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Text Messaging to Increase Readiness to Change Alcohol Use in College Students

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Abstract We tested the feasibility and effectiveness of an alcohol counseling intervention delivered via personalized text messages for college students with problem alcohol use. College students aged 18–23 completed online substance use and mental health questionnaires that served as a screening tool for problem alcohol use. We invited students who screened positive to be randomized to intervention ($n = 8$) or control groups ($n = 10$) and assessed them at 1 month after they received their last text message. The intervention group received between four and six text messages daily for 4 days that required brief participant responses during the week following the web-based baseline assessment. Participants in the intervention group could also request booster texts for additional support. We personalized all texts, using data collected at baseline. Using a repeated measures ANOVA, we found that compared to the control group, the intervention group increased in readiness to change from baseline to follow-up ($p < .01$). Other promising trends were an increase in the intervention relative to the control group's confidence in their ability to change drinking behavior, and an increase in intentions to reduce alcohol use. These exploratory results indicate that the automated texting program we developed works well with college students and that text messaging as a means to deliver preventive interventions is a promising delivery platform.

Keywords Text-messaging · Young adults · Readiness for change · Alcohol · Substance use

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Introduction

Studies suggest that young adults are more likely than older adults to engage in heavy episodic drinking, and that young adults are a high risk group for problem drinking and negative sequelae. Approximately four in ten young adults aged 18–22 engaged in binge drinking in the last year (SAMHSA, 2012).

Mobile phone-based interventions are an innovative method for reaching young people and have been established as an evidence-based, recommended approach towards addressing health issues (Free et al., 2011). Research has shown that young adults

have positive attitudes toward mobile interventions and mobile data collection has the advantage of real time reporting and ease of use (Kuntsche & Robert, 2009; Laursen, 2010). Text-based alcohol use interventions can also reduce hazardous drinking by young adults (Suffoletto, Callaway, Kristan, Kraemer, & Clark, 2012).

Research has demonstrated strong effects of motivational interviewing (MI) as a means to reduce alcohol-related problems (Barnett, Sussman, Smith, Rohrbach, & Spruijt-Metz, 2011). Effective MI interventions activate client motivation through increasing change talk—i.e., client produced discussions of the benefits of change–and thereby increase readiness to change (Apodaca & Longabaugh, 2009). We hypothesized that (1) an alcohol reduction text-messaging technological platform could be developed and employed in an automated format, and (2) the intervention would lead to decreases in alcohol use.

Methods

We administered a brief survey in January through May of 2012 to 663 students enrolled in undergraduate psychology courses at a large southeastern university. Students completed all surveys anonymously online via a secure survey system. We conducted all consent procedures anonymously online, and study procedures and materials were approved by our university's Institutional Review Board. We used Alcohol Use Disorders Identification Test (AUDIT; Bohn, Babor, & Kranzler, 1995) scores of 8 or more to screen and classify participants as problem drinkers. Almost one third of the sample screened (32 %) had AUDIT scores of 8 or higher, indicating hazardous drinking ($M = 6.17$, $SD = 5.96$, range = 0–40, $\alpha = .86$). Of the 212 participants who met the criteria for "problem drinking," 18 (8 %) enrolled in the study. We randomized participants who agreed to be enrolled in the text-message intervention study to either the control ($n = 10$) or treatment ($n = 8$) conditions.

We adapted a 20 min in-person intervention that has demonstrated its effectiveness in increasing readiness to change substance use behavior and in reducing high-risk behaviors (Mason, Pate, Drapkin, & Sozinho, 2011). The intervention applied MI principles with social network counseling that included reflection on

Table 1 Text messages by day and booster messages

	Automated personalized text messages
Day 1	
Message 1	"Hi SUBJECT_NAME. This is the XXX Psych Study. What up? How U feeling today? Txt back: good, ok, bad."
Message 2	"B-4 we start, do U think it will be hard for U to reduce or stop drinkin? Txt back: no way, maybe, or def."
Message 3	"Let's talk about sum of your responses from the survey. U reported drinkin NUMBER_OF_DAYS days in past 30 days. Can U tell me what U like about drinkin?"
Message 4	"OK, thanks I appreciate it. Can U also tell me what U dislike about drinkin?"
Message 5	"Sometimes there are pluses & minuses to drinkin. What are U doing now?"
Message 6	"Thanks for your responses. I appreciate it. I hope U can think over what we discussed. Bye. Need some extra support? Txt: boost"
Day 2	
Message 1	"Hey SUBJECT_NAME. How are U feeling? Txt back: good, ok, bad."
Message 2	"Let's talk more about ur drinkin. Did U know that ALCOHOL_USE_% of other 18–23 year olds drink less than you? How's that for you? Txt: surprised, unsure, upset."
Message 3	"Can U tell me how U see your life in light of your current drinkin?"
Message 4	"Ok, thanks for ur response, I really appreciate it. Need some extra support? Txt: boost"
Day 3	
Message 1	"Hey SUBJECT_NAME. How r u doing? Txt back: good, ok, bad. Then, let's talk about your friends."
Message 2	"Your network is RISK_LEVEL risk to affect your drinkin. How do U feel about ur network? Txt back: ok, need to change, need lots of change."
Message 3	"How would U rate ur craving right now? Txt back: Intense, pretty strong, under control."
Message 4	"Remember, very small adjustments in ur network can have big effects w/ur drinkin. What are U doing now?"
Message 5	"K, thx. I hope U can think over what we discussed. Hang in there, bye. Need some extra support? Txt: boost"
Day 4	
Message 1	"Hey SUBJECT_NAME. Howz life? Txt back: good, ok, bad."
Message 2	"Based on what we have been texting about, would U consider making any small adjustments to ur drinking at this time?"

Table 1 continued

	Automated personalized text messages
Message 3	"An option is to spend slightly more time with non-drinkers and less with drinkers, and spending more time at non-drinking locations. What do U think?"
Message 4	"What do you think U would like to do about your drinkin?"
Message 5	"Thx for ur texts. Hope U can think over what we discussed. Questions? EMAIL_CONTACT PHONE_CONTACT. Complete follow-up survey in 1 mnth & get $20"
Boosters	
Boost 1	"Ask for support from a non-drinking friend, find out what they are doing tonight."
Boost 2	"Mix up ur routine so U won't be tempted to drink, do different things."
Boost 3	"Try to spend less time at places that remind U of drinking. U can do this!"
Boost 4	"Hang in there, U are doing great! Go work out, see a movie, have a meal."
Boost 5	"Go to a coffee shop, go to a bookstore, study, improve ur GPA!"
Boost 6	"Hang in there, there are lots of students who are interesting, fun, cool, and sober, like U!"

peer risks and protection. The week following a baseline assessment, we delivered the text-messaging intervention over four consecutive days and sent four to six messages daily, each of which required a response lasting no more than 1 min. Participants completed a follow-up assessment 1 month after they received their last text message.

Although the text messages were sent via a computer program, they were personalized in order to make participants feel as if they had a *helping relationship*. To that end, we used students' first names and based texts on their survey responses. Table 1 displays the text messages that we sent as well as the booster messages (if requested).

Measures

Baseline and Follow-Up

Psychiatric symptomatology We used the 12-item Brief Symptom Inventory (BSI; Derogatis, 1993) to measure participants' symptoms and their intensity in the last week ($\alpha = .91$).

Substance use Participants answered questions concerning the frequency with which they used alcohol, marijuana, and other substances in the past month (Benotsch et al., 2006) ($\alpha = .82$).

Problem drinking We used the 10-item AUDIT (Bohn, Babor, & Kranzler, 1995) to identify hazardous drinking among participants ($\alpha = .86$).

Alcohol expectations We used the 12-item Drinking Expectancy Questionnaire (Brown, Christiansen, & Goldman, 1987) to measures participant expectations of alcohol use ($\alpha = .90$).

Taking steps to reduce alcohol use We assessed this construct with an 8-item subscale titled *Taking Steps* from the Stages of Change Readiness and Treatment Eagerness Scale (SOCRATES; Miller & Tonigan, 1996; $\alpha = .93$).

Within Text Messages Assessments

Readiness to change Participants indicated their readiness to change by responding to a question that asked: "How ready are you to change your alcohol use?" using responses that ranged from 1 (*not ready at all*) to 5 (*extremely ready*).

Difficulty stopping drinking We asked participants to respond to the question: "Do you think it will be hard to stop drinking?" which included responses 1 (*no way*), 2 (*maybe*), and 3 (*def*—for *definitely*).

Social network satisfaction Participants indicated their satisfaction with their close friend social network by asking: "How do you feel about your network?" which included responses coded as 1 (*ok*), 2 (*need to change*), 3 (*need lots of change*).

Technology Development and Application

We implemented the Short Message Service, or text messaging service, component of the system using a commercial Cloud-based Application Programmer Interface (API) called TROPO (TROPO, 2013). Participants received text message sequences over 4 days. We sent the initial message of each day using an individualized time permission window criterion during the period in which participants indicated that they were available to receive text messages. When a participant replied to a given message, the text-messaging platform responded with a customized, outgoing message based on that participant's current progress criteria, or status, within the study.

Table 2 Intervention and control group changes from baseline on key outcomes

Key outcomes	Intervention ($n = 8$)		Control ($n = 10$)		Cohen's d
	Baseline Mean (SD)	Follow-up Mean (SD)	Baseline Mean (SD)	Follow-up Mean (SD)	
AUDIT total[a]	14.1 (4.0)	9.7 (5.4)	10.6 (2.7)	5.9 (2.4)	0.90
#Drinks past week[b]	11.1 (5.7)	8.3 (9.9)	8.0 (6.8)	3.6 (5.2)	0.59
#Drinks, last occasion[b]	7.0 (5.0)	6.8 (5.4)	5.4 (3.0)	3.6 (1.2)	0.81
Maximum #drinks past month[b]	11.4 (6.3)	9.2 (7.1)	8.1 (3.1)	5.9 (3.6)	0.58
Avg #drinks/occasion last month[b]	4.9 (2.2)	4.1 (2.5)	4.3 (1.6)	3.5 (2.1)	0.25
Alcohol expectations[c]	33.2 (5.6)	30.5 (4.8)	31.4 (4.0)	30.3 (4.4)	0.04
Readiness to change drinking[d]	1.6 (0.9)	2.7 (1.4)	2.2 (1.0)	1.2 (0.4)	1.37*
Importance of changing[d]	1.9 (1.2)	1.8 (1.1)	2.0 (0.9)	1.3 (0.7)	0.43
Confidence in ability to change[d]	4.1 (1.1)	4.6 (0.5)	4.5 (0.9)	4.1 (1.6)	0.39
Intentions to reduce alcohol use[d]	2.3 (1.1)	3.0 (1.0)	2.7 (1.28)	2.2 (1.0)	0.71
Taking steps to reduce alcohol use[e]	18.5 (8.7)	18.8 (9.2)	19.3 (9.8)	13.3 (6.0)	0.69

* $p < 0.01$

[a] Bohn, Babor, and Kranzler (1995)

[b] Benotsch et al. (2006)

[c] Alcohol Expectancy Questionnaire, Brown, Christiansen, and Goldman (1987)

[d] Adapted from Sobell and Sobell (2011)

[e] SOCRATES (Miller & Tonigan, 1996)

Analysis

All participants enrolled in the text trial ($N = 18$) completed a baseline and follow-up assessment. We calculated descriptive statistics based on participants' characteristics, including their texting behaviors (# text per day), alcohol use, and readiness to change drinking behavior. To determine the effect of the intervention, we used a repeated measures ANOVA examining Condition × Time interactions. We obtained Cohen's (1988) d effect size statistic by computing the standard mean difference between groups on outcomes of interest.

Results

The study sample comprised full-time college students, and included six freshman, six sophomores, and six juniors. Ten were females, and the mean age of the sample was 19.2 years ($SD = 1.3$). Twelve students reported their race/ethnicity as white, four as African-American, and two as Hispanic/Latino. Participants reported texting on average between 46 and 60 texts per day. The texting program sent 160 texts, of which 159 (99%) were received. One-third of treatment participants requested booster texts. All texts were delivered in the correct day sequence and within each day, the sequence of texts and responses was consistently accurate.

We conducted Pearson correlation analyses and found a strong negative correlation ($r = -.816$, $p < .05$) between our Day 1 text item "Do you think it will be hard to stop drinking?" and the item "How ready are you to change your alcohol use?" We found a strong positive correlation between our Day 3 text item "How do you feel about your network?" and the BSI Anxiety scale, of which higher scores indicated more anxiety ($r = .764$, $p < .05$).

Table 2 reveals that at baseline the intervention group drank more than the control group, and the intervention group had higher AUDIT scores. Both groups reported less drinking at the followup. The intervention group increased in readiness to change from Time 1 to Time 2, whereas the control group decreased in readiness. Using a repeated measures ANOVA, the interaction term for Condition × Time was significant, $F(1, 16) = 13.69$, $p < .01$, suggesting that the intervention increased readiness to change

over this time period. The effect size for this intervention on this variable was large, with a Cohen's d of 1.37, indicating that the intervention had a strong effect on readiness to change.

The intervention group manifested increased intentions to reduce alcohol use in the month following the texts, whereas the control group reported decreased intentions a month after their baseline survey. The interaction term approached significance, $F(1, 16) = 3.19$, $p < .10$. Similarly, the intervention group increased their willingness to take steps to reduce alcohol use and the control group decreased in their willingness to take these steps. The interaction term also approached significance, $F(1, 16) = 3.58$, $p < .10$.

Discussion

The preliminary effects of our automated computer program that can accurately remind, send, respond, track, and maintain a text-messaging intervention are promising. Our ability to reach populations of interest at an extremely low cost has implications for a public health approach towards substance use prevention and treatment. Effect sizes would not have to be large to justify the further testing of this type of intervention on problem alcohol use for high-risk populations such as college students. Other promising findings are the significant increases in the readiness to change construct and the large effect size, while not quite significant effects on willingness to take steps to reduce alcohol use and on intentions to reduce alcohol use. These exploratory results suggest that the MI-based intervention activated participants' motivation for change by raising their awareness of their drinking frequency relative to national normative data, and subsequently by reevaluating their drinking behavior.

This pilot study has several limitations. First, because the sample size is small and could produce unstable findings, our study should be replicated in a larger trial. Our ability to detect significance was constrained by the study's limited power (and low N), however, we considered the strong effect sizes worthy of mention. Our very small (8 %) recruitment rate is also cause for concern, and may reflect a self-selection bias: the students who agreed to participate in the study may have been particularly interested in changing their alcohol use behaviors. However, we attribute this low participation rate in part to the timing of the

intervention, which was late in the semester, and immediately prior to final examinations students were less inclined to be involved in a research project. Indeed, the students we recruited had already fulfilled their research requirements for the term, and were therefore less likely to express interest in participating in our study. Further, the follow-up time interval was short and should be lengthened to further investigate the stability of our findings. Our intervention dosage was very small, given the mean number of text interventions was 122, and our pilot only had 26, making change harder to detect. Another limitation is that the intervention and control groups differed at baseline on reported drinking behavior. Students in the control group were more moderate drinkers at baseline, making interpretation more difficult. They may have also experienced an assessment effect that reduced their drinking.

We conclude that our exploratory trial, which tested a proof-of-concept, automated text-messaging computer programming using an evidence-based text intervention, produced sufficiently promising results to warrant further study.

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