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Web-based nutrition education for college students: Is it feasible?

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Abstract

College students have poor nutrition habits and often exhibit at-risk weight control behaviors; yet, health promotion efforts on campuses often target other risk behaviors such as alcohol and tobacco use. The goal of this study was to determine program content and examine the feasibility of a web-based nutrition education program for college students using innovative applications of tailoring, targeting and personalization of information. Comprehensive program planning entailed three phases: focus groups and use of concept mapping methodology, prototype web program development, and feasibility testing of the prototype. Results of concept mapping suggested that students and experts agreed on the relative importance of the major content areas unique to the college audience. A prototype web program, informed by health promotion theories, was developed and evaluated. Students and college health professionals participated in the feasibility evaluation, which included acceptance and usability testing of the prototype. Mean scores were computed for the acceptance ratings that indicated that the prototype web program was not only feasible, but also compelling and relevant for the college audience. In conclusion, a tailored, web-based interactive nutrition program could potentially be used to provide individualized nutrition information to encourage college students to adopt healthy eating behaviors.

Keywords

College students; Nutrition education; Website; Internet; Concept mapping; Tailoring

1. Background

Nutrition education is now an established and urgent health promotion priority for all age groups (Anderson, Shapiro, & Lundgren, 2003). In college settings, however, other health issues such as alcohol, drug, and tobacco use have often taken precedence in campus policy due to acute consequences for these specific risk behaviors. But despite the obvious importance of adopting healthful eating practices, college students tend to engage in a number of problematic eating behaviors, including unhealthy dieting, skipping meals, high

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intake of fast foods, low intake of fruits and vegetables, and minimal consumption of dairy products (Cotunga & Vickery, 1994; Douglas & Collins, 1997; Huang, Harris, Lee, Nazir, Born and Kaur, 2003; Matvienko, Lewis, & Schafer, 2001). In addition, the percentage of children and adolescents who are overweight has doubled in the last 30 years (CDC, 2002) and the prevalence of obesity and related mortality rates continue to rise in adults (Flegal, Carroll, Ogden, & Johnson, 2002; Mokdad et al., 2005). Notably, although unwanted weight gain can occur at any age, it most commonly occurs between 18 and 34 years of age (Williamson, Kahn, Remington, & Anda, 1990). In fact, the largest increase in obesity between 1990 and 2000 occurred in 18–29 year olds (Freedman, Khan, Serdula, Galuska, & Dietz, 2002; Ogden, Flegal, Carroll, & Johnson, 2002) suggesting that health promotion efforts be targeted to younger audiences.

Why target nutrition education efforts to college students? An important consideration for health programming is that young adults are at a crucial stage in their development as they transition from parental control over lifestyle behaviors to assuming responsibility for their own health choices. A previous study suggests that college students may have minimal knowledge of healthy eating behaviors and nutritional requirements. Matvienko et al. (2001), in a study of female first-year college students, reported that the subjects demonstrated low baseline knowledge of nutrients, food labels, and the groups of the food guide pyramid. Further, they knew ‘virtually nothing about energy metabolism and expenditure’ (Matvienko et al., 2001, p. 99). Kessler, Jonas, and Gilham (1992) conducted an assessment of the prevalence and scope of nutrition services offered through 208 randomly selected American College Health Association member health centers. Of the 160 respondents, 79% offered some type of nutrition education for students, with one-to-one counseling being the most common and labor intensive approach (96%). The size of enrollment was positively correlated with the likelihood of providing nutrition programs. Although health educators, nurses, doctors, and trained peer educators provided the services, registered dietitians were the most common providers and often the coordinators of the program. There was little cost to students, although weight management programs were the most expensive and the most variable in content. Unfortunately, the authors did not provide any data as to how well such programs work, to what extent students utilized them, or the actual costs involved in working one-to-one with students. Belaski (2001) recently concluded that nutritionists face significant challenges when working with college students and that efforts are needed to determine the best way to reach this at-risk group. Indeed, this presents both a challenge and an opportunity for higher education institutions to educate and motivate students to practice healthy lifestyle habits. Using innovative technologies may provide one solution to delivering nutrition education to the college audience.

1.1. Targeting college nutrition programs to gender

We argue that the college population is a particularly important target audience for health promotion initiatives related to nutrition, especially in terms of gender. For instance, there is a robust literature on dieting behaviors in female college students. Intense dieting and weight loss practices among college women have been implicated in the development of a host of physiological, psychological, and behavioral problems that adversely affect physical and emotional health, academic performance and retention rates. Dieting and weight concerns have become so widespread and consistent over the years as to be termed ‘normative’ (Striegel-Moore, Silberstein, & Rodin, 1986). The majority of young women in a number of studies reported feeling too fat, regardless of their actual weights, and many succumbed to repeated dieting (Ackard, Croll, & Kearney-Cooke, 2002). Indeed, many freshmen college women fear weight gain. Popular magazine and newspaper articles have been dedicated to this topic (Petran, 1991); also, the plethora of nutrition websites currently available tend to promote dieting and weight loss products (e.g. www.ediets.com;

www.burnthefat.com; www.personal-diet.com; www.southbeachdiet.com to name a few) and are geared to the general adult audience. A common concern among college students is the 'Freshman 15', the belief that women routinely gain 15 pounds upon entering college. This belief may predispose women who occasionally diet to diet more strenuously, and for those who do not, to begin to do so. Even though most college women who diet do not advance to diagnosable eating disorders, the physiological, psychological and behavioral problems related to intense dieting and weight loss practices are potentially destructive (Paxton, 1993). Thus, the possibility for developing problematic weight control strategies or disordered eating may increase with the advent of matriculation into college (Ackard et al., 2002).

Although more often thought of as a woman's issue, nutrition in college men is actually a major health concern. College men are far less knowledgeable about health in general (American School Health Association, 1989) and particularly about risk factors for heart disease (White & Klimis-Tavantzis, 1992) than are college women. Research has consistently found that men have less healthy lifestyles than women (Kandrack, Grant, & Segall, 1991; Lonnquist, Weiss, & Larsen, 1992). In addition, men engage in far fewer health-promoting behaviors than women. With regard to nutrition practices, men eat more fat, less fiber, and are more often overweight than women (Courtenay and Keeling, 2000). College men, in particular, consistently score lower than college women on healthy behavior measures, including eating habits and exercise (Oleckno & Blacconiere, 1990; Weiss & Larson, 1990). O'Dea & Abraham (2002) reported that one-fifth of college men worried about their weight and shape and 9% reported disordered eating. There is also an emerging and alarming literature on young men's use of anabolic steroids to increase muscle mass (Cafri, Thompson, Ricciardelli, McCabe, Smolak and Yesalis, 2005). Moreover, although the health-promoting behaviors of college women increase over time, those of college men decrease as they get older (Lonnquist et al., 1992). The poor nutrition and exercise behaviors that develop in adolescence and early adulthood pose substantial risk for the development of disease and poor health in later years. Research suggests the need for designing health interventions that are gender-specific. Courtenay (1998) points out that women are much more prepared to make changes in unhealthy behaviors than men and that interventions that do not take these differences into account will not succeed. Men's needs in the area of nutrition education are just as critical as women's. Any program aimed at increasing health-related knowledge, attitudes, and behaviors must recognize such gender differences and target the program accordingly.

1.2. The Internet opportunity

In an effort to address nutrition education, researchers and educators have developed nutrition education programs for college students; however, these programs are variable in approach and often minimally impact behavior (Kern, 2001; Sun, Sangweni, Chen, & Cheung, 1999). Use of the Internet is an innovative way to address the problem of poor nutrition on college campuses. Indeed, the Internet has become central to most students' educational experiences and offers an exciting opportunity to engage students through interactive multimedia programs. A recent survey finds that 85% of college students own a personal computer and 86% go online daily (Jones, 2002). A systematic review of the Internet for college nutrition information using specific search terms (e.g. 'nutrition' or 'diet' or 'weight management' and college students or teenagers) revealed a host of nutrition content, but upon closer inspection it becomes clear that most of these sites are either simple web pages with some basic nutrition information for an unspecified audience (i.e. no mention of college nutrition or college health) (67%), university nutrition courses or course syllabi (26%), or product promotions (7%) (Cousineau, Goldstein, & Franko, 2004). Additionally, the 'one size fits all approach' afforded by most programs may be deemed not

relevant and offer little in terms of feedback and individualized nutrition information (Kreuter, Strecher, & Glassman, 1999), suggesting a need for comprehensive nutrition programming designed specifically for the college student.

We use the definitions pertaining to tailored health promotion offered by Cowdery, Konkel, and Wildenhaus (2002) where *personalization* simply refers to using a person's name in information materials; *targeting* refers to the content intended for a specific group of people (e.g. women, BMI category, etc.); and *tailoring* refers to a method of generating health messages or strategies based on a person's answers to a questionnaire, resulting in custom information that is 'personally relevant and meaningful for the participant' (p. 2.). Computer technologies, especially online platforms, allow for these three levels of individualizing health communications. Further, online multimedia applications increasingly allow not only for targeting information to specific groups of college students, but for tailoring of personal health information to the individual, offering advantages over standard text- or video-based education materials, and even approximating counseling information learned from a nutritionist (Brug, Oenema, & Campbell, 2003; Oenema, Brug, & Lechner, 2001; Ritterband, Gonder-Frederick, Cox, Clifton, West and Borrowitz, 2003; Wantland, Portillo, Holzemer, Slaughter, & McGhee, 2004).

In summary, with a new generation of computer-tailored health programming (Brug et al., 2003; Cowdery et al., 2002; Kreuter, & Skinner, 2000) available in online formats, nutrition messaging can be *personalized* by displaying the user name on a home page or on feedback reports; *targeted* to a group (e.g. to college students); and *tailored* to current eating and lifestyle habits (e.g. provision of unique combinations of messaging to the student who skips breakfast, or eats pizza at midnight, or relies on protein shakes for a nutrition 'fix', or may need motivational strategies to eat healthier while managing a busy academic schedule).

2. A theory-based nutrition program using the Internet

Our aim was to develop a prototype for an individualized online nutrition program for college students that was (1) grounded in health promotion theory and (2) built upon the previous research on computer-tailored nutrition education. Instead of embarking on a fully functional program requiring intensive computer programming and multimedia design, we set out to develop and test a prototype web program. In other words, the goal of the study was to determine the feasibility of an online nutrition program for college students, i.e. is the program viable for this audience, can students understand and navigate the program, and is it acceptable to students and college health professionals, and based on this information, does it merit full production?

In formulating a framework to drive both focus group discussion and web program development, the first step was to rely on established theoretical principles used in health promotion and nutrition education. Brug and colleagues (Brug et al., 1999), well-known for their research in computer-tailored nutrition interventions, concluded that four theories are useful when teaching nutrition information using computer technology. These include the health belief model, the theory of reasoned action and planned behavior, social cognitive theory, and the transtheoretical model. They stated that 'these theories incorporate a limited number of similar constructs. Specific dietary changes are most probably influenced by motivation or intention to change, by the expected benefits and costs of the specific changes, attitude towards these changes, perceived social influences, and self-efficacy expectations related to the dietary changes in question' (Brug et al., 1999, p. 149). Empirical evidence in nutrition promotion has shown that multiple behavioral determinants need to be assessed when planning nutrition education programs (Brug et al., 2003). The stage of change model (Prochaska & DiClemente, 1986), in particular, has gained traction in health promotion.

This model has been utilized to increase fruit and vegetable consumption in high school students (Kristal, Glanz, Curry, & Patterson, 1999) and is one of the principles of other computer-based nutrition and physical activity programs used in primary care settings (Block, Miller, Harnack, Kayman, Mandel and Cristofar, 2000; Calfas, Sallis, Zabinski, Wilfrey, Rupp and Prochaska, 2002; Patrick, Sallis, Lydston, Prochaska, Calfas and Zabinski, 2001; Prochaska et al., 2000; Kristal, Curry, Shattuck, Feng, & Li, 2000). Previous work by our group (DF) on a computer-tailored eating disorders prevention program for college freshman women (*Food, Mood, and Attitude*) has also been informed by social cognitive theory and other psychological theories relevant to eating disorders prevention (e.g. harm reduction). The results of a randomized, controlled clinical field trial showed that among those college women at highest risk for disordered eating, those who used the *Food, Mood, and Attitude* CD-ROM had a greater increase in knowledge, a greater decrease in internalization of negative cultural attitudes toward appearance, and a significant reduction in problem eating behaviors, including weight and shape concerns, than high risk women in the control group (Franko et al., 2005). This suggests that developing computer-based health programming grounded in multiple but relevant behavioral theories is likely a key factor in program success.

In summary, our approach to developing a tailored web-based nutrition program for college students was informed by the literature on the advantages of theory-based, computer-tailored nutrition education (Brug et al., 1999), studies on the poor nutrition habits of college students and their lack of nutrition knowledge and misinformation, and the prevalence of at risk weight control behaviors (Ackard et al., 2002; Cafri et al., 2005; Matvienko et al., 2001; Winzelberg et al., 2000). The study described here entailed three phases: content development, development of a prototype web program, and feasibility (i.e. acceptance and usability testing) of the prototype website.

3. Methods

In order to design a web program specifically for the college population that will ultimately be comprehensive in scope and relevant to the audience, we convened groups of students and gathered detailed information that guided program development. We wanted to determine: What do students want and need in terms of nutrition education? What would make a web-based program compelling to them? Would students use it? Would campus health personnel recommend the program? The focus groups served as a needs assessment to derive the major nutrition content themes and specific web features that college students and health experts perceived as unique and important. With this information in hand, we could then develop and test a prototype version of a theory-driven, tailored web-based nutrition education program for this audience.

3.1. Phase one: content development

Separate focus groups were conducted in a university setting with college health experts and college students. The expert group included six professionals from four area universities in northeastern USA (i.e. a behavioral psychologist; a registered nurse; a registered dietitian; a director of health education; a health care counselor; and a director of bureau study council). The experts were asked a series of questions in order to identify the most salient nutrition issues on campuses and the types of information that would be relevant to developing a personalized website for college students. Experts were also asked to complete the following prompt statement, 'the most important features of the proposed website are ...' Completed statements were collected as part of a concept mapping preparation task for later use.

Student participants were recruited by posting flyers about a 'college health study' around the participating college campuses. Prior to the initiation of this study, approval was

obtained from the human subjects committees of the institutions involved. Written informed consent was obtained from all subjects before data collection commenced. In an effort to standardize the group format, all facilitators received training in focus group implementation and were knowledgeable about conducting focus groups with this population and in this setting. Focus groups (led by TC, DF, and MC) lasted approximately 2 h and included a variety of questions developed by the research team. During the focus groups students were given a brief description of the proposed nutrition website and prompted to discuss several topics. These discussion topics included: (1) beliefs and concerns about nutrition and eating habits during college; (2) nutrition-related challenges and steps taken toward a healthy diet; (3) weight management and body image concerns; (4) campus versus apartment living influences on eating; (5) gender differences in nutrition and weight management; (6) experiences with the Internet; and (7) website features that would appeal to college students. The discussions were tape-recorded. In addition, students completed a survey that asked about various nutrition topics (e.g. current diet, importance of nutrition, concern about weight gain). Finally, students were asked to complete, in writing, the same prompt statement that was used with the experts (i.e. ‘the most important features of the proposed website are ...’). Transcriptions of taped focus-group discussions and individual responses on the open-ended questions were examined in the content analysis process and open-ended questions were categorized into themes. Mean ratings were computed for the student surveys on nutrition habits and beliefs.

3.1.1. Concept mapping—A process called ‘concept mapping’ (Trochim, 1989; 1993) was used to systematically organize feedback from students’ and professionals’ responses to the focus group prompt statement. This is a technique that sorts and categorizes qualitative data. Specifically, the research team reviewed the statements resulting from the prompt statement and compiled a final list of 67 statements that was entered into a software program (The Concept Systems[®] software, version 1.751, 1996–2002) (see Cousineau et al., 2004). Next, participants were recruited to complete a ‘concept mapping’ task to organize and prioritize the content statements. There were 21 raters, which included a new set of college students ($N = 8$), the panel of eight college health experts, and the research team ($N = 5$). Each concept mapping participant sorted the statements into categories and also rated each of the 67 statements on a five-point scale of degree of importance for a nutrition website. The software produced a cluster analysis that organized statements into higher order conceptual groupings or maps. These maps informed the major content modules for the program.

3.1.2. Focus groups results—Student focus groups consisted of 27 college students (three groups of nine) at two university sites (Northeastern University, Boston, MA, and Florida International University, Miami, FL). The total sample was 56% female and 59% minority (primarily African American and Hispanic/Latino). See Table 1 for complete demographic data. In the qualitative review of the focus group data, the factors that the college health experts and students viewed as influencing their nutrition health were categorized based on theme, and on the depth and breadth with which the participants discussed them. The experts identified many important issues related to college nutrition: (1) skills and tips to establish and maintain a healthy diet; (2) gender specific suggestions; (3) specific dietary facts and advice on managing time and making healthier food choices; (4) debunking myths about weight gain and fad diets; and (5) physiological information and consequences of poor eating habits. More general factors that could be a focus on a college nutrition website, according to these experts, included body image, cost/convenience of healthy eating, recipes, and ethnic/cultural concerns. Consequently, they supported the inclusion of a list of local links and resources for students seeking help for proper nutrition and wellness strategies.

The college student data were also informative. Similar to themes highlighted by the experts, the recurring themes identified by the students included managing schedules with classes and dining hall hours, lack of availability and the expense of healthy foods, having to prepare meals for the first time, accessibility of fast food, socializing with friends with bad eating habits, stress, and pressure to look thin or muscular.

Examination of the concept mapping results, generated by The Concept Systems® software, permitted us to determine six main clusters of domains of nutrition-related information identified by both student and expert participants and the relative importance attributed to these domains and their component statements. Correlations between the students' concept mapping ratings and the expert/research staff were high ($r = .92$), suggesting that students and experts agreed on the importance of the content areas for a website. The results of the concept mapping were translated into the main content areas of the website program (See Fig. 1).

3.1.3. Student survey results—The results of the student surveys indicated that 47% of students rated their current diet in the unhealthy range compared to 26% in the healthy range. Nevertheless, on a scale of 1–5 (not at all important to very important), 78% rated personal nutrition as important to very important. When asked how much effort they put into maintaining a healthy diet, the majority (88%) of these students reported putting some effort to very much effort (a rating of 3–5 on a five point Likert scale). Forty-five percent believed their diet had gotten worse since starting college, and 27% reported that attaining proper nutrition was somewhat of a problem on campus and 50% reported this was a problem or very big problem on campus. As for levels of concern about the 'Freshman 15' weight gain, 33% felt it was somewhat of a concern, and 48% felt it was very much a concern or an extreme concern. Feedback also confirmed that students (99%) would visit and return to a personalized nutrition website that offered individualized feedback based on health assessments. Overall, students endorsed the notion of a nutrition website as long as it contained current, valid information on nutrition and weight management, and that the information, design, and language was appropriate for and specific to college students (Table 2).

4. Phase two: prototype nutrition website

For the purposes of this study, a prototype website was developed which was highly graphic and stylized for the college audience and contained approximately 10% functionality of a final program. The web architecture for navigation and select screens was determined by a web programmer and the two lead authors who are health psychologists (TC & DF); the screens and interactive tools were created by a web designer.¹ All content was reviewed by two nutritionists. The main education modules, derived from the six main concept mapping clusters, were combined into three main modules: (1) basic nutrition information and dietary advice for young adults (*Nutrition 101*), (2) eating in healthy ways in the context of collegiate life (*Eating on the Run*); and (3) dieting, weight management and body image issues (*Weighing In*). Each of these modules portrayed suggested content in the form of text headers and graphics for articles, interactive tools, polls, strategies, and quizzes.

¹The prototype website was developed in HTML and Macromedia Flash 7.0 by a web designer and a programmer. It was designed to approximate a 'live' experience. Actual computer programming was limited to the navigation of the prototype; programming of the sample assessment was beyond the scope of the feasibility phase of the project. The full web program has since been developed, including the complete programming of the self-assessments and concomitant feedback.

4.1. Tailored feedback

Since all participants identified student personalization and tailoring features as key components, the website is intended to include brief assessments of a student's food intake, eating habits, motivation to change behaviors, and beliefs and attitudes about healthy eating. On the basis of responses to these assessments, students would receive immediate, tailored feedback resulting from a complex programming algorithm. This information would be summarized in a nutrition profile addressed to the individual user using his/her log-in user name and demographic information provided in the initial log-in to the website (i.e. personalization). This profile can be printed out for personal review or consultation with a college health professional. In the prototype, tailored feedback from the assessment was simulated based on a hypothetical user. An online questionnaire, *My Eating Habits*, was presented and simulated feedback was displayed. Examples of the prototype questions included: Are you on a college meal plan? On average, how often do you eat meals? How soon do you eat after you wake up? On average, how often do you eat a fast food meal? Do you diet to manage weight?

Additionally, users were presented with a simulated personal profile that included a colorful bar detailing nutrition serving sizes based on the USDA food pyramid and specific feedback for motivation to change, nutrition beliefs and nutrition habits. The point here was to ensure that the simulated profile content was presented in a style and narrative tone that would be appealing to students. In the final program, when students return to the website, they can revisit the profile section and reassess their nutrition habits (which, in turn updates their profile with tailored feedback). Examples of feedback for a female college freshman, living on campus, are presented in Fig. 2.

4.2. Targeting information

The prototype also demonstrated how content areas or features on the website become highlighted or 'flagged' based on various demographic information as a means of targeting information. For example, a student who indicates that he or she skips meals regularly would be directed to relevant material, such as an interactive meal planner tool, a peer story about the importance of regular meals for energy and concentration, and a link to tips and strategies to develop more effective time management. On the prototype, select topic areas that included functional interactive features or text content were displayed with an iconographic check mark to indicate that the information is intended for the user: *Minding Your Meals* allows the user to select foods consumed over the course of a day and get feedback on caloric intake; *Fast Food Favorites* allows users to select their favorite foods and view nutritional values and suggested alternatives. Two Macromedia Flash[®] movies of peer stories were also included, entitled: *3 am was Pizza Time* and *Dining Hall Dilemmas*.

5. Phase three: feasibility testing

Feasibility research was used as a means to demonstrate concept viability of this prototype nutrition website for college students in order to determine if: (1) college students consider the website usable, comprehensible, interesting, and potentially effective for addressing nutrition during the college years and (2) college health providers and administrators believe the website will be an effective means of providing nutrition education for college students. Feasibility testing included two tasks: acceptance and usability testing.

5.1. Acceptance testing

After viewing the entire program, students and experts rated their acceptance and satisfaction with the interface and navigation, how they might feel about offering the program at a college setting, the relevance and quality of the content, and their overall

impression of the program concept (Likert scale, 1 = poor to 7 = excellent). Suggestions for enhancements, deletions, or additions were also solicited. An acceptability criterion of 80% was established, i.e. on average 80% of end users would rate their satisfaction with the interface in the 'very good'–'excellent range (5–7 on Likert scale).

5.2. Usability testing

Traditional usability methodology was utilized (Nielsen NetRatings, 2002). Using a laptop computer, we met with a new group of students individually ($N = 16$) and asked them to complete seven navigational tasks on the website,² e.g. finding a specified content area or updating one's profile. A silent observer trained in usability testing (MR, ER) noted areas of difficulty or confusion. As a crosscheck of our observations of a student's performance, we also asked students to rate the difficulty of each task as they completed them (1 = very easy, 7 = very difficult). We established the following evaluation criteria for usability testing: on average, 80% of end users would be able to successfully complete at least five of the seven tasks without assistance.

5.3. Results

Overall, the results from the feasibility testing based on the prototype website were quite positive. The students and experts gave the website high ratings overall. In terms of acceptance, we met the high acceptability criterion (80%) on 18 of 19 ratings, and 75% on the remaining item. Specifically, students found the web-based format to be informative, appropriate in tone and language, graphically appealing, and easy to navigate. They responded well to the self-assessment and nutrition profile for individual users (student average ratings >6.0). They reported high satisfaction with many features of the site, including the interactive tools and content areas. Despite a high rating of 5.9, several students stated that the load time was too long and that they would have preferred a text-base alternative. Similarly, the experts considered the content and language (e.g. presentation of articles, strategies, and tips) to be appropriate for college students and they responded extremely well to the simulated nutrition profile (expert average ratings >6.0).

The usability criterion for students was met for four of the seven tasks (e.g. >80% correct response rate), and the other three tasks were completed without assistance by 75, 68.8 and 43.6% of students, respectively. Thus, several features may require more prominent (i.e. centralized) placement in the completed website. Overall, the majority of students (93%) felt that they would use this site if they were experiencing nutrition concerns.

6. Discussion

Nutrition education for college students is an important topic and campuses vary in their approaches in reaching out to students, given budgets and other health priorities (Debate et al., 2001). National attention to the obesity epidemic will likely spur colleges and universities to direct more attention to nutrition education and obesity prevention (Anderson et al., 2003). Computer-tailored nutrition education is likely to be a helpful tool in enabling and encouraging college students to make wise food intake decisions. Mounting evidence indicates that tailored web-based nutrition education is a viable means of providing this information (Brug et al., 2003).

In developing a program to improve college students' dietary behaviors, it is important to identify factors they view as influencing their choices, difficulties they face in making

²According to Virzi (1992), 80% of interface design problems are discovered with only five users and virtually all problems are identified by 10 users.

healthy choices, and suggestions they deem pertinent to making behavior changes. The students in the focus groups were concerned about attaining proper nutrition but reported a number of barriers specific to college life. College health experts also raised a number of challenges for today's busy student, including the increasing presence of fast food vendors on campus and barriers to preparing meals for oneself. Both students and experts agreed on the essential components for an interactive web-based nutrition program, which included student personalization and tailoring features, practical strategies for healthy meal planning and eating on a budget, basic nutrition knowledge, expert advice, and information on weight and body image issues. The concept mapping approach was uniquely suited for outlining the content of the entire program, making possible the translation of content for a final program into well-defined web architecture. Importantly, developing a program that relates to student life and uses their language seems to be central to gaining student interest in such a program. An important strength of this program is that development was driven by actual concerns of college students. Students in this study were intrigued with the idea of an online nutrition education program that would allow them to receive empirically-based information and individualized feedback in a confidential manner. Results from this study suggest that such a program is not only feasible, but is practical, engaging, and potentially effective for college students.

There are several limitations to this qualitative study. The focus group students were largely from urban university campuses, which may not reflect the nutrition concerns of students in smaller rural settings or community colleges. Further, college students who choose to participate in health-related focus groups are likely different from students who are not interested in such participation. Thus, more research is needed to assess whether the results are generalizable to a more diverse college audience. Finally, since this was a prototype website, with limited functionality, we could not test the efficacy of the program. The results of the current study represent an initial step toward the development of a theory-based, interactive program that provides education and tailors nutrition information to college students.

6.1. Lessons learned

This comprehensive program planning approach for a web-based nutrition program for college students underscores the need to enlist the target audience in the planning process. While it may be argued that many nutrition websites exist that offer dietary tools and personalization features, these are by and large intended for a general audience and may reinforce maladaptive weight control behaviors. College students have distinctive health concerns and needs that reflect both a developmental transition toward independence as well as the unique campus environment. Both the students and the college health experts confirmed this assumption and provided key content priorities. We did not formally assess students' interest or concerns about the role of nutrition in preventing future health risks, such as diabetes, cardiovascular disease or cancer. This may have offered an interesting young adult perspective on their expectations for a nutrition program. We suspect from the information gathered in the focus groups that the more immediate benefits, such as feeling healthy or looking good, are more likely to influence behavior change in this population.

As previously stated, the nutrition web program we developed was not fully functional and thereby not tested in a randomized, controlled field study. The goal was to test the feasibility of a prototype to determine whether the program merited further funding and effort to develop customized materials. In this regard, the evaluation process was successful. However, additional input from a larger sample of campus administrators, health center directors and nutritionists may have offered perspectives on integration and dissemination of the nutrition program into existing programs, future health promotion goals, and to what extent such a program may serve as an alternative to onsite nutrition or health counselors.

We predict that a web-based interactive nutrition program may offer colleges a viable, cost-effective nutrition education tool which could serve as an important adjunct to health services and campus programming. However, as the fully-functional program is tested with over 400 college students at six college campuses in the USA, the issue of cost-effectiveness will be assessed. Finally, some health scientists may contend that developing a computer-tailored nutrition program for college students is simply duplicative of the plethora of other online nutrition resources available. In effect, this study proved otherwise. The lesson learned from this evaluation study is that college students are interested in nutrition resources that target their unique needs, particularly when that information is individually tailored.

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UPDATED CONTENT ASK THE EXPERT STUDENT VOICES COLLEGE NEWS

DID YOU KNOW?

Each day, the typical American has only 4 servings of fruits and vegetables, just one serving short of the recommended daily minimum. All the more reason to pack an extra apple.

My Eating Habits Feedback

You report that you are:

- On a college meal plan
- Eating one meal a day
- Snacking late at night
- Waiting 3-4 hours to eat after waking
- Grabbing 3-5 fast food meals per week

Click to view your [Total Nutrition Profile](#)

You're not alone! For many college students, the transition from high school to college brings many changes. You may find yourself:

- Adjusting to a meal plan from home cooking.
- Eating on the run because your schedule is so busy.
- Not having anyone to shop or cook for you so you grab whatever's there.
- Balancing work, school, friends, and trying to eat right.

Here are some Tips:

- If you've got it, use it** – The advantage of being on a meal plan is that you know when meals are available, and there are always a variety of foods to choose from. Grab an apple and granola bar for classes later.
- Eat well when you can** – Having one meal a day is fine as long as you get enough healthful energizing snacks during the day.
- Manage your time better** – Getting up 10 minutes earlier each day to eat will fuel you for hours and make a big difference all day long!
- Rule of Thumb** – Try to have something from all the food groups during the day. Add some dairy (milk, yogurt), carbs, whole grains, and protein (meat/nuts/soy) and fruits to your meals or low-fat snacks in order to get all the nutrients you need.
- Choose wisely** – If you do have to eat a fast food meal, get a hamburger or broiled chicken sandwich AND a salad. No supersizing!
- As a woman**, be mindful of getting enough calcium and folic acid (Vitamin B9). A good start would be adding leafy greens and enriched cereal grains to your diet.

RELATED QUIZ

Are you a Smart Snacker? Take the Quiz!

RELATED TOOL

Fast Food Favorites

COLLEGE NEWS

Read & Hear what students are saying!

Fig. 2. Sample tailored feedback. The text represents sample tailored feedback for a freshman female college student, living on campus, who has a meal plan. © 2006 Inflexion, Inc.

Table 1

Student demographics

	Focus groups	Usability/acceptance testing
Sample size	27	16
Gender		
Male	12 (44%)	6 (37.5%)
Female	15 (56%)	10 (62.5%)
Race		
Caucasian	11 (41%)	9 (56.3%)
African American	3 (11%)	2 (12.5%)
Asian American	4 (15%)	0
Hispanic American	2 (7%)	3 (18.8%)
Other	7 (26%)	2 (12.5%)
Average age	21.5	20.4
Residence		
Dormitory living	9 (33%)	9 (56.3%)
Living with parents	4 (15%)	2 (12.5%)
Apartment/other	14 (52%)	5 (31.4%)

Table 2

Program development phases

Study phase	Format	Sample	Results and feedback
Phase one			
Focus groups	2-h group meetings, survey	College students <i>N</i> = 27	Ratings of current diet, personalized advice and motivational slogans; interactive meal planning; basic nutrition information; gender issues related to food, dieting and body image; debunking dieting myths; healthy, cost-effective meal alternatives
	2-h group meeting, survey	Health experts <i>N</i> = 6	Realistic meal strategies; long-term consequences of poor diet; physiological information; appropriate caloric information for body size and build; snacking tips; nutrient/vitamin info
Concept mapping task	Formal content analysis of all participant ratings of website content ideas using The Concept Systems® software q 2004–2006; all rights reserved. Concept Systems Inc.	<i>N</i> = 21 Eight students	Identification of most relevant content areas: healthy eating on a budget
		Eight health experts <i>Five researchers</i>	Healthy meal planning; personalization features; basic nutrition facts; body image/weight concerns; expert nutrition info
Phase two	Pilot website development		One module, <i>Eating on the Run</i> , developed Included sample assessment/profile, two interactive tools (meal planner, fast food calorie chart), article, strategy, expert Q&A, audio peer stories
Phase three			
Usability/acceptance tests	45-min independent review of website	College students <i>N</i> = 16	Positive indicators for ease of navigation; visual appeal; quality of content; overall satisfaction; suggestions for improvement
Acceptance test		Health experts <i>N</i> = 6	