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Article

A 2-year young adult obesity prevention trial in the US: Process evaluation results

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Summary

Our objective was to conduct a process evaluation of the CHOICES (Choosing Healthy Options in College Environments and Settings) study, a large, randomized, controlled trial designed to prevent unhealthy weight gain in young adults (aged 18–35) attending 2-year community colleges in the USA. The 24-month intervention consisted of participation in an academic course and a social networking and support website. Among intervention participants, completion rates for most course activities were >80%, reflecting a high level of dose received. Course retention and participant satisfaction were also high. Engagement results, however, were mixed with less than half of participants in the online and hybrid sections of the course reporting that they interacted with course materials ≥3 h/week, but 50–75% reporting that they completed required lessons 'all/very thoroughly'. Engagement in the website activities was also mixed with more than half of intervention participants logging onto the website during the first month, but then declining to 25–40% during the following 23 months of the intervention. Intervention engagement is a challenge of online interventions and a challenge of working with the young adult age group in general. Additional research is needed to explore strategies to support engagement among this population, particularly for relatively long intervention durations.

Key words: obesity prevention, process evaluation, young adulthood

BACKGROUND

Young adulthood (aged 18–35 years) is a critical period for the development of obesity (Gordon-Larsen *et al.*, 2004, 2010; Harris *et al.*, 2006; Nelson *et al.*, 2008) and an important transition point when many people move out of family homes and establish independent lifestyles. The transition into young adulthood is marked by a decline in physical activity (Nelson *et al.*, 2006), and the prevalence of obesity doubles as individuals progress from their 20s to 30s (Nelson *et al.*, 2008; Gordon-Larsen *et al.*, 2010). Poor dietary behaviors are more prevalent among young adults than nearly any other age group (Paeratakul *et al.*, 2003; Nielsen and Popkin, 2004). Health-related behaviors established in young adulthood likely persist later in life (Nelson *et al.*, 2008).

Of the few weight gain prevention interventions developed for young adults to date (Laska *et al.*, 2012), most have shown promising results as pilot studies but lack data from fully powered trials, as well as process evaluation. In general, process evaluation allows investigators

to understand intervention implementation, participant engagement and retention during the intervention. Process evaluation is particularly important when conducting interventions in untested settings, where new and different factors may challenge implementation.

A further limitation of work in this area is the individualistic approaches that have been utilized and limited mechanisms for large-scale dissemination and/or institutional sustainability (Laska *et al.*, 2012). Although several studies have been conducted in traditional 4-year universities, no such studies have evaluated interventions in other postsecondary settings. Two-year colleges may be important venues for this research, given many young adults from lower-income and diverse backgrounds enroll in these institutions (Adelman, 2005). Two-year college students are also at higher risk for unhealthy weight behaviors compared with 4-year students (Nelson *et al.*, 2009; Laska *et al.*, 2011). However, several factors make it more challenging to implement large-scale trials in 2-year colleges, including students with more time demands (e.g. school, work and family issues) and limited institutional infrastructure, including fewer college health resources. Understanding the feasibility for rigorous intervention implementation in these settings is an important gap in the literature.

The purpose of this article is to describe process evaluation for the CHOICES (Choosing Healthy Options in College Environments and Settings) study, a randomized, controlled weight gain prevention intervention for 2-year college students in the USA. We specifically examined dose, engagement, satisfaction and retention of participants in the CHOICES intervention to inform future work.

METHOD

CHOICES, a 24-month intervention to prevent excess weight gain among young adults enrolled in 2-year colleges, was one of seven EARLY (Early Adult Reduction of weight through LifestYle intervention) Trials testing the effectiveness of technology-based obesity interventions (Lytle *et al.*, 2014a,b). CHOICES included 441 participants from three colleges in the Twin Cities area of Minnesota (USA) who were randomized into intervention or control conditions (Lytle *et al.*, 2014a,b). Eligibility requirements included aged 18–35, body mass index 20–34.9 kg/m^2 and planning to be in the geographic area for ≥2 years. Additional EARLY trial criteria excluded individuals with significant health problems (Lytle *et al.*, 2014a,b). Study procedures received University of Minnesota Institutional Review Board approval.

The CHOICES intervention included four content areas: (i) nutrition, (ii) physical activity/sedentary behaviors, (iii) stress and (iv) sleep. These targets were identified as contributors to weight gain and issues in formative research (Nelson *et al.*, 2009; Laska *et al.*, 2011; Linde *et al.*, 2014). The intervention consisted of two overlapping phases: an academic course and a social networking and support website. Intervention development was informed by ecological theories of health behavior (Sallis *et al.* 2008; Valente, 2008), social cognitive theory (Bandura, 1986) and social network theory (Valente *et al.*, 2004), suggesting weight-related behaviors are influenced by personal and socioenvironmental factors (Lytle *et al.*, 2014a,b).

Students randomized to the intervention first participated in a one-credit course offered through their college. The course focused on eating, activity, stress management and sleep habits as ways to help maintain or achieve a healthy weight (Kjolhaug, 2011). Participants chose between three available sections (online, face-to-face and hybrid) to meet scheduling needs and learning preferences.

The social networking and support website was introduced during the course and continued as the primary intervention channel until 24 months. The website was password protected and open to intervention participants and a limited number of invited guests. It was designed to reinforce, inform and encourage exchange and support between participants. Participants were encouraged to track their weight and/or 10 weight-related behaviors (sugar-sweetened beverages, fast food, fruits/vegetables or breakfast consumption, eating mindfully, TV/movie viewing, computer/internet use, physical activity and sleep or stress management) on the website and set goals for selected behaviors. Trained interventionists interacted with participants through the website, text messaging and telephone calls, offering encouragement and problem-solving support. The website included articles, recipes, quizzes, videos and ways to accumulate points for prizes.

Evaluation

Outcome evaluation measures were collected at baseline and 4, 12 and 24 months. These included demographics, weight-related behaviors (e.g. dietary intake, physical activity), psychosocial factors and other health factors, as well as measured height and weight. Participants received $100 gift cards for participating in each outcome assessment.

In contrast, the CHOICES *process* evaluation was driven by the intervention design and developed to take a broad approach in evaluating (i) intervention dose received and intervention engagement, (ii) participant satisfaction and (iii) retention in the intervention. Participants received no compensation or incentives (i.e. course points) for completing process evaluation surveys. Process evaluation measures included:

Course grade, attendance and assignment completion data were obtained from the Desire2Learn (D2L) Learning Management System at the colleges. Course instructors (study interventionists) maintained attendance records, matched to D2L for quality assurance.

Course-related survey data were obtained through web-based surveys. CHOICES evaluation staff emailed survey links and reminders to course participants. Participants in the face-to-face course section were asked to complete the survey twice during the term. Participants in online and hybrid sections were asked to complete the survey four times, after each module. The variation in timing of survey administration by section was necessary because of different course formats. Overall, 66% of course participants provided data on these surveys. Rates of survey completion varied between course sections, ranging from 42 to 61% for the face-to-face sections, 55 to 70% for the hybrid sections and 42 to 58% for the online sections.

Participants in the online and hybrid sections were asked, 'Approximately how many total hours per week (on average) did you spend interacting with material (lessons, assignments, quizzes, etc.) for these modules of the course?'; response options ranged from 0 to ≥7 h. Students were also asked, 'To what extent did you complete the required lessons within these modules of the course?' (all/very thoroughly, somewhat and none/very minimally). These questions were not asked in the face-to-face section where engagement was assessed via attendance.

During the final course-related process evaluation survey, participants responded to four statements: 'The material presented in this course has been interesting', 'I have been able to understand the material presented in this course', 'I have been satisfied with my course instructor's communication' and 'My instructor provides meaningful and helpful feedback on my assignments' (four possible responses: strongly agree to strongly disagree).

Website engagement data were obtained from the CHOICES website and included frequency of logging in to the site and of logging a weight on the website. These parameters were measured because they could be readily compared across all EARLY trials and were primary markers of engagement with the website.

Overall satisfaction. In the 24-month outcome assessment survey, participants were asked, 'How satisfied are you overall with the healthy lifestyle program you received from CHOICES?' (four possible responses: very dissatisfied to very satisfied) 'Would you recommend the healthy lifestyle program you received from CHOICES to others?' (definitely not, probably not, probably would, definition would) and 'Given the effort you put into following the healthy lifestyle program you received from CHOICES, how satisfied are you with your progress over the past year?' (scale of 0–8, very dissatisfied to very satisfied).

Analysis

Analyses were conducted examining descriptive characteristics, including sample means and count data. Process evaluation data were stratified by section type and/or module topic to add insights into differences across these variables. Differences in the sociodemographics of those who completed and/or passed the course (vs. those who did not) were examined using tests of proportions ($\alpha = 0.05$) via STATA v10.1 (StataCorp, College Station, TX).

RESULTS

At baseline, CHOICES intervention participants ($n = 224$) included 67.0% females; 76.3% identified as White and 7.6% as Hispanic or Latino in origin. Half (49.5%) reported that one or more of their parents was a college graduate, and 67.9% had a current annual income of <$12 000.

Participants randomized to the intervention condition ($n = 224$) were given the choice of course delivery format, and nearly half chose the online section (49%), 9% chose hybrid and 33% chose face-to-face. An additional 21 students (9%) never registered for any section of the course and thus were in an SNS (Social Networking Site)-only condition; thus, they were exposed to the CHOICES website but not the course. Among participants enrolled in the course, 85.7% ($n = 174/203$) stayed enrolled through the end of the semester, ranging from 80.0% in the hybrid section to 90.4% in the face-to-face; 29 participants dropped the course after the semester began. Among course completers, 79.3% received a passing grade (138/174), and 36 received a failing grade, mostly due to failure to submit assignments; this did not differ significantly across the three colleges. No significant differences were observed in course completion by gender, age, race or income. One of the three colleges had significantly lower course completion rates [$p < 0.01$, 56% (19/34) vs. 81 and 82% at the other two colleges].

Data summarizing intervention dose, reach and engagement are in Table 1. Activity completion rates ranged from 68.8 to 100.0%, but most were greater than 80%. Notable differences in dose received by section type or module topic were not apparent.

Across module content areas, less than half of students reported interacting with course materials ≥3 h/week (a standard expectation for one-credit courses), ranging from 32.7–47.1% in the online section to 7.7–27.3% in the hybrid section. One half to more than three-quarters (54.6–81.8%) of students in the online and hybrid sections reported completing the required lessons 'all or

Table 1: Student-level process evaluation for the CHOICES intervention course: dose received, reach and engagement by course section and module

Dose received	Course module			
	Nutrition	**Physical activity**	**Sleep**	**Stress/time management**
Online section				
Percent completing log and goal assignment	70.3% (64/91)	81.3% (74/91)	71.4% (65/91)	84.6% (77/91)
Percent completing quiz	82.2% (74/90)	87.8% (79/90)	81.1% (73/90)	90.0% (81/90)
Percent completing reflection	72.5% (66/91)	78.0% (71/91)	76.9% (70/91)	82.4% (75/91)
Hybrid section				
Percent completing log and goal assignment	75.0% (12/16)	81.3% (13/16)	68.8% (11/16)	75.0% (12/16)
Percent completing quiz	75.0% (12/16)	87.5% (14/16)	87.5% (14/16)	100.0% (16/16)
Percent completing reflection	NA	NA	NA	93.8% (15/16)
Face-to-face section				
Percent completing log and reflection assignment	70.2% (47/67)	82.1% (55/67)	86.6% (58/67)	91.0% (61/67)
Reach/engagement	**Nutrition**	**Physical activity**	**Sleep**	**Stress/time management**
Online section				
Percent reporting that they interacted with course materials ≥3 h/week	46.7% (21/45)	47.1% (24/51)	32.7% (17/52)	46.6% (27/58)
Percent reporting that they completed the required lessons 'all/very thoroughly'	59.1% (26/44)	64.7% (33/51)	71.7% (38/53)	75.4% (43/57)
Hybrid section				
Percent interacting with course materials ≥3 h/week	27.3% (3/11)	7.7% (1/13)	18.2% (2/11)	21.4% (3/14)
Percent completing the required lessons 'all/very thoroughly'	54.6% (6/11)	69.2% (9/13)	81.8% (9/11)	64.3% (9/14)
Percent attending in-person course sessions (e.g. cooking demonstrations, physical activities, yoga and stress reduction activities	75.0% (12/16)	68.8% (11/16)	NA	62.5–93.8% (10/16–15/16)[a]
Face-to-face section				
Percent interacting with course materials ≥3 h per week	NA	NA	NA	NA
Percent completing the required lessons 'all/very thoroughly'	NA	NA	NA	NA
Percent attending class	68.7–79.1% (46/67–53/67)[a]	68.7–76.1% (46/67–51/67)[a]	83.6% (56/67)	59.7–83.6% (40/67–56/67)[a]

[a]Ranges include attendance for multiple course sessions (hybrid section: three sessions for stress/time management module; face-to-face section: four sessions for nutrition module, two sessions for physical activity module and seven sessions for stress/time management module). NA: Data not available for specified course section and/or module.

very thoroughly'. Comparable data were not available for the face-to-face section. Attendance at in-person classes for those in hybrid or face-to-face sections ranged from 59.7 to 93.8%.

Course satisfaction was high (Table 2), with 81–100% of the students agreeing with statements like, 'The material was interesting', 'I understood the material', 'I was satisfied with instructor's communication' and 'The feedback on assignments was meaningful and helpful'. There were no consistent disparities in satisfaction between midterm vs. end-of-term evaluations or across section types. There were also no significant differences in these four satisfaction variables across the three colleges. Not all participants provided course-related survey data; overall, females were more likely to provide these data than males ($p = 0.001$) and White participants more likely than non-White ($p = 0.02$).

Figure 1 displays website participation among participants randomized to the intervention, both in terms of (i) logging in and (ii) logging their weight at least once per month. During the first month, more than half of participants logged in and logged their weight. This declined to 36 and 27%, respectively, in month 2 and remained in the 20–40% range during the following 22 months of intervention. Figure 2 displays website participation by intervention course section.

Table 2: Self-reported student satisfaction with the CHOICES intervention course

	Percent who agree or strongly agree with the following statements			
	The material was interesting	**I understood the material**	**I was satisfied with instructor's communication**	**The feedback on assignments was meaningful and helpful**
Online section				
Mid semester evaluation	94.0% (47/50)	98.0% (50/51)	100.0% (51/51)	94.0% (47/50)
End of semester evaluation	88.5% (46/52)	96.2% (50/52)	96.2% (51/53)	83.0% (44/53)
Hybrid section				
Mid semester evaluation	100% (13/13)	100% (13/13)	91.7% (11/12)	100% (13/13)
End of semester evaluation	100% (11/11)	100% (11/11)	100% (11/11)	100% (11/11)
Face-to-face section				
Mid semester evaluation	95.1% (39/41)	100.0% (41/41)	97.4% (38/39)	80.5% (33/41)
End of semester evaluation	96.7% (29/30)	100.0% (30/30)	96.7% (29/30)	93.3% (28/30)

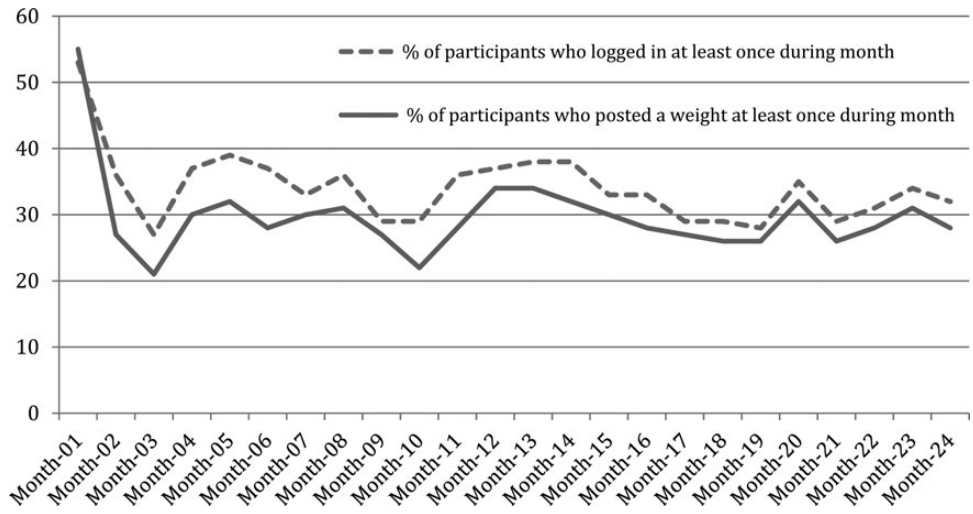

Fig. 1: Engagement in the CHOICES social networking and support website: percent of enrolled participants randomized to the intervention ($n = 224$) who logged into the website and/or posted their weight on the website at least once per month during the 24-month intervention.

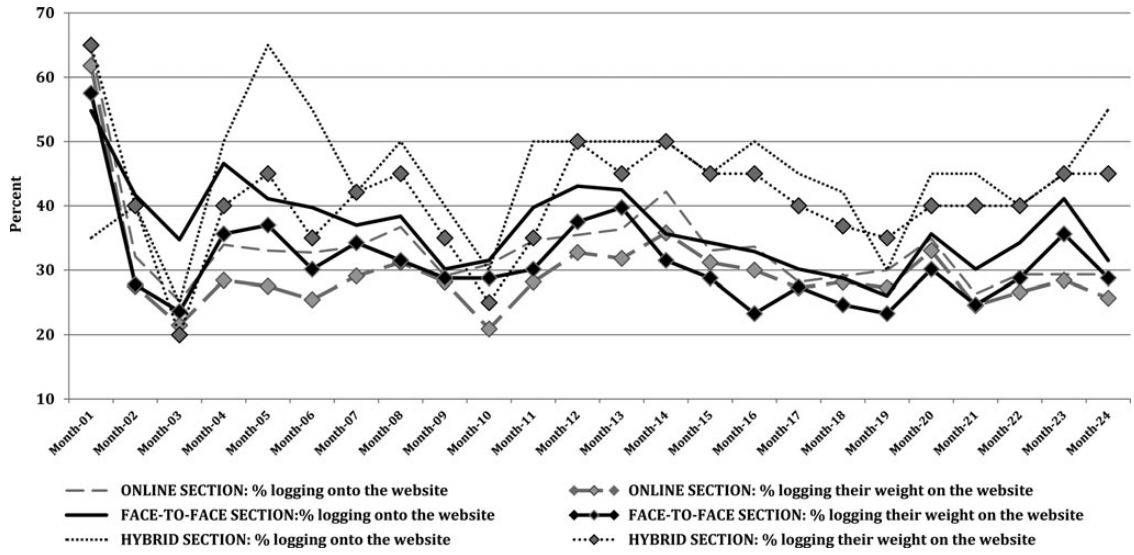

Fig. 2: Engagement in the CHOICES social networking and support website: percent of enrolled participants randomized to the intervention ($n = 224$) who logged into the website and/or posted their weight on the website at least once per month during the 24-month intervention, stratified by intervention course section (online, face-to-face and hybrid).

After 24 months, 84% (188/224) of intervention participants completed follow-up assessments and provided data describing their overall satisfaction with the intervention. Of these, 91.5% reported being 'somewhat' or 'very satisfied' with CHOICES and 94.1% said they would 'probably' or 'definitely' recommend it to others. When rating their satisfaction with their progress in the CHOICES program on a scale of 0 (very dissatisfied) to 8 (very satisfied), participants tended to report satisfaction (median = 6, mean = 5.5 ± 1.8).

DISCUSSION

To our knowledge, this study is the first randomized, controlled trial of its kind to evaluate a weight gain prevention intervention in 2-year community colleges. Two-year community college students are an important, yet challenging, population with which to work. In addition to exhibiting less healthful lifestyle characteristics than traditional 4-year university students (Nelson *et al.*, 2009; Laska *et al.*, 2011; Nanney *et al.*, 2015), they are an extremely heterogeneous group, exhibiting a wide array of work situations (ranging from not working to working full-time), course loads (taking one class vs. attending full-time), family situations (having families of their own vs. living with parents) and more. Nearly half of young adults attend colleges and universities across the USA, and nearly 8 million attend 2-year colleges (National Center for Education Statistics, 2014a,b). Thus, these institutions may be important partners for implementing population-based weight gain prevention programs among young adults, particularly those from diverse backgrounds.

As 2-year colleges are relatively untested venues for interventions of this magnitude, it is important to examine multifaceted process evaluation measures, including implementation, engagement and retention. Previous research has shown that the young adult age group poses significant challenges for recruitment, engagement and retention in large behavioral weight loss trials intended to target adults of all ages (e.g. 18–65 years) (Gokee-Larose *et al.*, 2009). Overall, our process evaluation for the CHOICES intervention yielded mixed results. Intervention dose received through the one-credit course was generally high, with >80% completion rates for most assignments and activities across three course delivery formats: face-to-face, hybrid and online. These rates were likely high because students were taking the course for credit and would receive a grade. Originally, we intended to deliver course content through a noncredit seminar, but formative work revealed that offering it for academic credit would improve students' motivation to engage with the material and perform well (Linde *et al.*, 2014). Participant satisfaction with the course was also high for all course delivery formats (Figure 2).

Despite some successes, however, students' engagement in the online and hybrid delivery formats was lower than anticipated. The face-to-face section had the highest retention (>90%) and perhaps provided a better connection with students through more personal relationships with instructors

and peers. Interestingly, the hybrid section—a combination of online and in-person activities—was not popular. Only 10% of course participants enrolled in this section, and engagement was low relative to the face-to-face section. This may suggest a binary preference for course delivery, either as a traditional in-person class or an entirely online class.

Overall, rates of engagement in the intervention website were high during the first 1–2 months, but then declined and plateaued. This is consistent with other trials using similar intervention platforms (Glasgow *et al.*, 2007; Johnson and Wardle, 2011; Short *et al.*, 2014). High initial rates of engagement on the website were expected, given that participants were introduced to the website while enrolled in the course; a course requirement was to log on to the site at least once. Despite the decline in website engagement, it is encouraging that 30–40% of participants continued to be engaged throughout the 24-month intervention. This duration is longer than other interventions conducted in this area (Laska *et al.*, 2012) and is particularly notable considering most community college degree programs are intended to be no longer than 2 years. It may be that engaging students via the course at the outset of the intervention enhanced their interest in continued engagement on the website.

This study fills an important gap in the literature. A recent review of young adult weight gain prevention interventions found that among 10 identified intervention studies that used weight status or body composition as a primary outcome, only five included process evaluation measures such as adherence to, or acceptability of, the intervention (Laska *et al.*, 2012). A notable strength of our study was that we assessed process data from multiple sources, including self-reported data (e.g. participant satisfaction and engagement in course content) and objective data (e.g. class attendance, assignment completion and website logins). These data highlight numerous important opportunities and challenges that are helpful to consider for future interventions in community colleges. Furthermore, CHOICES included several course formats to accommodate scheduling needs and learning preferences, which was a strength of the study; however, this multimodal design required development of different evaluation metrics, methods and schedules for each of the sections, such that a direct comparison between section types may not be possible. Selection bias (i.e. students self-selecting the course section in which to enroll) also limits our ability to interpret differences between section types. Some process data, such as the course-related surveys, were missing for a number of course participants, thus presenting additional opportunity for bias. Finally, during implementation of this 24-month intervention, extensive process data were generated, and it became necessary to distill these data into several key components rather than presenting them as a whole.

In considering the implications of these results, it is important to note from our anecdotal observations that many students in these colleges were struggling with an array of issues that have important health implications, including food insecurity, credit card debt, mental health problems and homelessness. These circumstances underscore the need for intervention content and skill building in areas such as stress, resiliency, time management and financial health—areas that extend beyond typical topic areas for obesity prevention, such as dietary intake and physical activity. These circumstances enhance the challenges of engaging young adult participants in a weight gain prevention intervention, particularly one that is 24 months in duration.

Overall, complex health concerns like obesity demand solutions that are multidimensional. Therefore, interventions that comprehensively address weight and weight-related behaviors require broad evaluation frameworks. Findings from our comprehensive process evaluation indicate that it is possible to implement large-scale intervention trials in a 2-year community college setting and achieve a high intervention dose with high participant satisfaction. However, our research and the work of others have shown that participant engagement is challenging among the young adult age group (Gokee-Larose *et al.*, 2009), and maintaining engagement over long periods may be even more challenging. Intervention studies targeting young adults, like CHOICES, that rely heavily upon technology and multimodal engagement require flexibility both in their intervention approach and corresponding evaluation strategies.

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