	13.75***	.13
Problems	3.08	0.33	2.92	0.57	2.21	0.83	0.47	.01

Note. $n = 187$. The actual norm presented on the card was 6.95. Higher perceptions ($n = 124$) were coded as greater than 7. Accurate perceptions ($n = 43$) were coded as 6 or 7. Lower perceptions ($n = 20$) were coded as less than 6. η_p^2 = partial eta squared.

 $p < .001$.