About Eating: An Online Program With Evidence of Increased Food Resource Management Skills for Low-Income Women

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ABSTRACT

Objective: Produce and evaluate About Eating (AE), an online program for low-income women aligned with the Satter eating competence model, congruent with best practices for nutrition education of low-income audiences.

Methods: Responses from iterative cognitive interviews and online surveys with diverse samples of low-income women informed lesson revisions. The researchers conducted a randomized controlled trial of AE with low-income women to determine its impact on dietary behavior and food security.

Results: In all, 284 women reviewed at least 1 AE lesson and endorsed it. After AE, women (n = 288) increased in use of food resource management skills (eg, using a budget [P = .008] and planning meals to include all food groups [P = .002]). About Eating participants who were food secure had more confidence in managing money for food (P = .002) and keeping track of food-related purchases (P = .02) than food-insecure persons.

Conclusions and Implications: Mixed-methods research with life stage and geodiverse samples confirmed the usefulness of AE. Food security assessment may enhance interpretation of intervention effectiveness.

Key Words: food management, low income, nutrition education, food security, online education (J Nutr Educ Behav. 2015;[ ]1-8.)

INTRODUCTION

The Satter model of eating competence (ecSatter) is an intra-individual approach to food selection and eating behaviors focused on enjoyment, attention to internal regulation of intake, food acceptance, and food resource management skills to plan, purchase, and prepare meals and snacks on a regular basis.1 Eating competence is associated with greater dietary quality,2,3 reduced cardiovascular risk,4,5 increased physical activity,4 fewer symptoms of disordered eating, including weight satisfaction and normal body mass index,5-9 better sleep quality,10 and parent modeling healthful eating behaviors.11 Satter offered descriptions of ecSatter-driven nutrition education and guidance for adoption,12 and nutrition education programs congruent with ecSatter have been suggested.8,13,14 However, to date, none have been tested or made available to nutrition educators, especially those working with low-income audiences.

Specific recommendations have recently been nominated as best practices for nutrition education of low-income audiences.15 Domains include program design, delivery, and evaluation. Specifically noted is content that is appropriate for the target audience and related to physical activity, food resource management, and eating behaviors. Experts recommend the following: behavior change goal setting; apparent evidence base and theoretical underpinning; learner-centered methodologies; and evaluation with formative, process, outcome, and impact stages to realize sustained behavior change.16,17

The purpose of this project was to produce and evaluate an online curriculum for low-income women that was aligned with ecSatter tenets and congruent with best practices for nutrition education for low-income audiences with the potential to be evidence-based and sustainable.

METHODS

About Eating Development and Description

As shown in Figure 1, About Eating (AE) was developed and tested in several phases beginning with modification of WebHealth, an online, non-dieting, 10-module program developed for college students that successfully motivated healthful behaviors and
Enjoying Eating was developed to in-

to 30 minutes to review and includes

directed; it is designed to take from 15

of participation. Each AE lesson is self-

individually tailored depth and scope

any order and as often as desired, with

each of the 6 lessons can be viewed in

ecSatter and is learner-centered in that

addresses core constructs of

gram designed for low-income women

based, self-directed, interactive pro-

approach to body size and weight

increased fruit and vegetable

sayings that were trans-

ned for a low-income audience using

an iterative process of cognitive inter-

views and revision review by the target

audience. These reframed lessons

became the first 4 AE lessons. To

expand AE to 6 lessons, additional

WebHealth modules (2 on physical ac-

and 2 on body image and weight

issues) were similarly repurposed for a

low-income audience in 2 separate

stages that included realignment into

1 lesson for each topic to evolve into

About Being Active’s and About My

Size.19 In all, formative evaluations

informative revisions of 8 of the 10 Web-

Health lessons that featured ecSatter te-

nets, physical activity information, and

approach to body size and weight

acceptance.

The resulting AE program is a Web-

based, self-directed, interactive pro-

gram designed for low-income women

that addresses core constructs of

ecSatter and is learner-centered in that

each of the 6 lessons can be viewed in

any order and as often as desired, with

individually tailored depth and scope

of participation. Each AE lesson is self-

directed; it is designed to take from 15

to 30 minutes to review and includes

interactive activities that can be

tailored to participant responses. Enjoying Eating was developed to in-

crease appreciation for enjoyment of food as a component of healthful eating. Your Food Variety identifies the value of food acceptance, offers ways to increase food variety in the diet, and includes a food preference survey validated to be a proxy for a food frequency questionnaire.20

About Being Active provides opportunity to examine benefits of physical activity and helps develop methods and goals to increase the level of physical activity. Time to Eat provides skill-

building activities to plan, shop, and

prepare healthful meals and snacks. About My Size encourages participants to accept their own and others’ body size and to consider societal values about body image. Finally, Hunger and Fullness examines factors that in-

fluence internal regulation and cues for eating.

Formative and Outcome Assessment

Formative assessment of the ecSatter lessons21 and of About Being Active have been described previously.5

WebHealth’s body image and size perception lessons were initially evaluated through face-to-face cognitive interviews with 24 low-income women from 3 geographically disparate settings. Criteria for participation

Figure 1. Development stages of About Eating, a curriculum based on the ecSatter model.
Eligible persons were stratified by participation in the Expanded Food and Nutrition Education Program and then randomized to the AE or comparison group before completing the pre-survey. About Eating participants were given 10 days to complete a lesson and were sent up to 2 e-mail reminders per lesson. After a 14-day adoption period, the post-survey link was e-mailed. Comparison participants had access to the CG Web site for 30 days and received a total of 5 e-mail reminders to visit the site. Both groups had access to the post-survey for 9 days and up to 2 e-mail reminders were sent for nonresponders. Participants completed pre- and post-survey sets that included measures of food security, food resource management, and eating competence.

**Evaluation Instruments**

For all samples, individual lessons were assessed for reading difficulty, Web site navigation, interest, usefulness, graphics, length, and design/color by selecting a response option indicating level of agreement with the positively framed statement. Response options ranged from no, not at all to yes, definitely. This instrument was tested for comprehension and reading ease with the target audience before use. Demographic items were also included on evaluation surveys.

**Food security** was assessed with the USDA 6-item food security screener to reduce respondent burden. Scores of 0 or 1 indicated food security; higher scores (2–6) were identified as food-insecure. Food resource management skills were evaluated with 13 Likert-scaled items from the Behavior Checklist developed for Expanded Food and Nutrition Education Program. Response options ranged from 1 to 5, with higher scores denoting better skills. Eating competence was measured with the 16-item Satter eating competence inventory validated with low-income audiences (ecoSI 2.0). Scores for each statement range from 0 (never/rarely) to 3 (always). Responses are summed; thus, ecoSI 2.0 scores can range from 0 to 48; scores $\geq 32$ indicate eating competence.

<table>
<thead>
<tr>
<th>Table 1. About Eating Evaluation Samples From 5 Studies (n [%])</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>6-Lesson Version</strong></td>
</tr>
<tr>
<td>Parents of Fourth-Gradersa (n = 57)</td>
</tr>
<tr>
<td>Age, y (mean ± SD)</td>
</tr>
<tr>
<td>Female</td>
</tr>
<tr>
<td>Race</td>
</tr>
<tr>
<td>White non-Hispanic</td>
</tr>
<tr>
<td>Black</td>
</tr>
<tr>
<td>Supplemental Nutrition Assistance Program participation</td>
</tr>
<tr>
<td>9 (16)</td>
</tr>
<tr>
<td>Special Supplementation Program for Women, Infants, and Children participation</td>
</tr>
<tr>
<td>12 (21)</td>
</tr>
<tr>
<td>Body mass index (mean ± SD)</td>
</tr>
<tr>
<td>Underweight</td>
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<tr>
<td>Normal</td>
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<tr>
<td>Overweight</td>
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<td>Obese</td>
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<tr>
<td>Obese</td>
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<tr>
<td>n/a indicates not available.</td>
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</tbody>
</table>

**n/a indicates not available.**

**aParents of fourth-grade children participating in a larger school-based nutrition education study;**

**bFormative data collected with cognitive interviews;**

**cAffirmed age range, 18–45 years;**

**dBased on self-reported height and weight.**
completed an online survey set after cognitive interviews with response input on researcher-supplied computers. Other samples completed surveys at their convenience using their own or available computers. Survey responses were downloaded from either a Qualtrics platform (Qualtrics LLC, Provo, UT, 2014) or Perseus platform (Perseus SurveySolutions, Perseus Development Corporation, Bucks, UK) (for the pre-post AE and end-of-lesson surveys, respectively) into an SPSS database (version 21.0, IBM, Inc, Armonk, NY, 2012) for analyses. Data were analyzed with descriptive statistics, chi-square, independent, and paired t tests, and ANOVA as appropriate. A univariate generalized linear model assessed pre to post differences between AE and comparison groups and interaction with food security status.

The Pennsylvania and Colorado State University Institutional Review Boards for the Protection of Human Subjects each reviewed and approved their state-specific studies.

RESULTS

Women reviewing WebHealth lessons for translation to a low-income audience were mostly white, non-Hispanic, obese SNAP participants (Table 1) with responsibility for minor children. Initial interviews to develop About My Size suggested that revisions to the 2 WebHealth lessons be centered on content load, language level, pictures, and layout, including navigation components. Suggestions included increasing diversity for images of body size and eliminating technical terms. Cognitive interview results, interviewer notes, and team discussion led to merging key concepts from the WebHealth lessons on body image and body size perception into 1 lesson with a focus on content load, language level, pictures, layout, and navigation components. Upon review of this revised lesson, participants reported the single lesson to be more useful, preferring the revised length, content, and overall design. Feedback revealed that low-income women were interested in learning about body image and body size issues. For each of the 6 AE lessons, all lesson evaluations documented a positive response and supported continued use and application to low-income audiences (Table 2).

Impact Assessment

As shown in Table 1, participants were young, mostly white SNAP participants, and overweight or obese. Food security was low or very low for 39%; 60% of CG and 38% of AE were considered food-insecure. A minority was categorized as eating-competent (39% with an ecSI 2.0 score ≥32); ecSI 2.0 demonstrated internal consistency with Cronbach alpha of .87. About Eating positively affected food resource management skills. After AE, participants reported running out of food before the end of the month less often, increased use of nutrition facts labels to make food choices, greater use of a written spending plan for food, more confidence to manage money to make healthy food available, and more frequent meal planning to include all food groups. Click ‘n Go participants only increased tracking of food-related expenses and (like AE) increased planning of meals to include all food groups (Table 3). Click ‘n Go participants decreased comparison of prices to save money (P = .05); AE reported no change. Compared with no change in AE use of comparing prices to save money, decrease of the practice for CG was significant (0.06 ± 0.79 vs −0.19 ± 0.91; P = .01). Food security status was related to intervention effect for 3 food resource management behaviors: (1) confidence in managing money to make food available; (2)
keeping track of food-related expenses; and (3) use of a written spending plan or budget for food. As shown in Figure 2, these behaviors tended toward or significantly improved in AE food-secure but not food-insecure participants. Click 'n Go food security status was not related to change in food resource management skills. In addition, comparison of changes from baseline for these behaviors between AE and CG revealed trends toward or significant improvements in AE food-secure and CG food-insecure participants, respectively (confidence to manage money to make food available: 0.11 ± 0.12 vs 0.20 ± 0.16; keeping track of food-related purchases: 0.23 ± 0.13 vs 0.32 ± 0.18; use of a written spending plan/budget: 0.13 ± 0.13 vs 0.34 ± 0.19), but were improved for AE food-secure participants and unchanged or worse for AE food-insecure participants (confidence to manage money to make food available: 0.56 ± 0.12 vs −0.04 ± 0.16; keeping track of food-related purchases: 0.31 ± 0.13 vs −0.19 ± 0.18; use of a written spending plan/budget: 0.40 ± 0.13 vs 0.00 ± 0.18). Although AE and CG participants both reported running out of food at the end of the month less frequently (−0.42 ± 0.10 vs 0.12 ± 0.10), the AE decrease was significantly greater (P = .04) when controlling for food security status. About Eating food-insecure participants had the greatest decrease in worry about running out of food before the end of the month (AE: −0.60 ± 0.17 vs −0.24 ± 0.12; CG: −0.21 ± 0.17 vs −0.03 ± 0.12).

DISCUSSION

This project described the promising transition of WebHealth, an online, nutrition-centered, non-dieting-based intervention for college students to AE, an online program for low-income women based on the Satter model of eating competence and alert to best practices in nutrition education for low-income audiences. A controlled, randomized impact study revealed greater improvement of food resource management skills for AE participants; the magnitude of changes was congruent with those reported by Auld et al after an intervention more intensive than AE. A strength of this project was the use of qualitative and quantitative evaluation methods as well as formative, process, outcome, and impact approaches to study this specific curriculum. In addition, involvement of several diverse samples providing food behavior practices and food security status in addition to curricular responses better informed the revisions. Small sample size and self-selection to participate limit the generalizability of the findings. The design of the randomized impact assessment did not allow for participants to revisit AE after 1 viewing. Thus, the more realistic experience of returning to information and activities of interest could not be considered when making conclusions of AE efficacy.

These findings support the underpinnings of SNAP-Education (SNAP-Ed) (ie, positive impacts that follow from SNAP-driven food security can synergize nutrition education efforts). People who do not worry about food being unavailable have more cognitive capacity to learn new concepts and practices. Whereas AE participation required engagement and attention to information to progress through the lessons, CG participants were only frequently informed about the availability of the lessons; study completion did not depend on the threshold of participation. Thus, food-insecure as well as food-secure persons could achieve completion without effort; this was not the case with AE.

The emergence of AE from WebHealth provided an opportunity to examine strategic considerations in contemporary conversations of intervention development and deployment: implementation and dissemination science, translational science, evidence-based analysis, and best practices in education. WebHealth efficacy was tested in a randomized, controlled multicenter trial that revealed a positive impact on fruit and vegetable intake.
and physical activity. However, efficacy does not always translate to effectiveness, which is the real-life under non-research conditions. Deficient attention to this external validity has hindered application of health promotion research to the practice of health education. Indeed, WebHealth investigators demonstrated possible limitations in generalizing their findings by noting significant gender differences in response to program components. Gender was even identified as an issue at baseline, when clusters of college students, defined by psychographics and gender, were identified who differed in physical activity and fruit and vegetable intake. These findings and issues raised about making interventions more useable prompted interviews with experts and low-income women to ascertain whether WebHealth could be expected to perform for this target audience. Responses revealed that although the basic structure of the program could remain intact, changes in graphics, language, reading level, and design would be required. In a sense, the required modifications represented an application of translational science, that is, research about needs, health, lifestyle, and interests of food-insecure and resource-constrained women were translated to an educational structure that had been crafted for another demographic. However, the development stages presented here represent mostly another efficacy study, because each had inclusion criteria for participation and were limited in scope and sample size. In fact, finding that food security status interacted with intervention impact argues against broadly assigning efficacy to low-income women. It is unknown whether AE will be acceptable, useful, interesting, and effective for women of varying ages and socioeconomic position. Principles of dissemination and implementation science must be applied to make these determinations.

Inherent in implementation science is the use of evidence-based interventions. However, in nutrition science and nutrition education, the explicit meaning of “evidence-based” has been the subject of debate. According to the USDA, criteria for an evidence-based nutrition education intervention delivered to low-income, SNAP-eligible persons are less stringent than those required by the Centers for Disease Control and Prevention or the Institute of Medicine. For SNAP-Ed, a continuum of evidence-based practices is proposed by noting that.

An evidence-based approach for nutrition education and obesity prevention is defined as the integration of the best research evidence with the best available practice-based evidence. The best research evidence refers to relevant rigorous nutrition and public health nutrition research including systematically reviewed scientific evidence. Practice-based evidence refers to case studies, pilot studies, and evidence from the field on nutrition education interventions that demonstrate obesity prevention potential.

Further explanation supports the use of “… interventions that have not been rigorously tested but show promise based on results from the field (practice-based).”

In her commentary on evidence-based analysis, Achterberg also suggested a more facile approach, noting that an evidence base can be assessed considering “all of our evidence, to use and apply the best of it, to work with what is available at the time, and to generate sound advice and public policy.” Research designs such as the sequential multiple assignment randomized trial are valid options to a randomized, controlled trial, which have limited application and ethical issues in nutrition interventions. The rigor, relevance, and robustness of nutrition education will benefit from the many options available to demonstrate the evidence supporting each approach.

**IMPLICATIONS FOR RESEARCH AND PRACTICE**

About Eating (available for preview through the Nutrition Education Engineering & Designs Center at The Pennsylvania State University) is an evidence-based program, framed by
ecSatter, shown to enhance food resource management skills, and is available for dissemination to assistance program participants, including SNAP–Ed, that target low-income persons with household food management responsibilities. Impact assessment revealed that being food secure may have an added benefit of being more receptive to education on food resource management, and suggested that food security be considered when characterizing nutrition education success with low-income audiences. Next steps for AE must employ dissemination and implementation science concepts, especially to address adoption and sustainability. Adoption of AE could be applied as a single-case research design of dissemination and implementation science practices in nutrition education. This approach is made all the more challenging by the need to educate nutrition and health professionals about the value of ecSatter, a model shown to be congruent with desired health outcomes but less aligned with many current nutrition guidelines.

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REFERENCES

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CONFLICT OF INTEREST

The authors have not stated any conflicts of interest.