

A text message intervention to reduce first year university students' alcohol use: A pilot experimental study

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Abstract

Objective: The aim of Orientation Week is to help new students acclimatize to university life. However, Orientation Week is characterized by heavy alcohol use and during this time students may develop drinking patterns that persist into the academic year. The aim of the current study was to refine a brief Ecological Momentary Intervention (EMI) and test its effectiveness in reducing students' alcohol use during both Orientation Week and throughout the academic year.

Method: We conducted two focus groups with students who had received a pilot intervention. We then updated and trialled the intervention with students from two residential colleges (College 1 $n = 117$ and College 2 $n = 269$) who were assigned to either an Ecological Momentary Assessment (EMA) condition or an EMA-EMI condition. Students in both conditions reported their pre-university drinking and their drinking during Orientation Week and the academic year via text message. In addition to the EMA messages, during Orientation Week, participants in the EMA-EMI condition received messages highlighting the potential social consequences of heavy alcohol use.

Results: In College 1 those in the EMA-EMI condition consumed fewer drinks, relative to those in the EMA condition, across both Orientation Week (9.7 vs. 15.5; $t(98) = 2.138$, $p = .018$) and the academic year. (4.3 vs. 6.8; $t(98) = 1.788$, $p = .039$). There were, however, no significant differences between conditions in College 2.

Conclusion: The current findings suggest that EMIs may be successful under certain circumstances and may provide a simple, cost-effective means of intervening.

Keywords

Orientation Week, student drinking, Ecological Momentary Intervention, text message intervention, alcohol intervention

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Introduction

For many young adults, the end of adolescence is defined by the transition from high school to university.^{1,2} This period of time is often associated with a number of changes as adolescents move away from parents and friends, gain more independence, and experience new financial and academic pressures.^{1–3} To combat this difficult transition period, many universities around the world organize orientation activities for their first-year students. Orientation Week (also known as O'Week, Frosh Week, Freshers' Week, Introductory Week, etc.) aims to introduce

new students to university life with very few academic requirements.⁴ This is accomplished via a number of social events and meet-and-greets which allow students to create a new social support network and explore the university campus.⁵ Unfortunately, Orientation Week is also a period of heavy alcohol use.⁵

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One could argue that a combination of factors coincide during Orientation Week that help to create a perfect ‘storm’ for excessive alcohol use, such as students’ newfound independence,¹ social desires,⁶ increased access to alcohol^{7,8} and liberal university drinking norms.⁹ Indeed, in New Zealand, students report consuming twice as many drinks during Orientation Week compared with a typical week before university (26 *vs.* 13)⁵ and experience a higher number of alcohol-related harms (five *vs.* one)¹⁰ during Orientation Week when compared with a typical week during the academic year. In a cross-sectional study, students who reported participating in Orientation Week in their first year were more likely to report risky drinking.¹¹ Indeed, drinking during Orientation Week may not be a ‘one-off’, and the patterns of alcohol use students establish during Orientation Week appear to persist into the academic year.⁵ Given Orientation Week presents a window of risk for first-year students, there is a clear impetus for interventions aimed at reducing alcohol consumption during this time period.

Alcohol interventions aimed at periods of risk (e.g. Orientation Week; 21st birthdays) have distinct advantages over more traditional intervention approaches. For example, they allow for limited resources to be allocated during a known period of harm and their content can be tailored to the specific event.¹² Unfortunately, previous event-specific interventions have received mixed support (e.g. 21st birthdays,^{13–15} Spring Break).^{16,17} One critical limitation of these previous event-specific interventions is that they rely heavily on participants’ memory for the intervention content. Indeed, in the context of a 21st birthday intervention, Hembroff et al.¹⁸ suggested that their birthday card intervention appeared to reduce drinking only when participants were able to recall the intervention information. Therefore, to place less burden on memory, researchers have begun to use text messages to remind participants about the intervention information.^{19,20} An additional advantage of using text messages is that you can provide participants with intervention information in the context it needs to be implemented (e.g. a social occasion).

To date, Ecological Momentary Interventions (EMIs; the act of intervening in the moment) have been used to improve a number of health-related behaviours, such as risky sexual behaviour,²¹ smoking²² and weight management.²³ They offer a number of advantages due to the ubiquity of mobile phones, low cost of text messaging and ease with which they can be implemented. With respect to alcohol consumption, researchers are only just starting to utilize text message interventions.^{20,24–28} For example, in a recent pilot study, Riordan et al.²⁹ implemented an EMI during Orientation Week with the aim of reducing

both Orientation Week and academic year alcohol use. Students assigned to the EMI condition were sent one text message every night (19:30 h) during Orientation Week. The text messages alternated between relaying the health consequences of drinking (e.g. ‘Long term drinking can increase the risk of a stroke. Start good drinking habits now’) and the social consequences of drinking (e.g. ‘Think about your mates when you drink, you can ruin their nights too’). To test the effectiveness of the intervention, all participants were asked to report their alcohol use during Orientation Week and fortnightly throughout the academic year using Ecological Momentary Assessments (EMAs; text messages asking students to report their drinking from the previous day or three days). Half of the students just reported their drinking at each time point (EMA condition) and the other half received both the EMA and EMI messages (EMA-EMI condition). For women, but not men, those in the EMA-EMI condition drank significantly less alcohol during Orientation Week (9.3 fewer standard drinks) and during the academic year (2.5 fewer standard drinks) when compared with women in the EMA condition. This finding provided preliminary evidence that Orientation Week is a sensitive period and that behavioural changes made during Orientation Week may have lasting impacts.

Given the potential promise of this style of intervention³⁰ and the nature of Orientation Week, it is imperative that the intervention is refined to maximize its impact and efficacy. To this end, in the current study we solicited feedback from participants who received the pilot intervention and tested a refined intervention in two residential colleges. We then aimed to test the preliminary indicators of effectiveness and ran a pilot experimental study in order to test the intervention. We randomly assigned students from two first-year residential colleges into either an EMA or EMA-EMI condition. Students in the EMA-EMI condition received the updated intervention during Orientation Week and all participants reported their alcohol use before Orientation Week, during Orientation Week, and fortnightly during the first semester of the academic year. We hypothesized that students in the EMA-EMI condition would consume less alcohol during both Orientation Week and the first semester of the academic year.

Method

Method and results – focus groups and intervention refinement

To refine the pilot intervention we conducted two focus groups six months after Riordan and colleagues²⁹

Orientation Week intervention: one with men ($n=6$) and one with women ($n=7$). Participants were aged between 18 and 20 years ($M=18.6$) and had received the EMI messages during Orientation Week. Participants were asked for feedback about the EMI content, the timing of the messages, and for any thoughts on how the intervention could be improved. The sessions were transcribed and analysed by two independent coders using an inductive thematic approach.³¹ Four main categories emerged, three of which pertained to the EMI.

Category 1. Social, not health messages. Health messages, particularly long term messages, were deemed ineffective. Social messages were deemed effective:

‘The one about your mates is good because you can think about other people. But, like, it’s REALLY obvious that long term, it’s [alcohol is] gonna affect you health-wise.’
‘With the friends one it’s pretty good because normally we don’t really care about our bodies as much with, like, the whole alcohol poisoning and long-term risk... we just wanna get wasted. But the friends’ thing resonates a bit more because you’re not thinking about yourself, you’re thinking about those closest to you. So it can motivate you a bit more.’

Category 2. Tone of messages. EMI messages should adopt a colloquial tone or use slang:

‘...usually a lot of people, like, when they come to university, this is their first time away from parents... They’ve got this new sense of freedom and the last thing any of us really want is text messages that sound like my mother.’
‘That’s how we sorta talk, like “don’t be dicks” and then it [the text message], we actually would like it.’

Category 3. EMI delivery

Subcategory 3a. Delivery type. Text messages emerged as the most effective way of delivering intervention messages:

‘We check our phones coooonstantly.’
‘A private message on Facebook... I’m not gonna sit on a computer and be like ooooh. A text message is probably the best way I reckon.’
‘App-based means we have to download it... and how many people will go out of their way to download that?’

Subcategory 3b. Delivery time. Intervention messages should be sent earlier, before heavy drinking begins:

‘I’d say the timing, like, getting things earlier, like, I started drinking in [Orientation Week] and then I got a few texts from the survey and it was just too late...’

Subcategory 3c. Message frequency. Messages could be sent more than once a day, but on fewer days to ensure they were still novel:

‘Maybe you need to send more than one?... One earlier in the day?’
‘I would maybe do something with the frequency of texts, ‘cos after a while I just got them and I just wouldn’t look at it.’

Category 4. Orientation Week expectations. There is an expectation and pressure for students to drink excessively during Orientation Week:

‘... the point of O’Week is making friends and getting as drunk as possible.’
‘... I didn’t drink before I got to [university], and then you get to [Orientation Week] and everyone’s like “let’s get smashed”... You drink far too much.’

Although women made overall more suggestions, both focus groups were unanimous in their criticism of health messages, and made similar suggestions for message timing, type of delivery and message frequency. While only the women suggested the tone should be more colloquial, men were receptive to the addition of messages that included slang (e.g. ‘don’t be a dick’).

Intervention messages and timing

Taking this feedback into account, we refined the intervention to include only messages with the potential social consequences of alcohol use and employed a more colloquial tone. We also sent the messages earlier in the evening, sent two messages per night, and only sent messages on the major drinking nights (see Table 1).

Participants and procedure

We recruited first-year students residing in two residential colleges at the University of Otago, New Zealand. At College 1 ($n=\sim 160$), participants were recruited during their first college meeting of the year, and at

Table 1. Refined schedule of intervention messages and timing of the messages.

Day	Initial message 19:00 h	Top-up message 21:00 h
Tuesday (toga party)	Think about your friends when you drink, you can ruin their night, too.	Remember, don't ruin your mates' night!
Thursday (music concert)	These could be your friends for the year. Look after each other if you are drinking.	Remember, look after your friends!
Friday (music concert)	Think about your friends if you are drinking. Don't be the story everyone tells after a night out.	Remember, don't be the story everyone tells tomorrow.
Saturday (rugby match)	Don't be a dick. Drinking too much can turn you into a burden for your friends.	Remember, don't be a dick!

College 2 ($n \approx 470$) during their first floor meeting of the year. During these meetings we explained the premise of the study before distributing written consent forms and a brief survey. Each survey included a New Zealand definition of a standard drink for reference. A large proportion of residents in each college attended the initial meetings and filled out the survey (College 1 = 76.9%, College 2 = 93.0%).

The final question of the survey invited students to supply a mobile phone number to take part in a brief text message intervention study. By signing up they were informed that they may receive messages about drinking consequences during Orientation Week and would be asked to report their drinking from the past three days during Orientation Week and the first semester. One hundred and seventeen students at College 1 (73.1% of the college) and 269 from College 2 (57.4% of the college) provided their mobile phone numbers and were selected to take part in the study. Selected participants were randomly assigned to either an EMA-EMI or an EMA condition. Participation was incentivized at College 1 by the opportunity to win a Samsung Galaxy Tab 3 and two prizes of NZ\$100 cash and at College 2 by a NZ\$2 cash reward per EMA reply. All participants selected for the intervention study received two EMA text messages during Orientation Week and seven fortnightly text messages during first semester. Those in the EMA-EMI condition also received intervention messages on four of the typically heavier drinking Orientation Week nights (see Table 1 for message timing).

Participants selected to take part from College 1 ($n = 116$) consisted of 47 (40.2%) men and 70 (59.8%) women, which is representative of the colleges' and University of Otago's population (57.3% females).³² Participants were predominantly New Zealand European/Caucasian decent (65.8%; 13.7% Maori/Pacific Islander; 17.1% Asian; 3.4% other) and were on average 18.4 years old ($SD = 0.8$).

Participants selected to take part from College 2 ($n = 261$) consisted of 123 (45.6%) men and 147 (54.4%) women, which is representative of the colleges' and University of Otago's population (57.3% females).³² Participants were predominantly New Zealand European/Caucasian decent (79.3%; 13.0% Maori/Pacific Islander; 6.7% Asian; 1.1% other) and were on average 18.4 years old ($SD = 0.4$).

Measures

Demographics. Demographic data included gender and ethnicity.

Pre-university alcohol consumption. In our initial survey, students were asked to report the number of drinks they had consumed in the previous week in February (the week before Southern Hemisphere Orientation). Specifically:

'Using the calendar below, we would like you to reconstruct your drinking from the past week (February 9th – 15th). Make sure you list a number for each day of the calendar. For days you didn't drink, please use a "0". On days that you did drink, please write the total number of standard drinks that you consumed.'

To create a measure of weekly pre-university drinking we summed across all seven days.

We also asked participants to report general alcohol use on the Alcohol Use Disorder Identification Task (AUDIT-C) ($\alpha = 0.87$)³³ and alcohol-related harms from the past three months on the Brief Young Adult Alcohol Consequences Questionnaire (B-YAACQ) ($\alpha = 0.90$)³⁴ in order to determine whether the participants we retained in the study were representative of the colleges' alcohol use patterns in general. For the AUDIT-C (a brief screening measure that helps indicate hazardous drinkers), students answered three questions about their alcohol consumption (scored from

0 to 12); a score of 0–3 represents low risk drinking, 4–5 moderate drinking, and 5+ is considered high risk. For the B-YAACQ (an alcohol-related consequences measure designed for students), students indicate whether or not they have experienced any of 24 consequences because of their drinking (yes = 1; no = 0). The 24 items were summed to provide a number of consequences experienced (ranging from 0 to 24). At the host institution, previous research has found that students reported experiencing on average five consequences because of their drinking in the past three months.³⁵

Orientation Week alcohol consumption. Participants in the intervention and control condition received two text messages during Orientation Week asking them to report their alcohol use. The first message was sent on Thursday at 14:00 h ('How many drinks did you have Mon, Tues, Wed? Send reply like this: 1,5,0') and the second was sent on Sunday at 14:00 h ('How many drinks did you have Thurs, Fri, Sat? Send reply like this: 1,5,0'). We summed the numbers across all six days to create a measure of Orientation Week alcohol use. For participants with missing data, we took a daily mean and multiplied it by 6. This was deemed appropriate as over 75% of participants from both colleges included in the analyses completed both reports.

Academic year alcohol consumption. Participants in the intervention and control condition also received one message fortnightly during the first semester (8 March to 31 May; $n = 7$ text messages) asking them to report their weekend drinking ('How many drinks did you have Thurs, Fri, Sat? Send reply like this: 1,5,0.'). We asked for reports of weekend drinking because the majority of alcohol is consumed by students over the weekend period.^{10,36} We also created a measure of typical weekend drinking, by taking a mean of weekend alcohol use. This was deemed appropriate as over 75% from both colleges completed over half the reports; 35.0% from College 1 and 44.0% from College 2 completed all seven reports.

Results

Data strategy

For each college, we used an Analysis of Variance (ANOVA) with Time (3: Pre-University vs. Orientation Week vs. University) as a repeated measure and Condition (2: EMA vs. EMA-EMI) and Gender (2: Men vs. Women) as a between-participant factor. Finally, we conducted a series of one-tail t -tests at each time point to directly compare

the number of drinks consumed by EMA and EMA-EMI.

For completeness, we present the outcomes for participants with per-protocol (for those participants who had baseline and at least one Orientation Week report and one academic year report²⁹), complete cases, and for all participants who were assigned to a condition according to the intention-to-treat principle (using multiple imputation with fully conditional specification). A comparison of baseline drinking variables demonstrated that those who were selected to take part in the study did not differ from those who were not (see Supplementary Material File 1 online for attrition analyses). Participant flow is presented in Figures 1 and 2.

College 1 EMA-EMI vs. EMA

Alcohol use data were not normally distributed and, therefore, they were transformed ($\ln + 1$) before being submitted to a repeated measures ANOVA. For per-protocol analysis, an ANOVA revealed a main effect of Time, $F(2, 192) = 15.289$, $p < .001$, no main effect of Condition, $F(1, 96) = 1.993$, $p = .161$, but a significant interaction between Time and Condition, $F(2, 192) = 4.388$, $p = .020$. A similar finding was found when using multiple imputation (Time = $F(2, 226) = 21.180$, $p < .001$; Condition = $F(1, 113) = 2.431$, $p = .124$; Time and Condition, $F(2, 226) = 2.961$, $p = .058$) and when using complete cases (Time = $F(2, 48) = 10.003$, $p < .001$; Condition = $F(1, 24) = 6.015$, $p = .014$; Time and Condition, $F(2, 48) = 3.919$, $p = .027$).

To determine the source of the significant interaction we conducted a series of one-tail t -tests directly comparing the EMA and EMA-EMI. For per-protocol analysis, there was no significant difference between groups in their alcohol use pre-university, $t(98) = 0.147$, $p = .442$. There was, however, a significant difference between groups during both Orientation Week, $t(98) = 2.138$, $p = .018$, and the first semester of the academic year, $t(98) = 1.788$, $p = .039$, with the EMA-EMI consuming significantly less alcohol during both time points (Figure 3). A similar effect was seen when using multiple imputation (pre-university = (EMA = 6.0, EMA-EMI = 5.5) $t(115) = 0.267$, $p = .354$; Orientation Week (EMA = 16.5, EMA-EMI = 10.2) = $t(115) = 2.170$, $p = .015$; academic year = (EMA = 7.6, EMA-EMI = 5.2) $t(115) = 1.845$, $p = .033$), but not for those with complete cases (pre-university = (EMA = 2.6, EMA-EMI = 4.4) $t(26) = -0.459$, $p = .325$; Orientation Week (EMA = 15.3, EMA-EMI = 10.8) = $t(26) = 1.606$, $p = .060$; academic year = (EMA = 5.8, EMA-EMI = 2.9) $t(26) = 1.326$, $p = .103$).

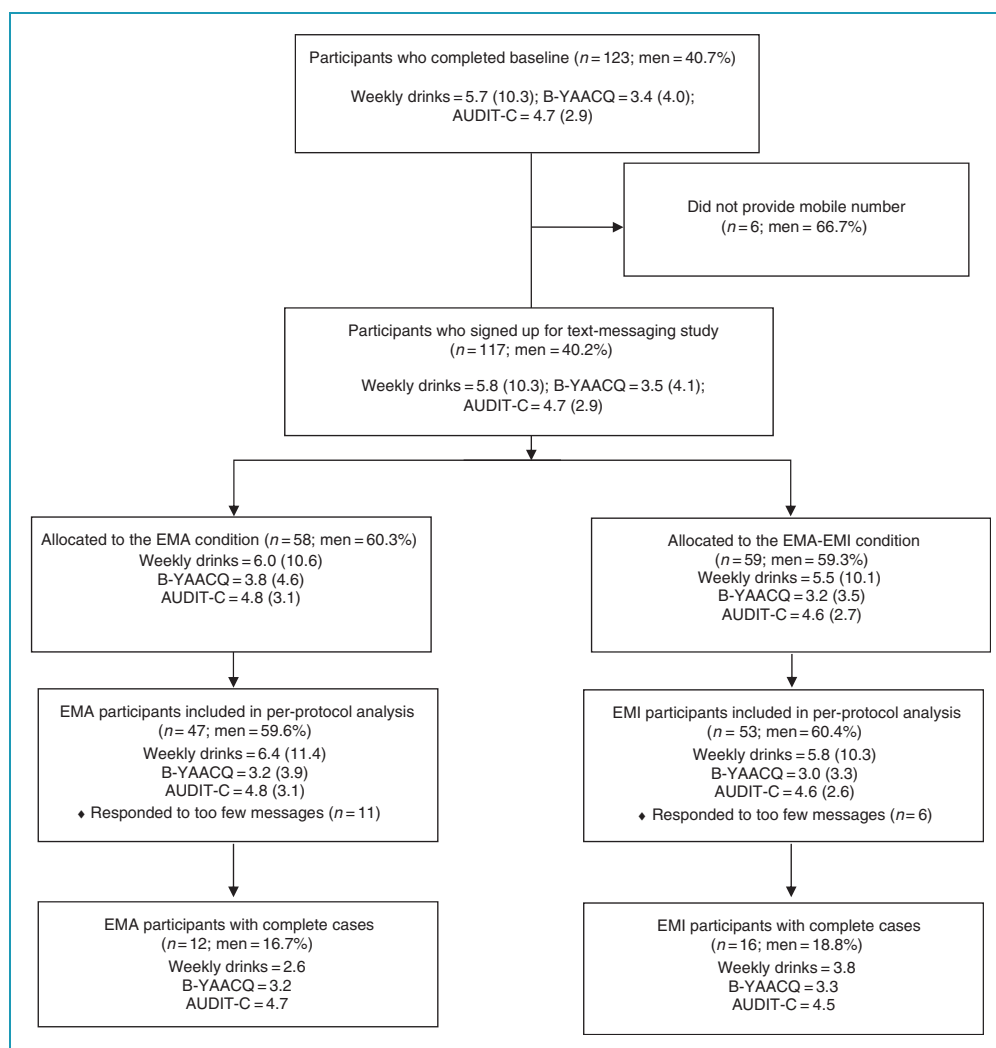


Figure 1. Mean pre-university week alcohol use, Brief Young Adult Alcohol Consequences Questionnaire (B-YAACQ) and Alcohol Use Disorder Identification Task (AUDIT-C) and standard deviations for attrition groups in College 1. (New Zealand definition of a standard drink is 10 g of ethanol.)

EMI: Ecological Momentary Intervention; EMA: Ecological Momentary Assessment.

With respect to gender, the per protocol analysis revealed there was no main effect of Gender, $F(1, 96) = 2.213$, $p = .140$ (multiple imputation = $F(1, 113) = 2.783$, $p = .102$; complete cases = $F(1, 24) = .161$, $p = .692$), no interaction between Time and Gender, $F(2, 192) = 2.334$, $p = .101$ (multiple imputation = $F(2, 226) = 1.568$, $p = .230$; complete cases = $F(1, 48) = .513$, $p = .602$), Condition and Gender, $F(1, 96) = 0.058$, $p = .811$ (multiple imputation = $F(1, 113) = 1.425$, $p = .258$; complete cases = $F(1, 24) = 1.926$, $p = .178$) or Time and Condition and Gender, $F(2, 192) = 0.352$, $p = .542$ (multiple imputation = $F(2, 226) = .982$, $p = .367$; complete cases = $F(2, 48) = 2.043$, $p = .141$), demonstrating

that the impact of the intervention did not have a differential effect on the two genders.

College 2 EMA-EMI vs. EMA

Alcohol use data were not normally distributed and, therefore, they were transformed ($\ln + 1$) before being submitted to an ANOVA. An ANOVA with Time (3: Pre-University vs. Orientation Week vs. University) as a repeated measure and Condition (2: EMA vs. EMA-EMI) and Gender (2: Men vs. Women) as a between-participant factor revealed a main effect of Time, $F(2, 474) = 221.529$, $p < .001$, but no main effect of Condition, $F(1, 237) = 2.177$, $p = .141$, or interaction

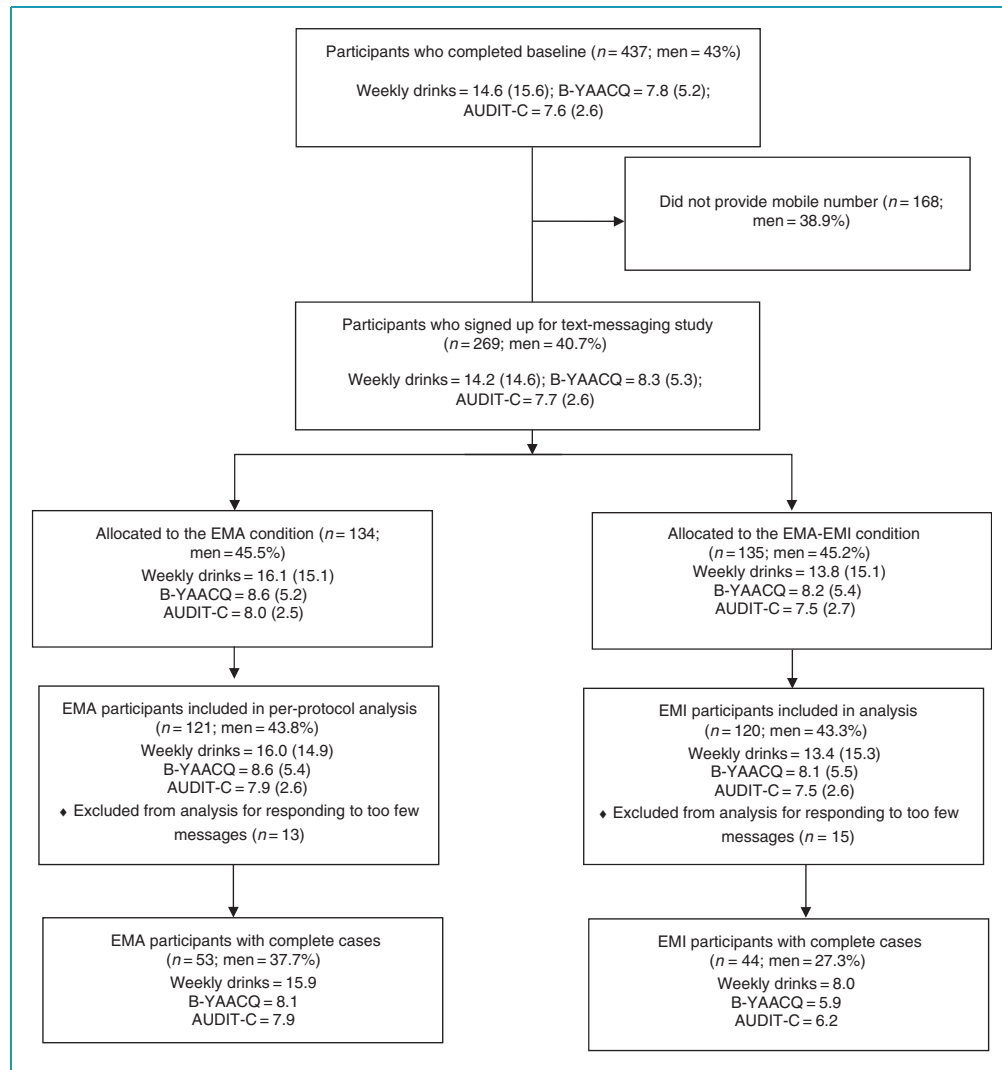


Figure 2. Mean pre-university week alcohol use, Brief Young Adult Alcohol Consequences Questionnaire (B-YAACQ) and Alcohol Use Disorder Identification Task (AUDIT-C) and standard deviations for attrition groups in College 2. (New Zealand definition of a standard drink is 10 g of ethanol; AUDIT-C 0–3 = low risk drinking.)

EMI: Ecological Momentary Intervention; EMA: Ecological Momentary Assessment

between Time and Condition, $F(2, 474) = 0.880$, $p = .415$, suggesting that, although the amount of alcohol consumed differed across time points, the intervention did not impact the amount consumed at any time point (Figure 3). A similar finding was found when using multiple imputation (Time = $F(2, 532) = 220.251$, $p < .001$; Condition = $F(1, 266) = 1.570$, $p = .212$; Time and Condition, $F(2, 532) = .580$, $p = .564$); however, those with complete cases in the EMA-EMI condition consumed significantly fewer drinks at each time point than the EMA condition (Time = $F(2, 186) = 71.785$, $p < .001$; Condition = $F(1, 93) = 9.024$, $p = .003$; Time and Condition, $F(2, 186) = 1.087$, $p = .339$).

With respect to gender, there was a main effect of Gender, $F(1, 237) = 56.387$, $p < .001$ (multiple imputation = $F(1, 266) = 25.994$, $p < .001$; complete cases = $F(1, 93) = 5.455$, $p = .157$), no significant interaction between Time and Gender, $F(2, 474) = .071$, $p = .932$ (multiple imputation = $F(2, 532) = .072$, $p = .933$; complete cases = $F(2, 186) = .431$, $p = .373$), reflecting the fact that men consumed more alcohol than women pre-university, $t(239) = 3.267$, $p < .001$ (multiple imputation = $t(268) = 3.665$, $p < .001$), during Orientation Week, $t(239) = 3.777$, $p < .001$ (multiple imputation = $t(268) = 4.179$, $p < .001$) and during university, $t(239) = 5.303$, $p < .001$ (multiple imputation = $t(268) = 5.947$, $p < .001$). Finally,

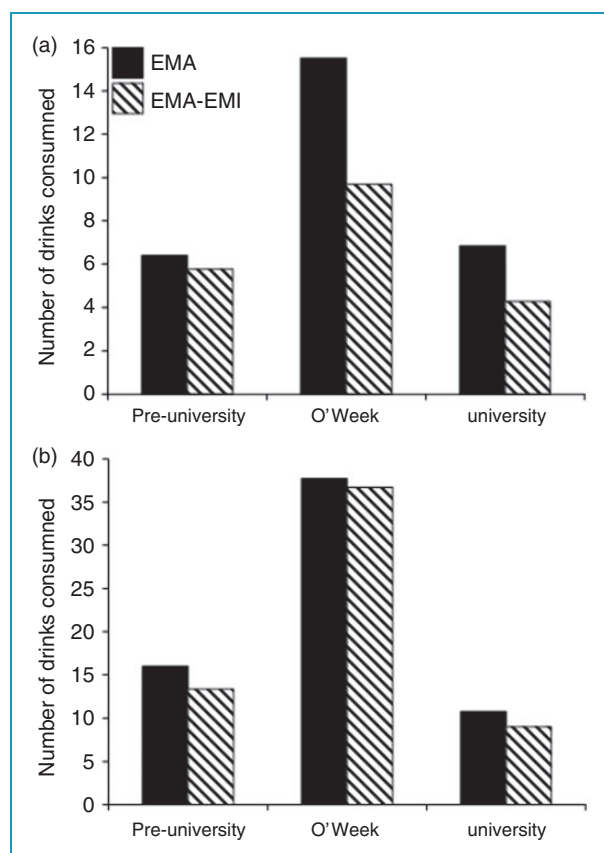


Figure 3. Mean pre-university week alcohol use, Orientation Week (O'Week) alcohol use and university weekend drinking (University) for EMA and EMI conditions in College 1 (a) and College 2 (b). EMI: Ecological Momentary Intervention; EMA: Ecological Momentary Assessment

neither the Condition and Gender, $F(1, 237)=0.365$, $p=.547$, nor Time and Condition and Gender, $F(2, 474)=0.608$, $p=.545$, interactions were significant (multiple imputation Condition and Gender = $F(1, 266)=0.194$, $p=.67$; Time and Condition and Gender, $F(2, 532)=0.611$, $p=.551$; complete cases Condition and Gender = $F(1, 93)=.041$, $p=.840$; Time and Condition and Gender, $F(2, 186)=0.015$, $p=.904$).

Discussion

In College 1, students who received the EMA-EMI messages reduced their drinking during Orientation Week and the academic year relative to the EMA condition. Specifically, the EMA-EMI condition consumed 5.8 fewer standard drinks during Orientation Week and 2.5 fewer standard drinks during a typical weekend. In contrast to the pilot,²⁹ which reduced only women's drinking, there was no difference in effectiveness between men and women. Despite the positive findings

from College 1, students in College 2 who received the EMI messages did not reduce their drinking relative to the EMA condition at any time point.

A potential explanation for the discrepancy between our findings for College 1 and College 2 is the different levels of alcohol consumption between the two colleges. For example, students in College 2 consumed markedly more alcohol than those in College 1 both pre-university (14.7 vs. 6.1) and during Orientation Week (37.2 vs. 12.4). Therefore, the EMI may have been more successful at preventing the uptake of heavy drinking and/or curbing the alcohol consumption of relatively light drinkers during Orientation Week. This view is broadly consistent with the pilot,²⁹ in which the EMI was effective in females but not males (with females in this study considered relatively light drinkers when compared with the males). Given that the EMI intervention is a 'light touch', it makes sense that those who already have an established pattern of drinking may be more difficult to change. For residential College 2, a more intense intervention may be required to reduce drinking. For example, the EMI may be best used when paired with a more intensive online intervention.³⁷

Beyond simply adding an online component to the current EMI, changes could also be made regarding the timing and frequency of the messages. For example, given the minimal amount of contact, it is critical that the EMI messages are sent at a time when students can effectively implement the advice. Given that those in College 2 consumed significantly more alcohol during Orientation Week (37.2 vs. 12.4), it is possible that these students may have started drinking earlier, thus limiting the impact that the intervention could have. Future iterations of this intervention could circumvent this issue by sending messages both before^{26,28} and during drinking sessions.^{19,20,29} For example, Suffoletto et al.²⁸ have seen some success when sending messages encouraging participants to set safe drinking goals before drinking sessions. Although this strategy has not been trialled during a period of heavy drinking (e.g. Orientation Week), a combination of the two strategies (i.e. goal setting and in the moment messages) may ensure that participants receive an intervention message before they start drinking and a reminder during the drinking session.

Furthermore, given that College 2 students consumed more alcohol during Orientation Week, it is also possible that they may have consumed alcohol on nights without university organized Orientation Week events. In the previous iteration of the intervention,²⁹ EMI messages were sent every night during Orientation Week, while in the current study EMI messages were sent on only four nights. The current findings suggest that a higher frequency of messages may be

critical to reducing event specific alcohol consumption or, alternatively, that it may be easier to reduce drinking during typically lighter drinking nights (i.e. those without large social events).

Limitations and strengths

Despite the inability to replicate the College 1 findings in College 2, a strength of the study was to further highlight that Orientation Week may be a sensitive period in which students define their university drinking.⁵ Future intervention studies should consider ‘front-loading’ intervention content to incoming students to prevent the establishment of risky drinking behaviours.

With respect to measures, we measured only alcohol use. Although it is difficult to collect more comprehensive data via text message, future studies may look to validate shorter scales for measures such as alcohol related harm and utilize an end of study survey to collect more detailed information.

Finally, we tracked student drinking over the first semester. Future iterations should track drinking over a longer period to determine how long these effects last.

Conclusion

This study adds to a growing number of studies employing mobile technology to influence health-related behaviours.³⁰ We found we were able to reduce drinking under some circumstances by intervening during Orientation Week (i.e. in College 1 but not College 2). Given that the current intervention placed very little burden on participants, and is relatively easy to implement, it provides a potential low-investment intervention to reduce alcohol consumption for new university students.

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References

1. Chemers MM, Hu L-t and Garcia BF. Academic self-efficacy and first year college student performance and adjustment. *J Educ Psychol* 2001; 93: 55–64.
2. Iyer A, Jetten J, Tsivrikos D, et al. The more (and the more compatible) the merrier: Multiple group memberships and identity compatibility as predictors of adjustment after life transitions. *Br J Soc Psychol* 2009; 48: 707–733.
3. Robbins SB, Lauver K, Le H, et al. Do psychosocial and study skill factors predict college outcomes? A meta-analysis. *Psychol Bull* 2004; 130: 261–288.
4. Pascarella ET, Terenzini PT and Wolfe LM. Orientation to college and freshman year persistence/withdrawal decisions. *J High Educ* 1986; 57: 155–175.
5. Riordan BC, Scarf D and Conner TS. Is orientation week a gateway to persistent alcohol use in university students? A preliminary investigation. *J Stud Alcohol Drugs* 2015; 76: 204–211.
6. Christie NG and Dinham SM. Institutional and external influences on social integration in the freshman year. *J High Educ* 1991; 62: 412–36.
7. Chaloupka FJ and Wechsler H. Binge drinking in college: The impact of price, availability, and alcohol control policies. *Contemp Econ Policy* 1996; 14: 112–124.
8. Kypri K, Bell ML, Hay GC, et al. Alcohol outlet density and university student drinking: A national study. *Addiction* 2008; 103: 1131–1138.
9. Baer JS. Effects of college residence on perceived norms for alcohol consumption: An examination of the first year in college. *Psychol Addict Behav* 1994; 8: 43.
10. Riordan BC, Flett JA, Lam T, et al. The Jekyll and Hyde of our drinking: Event specific drinking, interventions and prevention. In: Gutierrez W (ed.) *Alcohol consumption: Patterns, influences, and health effects*. New York, NY: Nova, 2016, pp. 129–166.
11. Myrtveit SM, Askeland KG, Knudsen AK, et al. Risky drinking among Norwegian students: Associations with participation in the introductory week, academic performance and alcohol-related attitudes. *Nord Stud Alcohol Drugs* 2016; 33: 361–380.
12. Riordan BC, Flett JA, Conner TS, et al. Text message interventions for alcohol use: Current research and future directions. In: Gutierrez W (ed.) *Alcohol consumption: Patterns, influences, and health effects*. New York, NY: Nova, 2016, pp. 185–192.
13. Neighbors C, Lee CM, Lewis MA, et al. Internet-based personalized feedback to reduce 21st-birthday

- drinking: A randomized controlled trial of an event-specific prevention intervention. *J Consult Clin Psychol* 2009; 77: 51–63.
14. Neighbors C, Walters ST, Lee CM, et al. Event-specific prevention: Addressing college student drinking during known windows of risk. *Addict Behav* 2007; 32: 2667–2680.
 15. Steinka-Fry KT, Tanner-Smith EE and Grant S. Effects of 21st birthday brief interventions on college student celebratory drinking: A systematic review and meta-analysis. *Addict Behav* 2015; 50: 13–21.
 16. Lee CM, Lewis MA and Neighbors C. Preliminary examination of Spring Break alcohol use and related consequences. *Psychol Addict Behav* 2009; 23: 689–694.
 17. Lee CM, Neighbors C, Lewis MA, et al. Randomized controlled trial of a Spring Break intervention to reduce high-risk drinking. *J Consult Clin Psychol* 2014; 82: 189–201.
 18. Hembroff L, Atkin C, Martell D, et al. Evaluation results of a 21st birthday card program targeting high-risk drinking. *J Am Coll Health* 2007; 56: 325–332.
 19. Renner KA, Walker N, Parag V, et al. Harm reduction text messages delivered during alcohol drinking: Feasibility study protocol. *JMIR Res Protoc* 2012; 1: e4.
 20. Wright CJ, Dietze PM, Crockett B, et al. Participatory development of MIDY (Mobile Intervention for Drinking in Young people). *BMC Public Health* 2016; 16: 1.
 21. Ybarra ML and Bull SS. Current trends in Internet-and cell phone-based HIV prevention and intervention programs. *Curr HIV/AIDS Rep* 2007; 4: 201–207.
 22. Rodgers A, Corbett T, Bramley D, et al. Do u smoke after txt? Results of a randomised trial of smoking cessation using mobile phone text messaging. *Tob Control* 2005; 14: 255–261.
 23. Bacigalupo R, Cudd P, Littlewood C, et al. Interventions employing mobile technology for overweight and obesity: An early systematic review of randomized controlled trials. *Obes Rev* 2013; 14: 279–291.
 24. Berman AH, Gajecki M, Sinadinovic K, et al. Mobile interventions targeting risky drinking among university students: A review. *Curr Addict Rep* 2016; 3: 166–174.
 25. Bock BC, Barnett NP, Thind H, et al. A text message intervention for alcohol risk reduction among community college students: TMAP. *Addict Behav* 2016; 63: 107–113.
 26. Suffoletto B, Callaway CW, Kristan J, et al. Mobile phone text message intervention to reduce binge drinking among young adults: Study protocol for a randomized controlled trial. *Trials* 2013; 14: 93–101.
 27. Suffoletto B, Kristan J, Chung T, et al. An interactive text message intervention to reduce binge drinking in young adults: A randomized controlled trial with 9-month outcomes. *PloS One* 2015; 10: e0142877.
 28. Suffoletto B, Kristan J, Callaway C, et al. A text message alcohol intervention for young adult emergency department patients: A randomized clinical trial. *Ann Emerg Med* 2014; 64: 664–672. e4.
 29. Riordan BC, Conner TS, Flett JA, et al. A brief orientation week ecological momentary intervention to reduce university student alcohol consumption. *J Stud Alcohol Drugs* 2015; 76: 525–529.
 30. Heron KE and Smyth JM. Ecological momentary interventions: Incorporating mobile technology into psychosocial and health behaviour treatments. *Br J Health Psychol* 2010; 15: 1–39.
 31. Thomas DR. A general inductive approach for analyzing qualitative evaluation data. *Am J Eval* 2006; 27: 237–246.
 32. University of Otago. *Quick statistics*, <http://www.otago.ac.nz/about/quickstats.html#4> (2016, accessed 24 November 2016).
 33. Bush K, Kivlahan DR, McDonell MB, et al. The AUDIT alcohol consumption questions (AUDIT-C): An effective brief screening test for problem drinking. *Arch Intern Med* 1998; 158: 1789–1795.
 34. Kahler CW, Strong DR and Read JP. Toward efficient and comprehensive measurement of the alcohol problems continuum in college students: The Brief Young Adult Alcohol Consequences Questionnaire. *Alcohol Clin Exp Res* 2005; 29: 1180–1189.
 35. Riordan BC, Flett JA, Hunter JA, et al. Fear of missing out (FoMO): The relationship between FoMO, alcohol use, and alcohol-related consequences in college students. *Ann Neurosc Psychol* 2015; 2: 2.
 36. Del Boca FK, Darkes J, Greenbaum PE, et al. Up close and personal: Temporal variability in the drinking of individual college students during their first year. *J Consult Clin Psychol* 2004; 72: 155–164.
 37. Haug S, Paz Castro R, Kowatsch T, et al. Efficacy of a web-and text messaging-based intervention to reduce problem drinking in adolescents: Results of a cluster-randomized controlled trial. *J Consult Clin Psychol* 2017; 85: 147–159.