Translating a health behavior change intervention for delivery to 2-year college students: the importance of formative research

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ABSTRACT

Young adults are at risk for weight gain in the transition to independent adulthood; 2-year college students are at greater risk and understudied relative to 4-year students. This project conducted formative research for a randomized controlled weight gain prevention trial among 2-year college students, to ensure appropriateness of content and delivery of a curriculum originally developed for 4-year college students. Data were collected from community college students, faculty, and staff from October 2009 to August 2011. Work included focus groups and key informant interviews, curriculum pilot testing, and social network and support website beta testing. Based on focus groups and interviews, program content, course delivery modes, and communication channels were adjusted to meet population interests and preferences. The course was delivered successfully in pilot testing, and the website was received well by beta testers. Formative work successfully guided program adaptations to address population needs.

KEYWORDS

Obesity prevention, Young adults, Curriculum development, Intervention delivery, Formative research

BACKGROUND

Obesity is an increasingly important public health concern in the United States [1]. Given the strong evidence for associations between obesity and a number of costly health outcomes, including hypertension, diabetes, hypercholesterolemia, heart disease, and some cancers [2–6], interventions to reduce weight gain are critical to protect against these adverse outcomes.

Obesity risk and disparities in college students

Young adults are at increased risk for weight gain, particularly as they transition from high school to college and to independent living [7]. Prevalence data indicate that rates of overweight and obesity have increased steadily over time among college-aged youth

Implications

Practice: Health behavior change programs targeting two-year college students can and should be tailored with attention to the unique demographics, interests, and needs of this population, as they are older, more racially and ethnically diverse, and at greater risk for obesity on average when compared to four-year college student averages.

Policy: Stakeholder feedback is necessary to optimize investigator-driven, community-based projects, in order to maximize research potential.

Research: Formative evaluation across multiple domains and with key informant sources is essential for successful implementation of evidence-based interventions to meet new population needs.

[8], including students attending 4-year colleges [8, 9]. Considerably less obesity-related research has been conducted among 2-year college students relative to 4-year students, although 2-year college students may be at even greater risk for overweight/obesity, poor dietary intake, and physical inactivity than students attending 4-year colleges [10, 11].

Reasons for the obesity disparity elucidated by this work include differences in age, racial/ethnic background, obesity rates and associated health behaviors. Two-year college students are older on average, and thus further along an expected adult weight gain trajectory than their 4-year counterparts [10–12]. Greater racial and ethnic minority representation has been observed among 2-year students, which corresponds to greater risk for overweight or obesity [10, 11, 13]. Prevalence rates for healthy dietary intake and physical activity behaviors also favor 4-year students [10, 11, 14]. In addition, 2-year students are more likely to be married, partnered, or to have children, and do not share on-campus housing arrangements due to the lack of

structured student housing on 2-year campuses, which presents environmental challenges that are distinct from those present for 4-year students [10, 11]. Thus, 2-year college populations represent an important point of contact to address health disparities among at-risk young adults, and any intervention approaches may require adjustment of those developed for 4-year students due to these differences between populations.

The CHOICES program

Decreased physical activity and poor nutrition [15–17], as well as other factors such as inadequate sleep [18] and stress [19] are leading contributors to a variety of short- and long-term negative health consequences among young adults. The CHOICES (Choosing Healthy Options in College Environments) trial was designed to develop and test innovative strategies to prevent unhealthy weight gain in students attending 2-year colleges [20]. CHOICES recruited 440 students from three colleges in the Minneapolis/St. Paul area. Students were randomized to a control arm that received information about healthy weight, or to an intervention arm for 24 months; intervention started with a single semester health curriculum followed by behavior monitoring and interaction via a social network and support website for 20 months. Twenty-four month body mass index was the primary study outcome.

The importance of formative research: application to CHOICES

Formative evaluation conducted prior to intervention development is an important step in identifying and refining optimal methods of intervention delivery, as it allows a research team to take advantage of the input of target population knowledge. These methods are largely qualitative in nature, relying on focus groups, key informant interviews, and experiential feedback to provide information [21]. Given the limits on weight control success with typical obesity prevention efforts, it is critical to refine interventions to meet population needs, by using systematic methods to gather information from the target population prior to program launch [22]. The CHOICES team based our initial work on this process, by selecting a specific target population (young adults) and delivery channel (2-year college curriculum), narrowing our behaviors of interest (dietary intake, physical activity, sleep, and stress-related behaviors), and carefully designing an intervention plan, with input from the target population, to best influence behavior change and weight change as a result of the trial [21, 22].

Previous studies have examined dietary intake, physical activity, and other weight-related behaviors in qualitative work with 4-year college students [23, 24], but not with 2-year college students. Given that the existing scholarly literature has not covered the specific obesity prevention and weight management needs of 2-year college students [7],

the CHOICES study began with the formative work described here. We sought to develop the evidence base for intervention with 2-year student populations by examining the relevance of an existing weight and health management curriculum for 4-year college students, with the aim of adapting it for the 2-year college population targeted by CHOICES.

The "Sleep, Eat & Exercise" (SEE) course was selected as the curriculum to be implemented. SEE is a web-based introductory course developed within a 4-year college curriculum, and covering basic concepts in nutrition, sleep, physical activity, and stress management [25]. The original course included units on how to navigate health behaviors while living in a residence hall or other campus housing, details of recreation and dining facilities specific to the University at which it was developed, and did not depict students outside of the 18–22 year age range [25]; all of these factors required that the course be reviewed and appropriately modified for 2-year students. Likewise, since there was no existing website encouraging 2-year college students to engage in healthy weight maintenance behaviors, and due to the relative newness of the evidence base regarding feasibility and usability of social media and web technologies in health interventions [26], formative assessment was critical to the web development stage of the project.

Problem statement and purpose of study

The overall goal of this paper was to describe the process of applying three stages of formative data collection to the key components of the CHOICES intervention: a for-credit course curriculum in the intensive intervention phase and a newly created social network and support website in the intervention maintenance phase. Results highlight the important lessons learned in the formative phase that were applied throughout the intervention phase of the study and describe how that information was incorporated into intervention design and content. Formative work was viewed as critical to this team's ability to accomplish research goals by seeking feedback from our target population so that our decisions on intervention and website design, content, and delivery would be data-driven and population-appropriate.

METHODS

The formative evaluation was conducted in three stages: focus groups and key informant interviews to elucidate best practices for program delivery, pilot testing of course material, and beta testing of a social network and support website developed for the study. Data were collected between October 2009 and August 2011 at three community colleges in the Minneapolis/St. Paul metropolitan area: Saint Paul College (SPC), Century College (CC), and Inver

Hills Community College (IHCC). Study procedures were approved by the University of Minnesota Institutional Review Board (IRB) and research protocols at each college. Informed consent was obtained from all participants using a standardized consent form that followed conventional human subjects protection protocols with regard to describing the research, demands of participation, compensation, and confidentiality of the data collected. Specific study aims were described as follows, "You are invited to participate in a study that is looking at programs to help college students avoid unhealthy weight gain…. You are being asked to participate in a 90-minute focus group or interview that will ask for your opinions on barriers to staying healthy and avoiding unhealthy weight gain in college. In addition, we will ask for your opinion on the types of programs that might be most effective, feasible and well accepted by students."

Recruitment for all stages in the formative phase was conducted using research staff contacts with school staff from the grant planning phase of the project, convenience sampling of students solicited by staff in high-traffic areas of the schools, and snowball sampling (i.e., requesting that existing study participants recruit new participants from friends or other contacts); details of recruitment for each phase are presented in the Sample section.

Sample

The primary study liaisons at each college suggested specific staff members to be interviewed at their respective colleges. During interviews, participants were asked for names of other staff to interview. We also asked staff to provide names of student leaders to contribute to focus groups or interviews. A total of 30 staff members were interviewed (13 men, 17 women), including 13 Student Services personnel (representing Student Life Directors, Retention Coordinators, Health Services Staff, and Enrollment Services Staff), 12 faculty members (representing Psychology, Sociology, Theater, Physical Education, Health, and English departments), three administrators (two Deans and a college administrative official), and two food service staff members. Fifteen college employees (faculty and/or staff) were interviewed from SPC, seven were interviewed from CC, and eight were interviewed from IHCC. The mean age of participating faculty and staff was 44.7 (10.9) years, range 28–62 years.

Student focus group participants were recruited from common, high-traffic areas at the three colleges; to facilitate recruitment, research staff were present at information tables and enrolled interested students using standardized consent forms. Thirteen students were interviewed individually (two men, 11 women; five from SPC and CC and three from IHCC). The mean age of interviewed students was 22.4 (3.4) years, range 18–27 years. Ten focus groups were conducted with 44 participants (13 men, 31 women; 14 from SPC, nine from CC, 21 from IHCC). The mean age of students in focus groups was 23.9 (8.6) years, range 18–57 years.

Stage 2 course pilot testing was conducted at IHCC. In Spring semester 2010, 38 of 48 recruited students were enrolled in the online course, with 34 students (seven men, 27 women) completing the course (70.8 %). The mean age of students in the online course was 24.2 (6.8) years, range 18–43 years. Based on results from Stage 1 formative work indicating interest in face-to-face (FTF) as well as online course options (see Stage 1 results, "Program Preferences"), in Spring semester 2011, 25 students were recruited to enroll in an additional FTF course. Twenty students (seven men, 13 women) enrolled and completed the course (80 %). The mean age of students in the FTF course was 21.5 (3.7) years, range 18–31 years.

Stage 3 website beta testing was conducted with a convenience sample of 13 students (two men, 11 women) recruited by research staff. Nine attended IHCC, and four were of comparable age to the student population of interest and were known to members of the research team. Age was available for ten of the 13 participants; mean age was 22.6 (6.1) years, range 18–34 years.

Procedures

Each focus group was led by one of three investigators from the research team (one man, two women), with doctoral degrees and expertise in nutritional or exercise sciences and with experience developing and/or implementing weight-related projects and programs with youth, adolescents, or young adults. All interviews with staff and students were conducted by female members of the research team, with master's degrees and expertise in educational and/or exercise sciences, one of whom had worked previously on weight-related projects with adolescents.

Stage 1: focus groups and key informant interviews

Focus groups and interviews were conducted with the aim of better understanding weight-related behaviors of 2-year college students (e.g., "What do you think are the causes of unhealthy weight gain that many college students experience?") as well as preferences for intervention content and delivery (e.g., "We are in the process of developing programs and ways to help students stay healthy and not gain excess weight during college…. One of the things that we are proposing is a one-credit web-based course on healthy eating, physical activity, stress, and sleep…. Do you think students would be willing to sign up for such a course if we paid for the credit?").

Scripts were developed by the research team and were designed to solicit ideas and feedback related to intervention content and delivery. Interviews lasted 30–45 min, and focus groups lasted 90 min.

Students were given a $20 Target gift card as compensation. Staff were also offered $20 Target gift cards, but seven of 30 participating staff declined, citing state institutional policies regarding acceptance of gifts by academic and professional staff. All focus groups and interviews were audio recorded to facilitate data analysis.

Stage 2: course pilot testing

In the online course, four 15-item online surveys were administered to gather feedback on course content, one after each of four modules. The first seven items asked students to rate the course in terms of clarity, interest, usefulness, relevance, and helpfulness; one item asked whether students felt the material was "too geared toward 4-year college/ university students," with no further prompting, and was designed to gauge perceptions of the course materials. Items were rated on a 4-point scale from strongly disagree to strongly agree. The next two items asked students to assess how much they learned from the class (1 = much less than expected to 5 = a great deal more than expected) and the difficulty of the class (1 = too easy to 5 = too difficult); the remaining items requested open-ended feedback on class content likes and dislikes, addition or deletion requests, and any other comments. For the FTF course, students completed four-item surveys at the end of each of 16 lessons. The first two items asked students to rate their interest in the lesson and the degree to which they had learned from it; items were rated on a 5-point Likert scale (1 = not at all interesting/didn't learn anything to 5 = very interesting/learned a lot). The remaining items were open-ended and assessed what students liked about the session and what they might change about it. Tuition was paid by the CHOICES study, and students who completed the pilot course received a $100 Target gift card as compensation.

Stage 3: CHOICES social network and support website usability testing

The website was built by a professional web design firm (Digital Telepathy, San Diego, CA, USA; www.dtelepathy.com), in consultation with the research team, and was designed to reinforce course lessons, provide tools to track 11 health behaviors (weight, sleep, fruit and vegetable intake, fast food intake, breakfast frequency, sugar sweetened beverage intake, mindful eating, computer and Internet time, physical activity, movie and television viewing, and stress management), to engage students with revolving content (e.g., articles, recipes) and to include interactive features (e.g., message boards, commenting, points and reward system, event calendar, news feed) in order to create a supportive online user community.

The website was pilot-tested to identify key elements of the user experience, including initial ease of use, how respondents use and evaluate behavior tracking components and interact with other users, and how to encourage engagement. One group of five students participated in a 30-min user-testing experiential evaluation powered by Usertesting.com, in which verbal feedback was recorded as students used the website, allowing for immediate feedback on site navigation and functionality. A second group of eight students was instructed to use the website for 5 days, followed by phone interviews with research staff to gauge experiences with the website. Groups were determined at random by study staff. Students who participated in user testing were compensated with $20 Target gift cards; students who used the website and were interviewed were compensated with $50 Target gift cards.

Data analyses

Data analysis of focus group and interview output was completed utilizing rigorous qualitative procedures in a three-step approach of data reduction, data display, and conclusion drawing and verification, using at least two independent reviewers at each stage to protect against bias [27]. First, recordings were transcribed verbatim and reviewed for accuracy. Data display was then conducted by two research team members who independently coded and summarized each transcript, using a template based on interview or focus group scripts. Transcript summary discrepancies were resolved by a third team member. Lastly, a study interventionist used the coding sheets to prepare a narrative summary and interpretation of the data [27]. A second research team member independently evaluated the summaries, and discrepancies in summaries or interpretations were resolved by a third team member. Highly similar concepts emerged from focus group and key informant data reduction; therefore, data were merged. Similar data reduction strategies were followed for open-ended responses from course pilot testing and website beta testing. Quantitative data from course pilot testing surveys were summarized in Microsoft Excel to generate percentages and weighted mean percentages of students responding favorably to questions asked following course units or modules.

RESULTS

Stage 1: focus groups and key informant interviews

Students, faculty, and staff provided thematically similar responses across questions, with no meaningful differences in patterns by school or informant type; therefore, aggregated results are presented. Major topics that emerged included: Barriers to Health, Weight Gain Prevention, Program Preferences (subtopics: Content and Delivery), and Communication Preferences.

Barriers to health

One barrier that emerged was time constraints. Students and staff indicated that as a result of competing time pressures, such as work, school, and family obligations, health behaviors are perceived as secondary concerns. As one student said, "Life gets in the way." Another student noted, "This is just school, when you leave school, you've got home. You've got bills, you've got kids, you've got jobs. Stress." Consequently, when students feel busy, they tend to eat foods on the go, which leads to unhealthy choices (e.g., fast food or energy-dense convenience foods). Financial constraints were also indicated as a potential barrier to health, in that students view healthy foods as "expensive" or unattainable on a limited budget. One student noted, "running from job to work to kids to home, and [fast food] is about the quickest and most accessible food, which isn't healthy." Students may also be more likely to skip meals rather than seeking healthy options when they feel overcommitted and pressed for time.

A second barrier to emerge was lack of sleep. Students and staff indicated that poor sleep quality and limited sleep duration contributed to difficulties in focusing on health or finding time for physical activity. Stress was viewed as an additional barrier, interfering with students' ability to make healthy dietary or activity choices due to time pressures. As one staff member remarked, "A lot of students here are single moms and so I think they are really tired. And stressed. And they are trying to keep up." It was also suggested that students may cope with stress by eating large portions or relying on "comfort foods" to manage their feelings. Lastly, personal choices were reported as barriers. Some students acknowledged that they make poor decisions about health because of lifestyle choices, peer pressure, or social norms.

Weight gain prevention

A second theme to emerge was that of weight gain prevention, which centered on changes that schools might pursue to address student weight gain. Staff and students indicated that the colleges could do more to provide convenient, inexpensive, and healthy food options or exercise facilities on campus. One student discussed being "surrounded by food…there are 20 vending machines so I feel kind of pressured to eat things that I don't really want… but I'm so hungry that I do it anyways…better options would be nice…."

Program preferences

A third theme emerged regarding CHOICES curriculum content and delivery preferences. With regard to content, respondents suggested that the program include nutrition information, including portion recognition, reading food labels, food com-

parisons, and behavioral effects of food intake. For example, one student said, "I think a lot of people don't pay attention at home how their mothers or whoever cooks their food, so a lot of people don't know what to eat or what to make. Maybe some healthy recipes; give us some knowledge of healthy eating." Lifestyle physical activity content was recommended, including reminders to take the stairs or to be more active with one's children. Stress reduction and time management techniques were suggested as well, as were hands-on activities to build skills. As one student commented, "I think as far as stress goes, even though people know that you can do yoga, they don't sit down and take the time to do it, so if there was a class where you could come and do it that would maybe be more supportive."

With regard to delivery, both students and staff said that randomizing students to the SEE course in a prescribed modality (i.e., online only, FTF, or a hybrid version with online content and FTF sessions) would not be appropriate. Students indicated that due to preferred learning styles and scheduling constraints, they would be much more likely to participate if they could choose a preferred course delivery mode. While the online curriculum was validated as an acceptable format for course delivery in this student population, students also told us that they were interested in options for FTF coursework or courses that combine the two approaches (online and FTF). Students and staff emphasized that students would also be much more likely to prioritize intervention activities if the course were offered for credit, rather than as a non-credit sequence. Lastly, comments from staff and students indicated that, regardless of the format of course delivery, investigators were encouraged to construct a program that was "relevant," "interactive," "experiential," and encouraging of social support within the curriculum (e.g., "I retain more if I'm actually interacting with the material").

Communication preferences

The final theme to emerge was that of communication preferences. Students and staff indicated that students used texting and Facebook as primary modes of communication, particularly with peers, but were not interested in having the study interact with them via Facebook. Interestingly, use of email was strongly discouraged by both students and staff, either because of decline in popularity as a communication mode, or due to infrequent email access by students: "Email you can just click and delete. I do that all the time." With regard to study recruitment, tables in common areas on campus were recommended as an effective way to reach students. Finally, investigators were cautioned by all school administrators and staff regarding varying levels of technology knowledge and/or off-campus computer access among their student bodies, based on their

perception that not all students have computers or Internet access at home; in addition, students indicated that either they or their friends relied on school facilities for access to computers.

Stage 2: course pilot testing

Based on feedback from Stage 1 indicating preference for multiple course delivery options, the course was pilot-tested in two formats: online and FTF. A hybrid version (online + FTF) was not tested due to overlap between this version and the pilot-tested modes.

Online course surveys

Results from the online course surveys are presented in Table 1. Responses were overwhelmingly positive, indicating that the class met students' needs and was delivered effectively. Over 90 % of students found the material to be clearly presented, interesting, and useful. Nearly all students judged the material to be relevant, though a significant minority (40 %) suggested that the material might be geared too much toward 4-year college students. The class was judged appropriate in terms of time spent on coursework and degree of difficulty

(73.8 % and 87.8 % favorable, respectively). In sum, open-ended responses from online surveys suggested changes to course content, relevance to a 2-year rather than 4-year student population, and lesson timing (see Table 1).

FTF course surveys

Results from the FTF course surveys are presented in Table 2. On average, over 75 % of students found the lessons interesting (interest range 68.8–100 %). Fewer students (61.1 %) felt they had learned from the lessons, with greater variability in these ratings than in the ratings of interest (learning range 33.3–92.3 %). The most popular lessons were the course introduction (100 % interested, 88.9 % learned from it), the first yoga session (92.9 % interested, 92.3 % learned from it), and the first cooking demonstration (100 % interested, 91.7 % learned from it). The least popular lesson was the tour of campus and facilities (e.g., fitness room), with 68.8 % of students finding it interesting and only 33.3 % feeling they had learned from it. For all other lessons, at least 72 % of students found the lessons interesting and over half felt they had gained more than a little knowledge as a result. As with the online survey responses, open-ended

Table 1 | CHOICES online course pilot module survey responses

Likert scale item responses					
Item	Module 1 ($n=30$)	Module 2 ($n=20$)	Module 3 ($n=19$)	Module 4 ($n=23$)	Weighted mean
Lessons were presented clearly (agree to strongly agree)	97 %	100 %	100 %	91 %	96.8 %
Lessons were interesting (agree to strongly agree)	97 %	100 %	100 %	96 %	98.0 %
Readings were interesting (agree to strongly agree)	90 %	85 %	95 %	91 %	90.2 %
Information is useful to me (agree to strongly agree)	100 %	95 %	95 %	100 %	97.9 %
Information is relevant to my life and experience (agree to strongly agree)	100 %	95 %	100 %	100 %	98.9 %
Material too geared to 4-year students? (no)	63 %	55 %	53 %	65 %	59.7 %
Assignments helped me learn and practice concepts (agree to strongly agree)	93 %	85 %	95 %	83 %	89.2 %
Amount of time spent? (expected or less)	63 %	80 %	79 %	78 %	73.8 %
Module difficulty rating (just right to easy)	83 %	95 %	84 %	91 %	87.8 %
Open-Ended Item Responses					
Topic	Changes Implemented for Main Trial				
Content	• Added lessons on procrastination				
	• Reduced the number of readings in all modules				
	• Made Sleep Disorders lesson optional				
Relevance	• Added references to night shift work to sleep lessons				
	• Added more interviews with community college students				
	• Removed references to dorm living from all content				
Timing	• Moved SMART goal setting introduction to earlier in the course				

Table 2 | CHOICES face-to-face course pilot lesson survey responses

Likert scale item responses				
Session	Interesting? (interesting to very interesting)		Learned something? (learned to learned a lot)	
	Percent	*n*	Percent	*n*
1 Introduction to Health and Wellness	100.0	9	88.9	9
2 Campus Resource Tour	68.8	16	33.3	15
3 Time Management	77.8	18	63.2	19
4 Yoga	92.9	14	92.3	13
5 Sleep	72.2	18	50.0	18
6 Weight Room Demonstration	80.0	15	56.3	16
7 Stress Management	93.8	16	68.8	16
8 Cooking Demonstration: General	100.0	12	91.7	12
9 Nutrition	85.7	14	64.3	14
10 Yoga with Relaxation Focus	85.7	14	64.3	14
11 Fit It In! (how to prioritize exercise)	75.0	16	68.8	16
12 Workout Demonstration	75.0	12	66.7	12
13 Making Health Affordable	92.3	13	69.2	13
14 Cooking Demonstration: Stir Fry and Salads	90.0	10	66.7	12
15 Relapse Prevention	76.9	13	53.9	13
16 Chillax (relaxation)	87.5	16	62.5	16
Weighted mean percent	77.4		61.1	
Open-Ended Item Responses				
Topic	Changes Implemented for Main Trial			
Delivery	• Added more time to discuss online learning system for downloading and submitting assignments			
	• Added more time to discuss SMART goals; created worksheet for SMART goal planning			
	• Eliminated hard copy of class workbook; all handouts were made available in class or online			
	• Ensured that experiential sessions were primarily activity-based rather than content-focused			
	• Purchased study cell phone to facilitate text reminders to students			
	• Added more student-led activities to cooking demonstrations (was pilot-tested as instructor-led)			
	• Enlisted study dieticians to provide more detailed feedback on student food and mood logs			
	• Added 10-min practice sessions to instructor-led exercise demonstration session			
	• Optimized space to minimize distractions and maximize privacy during physical activity sessions			
Content	• Removed all readings that were supplemental to the textbook			
	• Removed Campus Resource Tour from curriculum			
	• Reduced case studies to one per lesson			
	• Added different variations of yoga instruction to increase uptake by a variety of students			
	• Added content on financial impact of dining out versus preparing meals to eat at home			
	• Incorporated financial wellness and time management strategies across a wider range of lessons			
	• Focused more on basics of food identification and preparation techniques to meet needs of students with minimal food knowledge and preparation skills			
	• Removed Weight Room demonstration (NOTE: this was due to time constraints rather than student feedback)			
Timing	• Rearranged lessons so that Chillax relaxation content (last lesson in pilot) directly followed Stress Management lesson			

responses from the FTF lesson surveys also suggested changes to course content and timing; however, FTF feedback primarily focused on course delivery concerns and did not raise issues of relevance to the 2-year student population (see Table 2).

Stage 3: social network and support website usability testing

Usability testing elicited reactions to the design, functionality, and features of a beta version of the social network and support website developed for the study. Five main topics emerged: overall reactions, feedback on the goal setting and reward points system, constructive feedback, invitation of guests to the site, and identification of errors or technical difficulties.

Reactions to the website were overwhelmingly positive. Students indicated that using the website was a "fun activity to do." Another student appreciated the content, stating, "I really liked the articles and… how you could comment on them." The website design was appealing to students; one student noted, "I thought the layout was good and colors were nice." Goal setting and behavioral tracking tools, built into the site to maintain behavior changes during the study maintenance phase, were also received well. Students indicated that it was "fun" to track their behavior. Lastly, the points and rewards system integrated into the website to facilitate ongoing engagement was appealing as well; as one student offered, "Prizes motivate me!"

Some feedback provided by students was constructive, suggesting methods to optimize site content and usage. The most common constructive feedback centered on changing content periodically to promote interest in the site. For example, one student suggested, "It would be fun if the article on the homepage was changing…so you don't always see the same one on the dashboard." Another student commented more generally, stating, "Keep it up to date and interesting…so they don't lose interest in the website." Students also indicated a preference for reminders to engage in the site, as follows, "If it's not embedded into my calendar to remind me, it falls off the radar…either send me an email or a text message to remind people to go on."

Researchers also sought feedback on whether to open the social network and support website to invited guests to encourage social networking outside of a student's college peer group and to encourage engagement with the website over a period of time in which students might no longer be enrolled at their respective schools. Students responded favorably, with comments such as, "Only if the family/friends are really interested in those issues/topics," and "Yes, yes! I think if I had my own friends and family it would make me more excited to go on."

Finally, students provided troubleshooting tips regarding the website. Errors were identified, including comment and tracking features that were not working properly, web browser incompatibility issues, and slow response times on the testing production server.

DISCUSSION

The CHOICES study as delivered in the randomized control trial evolved from the original plan outlined in the grant proposal, owing to the 18-month formative evaluation described here. The formative process provided important guidance and insight for all aspects of the study, including recruitment, communication, delivery, design, and content, resulting in changes to intervention structure and delivery to better meet the needs of the target population.

Key refinements based on formative research

The formative process was critical to the development of a relevant and appealing intervention; to that end, certain intervention design and delivery options were changed based on formative results. Initially, the study design called for four intervention arms, including a series of free, FTF seminars offered without academic credit. Almost all faculty, staff, and students indicated that regardless of quality, a non-credit program would fall short with regard to maintenance of participant engagement over time. Despite the belief that there would be interest in the overall subject matter, nearly all participants indicated that in order to ensure attendance, course delivery should be offered with a strong incentive: namely, a college credit. Therefore, intervention plans were changed to include only for-credit options. Moreover, participants highlighted varying learning styles, scheduling accommodations, computer access limitations, and didactic preferences that suggested the modification of choice of course delivery mode (online or FTF) rather than random assignment to intervention modality as originally planned. This modification to our study design improved our ability to reach students at the schools and enhanced our chances of implementing the intervention successfully, both of which are key components of community obesity prevention approaches [22, 28, 29].

Because research on 2-year college students is scant, the formative process was critical to understanding the realities of daily life and interest in healthy weight behaviors in this particular population, prior to full-scale intervention delivery. Results affirmed a need to address financial concerns, time pressures, and issues related to raising children; this last concern is pressing for 2-year college students, as parenting rates are higher than among 4-year college students [10, 11]. It was made clear that the intervention needed to address these common concerns in order to be successful and well received by students. This led to the development of intervention content focusing on time management, healthy low-cost meals, financial wellness, free physical activity options and stress reduction resources.

The formative process also provided surprising responses to the use of technology for communication and intervention. While the original plan to use email as a primary means of participant communication seemed convenient and non-invasive, many

participants were strongly opposed to it, indicating a strong preference for text messages or phone calls.

The development and implementation of the website relied heavily on Stage 1 formative work as well as the beta testing of the website in Stage 3. In interviews and focus groups, there were widely varying perspectives about the use of existing social network websites (e.g., Facebook) for the maintenance phase of the study. Some students liked the idea of using a platform they were already using, while others had privacy concerns related to using Facebook as part of a program in which potentially sensitive information might be exchanged. Other students expressed a clear interest in keeping social lives and health behavior change efforts separate. Despite concerns about an existing platform, most students felt that a social network and support website would be a positive intervention strategy. Ultimately, the decision to create a study-specific website was based on concerns about maintaining control of the platform, protection of data, and the potential for Facebook to wane in popularity over time. Beta testing did not substantially change the intervention plan but did provide reassurance that the website would be appealing and useful to study participants. Results confirmed the need to implement a strategy of rotating content, recipes, and incentives to maintain student engagement during the 20-month period of social network and support website maintenance activity.

Limitations

This study was not without limitations. Due to the qualitative nature of the data collected, sample sizes for each phase were somewhat limited. Unfortunately, numerous budget- and time-related constraints would not allow us to conduct this work with a larger sample. In addition, we are limited by the lack of sociodemographic data with which to characterize our sample. However, participants were carefully selected to include a wide range of key informants, campus leaders, college staff, administrators, faculty and students. Despite these attempts, more women than men were recruited for the study (15–35 % male in student formative samples). However, 43 % of the faculty and staff recruited for interviews were male, and we observed no differences in willingness to engage students for formative work between male and female faculty and staff at the colleges. Of the three investigators who conducted focus groups or interviews with students, one was male, and no meaningful differences in response content were observed between male or female students, between focus groups or interviewees, or across schools with regard to results from those encounters. Time constraints also limited the data collection process. For example, only a partial version of the website was ready for beta testing, and this process did not test social interactions between participants. Users were on the website for a maximum of 5 days,

resulting in limited feedback. However, valuable data were gathered that allowed us to make important changes and identify potential problems with the website.

Summary of findings and conclusions

The overall findings from our formative work made critical contributions to the development and execution of the CHOICES Study. Without this formative stage, we certainly might have considered certain curriculum changes (e.g., removing references to dorms or a University campus). However, other decisions might have been made (e.g., selecting email for contacts, using Facebook for social networking, offering only an online course for no credit) that would have risked alienating students and reducing study implementation successes. Throughout our formative work, students, faculty, and staff were actively engaged in the early stages of the research process, thus creating positive working relationships early on that have facilitated ongoing study engagement to meet mutual research and participant goals. In sum, our work provides an important illustration of the value of careful formative planning, particularly in translating existing interventions for new audiences to address unique population needs.

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