

Using Facebook and Text Messaging to Deliver a Weight Loss Program to College Students

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Objective: Between 31 and 35% of the college-aged population is overweight or obese, yet few weight loss trials for this population have been conducted. This study examined the feasibility, acceptability, and initial efficacy of a technology-based 8-week weight loss intervention among college students.

Design and Methods: Students ($N = 52$) were randomly assigned to one of the three arms: Facebook ($n = 17$); Facebook Plus text messaging and personalized feedback ($n = 18$); Waiting List control ($n = 17$), with assessments at 4 weeks and 8 weeks (post-treatment). Participants were 20.47 ± 2.19 years old, 86.45 ± 17.11 kg, with a body mass index of 31.36 ± 5.3 kg/m². Participants were primarily female (86.5%), and the sample was racially diverse (57.7% Caucasian, 30.8% African American, 5.8% Hispanic, and 5.7% other races).

Results: The primary outcome was weight loss after 8 weeks (post-treatment); 96.0% of the participants completed this assessment. At 8 weeks, the Facebook Plus group had significantly greater weight loss (-2.4 ± 2.5 kg) than the Facebook (-0.63 ± 2.4 kg) and Waiting List (-0.24 ± 2.6 kg) (both P s < 0.05). Weight change at 8 weeks was not significantly different between the Facebook and Waiting List groups.

Conclusions: Results show preliminary efficacy and acceptability of the two active intervention arms (97.0% found the program helpful, 81.3% found the videos/handouts helpful, and 100% would recommend the program to others). Results indicate the potential for an innovative weight loss intervention that uses technology platforms (Facebook and text messaging) that are frequently used and already integrated into the cultural life of college students.

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Introduction

Obesity is associated with negative health and psychosocial consequences, ranging from increased risk of cardiovascular disease, diabetes, and liver disease (1) to depression, low self-esteem, and stigmatization (1). The college years are a vulnerable period for weight gain (2), with males and females gain between 3 and 4.3 kg during the first year (3,4), and 1.7 kg (females) and 4.2 kg (males) from matriculation to graduation (5). Given these trends, weight gain prevention programs with college students have been evaluated (6). However, 31-35% of college students are already overweight or obese (7). Evidence-based weight loss programming has been lagged behind other issues that are facing by the college students such as substance use and high risk sexual behaviors (8). Despite the fact that one-third of college students are overweight or obese (7), there is only one published randomized controlled weight loss trial (9) among college stu-

dents, which was limited by a high rate of attrition (52% before the end of 10 week treatment) and a primary outcome of weight loss expectations, not weight loss. Therefore, there is a need to empirically evaluate weight loss interventions in the at-risk population.

Both text messaging and electronic social networking are fully integrated into the lives of college students (10). Among college-aged students ($n = 273$; ages 18-26), 94% reported having a cell phone, and 89% reported having the phone with them at all times (even at bedtime) (11). Among those with a cell phone, 93% used the phone to text message (mean number of texts per day = 119) (11,12). Approximately 94% of students used text messaging more frequently than email or instant messaging services (13), and texting was rated as the preferred method of communication by the majority of college students (13). In terms of electronic social networking, Facebook is the most widely used site among college students, with

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penetration rates of Facebook on some campuses are as high as 99.5% (10). Facebook is the overall number one visited website with the highest number of minutes spent per day by visitors (14). With the integration of text messaging and Facebook into students' daily lives, these technologies provide the seamless capability of delivering evidence-based content via platforms that are frequently used and accessed. These technologies offer colleges a low-cost delivery modality through which evidence-based programming can be easily provided.

Support from one's social network has positive influences on morbidity and mortality (15). Studies have examined the influence of one's social network on chances of becoming obese (16,17) and whether obesity could spread within a social network, like a "contagion" (16,17). It is difficult to distinguish social network effects from environmental confounds (19), such as the clustering of obesity-related behaviors within friendship networks (18,19). However, social networks have been shown to be important for altering social norms related to obesity and obesity-related behaviors (e.g., acceptability of being overweight, inactivity, and eating unhealthy foods), which may have significant effects on weight loss (20). Facebook and other forms of electronic social media link individuals within an existing (or new) social network, and therefore provide a technology-based platform ideal for providing weight loss information and altering social norms about weight and weight behaviors, on a large, cost-effective scale (21).

In summary, given the widespread use of both text messaging and Facebook among college students, these technologies provide ideal platforms to deliver an accessible weight loss intervention. Therefore, this study was designed to evaluate the feasibility, acceptability, and preliminary efficacy of a novel, technology-based weight loss intervention for college students using adapted evidence-based weight loss content (22). Participants were randomly assigned to a Facebook, Facebook plus text messaging and personalized feedback (i.e., Facebook Plus), or Waiting List control group. We hypothesized that the Facebook Plus group would lose significantly more weight as compared with both Facebook and Waiting List. We also hypothesized that the Facebook group would lose more weight than the Waiting List group.

Methods and Procedures

Participants

Participants were 52 students recruited from a large, urban university in the eastern United States. This study was approved by the University's Institutional Review Board. Inclusion criteria were: (i) age 18-29 years; (ii) body mass index (BMI) of 25-50 kg/m²; (iii) healthy enough to participate in physical activity and lose weight safely determined by an in-person physical with a physician; (iv) a mobile phone plan that included unlimited texting; and (v) an active Facebook user. Additional exclusion criteria included: (i) current or planned use of any weight loss medication or other weight loss strategy; (ii) psychosis, severe anxiety, major depression, or panic disorder that had not been stabilized for at least 6 months; (iii) pregnancy, lactation, or plans to become pregnant during study duration; and (iv) an eating disorder. The following in-person and electronic recruitment strategies were used: University media outlets (e.g., online newspaper), posting flyers, broadcasting electronic announcements on websites, Facebook, and listservs, and partnering with campus and student organizations.

Procedures

Recruitment and study participation occurred during one of the two semesters (Fall 2010 and Spring 2011; Figure 1). All participants completed an online informed consent and series of baseline questionnaires before an in-person physical exam by a study physician. Participants who remained eligible attended a randomization session during which they were assigned into one of the three conditions: Facebook ($n = 17$); Facebook Plus text messaging and personalized feedback ($n = 18$); or Waiting List control ($n = 17$). The intervention was delivered weekly for 8 weeks. Participants were compensated for completed follow-ups (\$5.00 at 4 weeks and \$10.00 at 8 weeks (post-treatment)).

Intervention descriptions

Facebook. During the randomization session, all Facebook participants received information about the private Facebook group and privacy settings. The participant was "friended" by the private group, and was instructed to accept the request. The private Facebook group served as the portal to access the intervention content (i.e., handouts and podcasts; see Table 1 for weekly topics). To ensure confidentiality, this Facebook group was completely private and had a generic name (i.e., Healthy Owls). In addition to intervention content, participants also had access to polls and healthy activity or eating event invitations (e.g., on-campus farmer's market, group fitness class, and cycling event) to which they could respond. Participants were alerted to the availability of new intervention content via group postings and Facebook mail.

Suggested caloric targets were based on weight. For participants ≤ 113.6 kg, the calorie range was 1,200-1,500 kcal/day, with 1,500-1,800 kcal/day recommended for those with weights ≥ 113.6 kg (23). Participants were encouraged to gradually increase their physical activity with the target of engaging in moderate intensity exercise for at least 250 min per week (24-26).

Facebook Plus. Participants in the Facebook Plus arm received access to a private Facebook group with the same content described above (separate groups were used for the Facebook and Facebook Plus participants to limit cross contamination). Participants also received additional theoretically-driven intervention targets: goal setting, self-monitoring, and social support communicated via text messaging. Specifically, Facebook Plus participants: (i) set weight loss goals with a study staff member, which were adjusted as necessary to a maximum of 2 pounds per week; (ii) received tips on effective self-monitoring of food and physical activity; (iii) identified a nonstudy affiliated "buddy" who received an online assent directly from the participant to agree to be an identified support; and (iv) received a digital scale, pedometer, *Calorie King* book, measuring utensils. In addition to joining a private Facebook group and receiving weekly content, the Facebook Plus group contained three additional components: daily text messages, personalized feedback via weekly summary reports, and selection of a "buddy" to serve as a support person. Each will be described in detail below.

Text messages. The text messages were designed to encourage, reinforce, and provide brief feedback regarding self-monitoring of calorie, physical activity, and weight goals. Messages were programmed at random intervals, with a different type of message being sent each day so that the participant would not become habituated to the type of message sent and response required. There were three types

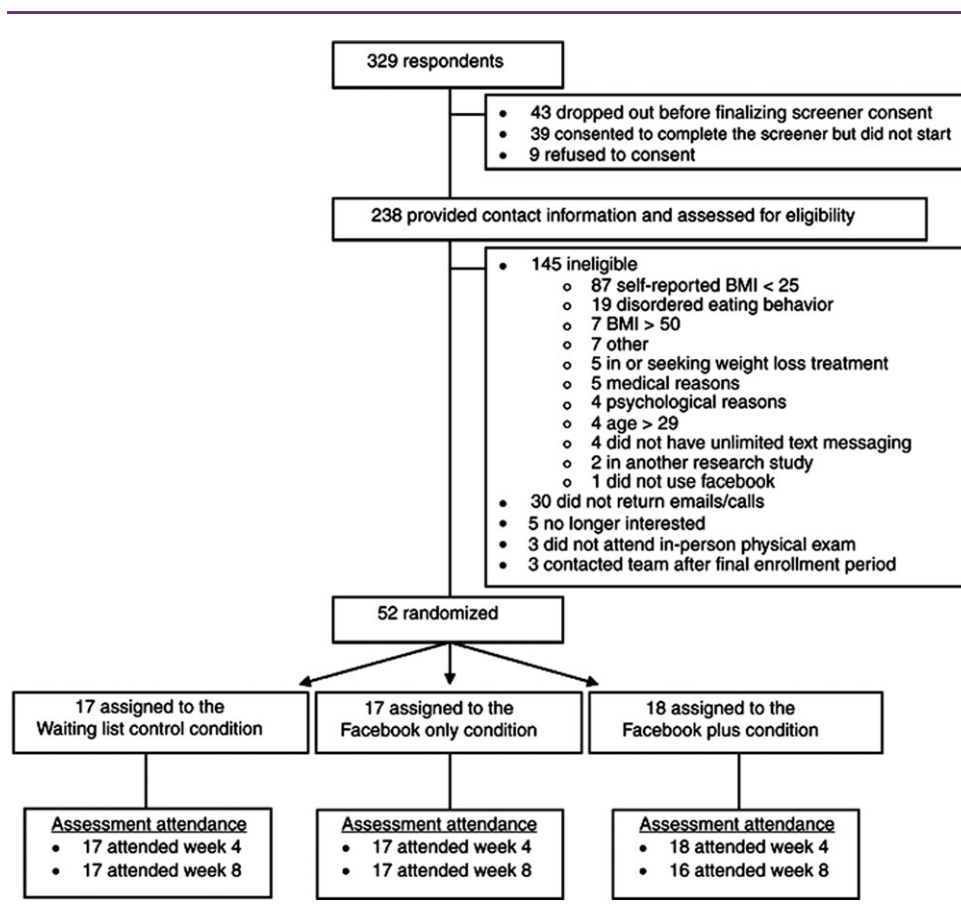


FIGURE 1 Participant flow chart.

of text messages. The first was a prompt for specific self-monitoring data (3 days/week). Participants received a prompt in the morning (e.g., *Hey there! Have a great day and be sure to keep track of diet and PA. We need results tonight ☺*) and request for data in the evening (*Please text today's: [PA], [weight], [calories]. Separate with commas (ex: 30,185,1550)*). Participants received immediate feedback on the basis of their responses (e.g., *We got your monitoring info, thanks! Good work!*). The second type of text message was for general self-monitoring (2 days/week). Participants received a prompt in the morning (e.g., *Having a daily routine can help you get into the habit of self-monitoring! Plan a time everyday when you record your diet and PA*) and request for data in the evening (*Hope u had a good day fellow texter! Did you monitor? A) diet only B) PA only C) both D) none*). Participants received immediate feedback on the basis of their response (e.g., *Hope this week isn't too stressful for you! Please try to monitor both diet and PA next time!*). The third type of text message contained tips based on self-identified high risk behaviors/situations (2 days/week). These were tailored based on risks participants endorsed at baseline such as late-night snacking, liquid calories, and meal skipping (e.g., *If you have a long day, pack ur gym clothes the night before and leave them by the door before u leave for the day. No excuses! ☺*).

Weekly tailored feedback reports. Each week, the self-monitoring data received via text were compiled into personalized reports,

which summarized progress, integrated progress with the skills training for the week, and provided encouragement. Reports included text and visual feedback of average weekly weight, calories and physical activity, as well as feedback on progress toward reaching one's behavioral goals. Graphs allowed participants to visually track their progress. Finally, reports contained thought provoking questions to which participants were able to respond in a chat box on

TABLE 1 Weekly topics

Week	Topic
1	Self-monitoring and navigating campus
2	Planning and nutrition
3	Internal vs. external hunger and eating triggers
4	Physical activity
5	Stress and distorted thinking
6	Social support
7	Special occasions, dining out, and holidays
8	Relapse prevention

Weekly content included evidence-based handouts adapted for college students and podcasts including video demonstrations.

the report page (e.g., “What helped you to reach your goal this week?” “What barriers have you noticed getting in the way of exercise?”). Notifications that personalized reports were available were sent via text, individual Facebook messages and group page announcements. Reports were accessed by clicking a link provided via Facebook. Although participants were routed to an external, secure page, they were able to easily return to Facebook using a “return to Facebook” icon at the top of their report.

Identification of a support “buddy”. In addition to support from other group members, participants selected a “buddy” who did not participate in the study to serve as a support person. Specifically, the support “buddy” received a text message when the participant was excelling or doing poorly with self-monitoring. The “buddy” was encouraged to either congratulate or offer support to the participant on the basis of his/her self-monitoring compliance for the week.

Measures

Demographics. Demographic information, including age, race, sex, and school year were assessed at baseline.

Height and weight. Height was taken using a stadiometer to the nearest quarter inch. Body weight was measured on a calibrated scale to the nearest quarter pound; BMI was calculated on the basis of height and weight ($BMI = \text{weight (kg)}/\text{height}^2 (\text{m}^2)$). For continuity, in-person weights were taken on the same scale at 4 and 8 weeks.

Secondary outcomes of interest

Secondary outcomes of interest were assessed at baseline and week 8.

Physical activity behavior. Physical activity was measured with a modified version of the Godin Leisure-Time Exercise Questionnaire (27) which assesses the number of days and the average minutes per day during the past 7 days that the participant engaged in strenuous, moderate, or mild physical activity. In a sample of University students, this measure has been shown to have test-retest reliability of 0.82 (28).

Goal setting and planning. Goal setting was measured using the 10-item exercise goal-setting scale (29). This measure assesses how one problem-solves and sets goals for adopting daily physical activity. This measure has been used with college students, with good internal consistency (0.89). Planning was measured using the exercise planning and scheduling scale (29). This 10-item measure assesses how one plans and schedules physical activity. This measure has been shown to have good internal consistency (0.87).

Physical activity self-efficacy. This measure is 5-items assessing one’s confidence that he/she can be active when faced with 5 common barriers (e.g., bad weather and lack of time). Reliability is as follows: $\alpha = 0.76$; test-retest reliability over 2 weeks = 0.90 (30).

Weight self-efficacy. The weight self-efficacy (31) measures perceived control over food-related behaviors, and incorporates 20 different food-related situations (e.g., social events). A total self-efficacy score is calculated, as well as five individual subscales. Internal consistency for the total scale and the individual subscales range from 0.70 to 0.90 (31).

Adapted social support for diet and exercise. This 48-item measure assesses the degree to which family or friends are sources of support specific to physical activity and dietary behaviors (32,33). Scores ranged from 1 (never/not applicable) to 5 (very often), and eight subscales scores were created (e.g., family: sabotage and support for diet). As suggested by Kiernan and colleagues (33) mean scores were evaluated. Internal consistency for the subscales were adequate to excellent (0.71-0.93).

Engagement/compliance. For both the Facebook and Facebook Plus participants, engagement was examined by quantifying available markers such as posting comments, “liking” posts, and responding to events. For the Facebook Plus participants, we tracked the text response time, as well as the overall compliance with each type of text message response.

Consumer satisfaction. This 23 item questionnaire measure assessed program satisfaction and perceived level of involvement with the program and was administered to Facebook and Facebook Plus participants. Facebook Plus participants were also administered an additional nine-item questionnaire focused on text messaging and their “buddy”.

Statistical methods

Data were expressed as means \pm s.d. For the primary outcome of interest (i.e., weight loss), statistical significance among experimental groups was determined by ANCOVAs (controlling for cohort) with post-hoc contrasts conducted to examine weight changes. For secondary outcomes of interest (i.e., psychosocial variables and physical activity), ANCOVAs (controlling for cohort) with post-hoc contrasts were conducted to examine statistical significance among experimental groups on changes on the psychosocial variables. Pre and post differences on these variables were also examined using repeated measures ANOVAs. Finally, for examining the relationship among text messaging compliance and weight change, correlations as well as *t*-tests were used. *P* values ≤ 0.05 were considered as statistically significant.

Results

Demographic characteristics

Participants were 20.47 ± 2.19 years old, 86.45 ± 17.11 kg, with a BMI of 31.36 ± 5.3 kg/m². Participants were primarily female (86.5%), and the sample was racially diverse (57.7% Caucasian, 30.8% African American, 5.8% Hispanic, 1.9% Asian, 1.9% bi/multi-racial, and 1.9% self identified as “other”). Nearly one-third of participants were sophomores (32.7%) with the rest as follows: 15.4% freshmen, 17.3% juniors, 21.2% seniors, and 13.5% graduate students. There were no differences between groups or cohorts on demographic variables (i.e., sex, age, academic year, marital status, and race).

Retention

A total of 100% of participants completed the 4-week assessment, and 96% completed the 8-week (post-treatment) assessment.

Weight loss

At 4 weeks, weight changes were -0.46 ± 1.4 for Facebook, $-1.7\text{kg} \pm 1.6$ for Facebook Plus, and $0.28\text{kg} \pm 1.7$ for Waiting List. These weight changes were statistically significant among

TABLE 2 Weekly text messaging response rates

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Average
Self-monitoring (%)	85.5	76.2	71.0	60.6	69.9	64.5	59.1	61.5	68.5
General monitoring (%)	86.0	91.9	70.1	88.6	85.1	72.1	74.4	69.8	79.8

groups, ($P < 0.01$). Post-hoc contrasts showed that Facebook Plus weight losses were significantly different from Waiting List ($P \leq 0.001$; 95% confidence interval: -6.61 and -1.93), and Facebook ($P < 0.05$; 95% confidence interval: -5.04 and -0.37). At 8 weeks, weight changes were: $-0.63\text{kg} \pm 2.4$ for Facebook, $-2.4\text{kg} \pm 2.5$ for Facebook Plus and $-0.24\text{kg} \pm 2.6$ for Waiting List. These weight changes were statistically different among groups ($P < 0.05$). Post-hoc contrasts showed that Facebook Plus weight losses were significantly greater than the Waiting List ($P < 0.05$; 95% confidence interval: -8.46 and -0.77) and Facebook ($P < 0.05$; 95% confidence interval: -7.70 and -0.04) groups. Weight changes at 4 and 8 weeks were not significantly different between the Facebook and Waiting List groups.

Secondary outcomes of interest: physical activity and psychosocial measures

ANCOVAs (controlling for cohort) with post-hoc contrasts were conducted to examine the changes on the psychosocial variables. After using a Bonferroni correction for multiple tests (≤ 0.0036), there were no significant differences within or among the groups on changes in any of the measures.

Engagement

Level of engagement was examined for the Facebook and Facebook groups by quantifying the number of times participants “liked” a study-related post, posted a comment, and RSVP’ed to an event.

Facebook. Almost one-fourth (23.5%; $n = 4/17$) of the participants “liked” the study-related posts on the Facebook group. The average number of “likes” per person among those four participants was 1.25. Seven participants (41.2%) posted or commented on the study-related content at least once. The average number of posts per person among those who posted or commented was 3.05. Finally, 88.2% ($n = 15/17$) responded to our event invitations at least once during the program. The average number of RSVPs among those who responded was 6.54.

Facebook Plus. Similarly, almost one-fourth (22.2%; $n = 4/18$) of the participants “liked” the study-related posts on the Facebook group. Those four participants “liked” our post once throughout their programs. Fourteen participants (77.8%) posted or commented on the study-related content at least once. The average number of posts per person among those who posted or commented was 1.3. Finally, 72.2% ($n = 13/18$) responded to our event invitations at least once during the program. The average number of RSVPs within those who responded was 8.56.

Compliance

Response rates to self-monitoring text messages. On average, participants sent their data 49.9 min (s.d. = 42.1) after the prompt was sent,

and 68.5% of all self-monitoring texts received a response containing self-monitoring data. Please see Table 2 for the weekly response rates. Neither rapid response time nor number of text responses were significantly related to weight loss at week 4 or week 8.

Response rates to general monitoring text messages. On average, participants sent their responses 29.4 min (s.d. = 30.0) after the prompt was sent, with 79.7% of all general monitoring texts receiving a response. Please see Table 2 for the weekly response rates. Neither rapid response time nor number of text responses were significantly associated with weight loss at week 4 or week 8.

Acceptability

Among Facebook and Facebook Plus participants who completed consumer satisfaction measures ($n = 32$), 97% found the program helpful (at least three on a 4-point scale), 81.3% found the videos and handouts helpful, and 100% would recommend the program to others. Among Facebook Plus ($n = 15$) participants, 93.3% reported that the texts were helpful, 100% reported that the tailored weekly reports were helpful and easy to read. Qualitative feedback included: (i) “I loved the tips that I was sent. I also liked that I got a text in the morning reminding me to do well that day” and (ii) “The graphs were a great idea and helpful – seeing my progress made it easier to stay on track!”

Discussion

To our knowledge, this pilot study is the first to demonstrate the feasibility of using Facebook to deliver adapted evidence-based weight loss content to college students. The data indicated that a combination of Facebook plus text messaging, feedback, and identifying a support person produced significantly greater weight losses than Facebook alone or a Waiting List control group. Little empirical data exist on standard weight losses among a college population, therefore, while 2.4 kg over 8 weeks might appear modest, it remains difficult to put the magnitude of weight loss (2.8%) in full context. However, the weight losses achieved by the Facebook Plus group approximated those previously obtained via face-to-face, dietitian-delivered, group treatment among a college population (34). The average weight loss must also be interpreted in the context of the nonface-to-face (or mediated) method of intervention delivery. This type of intervention delivery, through technology-based modalities, can be affordably and easily delivered to a large number of individuals. Future research is needed to determine the level of continued engagement and utilization of the platforms, as well as sustainability of weight loss. However, from a public health standpoint, even small to modest weight loss disseminated on broad scale could have a positive effect on population health.

Although significant differences in weight loss were found between the Facebook Plus and Facebook groups, weight change at both 4

and 8 weeks was not significantly different between the Facebook and Waiting List control groups. This provides some evidence that delivering weight loss content alone via a social networking platform may not be enough to drive behavior change. Whereas an important finding, this result must be interpreted with caution given the small sample size and the preliminary nature of the intervention. We also did not measure components such as social norms around healthy weight loss behaviors, that could have changed as a result of being enrolled in one of the two active treatment arms, and have been shown to be associated with weight loss (20). In addition, more research in a larger sample is needed to disentangle the most potent intervention components of the Facebook Plus intervention. As described above, the Facebook Plus group received additional components: daily text messages, personalized feedback via weekly summary reports, and identifying a social support “buddy.” One, or a combination, of these components was associated with weight losses, perhaps related to the self-regulatory processes of self-monitoring, goal setting, and feedback, and/or the selection of a support person.

Results provided support for feasibility and acceptability regarding the use of technology as a platform for delivering a weight loss intervention to college students. Specifically, of participants in the two active intervention arms, 97.0% found the program helpful, 81.3% found the videos and handouts helpful, and 100% would recommend the program to others. Social networking and text messaging, technologies that are already well-integrated into the lives of college students (10), can provide excellent platforms from which to deliver effective weight loss interventions. In addition, our text response rates were comparable to other studies in both college students and adults (35,36) indicating good compliance and utilization.

Although most colleges have implemented programming to address issues such as substance use and high risk sexual behavior (8), weight loss programming has lagged behind, despite health and psychosocial consequences of overweight/obesity (1). Despite the relatively delayed consequences of overweight/obesity as compared with other behaviors, colleges have an opportunity to deliver early interventions to their students to help them adopt healthy behaviors and reduce serious future health risks. It is possible that the lack of empirically-supported treatments developed for college students has contributed to this discrepancy. To date, there is only one published randomized controlled trial (9) of a weight loss intervention among college students; yet its significance is limited to because of a number of methodological weaknesses. Given shared contexts, norms, and food/physical activity resources, there is substantial opportunity for delivering weight loss programming to a population of college students. This pilot study is the first step toward establishing evidence-based weight loss programming for college students.

In addition to the need for evidence-based treatments, Universities may also be mindful of the costs associated with gold-standard weight loss interventions. For example, the average enrollment across degree-granting institutions in 2009 was 20,428 (37); this translates into 6,741 students per institution in need of weight loss programming. These numbers underscore the need for treatment options that have widespread dissemination potential and low overhead costs. The program evaluated in this pilot study may provide a realistic option for schools looking to achieve maximum penetration without paying a high price, as it uses technology that is already integrated into students’ lives (10). The weight losses achieved by

the Facebook Plus participants in this pilot study, although modest, show promise for broader dissemination, given the intervention was delivered exclusively via nonface-to-face methods.

Although little is known about obesity and social networks in a college population, social networks have been shown to be important for altering social norms, which may have significant effects on weight loss (20). To date, online social networks and weight-related behaviors have not been examined. However, an online social networking site like Facebook affords the ability to link existing social networks in addition to the creation of new networks. According to Facebook, the average user has 130 “friends” and spends nearly 1 h on the website (38). Participants in this pilot study had more than 500 “friends” on average. Consequently, it may be possible to use existing network connections to target social norms for weight and weight-related behaviors (e.g., acceptability of being overweight, inactivity, and eating unhealthy foods) (20), in addition to delivering content and encouraging the use of important weight loss behaviors such as self-monitoring and social support.

Limitations

Although this study has a number of strengths, there are several limitations that should be considered as they may affect the generalizability and interpretation of the results. First, this study was a small, randomized controlled pilot trial ($N = 52$), although the effects were large enough to detect significant differences among the groups. In addition, it was not possible for this pilot study to fully track engagement via Facebook. For example, we did not track logins to or length of time on Facebook, therefore unable to make comparisons to more traditional internet-based studies that typically examine login rates to quantify usage. Our data are limited to active participation (e.g., liking a post and RSVPing to an event) and do not capture other levels of engagement (e.g., number of times accessing the group, reading others’ posts, reviewing content, and reviewing personalized feedback reports). Finally, as with any multicomponent intervention, it is difficult to ascertain the extent to which each of the components accounted for change. Given that tracking the texts sent between “support buddies” and participants were beyond the scope of the data capture, we cannot be fully confident the extent to which social support was received by participants. However, it remains possible that the act of selecting and engaging a support person may have been a factor in the behavior change process.

Future directions

The promising results of this pilot trial provide support for further evaluation of the program. In particular, it will be important to adapt further additional evidence-based weight loss content to extend the number of sessions to at least a 6- or 12-month long intervention. This extension will help to answer questions regarding dose-response, and will allow for direct comparison to face-to-face group treatments that typically span a semester. Future studies are needed to better understand the factors that serve as motivation and predict weight loss success among college students. Given the nonface-to-face nature of the intervention, its utility in supporting weight loss maintenance should also be explored. Finally, the technology used in this program affords further tailoring of the treatment, which should be developed and assessed. For example, future studies should explore the use of tailoring text messages to both high risk

behaviors and times of day (e.g., late-night snacking, weekends, and during finals).

Given the cost associated with face-to-face interventions, technology-based interventions may have a greater potential to reach large numbers of individuals and make a public health impact (39,40). This study provides initial information on the use of social media platforms for the delivery of effective weight loss programming, which has the potential for broad reach and dissemination across college campuses.

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References

- United States Department of Health and Human Service. *The Surgeon General's Call to Action to Prevent and Decrease Overweight and Obesity*. Public Health Service, Office of the Surgeon General: Rockville, MD, 2001.
- Nelson MC, Story M, Larson NI, Neumark-Sztainer D, Lytle LA. Emerging adulthood and college-aged youth: an overlooked age for weight-related behavior change. *Obesity (Silver Spring)* 2008;16:2205-2211.
- Lloyd-Richardson EE, Bailey S, Fava JL, Wing R. A prospective study of weight gain during the college freshman and sophomore years. *Prev Med* 2009;48:256-261.
- Crombie AP, Ilich JZ, Dutton GR, Panton LB, Abood DA. The freshman weight gain phenomenon revisited. *Nutr Rev* 2009;67:83-94.
- Racette SB, Deusinger SS, Strube MJ, Highstein GR, Deusinger RH. Changes in weight and health behaviors from freshman through senior year of college. *J Nutr Educ Behav* 2008;40:39-42.
- Gow RW, Trace SE, Mazzeo SE. Preventing weight gain in first year college students: an online intervention to prevent the "freshman fifteen". *Eat Behav* 2010;11:33-39.
- American College Health Association. National college health assessment – Spring 2007 reference group data report (abridged). *J Am Coll Health* 2008;56:469-479.
- Sparling PB. Obesity on campus. *Prev Chronic Dis* 2007;4:A72.
- Ames GE, Perri MG, Fox LD *et al*. Changing weight-loss expectations: a randomized pilot study. *Eat Behav* 2005;6:259-269.
- Aleman AM, Wartman KL. *Online social networking on campus: Understanding what matters in student culture*. Taylor & Francis: New York, 2009.
- Pew Research Center. Cell phone data set. Washington, DC: Pew Research Center <<http://pewinternet.org/Shared-Content/Data-Sets/2010/May-2010--Cell-Phones.aspx>> (2010). Accessed 15 December 2011.
- Lenhart A. Cell phones and American adults: they make just as many calls, but text less often than teens. Washington, DC: Pew Research Center <<http://pewinternet.org/Reports/2010/Cell-Phones-and-American-Adults.aspx>> (2010). Accessed 17 January 2011.
- Hanley M. Institute for Mobile Media Research. Muncie: Ball State University <<http://cms.bsu.edu/Academics/CentersandInstitutes/CMD/IMMR/IntheMedia.aspx>> (2009). Accessed 17 January 2011.
- Boulton C. Facebook traffic rise makes google social tools essential <<http://www.eweek.com/c/a/Web-Services-Web-20-and-SOA/Facebook-Traffic-Rise-Make-Google-Social-Tools-Essential-238416/>> (2011).
- Berkman LF, Glass T. Social integration, social networks, social support and health. In: Berkman LF, Kawachi I (eds). *Social Epidemiology*. Oxford University Press: New York, 2000, pp 137-174.
- Cohen-Cole E, Fletcher JM. Is obesity contagious? Social networks vs. environmental factors in the obesity epidemic. *J Health Econ* 2008;27:1382-1387.
- Christakis NA, Fowler JH. The spread of obesity in a large social network over 32 years. *N Engl J Med* 2007;357:370-379.
- Madan A, Moturu ST, Lazer D, Pentland A. Social sensing: obesity, unhealthy eating and exercise in face-to-face networks. In: *Proceedings of Wireless Health 2010*. ACM: San Diego, 2010, p 104-110.
- de la Haye K, Robins G, Mohr P, Wilson C. Obesity-related behaviors in adolescent friendship networks. *Soc Networks* 2010;32:161-167.
- Leahey TM, Gokee LaRose J, Fava JL, Wing RR. Social influences are associated with BMI and weight loss intentions in young adults. *Obesity (Silver Spring)* 2011; 19:1157-1162.
- Park H, Rodgers S, Stemmler J. Health organizations' use of Facebook for health advertising and promotion. *J Interact Advert* 2011;12:62-77.
- Foster GD, Wyatt HR, Hill JO *et al*. Weight and metabolic outcomes after 2 years on a low-carbohydrate versus low-fat diet: a randomized trial. *Ann Intern Med* 2010;153:147-157.
- Wadden TA, West DS, Delahanty L *et al*. The Look AHEAD study: a description of the lifestyle intervention and the evidence supporting it. *Obesity (Silver Spring)* 2006;14:737-752.
- Borg GV. Psychological basis of perceived exertion. *Med Sci Sports Exerc* 1982;14:377-381.
- Donnelly JE, Blair SN, Jakicic JM *et al*. American College of Sports Medicine Position Stand. Appropriate physical activity intervention strategies for weight loss and prevention of weight regain for adults. *Med Sci Sports Exerc* 2009;41:459-471.
- Haskell WL, Lee IM, Pate RR *et al*. Physical activity and public health: updated recommendation for adults from the American College of Sports Medicine and the American Heart Association. *Circulation* 2007;116:1081-1093.
- Godin G, Shephard RJ. A simple method to assess exercise behavior in the community. *Can J Appl Sport Sci* 1985;10:141-146.
- Reed JA, Phillips DA. Relationships between physical activity and the proximity of exercise facilities and home exercise equipment used by undergraduate university students. *J Am Coll Health* 2005;53:285-290.
- Rovniak LS, Anderson ES, Winett RA, Stephens RS. Social cognitive determinants of physical activity in young adults: a prospective structural equation analysis. *Ann Behav Med* 2002;24:149-156.
- Marcus BH, Selby VC, Niaura RS, Rossi JS. Self-efficacy and the stages of exercise behavior change. *Res Q Exerc Sport* 1992;63:60-66.
- Clark MM, Abrams DB, Niaura RS, Eaton CA, Rossi JS. Self-efficacy in weight management. *J Consult Clin Psychol* 1991;59:739-744.
- Sallis JF, Grossman RM, Pinski RB, Patterson TL, Nader PR. The development of scales to measure social support for diet and exercise behaviors. *Prev Med* 1987;16:825-836.
- Kiernan M, Moore SD, Schoffman DE *et al*. Social support for healthy behaviors: scale psychometrics and prediction of weight loss among women in a behavioral program. *Obesity (Silver Spring)* 2012;20:756-764.
- Patience N, Napolitano MA, Denys M. Student weight loss group: student feedback and weight loss results. American College Health Association Annual Meeting, Philadelphia, PA, June 2010.
- Patrick K, Raab F, Adams MA *et al*. A text message-based intervention for weight loss: randomized controlled trial. *J Med Internet Res* 2009;11:e1.
- Schembre SM, Yuen J. Project TwEATs. A feasibility study testing the use of automated text messaging to monitor appetite ratings in a free-living population. *Appetite* 2011;56:465-468.
- Snyder, TD, Dillow, SA. *Digest of Education Statistics 2010 (NCES 2011-015)*. National Center for Education Statistics, Institute of Education Sciences, USDOE: Washington, DC, 2011.
- Qin L, Kim Y, Hsu J, Tan X. The effects of social influence on user acceptance of online social networks. *Int J HumComput Interact* 2011;27:885-899.
- Abrams DB, Orleans CT, Niaura RS *et al*. Integrating individual and public health perspectives for treatment of tobacco dependence under managed health care: a combined stepped-care and matching model. *Ann Behav Med* 1996;18:290-304.
- Glasgow RE, Vogt TM, Boles SM. Evaluating the public health impact of health promotion interventions: the RE-AIM framework. *Am J Public Health* 1999;89:1322-1327.