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## Delivering Normative Feedback to Heavy Drinking College Students via Text Messaging: A Pilot Feasibility Study

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### Abstract

Correcting misperceptions in drinking norms is an established method of reducing college student drinking; however, delivery of accurate norms has typically been limited to a single dose within the confines of an alcohol intervention. The present study tests the feasibility, acceptability, and preliminary efficacy of using text messages to promote pro-moderation descriptive and injunctive norms. Following a baseline survey, 68 heavy drinking college students were randomly assigned to receive 28 daily messages with either accurate norms information (experimental group,  $n=34$ ) or fun facts (control group,  $n=34$ ). Participants rated each message on a 5-point scale of interest, and at the end of the 28 days completed a follow-up assessment of normative perceptions and drinking behavior. The study protocol was feasible: 87% of invited students completed the screener, 64% of eligible students completed the consent form, and 93% agreed to participate. All messages were delivered and 98% were rated. Regarding acceptability, the mean interest rating for the alcohol-related text messages was 2.84 ( $SD=1.30$ ), and no participants withdrew from the study. Although between-group differences were not observed at follow-up, participants in the experimental group showed significant reductions between baseline and follow-up on peak drinks, frequency of heavy episodic drinking (HED), negative consequences, and injunctive norms ( $ps<.01$ ). Results lay the groundwork for development of a text-based prevention strategy for use in college settings.

### Keywords

alcohol; college students; intervention; text message

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#### Contributors

Drs. Nancy Barnett, Kate Carey, and Jennifer Merrill designed the study and oversaw data collection. Dr. Merrill conducted the statistical analysis and wrote the first draft of the manuscript. Holly Boyle assisted with data collection and manuscript drafts. All authors contributed to and have approved the final manuscript.

#### Conflict of Interest

All authors declare that they have no conflicts of interest.

Alcohol misuse among college students is associated with persistent rates of consequences, including injuries and even deaths (Hingson, Zha, & Weitzman, 2009). Because current interventions targeting college student drinking produce small effect sizes (Carey, Scott-Sheldon, Carey, & DeMartini, 2007; Tanner-Smith & Lipsey, 2015), it is essential to develop and test novel prevention strategies. In the present study, we test acceptability and feasibility of one such novel approach involving repeated exposure to SMS text messages that depict accurate descriptions of peer drinking behaviors and beliefs.

One strong predictor of high-risk drinking among college students is perceived norms (Perkins, 2002). Descriptive norms (DN, what others do) and injunctive norms (IN, what others approve of) are positively associated with drinking, both cross-sectionally and longitudinally (Larimer, Turner, Mallett, & Geisner, 2004; Lee, Geisner, Lewis, Neighbors, & Larimer, 2007; Mollen, Rimal, Ruitter, Jang, & Kok, 2013; Read, Wood, & Capone, 2005). However, estimates of others' drinking (DN) often exceed reports of one's own behavior, and estimates of others' approval of drinking behaviors (IN) are usually more permissive than one's own attitudes (Borsari & Carey, 2003). In other words, many students believe others drink and approve of drinking more than the student does, and often perceived norms are exaggerated relative to actual norms. In addition, students endorse more personal approval of protective behavioral strategies than they ascribe to others (DeMartini, Carey, Lao, & Luciano, 2011). The phenomenon whereby privately held attitudes are more conservative than perceived peer attitudes is sometimes termed "pluralistic ignorance" (Prentice & Miller, 2003).

Exaggerated perceived norms can have adverse effects on individuals and the community. Not only do perceived DN and IN predict later drinking behavior (Larimer et al., 2004; Wardell & Read, 2013), but self-other differences in DN (i.e., the perception that peers (others) are engaging in heavier drinking than the student is) predict increased drinking over time, suggesting that students conform to their (mis)perceptions (Carey, Borsari, Carey, & Maisto, 2006). Perceptions of self-other differences in IN can also serve to perpetuate permissive drinking environments, whereby individual students who do not share the perceived approval of excessive drinking feel in the minority (Prentice & Miller, 1993), and those holding pro-moderation attitudes (i.e., beliefs that it is a good idea to drink at low levels and/or take safety precautions to avoid risk while drinking) do not express their opinions for fear of social isolation (Glynn, Hayes, & Shanahan, 1997). Theoretically then, correcting such misperceptions could result in behavior change.

Personalized normative feedback is included in many efficacious interventions to reduce college student drinking, typically is delivered via computer screen or in person (Carey et al., 2007; Carey, Scott-Sheldon, Elliott, Garey, & Carey, 2012; Cronce & Larimer, 2011; Lewis & Neighbors, 2006). Nearly all of these have provided accurate descriptive norms to correct misperceptions of peer drinking behavior, in one or two exposures. Importantly, mediation analyses consistently support DN as a mechanism of change in alcohol consumption (Reid & Carey, 2015).

Though literature suggests that correcting exaggerated IN may also be a viable prevention strategy, few prevention interventions employ IN feedback with the goal of reducing risky

drinking. A recent review found weak evidence for mediation by IN (Reid & Carey, 2015). However, most of the reviewed interventions did not attempt to change IN, and those that included IN manipulations failed to successfully change IN (i.e., the “a” path in mediation); thus strong tests of the potential for a successful IN manipulation to facilitate change in drinking are missing. Recently, two studies demonstrate the malleability of IN. Prince and Carey (2010) manipulated informational content embedded in a survey. Specifically, a page of the survey contained a statement describing campus-based attitudes towards drinking leading to negative consequences (e.g., “Most students find that being unable to remember parts of an evening of drinking is highly unacceptable”), and contrasting these norms with data indicating that acceptability was commonly overestimated. IN changed immediately following presentation of this corrective information. Similarly, IN feedback delivered face-to-face reduced perceptions of IN and consumption and consequences at a 1 month follow-up, relative to an assessment-only control (Prince, Maisto, Rice, & Carey, 2015). Importantly, norms feedback is most persuasive when DN and IN align, presenting a consistent message (Reid, Cialdini, & Aiken, 2010). While correcting both exaggerated DN and IN has a sound theoretical basis as a prevention strategy, this combination strategy has been underutilized in alcohol abuse prevention interventions.

Meta-analyses show that existing alcohol prevention programs produce significant but small effects, but most rely on traditional in-person or computer-delivered formats (Scott-Sheldon, Carey, Elliott, Garey, & Carey, 2014; Tanner-Smith & Lipsey, 2015). There is a need for novel approaches to not only adjust the content of prevention and intervention messages, but also the delivery mode. Text messaging affords a cost-effective opportunity to promote health behavior change, with nearly universal reach. Nearly all (98%) young adults ages 18–29 own cell phones, and 97% of cell phone users use texts (Pew Research Internet Project, 2014). Reviews document the efficacy of text-based interventions on a variety of health outcomes (Cole-Lewis & Kershaw, 2010; Fjeldsoe, Marshall, & Miller, 2009; Free et al., 2013; Mason, Ola, Zaharakis, & Zhang, 2015; Mohr, Burns, Schueller, Clarke, & Klinkman, 2013), with growing support for text-based interventions to reduce alcohol use (Bock et al., 2016; Suffoletto, Callaway, Kristan, Kraemer, & Clark, 2012; B. Suffoletto et al., 2014; Weitzel, Bernhardt, Usdan, Mays, & Glanz, 2007). Texts have been used effectively to deliver tips, educational content, and reminders of users’ health goals (Klasnja & Pratt, 2012). To our knowledge, a text-based intervention designed specifically to correct misperceived norms has not been developed. However, such an intervention can reach students in the context of their daily lives with messages that compete with exposure to risky drinking and peer approval that maintains exaggerated unhealthy norms. Important for this investigation, the focus theory of normative conduct (Cialdini, Kallgren, & Reno, 1991) holds that norms are likely to influence behavior when they are made a salient focus of attention, which can be done with repeated text messages.

## 1.1 The Present Study

We conducted a pilot randomized controlled trial study to inform the development of an intervention that delivers normative feedback to heavy drinking college students via text messaging. Consistent with the phased approach described by Leon, Davis, and Kraemer (2011), the primary aims of this pilot study were to examine feasibility and acceptability of

the proposed intervention. As a secondary aim, we gathered initial evidence of efficacy by examining within- and between-group change in an experimental and control group on levels of alcohol use, alcohol consequences, perceived descriptive and injunctive norms.

## 2. Materials and Methods

### 2.1 Participants

Participants ( $N=68$ ) recruited from a residential 4-year college were eligible to participate if they were second-year students (because they were not currently the focus of other alcohol prevention efforts on campus), ages 18–20, met the NIAAA criteria for risky drinking (for men, 5 drinks in a day or 14 in a week; for women 4 drinks in a day or >7 in a week), and used text messaging at least weekly. Participants were excluded if they reported being in treatment for alcohol use disorder, an AUDIT score of 20 or higher (Babor, Higgins-Biddle, Saunders, & Monteiro, 2001) (because a prevention intervention is unlikely to affect students with likely dependence), and/or inability to receive text messages during the study.

### 2.2 Procedures

The University's Institutional Review Board approved study procedures. Eligibility was determined via an online screening survey emailed by the University's Office of Residential Life. Eligible participants were directed to an online consent form and baseline survey, which collected information on demographic characteristics, past 30 day alcohol use, and knowledge of descriptive and injunctive norms of alcohol use and consequences. Upon survey completion, participants provided contact information and received \$15. Participants who completed the baseline survey and an orientation session to learn more about the study were randomly assigned to the experimental condition (accurate norms information,  $n=34$ ) or control condition (fun facts,  $n=34$ ). In both conditions, participants were sent a text message once per day (at 7:00 pm) for 28 days using the Qualtrics system. After these 28 days, participants completed an online follow-up survey within one week and received \$20.

Procedures within each of the two conditions were identical with the exception of message content. Participants in the control condition received messages containing a fun fact (e.g., "A single elephant tooth can weigh as much as 9 pounds"). Participants in the experimental condition received messages containing a piece of DN or IN feedback (Table 1). In developing the normative feedback provided in this pilot study, we relied on recent data sets to which we had access and that included normative information. More specifically, the normative feedback provided in each IN message was based either on a 2014 survey of 233 college students conducted at a different university, or on a 2015 survey of a separate sample of 221 college student drinkers across the US. The IN items chosen for the present study were rated as most interesting to students in the latter sample (Merrill, Miller, Balestrieri, & Carey, 2016). DN messages regarding alcohol use and consequence rates were based on data collected from the students attending the university where the present study was conducted ( $N=2,820$ ), recruited during the 2011–2012 academic year to participate in an online survey. DN messages regarding rates of usage of protective behavioral strategies were derived from the National College Health Assessment II (American College Health Association, 2014) in Fall of 2014 ( $N=18,190$  drinkers).

## 2.3 Measures

**2.3.1 Demographic Information**—Demographic data included sex, gender identity, age, ethnicity, race, Greek involvement, and residence.

Data on alcohol use, consequences, and norms were collected both at baseline and follow-up.

**2.3.2 Drinks per Drinking Day**—A standard drink was defined as 12oz. of beer; 5 oz. of 12% table wine; 12 oz. of wine cooler; or 1.25 oz. of 80-proof liquor. Participants reported average number of standard drinks consumed in a single occasion in the past 4 weeks.

**2.3.3 Frequency of Heavy Episodic Drinking**—Participants were asked how frequently they engaged in heavy episodic drinking (HED; 4+ drinks [females] and 5+ drinks [males] in a single drinking occasion) in the past 4 weeks.

**2.3.4 Peak Blood Alcohol Content**—Participants reported the number of drinks consumed on their heaviest drinking day in the last four weeks, and the hours over which those drinks were consumed. Peak blood alcohol concentration (peak BAC) was estimated (Hustad & Carey, 2005; Matthews & Miller, 1979).

**2.3.5 Alcohol-Related Consequences**—Participants were asked to indicate whether they had experienced 24 alcohol-related consequences in the past 4 weeks using the Brief Young Adult Alcohol Consequence Questionnaire (B-YAACQ) (Kahler, Strong, & Read, 2005). The total number of consequences experienced were summed (Cronbach's alpha = .68 at baseline; .74 at follow-up).

**2.3.6 Descriptive Norms**—Participants completed an adaptation of the Daily Drinking Questionnaire (Collins, Parks, & Marlatt, 1985) estimating the number of drinks the typical student of their same gender and university consumed each of the seven days of the week. From this we derived the perceived number of drinks per drinking day.

**2.3.7 Injunctive Norms**—Participants were asked how disapproving or approving other students at their university were of (1) drinking, (2) drinking 5 or more drinks on one occasion, and (3) getting drunk, from 1 (*Strongly disapprove*) to 5 (*Strongly approve*). The mean of these three items was calculated (alpha = .76 at baseline; .83 at follow-up).

**2.3.8 Study feedback and acceptability ratings**—Participants responded to each text message with an interest rating from 1 (*Not at all*) to 5 (*Extremely interesting*). At follow-up, participants were asked whether friends participated in the study (to determine if intervention content had been shared between the two randomized groups) and completed open-ended questions about acceptability of message delivery times and frequency. Overall satisfaction was measured with 5 questions on a 5 point scale of how acceptable, convenient, interesting, and informative the messages were, as well as likelihood to recommend this program to other students.

## 2.4 Analytic Plan

To assess feasibility of the intervention, we examined targeted enrollment, consent rates, survey and text message programming success, and response rates to text interest ratings. To assess acceptability, we examined quantitative (e.g., interest rating assessed for daily texts) and qualitative feedback on the post-test survey from participants in the experimental group and participant withdrawals. We used t-tests to determine whether messages were more interesting to males versus females, and whether participants in the experimental group were more interested in messages specific to students from their own university than those generalizing to the broader population or in IN versus DN feedback.

To address our secondary aim regarding preliminary outcomes (typical drinks per drinking day, frequency of HED, peak BAC, alcohol-related consequences, descriptive norms, injunctive norms), ANCOVAs with baseline levels of the outcome as a covariate compared conditions on post-test means controlling for pre-test means. T-tests were used to examine within-group change in outcomes in each group. However, given that this was a pilot study not powered for significance testing, we were primarily interested in the calculation of effect sizes (Cohen's *d*s) for both within-group change and between-group difference (adjusted for pre-test scores).

## 3. Results

### 3.1 Descriptives

Participant demographics and baseline levels of outcome variables are shown in Table 2. At baseline, groups differed only on ethnicity. The control group contained a greater proportion of Hispanic students ( $\chi^2=4.22$ ,  $p=.04$ ) than did the intervention group. Because Hispanic ethnicity was not related to our outcomes ( $ps>.05$ ), this was not included as a covariate.

All 68 participants completed the follow-up survey, which revealed that 54 (79%) participants had a friend in the study, and 29 (43%) had a friend in the opposite condition. In the follow-up survey, all but three of these 29 participants (1 experimental, 2 control) described sharing and discussing the text messages with friends.

### 3.2 Feasibility of the protocol and intervention

A recruitment email was sent to 300 sophomores, 246 (87%) of whom completed the screener. Of those eligible ( $n=157$ ), 59% ( $n=93$ ) agreed to participate. Of those, 68 completed the baseline survey and were randomized. As such, targeted enrollment ( $n=60-75$ ) was met. Two participants were unable to receive SMS via the Qualtrics program, and were sent messages daily to their mobile phone number via email (in the form of an SMS).<sup>1</sup> Of all messages, 98% received an interest rating. Response rates did not differ by group or gender.

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<sup>1</sup>We used an email to SMS gateway by emailing the participant at his/her phone number and carrier extension (e.g. 5551234567@vtext.com). We used Boomerang for Gmail to pre-program the daily SMS to be sent at the same time as those sent through Qualtrics. Participants' response rating to each message was delivered to the study's Gmail account and each rating was transferred to the study's database.

### 3.3 Acceptability

Interest ratings for SMS sent in the experimental group averaged 2.8 ( $SD=1.3$ ); control messages (fun facts) were significantly more interesting to participants ( $M=3.7$ ,  $SD=1.3$ );  $t(66)=5.57$ ,  $p<.01$ . Collapsing across condition, males found the SMS to be significantly more interesting ( $M=3.55$ ,  $SD=0.60$ ) than did females ( $M=3.13$ ,  $p=.78$ );  $t=-2.16$ ,  $p=.03$ ; however, there were no gender differences within the experimental group in ratings of the drinking norms messages ( $t=-1.45$ ,  $p=.16$ ). Within the experimental group, participants were significantly more interested in messages specific to students from their own university ( $M=3.05$ ,  $SD=0.83$ ) than the broader population of college students ( $M=2.77$ ,  $SD=.74$ ),  $t(33)=3.18$ ,  $p=.003$ . Messages delivering IN and DN feedback received equivalent interest ratings ( $t=1.35$ ,  $p=.19$ ). No participants asked to withdraw from the study.

Overall, participants in both groups found the program to be acceptable and convenient (Table 3). Perhaps not surprisingly, students in the fun fact condition rated the program more favorably than those in the alcohol norms condition; however, all means were at or above the midpoint. Qualitative data regarding the frequency with which messages were sent revealed that many participants thought daily was a “good frequency”, “fine”, “appropriate” or “not bothersome at all” ( $n=39$ ). Only two participants (one control, one experimental) indicated that daily texts were “over-frequent” or “maybe kind of much.”

### 3.4 Preliminary Outcomes

ANCOVAs controlling for baseline levels of each outcome revealed no significant group differences at follow-up (Table 4). Within-group t-tests comparing baseline to follow-up levels on the outcomes revealed significant reductions in the experimental group in frequency of HED, peak BAC and consequences. Both groups significantly reduced in IN, and the control group significantly reduced in DN. Between-group effect sizes revealed that participants in the experimental group reported larger reductions in frequency of HED, peak BAC, alcohol consequences, and injunctive norms; however, the control group reported larger reductions in typical drinks per drinking day and DN. With the exception of a medium effect for alcohol consequences ( $d=-.59$ ), all between-group effect sizes were small. Among those in the treatment condition, SMS interest ratings were not significantly correlated with any outcome ( $ps>.05$ ).

## 4. Discussion

The present pilot randomized controlled trial examined the feasibility, acceptability, and effect sizes for change following an intervention designed to deliver corrective normative feedback to college student drinkers via text messaging. We aimed to provide feedback on two types of norms (injunctive and descriptive) across three types of behavioral targets (alcohol use, consequences, protective behavioral strategies). Results provide strong support for the feasibility of implementing the protocol and intervention itself, as well as for the acceptability of the intervention by heavy drinking college students. Not surprisingly given a pilot study not powered to detect significant effects, we did not observe differences in drinking behavior or norms as a function of intervention condition. However, we did observe significant reductions across most outcomes in the experimental group.

One of the most notable findings supporting feasibility was that the overwhelming majority (98%) of text messages received an interest rating in response, despite there being no incentive. In addition to allowing us to document that text messages were actually read, and to get a sense for the interest level in each specific message, we suspect that the request to rate each message results in better attention to the message content. Whether it is useful to request some type of response when translating this type of intervention into practice is an empirical question that can be tested in future research.

The intervention was generally acceptable as well. Participants in the experimental group rated the intervention as convenient, and indicated that they would recommend the program to a friend. On average, participants found the experimental messages to be moderately interesting. Although the interest value of the control texts (fun facts) was significantly higher, the response/exposure rates were equivalent; this is good news for establishing the feasibility and acceptability of daily text messages, and demonstrates that we delivered the intended dose. We chose interest ratings as a method to document exposure to the text content, and have no reason to believe that interest in content affects the efficacy of an intervention.

Participants did not report differential interest in injunctive versus descriptive norms, supporting inclusion of both types of feedback in future work. However, we did learn that students preferred to receive information on students from their own university versus college students more broadly. This, coupled with prior work documenting that norms are more closely related to personal behavior when one more strongly identifies with the reference group (LaBrie, Hummer, Neighbors, & Larimer, 2010; Reed, Lange, Ketchie, & Clapp, 2007) suggest that future interventions should use campus-specific norms and perhaps even those matched by gender or other aspects of one's identity (LaBrie et al., 2013).

Our primary goal was to first establish feasibility and acceptability, and we were underpowered to detect between-group differences in this pilot study. Nonetheless, significant within-group reductions were observed in both groups for IN (with the between-groups effect size favoring the experimental group). Unexpectedly, DN reduced significantly in the control group only. We note that within-group reductions were significant in only the experimental group for three outcomes: heavy drinking, peak BAC, and consequences. Each of these is an index of riskier, more problematic drinking, so it is encouraging to see these reductions exclusively among those receiving the intervention. Further, while most of the between- and within-group effect sizes were small, they were medium for negative consequences, perhaps because more of the messages focused on norms for consequences than level of drinking.

Our follow-up survey revealed that participants shared the messages they received with friends. Twelve participants in the control group (35%) received information from their friends on the facts provided in the experimental messages. Contamination of content between the conditions may in part explain the absence of group differences in this study, and the unexpected reduction in DN in the control group. However, this also speaks to the potential of text message interventions to benefit not only the original recipient of the



information, but one's friends as well, depending on the nature of sharing and conversation around the messages. Indeed, more frequent conversations about drinking safely and risk reduction correlate with use of protective behavioral strategies (Carey, Lust, Reid, Kalichman, & Carey, 2016). Thus, it is possible that the text messages containing normative information about protective strategies and lower levels of drinking could prompt conversations about risk reduction.

#### 4.1 Limitations and Future Directions

This pilot study was a first step in the development of a text-message intervention to correct exaggerated IN and DN for college student drinking. Findings were encouraging but highlight limitations that should be addressed in the next phase of this research. First, as noted, the normative information we sent relied on some data from college students from other universities; campus-specific norms and those matched to other characteristics of student groups (e.g., gender) should be used to develop more tailored and accurate feedback messages. Second, contamination was evident in this small RCT; participants shared message content among friends. In part, this may be because most participants lived on campus and were therefore more likely to see and communicate with one another. From an experimental perspective, a stronger test of this intervention may require obtaining samples that are more distinct and that include students less likely to interact. However, the finding that participants did share the information contained in the texts bodes well for dissemination. Future iterations of such interventions may take advantage of these peer-to-peer conversations, and specifically determine whether sharing messages is a mechanism through which behavior change occurs. For example, it may be possible to deliver different messages to different students on a given day; novelty and/or unpredictability could be transmitted to others in a way that amplifies the normative messages (Thomas, 2004), potentially providing some measure of intervention dose to the community. As noted by Dotson, Dunn, and Bowers (2015), while normative feedback interventions may result in relatively small improvements that are difficult to detect in comparison to control conditions, the type of program used here, perhaps more appropriate for prevention purposes, may nonetheless be expected to improve population-level outcomes.

Third, the messages sent in the treatment group tended to be wordier, requiring more mental manipulation than those in the control group, perhaps explaining their lower interest ratings. Future research should involve obtaining student feedback and assistance in crafting the ideal wording for such messages. Fourth, we were underpowered to detect effects on drinking outcomes and the hypothesized mediators (descriptive and injunctive norms). Finally, eligibility criteria reflected our intent to test a universal prevention intervention; therefore, findings cannot be generalized to non-college students, treatment-seeking samples, or those with potential alcohol use disorders.

#### 4.2 Conclusions

This pilot study laid the groundwork for a larger randomized trial evaluating the efficacy of this novel approach to delivering pro-moderation drinking norms. In the future, moving beyond the simple provision of information via text messaging, ecological momentary assessment (EMA) and ecological momentary intervention (EMI) may be useful in assessing

and changing normative perceptions. Specifically, participants could be prompted to report their drinking behavior in real-time, and normative information could be provided in response. This could even be done at a context-specific level (e.g., if a participant reported drinking in a bar, norms specific to bar locations could be provided, at a time when it is most relevant for the participant). Alternatively, repeated assessments of different perceived norms could be requested, followed by corrective feedback. Similarly, daily reports of the prior evening's drinking could be compared to actual norms, to create discrepancy. Each of these represents an exciting future direction for research that has promise for addressing risky drinking among college students.

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### Highlights

- Accurate descriptive, injunctive norms sent to college students in 28 daily texts
- Demonstrated feasibility and acceptability of using text messages to target norms
- Participants in experimental group reduced drinking behavior at post-test

**Table 1**

Example text messages and count of each type.

<b>Message Domain</b>	<b>Example Message</b>	<b>Count</b>
Injunctive norms for alcohol use	<i>91% of college student drinkers personally approve of drinking 1 or 2 alcoholic drinks on a drinking night</i>	1
Descriptive norms for alcohol use	<i>3 out of 4 students at Brown average fewer than 4 alcoholic drinks on days that they drink</i>	3
Injunctive norms for alcohol consequences	<i>Nearly 9 in 10 college students disapprove of drinking so much alcohol that one doesn't remember stretches of time</i>	8
Descriptive norms for alcohol consequences	<i>In any given 2 weeks, 85% of drinkers have NOT felt sick to their stomach or thrown up after drinking alcohol</i>	6
Injunctive norms for protective behavioral strategies	<i>Over 9 out of 10 college students approve of limiting cash on hand or not carrying credit cards when going out to drink alcohol</i>	3
Descriptive norms for protective behavioral strategies	<i>8 out of 10 college student drinkers nationwide have set a limit on the number of alcoholic drinks they will have that night</i>	7

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**Table 2**

Demographics and baseline values of outcomes by group

	<b>Control</b>	<b>Experimental</b>	<b>t/<math>\chi^2</math></b>	<b>p</b>
<b>Age</b>	19.00 (0.43)	19.03 (0.52)	-0.26	.80
<b>Sex</b>			1.13	.21
Male	12 (35%)	8 (23.5%)		
Female	22 (65%)	26 (76.5%)		
<b>Gender identity</b>			1.87	.39
Male	12 (35%)	8 (24%)		
Female	22 (65%)	24 (71%)		
Gender queer	0 (0%)	1 (3%)		
<b>Race</b>			3.79	.44
White only	22 (64.7%)	20 (58.8%)		
Black/African-American only	1 (2.9%)	3 (8.8%)		
Asian only	1 (2.9%)	3 (8.8%)		
Native American/Alaskan only	0 (0%)	1 (2.9%)		
Multiracial	8 (23.5%)	5 (14.7%)		
Missing	2 (5.9%)	2 (5.9%)		
<b>Ethnicity</b>			4.22	.04
Hispanic/Latino	8 (24%)	2 (6%)		
Non-Hispanic	26 (76%)	32 (94%)		
<b>Residence</b>			3.42	.18
On campus dorm	27 (80%)	32 (94%)		
Non-dorm university housing	2 (6%)	1 (3%)		
On campus frat/sorority house	5 (15%)	1 (3%)		
<b>Greek involved</b>	8 (24%)	3 (9%)	3.44	.18
<b>Outcome variables</b>				
Drinks per drinking day	5.16 (2.16)	4.46 (2.14)	1.35	.18
Frequency of HED	3.65 (2.59)	3.88 (3.22)	-0.33	.74
Peak BAC	.16 (.08)	.15 (.08)	0.20	.85
Alcohol consequences	3.38 (2.61)	4.56 (2.72)	-1.82	.07
Descriptive norms	4.45 (1.57)	4.24 (1.81)	0.52	.61
Injunctive norms	2.82 (0.58)	2.93 (0.56)	-0.78	.44



Descriptives on text messaging program acceptability in overall sample and by group

**Table 3**

	Full Sample		Control		Experimental		<i>t</i>	<i>p</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		
How <b>acceptable</b> was it to receive text messages as a part of this study?	4.71	0.69	4.88	0.41	4.53	0.86	2.16	.04
How <b>convenient</b> was it to receive text messages as a part of this study?	4.51	0.82	4.71	0.68	4.32	0.91	1.97	.05
How <b>interesting</b> was it to receive text messages as a part of this study?	3.37	1.36	4.24	1.05	2.50	1.05	6.82	<.001
To what extent would you <b>recommend</b> this text message program to other students?	4.04	1.06	4.47	0.86	3.62	1.07	3.61	.001
How <b>informative</b> was it to receive text message as a part of this study?	3.47	1.32	4.03	1.22	2.91	1.19	3.83	<.001

**Table 4**

Within-group (pre-post) change in outcomes and between-group differences in outcomes.

Outcome	Control			Experimental			ANCOVA				
	Baseline <i>M</i> (SD)	FUM (SD)	<i>t</i> ( <i>p</i> )	Within-group <i>d</i>	Baseline <i>M</i> (SD)	FUM (SD)	<i>t</i> ( <i>p</i> )	Within-group <i>d</i>	<i>F</i>	<i>p</i>	Between-groups <i>d</i>
DDD	5.16 (2.16)	4.76 (1.97)	1.70 (.10)	-.18	4.46 (2.14)	4.31 (2.14)	0.70 (.49)	-.07	0.09	.76	.11
HED freq	3.65 (2.59)	3.47 (2.42)	0.44 (.67)	-.07	3.88 (3.22)	3.29 (2.75)	2.10 (.04)*	-.18	0.59	.45	-.11
Peak BAC	.16 (.08)	.15 (.07)	0.87 (.39)	-.12	.15 (.08)	.13 (.08)	3.03 (.01)*	-.24	1.69	.20	-.12
Consequences	3.38 (2.61)	3.47 (3.16)	-0.14 (.89)	.03	4.56 (2.72)	3.00 (2.40)	3.52 (<.01)*	-.56	1.79	.19	-.59
DN	4.45 (1.57)	3.82 (1.15)	2.37 (.02)*	-.39	4.24 (1.81)	4.14 (1.81)	0.39 (.70)	-.05	1.9	.17	.34
IN	2.82 (0.58)	2.59 (0.69)	2.29 (.03)*	-.39	2.93 (0.56)	2.67 (0.52)	2.78 (.01)*	-.45	0.02	.89	-.07

Note: DDD=drinks per drinking day, HED freq = frequency of heavy episodic drinking; BAC = blood alcohol concentration; DN=injunctive norms; IN=norms; FU = follow-up; ANCOVA models testing between group differences on follow-up means controlled for baseline means. Negative between groups Cohen's *d*s indicate the experimental group reduced more, while positive effects indicate the control group reduced more.

\* *p*<.05