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The Effectiveness of Distance Education, Using Blended Method of Delivery for Limited-Resource Audiences in the Nutrition Education Program

Abstract

The study reported here sought to determine if the use of distance education lessons for teaching limited resource participants in a nutrition education program (NEP) is as effective as face-to-face methodology. One hundred and six participants were in the experimental group. Data was gathered at entry and examined behavior change, nutrient intake change, and self-efficacy. Results demonstrated that the participants made positive behavior changes, improved nutrient intake, and increased in self-efficacy as a result of the distance lessons. It was found that the use of distance education is an acceptable option when common barriers to face-to-face learning exist.

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Introduction

The goal of the Supplemental Nutrition Assistance Program (SNAP) is to "safeguard the health and well-being of the Nation's population by raising the level of nutrition among low-income households" (United States Department of Agriculture [USDA], Food and Nutrition Services [FNS], 2012a). The program aims to reach this goal in two ways. The first is by providing SNAP benefits to persons with limited resources that can be used to purchase food. The second is through aggressive nutrition education programs that are offered to SNAP participants (USDA/FNS, 2012a). Two programs that focus their energy on providing limited resource individuals with nutrition education are the Supplemental Nutrition Assistance Program- Education (SNAP-Ed) and the Expanded Food and Nutrition Education Program (EFNEP). In Nebraska, the two programs are called the "Nutrition Education Program" (NEP).

The SNAP-Ed program is available to all SNAP recipients, as well as anyone living at or below 185%

of the poverty threshold. The target audience for SNAP-Ed includes adults ages 19 and older, as well as, pregnant and parenting mothers and senior citizens ages 60 and older. SNAP-Ed also has a youth component to serve limited resource children ages 3 to 18. Most of the youth are reached through school programs in which 50% or more of the children attending a school are receiving free or reduced priced lunches (USDA/FNS, 2012b). During its 16 years of existence in Nebraska, the SNAP-Ed program has reached over 30,000 families. Furthermore, from 2010-2011, the University of Nebraska- Lincoln's SNAP-Ed program reached 3,251 families, 16,500 youth, and 233 seniors. Of these, 1,254 families and seniors graduated from the program (minimum of six lessons taught), and 83% demonstrated improvement in at least one food resource management skill, 89% showed improvement in at least one nutrition practice, and 66% exhibited improvements in at least one food safety practice (USDA, National Institute for Food and Agriculture [NIFA], 2012).

It is imperative, as professionals, that we find ways to make our educational efforts as effective as possible. "Health communications are more likely to be effective when they are culturally appropriate, and incorporate relevant concerns, barriers and motivators of individuals" (Campbell et al., 2004). Therefore, the goal of the research project reported here was to teach in such a way that it overcomes many of the common barriers that this population has identified when obtaining nutrition education. Until this point, most of the nutrition education lessons taught by SNAP-Ed have been delivered through the traditional face-to-face teaching methods.

However, this population faces multiple barriers with this technique. For example, large geographic rural areas and the lack of public transportation restrict program delivery options (Dromgoole & Boleman, 2006; Richardson, Williams, & Mustian, 2003). Furthermore, a large portion of this clientele is single working mothers. To participate in the program, these mothers would need to take time off from work during the day to participate in nutrition education, which may not be well accepted by employers, or they would need to participate in an evening program, which then would raise the issue of adequate child care, as well as the possibility of interference with other family commitments (USDA/FNS, 2012a). It is likely that barriers of this degree would decrease the desire of the individuals to participate in educational sessions.

In an effort to assist families with overcoming the described barriers, one idea would be to provide families with distance-based educational opportunities, such as Internet-based nutrition education programs. Additionally, these programs will be beneficial due to the limited state and federal funding available to provide face-to-face education. Francis, Martin, and Taylor (2011) suggested that clientele with limited time availability and cuts in personnel within Extension offices have increased the need for more effective indirect nutrition education delivery methods. Distance education has been proposed as a way to reach audiences at a lower cost compared to traditional classroom programs (Atkinson, Billing, Desmond, Gold, & Tournas-Hardt, 2007; Atkinson, et al., 2010; Bensely, Desmond, Saperstein, Billing, Gold, & Tournas-Hardt, 2006; Damron, et al., 1999).

Oregon staff looked at using distance learning in Klamath County. They found that there were generally positive attitudes towards using the Internet for food and nutrition resources. However, more formal nutrition education information was not as well received (Case et al., 2011). They noted that incentives, practical cooking tips, recipes, videos on how to prepare foods, and practical cost saving tips would help increase the likelihood of the formal nutrition education being used. Francis et

al (2011) reported that characteristics enjoyed by participants in focus groups on distance education included interactions between presenters and participants, visual aids, videos, receipt of written education materials, and receiving practical, easy to understand and relevant recommendations.

The SNAP-Ed program at the University of Nebraska-Lincoln has developed and evaluated a series of distance education lessons in an effort to eliminate barriers and reach families in an alternative fashion. The lessons can be offered as mail or online lessons depending on the participants' needs. Both options provide the same material and allow the participants to learn in an environment and at a time that is convenient for them.

Methods

Research was conducted to examine if the use of distance education, both mail and online, is as effective as the traditional face-to-face method of delivery, especially as it pertains to teaching nutrition education to limited resource participants. The subjects of the research study were adults 19 years of age and older who qualify for SNAP-Ed. The program is a free program designed to educate limited resource individuals about nutrition and food resource management.

The subjects were divided into two groups, control (n=107) and distant (n=106). Subjects in the control group completed their nutrition education lessons using the traditional face-to-face interaction with a NEP staff member either one-on-one or in a group setting. Subjects in the distance group completed their lessons using a blended method of delivery. This meant that while the subjects may have had one or more lessons with a NEP staff member via face-to-face interaction, each of them also completed at least one nutrition lesson via distance education either through the mail or online.

Regardless of how an NEP participant chooses to participate (face-to-face or blended), much of the procedure is the same. For example, once a participant expresses interest in the nutrition education lessons, the individual is enrolled into NEP following standard protocol for the EFNEP and SNAP-Ed program. This protocol involves completion of a confidential Adult Family Record, which provides the NEP staff with information such as demographics, highest level of education received, and involvement in government agencies. The record also contains a behavior checklist in which the participants stated how often they performed specific nutrition related behaviors on a five-point scale from "never" doing the behavior to "always" doing the behavior. Analysis of this checklist would provide information on behaviors such as meal planning and shopping, food safety, reading the nutrition facts label, consumption of sugar and salt, planning a food budget, and daily level of physical activity. In addition, a 24-hour food recall was collected at entry and exit to see if there were changes made in the participant's dietary quality.

After completion of the necessary paperwork, the participants choose whether they want to complete their lessons face-to-face with an NEP staff member, via distance education (U.S. mail or online), or a combination of both (blended method). Regardless of the method, a variety of lessons are available to meet the needs of the participant. Every participant is required to complete two mandatory lessons on the topics of MyPyramid and Food Resource Management. Additional topics available include, but are not limited to, meal planning and shopping, each of the five food groups, feeding children, and physical activity.

If the participants choose to complete their lessons via distance education, the lessons are provided to them either using the mail or the Internet. Each lesson contains a packet of information, as well as, a 10-question knowledge assessment tool. Each of these lessons was written at a fifth to sixth grade reading level (Flesch-Kincaid). It was estimated that each lesson would take the participants 20-25 minutes to complete.

After successful completion of six lessons, a participant graduates from NEP and receives a certificate of completion, as well as a copy of a cookbook to assist them in further meal planning and education. At this point, the participant will also complete exit paperwork, including another behavior checklist and 24-hour food recall. Additionally, participants who completed one or more of their lessons using distance education were asked to complete a 10-question Distance Education Survey. This survey was intended to identify why participants chose to complete their lessons via distance education, if they found the lessons to be beneficial, and if they felt the lessons were presented in a way that was easy to understand. This survey also allowed participants to identify ways that they were able to improve their nutritional behaviors as a result of the lessons. Additionally, the survey contained a self-efficacy question to determine how comfortable the participants felt in their abilities to make changes in their nutritional habits as a result of the information presented.

All of the required paperwork (the Adult Family Record entry and exit data, the Distance Education Survey, and the knowledge assessment quizzes that accompanied the distance education lessons) were coded and analyzed using SPSS with the help of a statistician. The 24-hour food recalls were analyzed using the County Reporting System (CRS5). Healthy Eating Index (HEI) was determined as an indicator of diet quality. Various methods of statistical analysis were used, including frequency, distribution, multivariate analysis, means, and chi-square analysis. The qualitative data gathered from the Distance Education Survey were entered into ATLAS.ti and were analyzed for frequencies. Each of these methods was used to determine if the distance education is, in fact, as effective as the traditional face-to-face methodology of teaching.

Results

There were a total of 213 subjects for this project, with 189 females and 24 males. The majority of the subjects were White-Non Hispanic (68.5%), followed by White-Hispanic (14%), African American (5%), and Native American (2.5%). Ten percent did not report race or ethnicity. Over 50% of the participants had a high school education or less. Half the subjects were from rural communities and half from urban communities.

All the participants completed the Adult Family Record at entry and at exit, which included the behavior checklists and 24-hour food recalls at entry and exit. Various analyses were performed on each of the 15 behavior checklist questions, including split plot analysis, multivariate and univariate analysis, Chi Square, and descriptive statistics. The analysis of the 15 questions for both the experimental and the control group demonstrated positive behavior changes (Table 1). For example, question one asked the participants on the scale of never (1) to almost always (5) how often they planned their meals ahead of time. At the time of entry into the NEP program, the mean response for this question was 3.14 +/- 1.153 and 3.27 +/- 1.159 for the control and the experimental groups, respectively. Upon exit, both groups reported an increase in this behavior with a mean of

3.41 +/- .951 and 3.67 +/- .983 for the control group and the experimental groups, respectively ($p < 0.01$). In other words, the analysis of the 15-item questionnaire found that both the control and the distance groups made positive changes of a similar magnitude regardless of the teaching method used.

Table 1.
Mean Responses Reported for Behavior Checklist

Q 1: How often do you plan your meals ahead of time?		
	Control Group	Experimental Group
Time	Mean +/- SD	Mean +/- SD
Pre	3.14 +/- 1.153	3.27 +/- 1.159
Post	3.41 +/- .951	3.67 +/- .983
Q 2: How often do you compare prices before you buy food?		
	Control Group	Experimental Group
Time	Mean +/- SD	Mean +/- SD
Pre	3.79 +/- 1.244	4.07 +/- 1.098
Post	4.00 +/- 1.037	4.24 +/- .890
Q 3: How often do you run out of food before the end of the month?		
	Control Group	Experimental Group
Time	Mean +/- SD	Mean +/- SD
Pre	2.31 +/- 1.201	2.20 +/- 1.268
Post	2.23 +/- 1.063	2.18 +/- 1.128
Q 4: How often do you shop with a grocery list?		
	Control Group	Experimental Group
Time	Mean +/- SD	Mean +/- SD
Pre	3.53 +/- 1.305	3.85 +/- 1.119
Post	3.94 +/- 1.080	4.08 +/- 1.052
Q 5: How often do you let meat and dairy sit out for more than two hours?		
	Control Group	Experimental Group
Time	Mean +/- SD	Mean +/- SD

Pre	1.28 +/- .737	1.26 +/- .606
Post	1.44 +/- .923	1.27 +/- .640
Q 6: How often do you thaw frozen foods at room temperature?		
	Control Group	Experimental Group
Time	Mean +/- SD	Mean +/- SD
Pre	3.08 +/- 2.266	2.46 +/- 1.311
Post	2.38 +/- 1.293	2.23 +/- 1.149
Q 7: When deciding what to feed your family, how often do you think about healthy food choices?		
	Control Group	Experimental Group
Time	Mean +/- SD	Mean +/- SD
Pre	3.79 +/- 1.244	4.07 +/- 1.098
Post	4.00 +/- 1.037	3.97 +/- .810
Q 8: How often do you prepare food without adding salt?		
	Control Group	Experimental Group
Time	Mean +/- SD	Mean +/- SD
Pre	2.93 +/- 1.452	3.23 +/- 1.237
Post	3.22 +/- 1.345	3.41 +/- 1.145
Q 9: How often do you use the "Nutrition Facts" on the food label to make food choices?		
	Control Group	Experimental Group
Time	Mean +/- SD	Mean +/- SD
Pre	2.21 +/- 1.172	2.90 +/- 1.294
Post	2.85 +/- 1.272	3.19 +/- 1.114
Q 10: How often do your children eat something in the morning within two hours of waking up?		
	Control Group	Experimental Group
Time	Mean +/- SD	Mean +/- SD
Pre	3.96 +/- 1.179	4.50 +/- .862
Post	4.25 +/- 1.043	4.52 +/- .803
Q 11: How often do you wash your hands before preparing food?		

	Control Group	Experimental Group
Time	<i>Mean +/- SD</i>	<i>Mean +/- SD</i>
Pre	4.59 +/- .821	4.75 +/- .635
Post	4.77 +/- .611	4.86 +/- .397
<i>Q 12: How often do you use community food resources like a food pantry or soup kitchen?</i>		
	Control Group	Experimental Group
Time	<i>Mean +/- SD</i>	<i>Mean +/- SD</i>
Pre	1.87 +/- .962	1.68 +/- 1.091
Post	2.04 +/- 1.224	1.67 +/- .984
<i>Q 13: How often do you drink regular pop (pop that is not diet)?</i>		
	Control Group	Experimental Group
Time	<i>Mean +/- SD</i>	<i>Mean +/- SD</i>
Pre	2.99 +/- 1.312	2.44 +/- 1.320
Post	2.86 +/- 1.361	2.32 +/- 1.206
<i>Q 14: How often do you use a written spending plan or budget?</i>		
	Control Group	Experimental Group
Time	<i>Mean +/- SD</i>	<i>Mean +/- SD</i>
Pre	2.74 +/- 1.365	3.13 +/- 1.363
Post	3.25 +/- 1.347	3.50 +/- 1.212
<i>Q 15: How often are you physically active for at least 30 minutes on 4 or more days of the week?</i>		
	Control Group	Experimental Group
Time	<i>Mean +/- SD</i>	<i>Mean +/- SD</i>
Pre	3.77 +/- 1.353	3.69 +/- 1.145
Post	3.92 +/- 1.196	3.75 +/- 1.017

As stated earlier, both the participants in the control group and the experimental group completed the 24-hour food recall at entry and exit to look for changes in dietary intake. Fourteen common nutrients were analyzed. Multiple positive changes were demonstrated by both the control group and the experimental group (Table 2). For example, when assessing intake of grams of dietary fiber, both groups demonstrated an increase in intake ($p < 0.002$). Additionally intakes of both vitamin B6 and vitamin C increased. Finally, CRS5 assigns each recall with an overall Healthy Eating Index or

HEI score. The higher the 24-hour recall nutrient intake, the greater the HEI score. Both the control group and the experimental group demonstrated increases in HEI scores from entry to exit ($p < 0.014$).

Table 2.

Mean Nutrient Intakes Based on 24-Hour Food Recall Between Distance Education and Control Group

Nutrient Intake	Control Group		Distance Group	
	Entry Mean +/- SD	Exit Mean +/- SD	Entry Mean +/- SD	Exit Mean +/- SD
Total Calories	1822.85 +/- 863.83	1959.02 +/- 1091.14	1806.27 +/- 1847.05	1644.32 +/- 700.58
Protein (grams)	75.50 +/- 37.77	84.81 +/- 47.33	69.74 +/- 38.87	75.01 +/- 30.06
Fiber (grams)	14.21 +/- 8.78	15.19 +/- 8.88	11.64 +/- 6.254	14.84 +/- 8.15
Carbohydrate (grams)	210.48 +/- 107.93	226.87 +/- 132.97	202.41 +/- 91.22	195.58 +/- 94.08
Fat (grams)	76.26 +/- 43.32	81.32 +/- 53.55	64.76 +/- 34.76	64.52 +/- 34.42
Saturated Fat (grams)	26.24 +/- 16.04	28.30 +/- 20.44	22.19 +/- 11.67	21.13 +/- 11.80
Sodium (milligrams)	3471.19 +/- 1870.92	3585.50 +/- 2397.70	3006.06 +/- 1723.90	3189.12 +/- 1644.83
Calcium (% RDA)	90.61 +/- 76.90	88.79 +/- 67.321	75.67 +/- 43.75	75.35 +/- 47.49
Iron (% RDA)	108.77 +/- 82.46	119.71 +/- 73.93	91.57 +/- 68.99	89.25 +/- 56.70
Vitamin A (RE)	602.24 +/- 476.77	591.74 +/- 383.60	554.42 +/- 456.57	616.56 +/- 761.49
Vitamin B6 (milligrams)	1.59 +/- .92	1.76 +/- .86	1.50 +/- 1.08	1.58 +/- .75
Vitamin C (milligrams)	59.99 +/- 68.24	70.26 +/- 77.73	54.70 +/- 64.17	63.38 +/- 62.49
Vitamin E (ATE)	5.32 +/- 3.37	5.82 +/- 4.47	4.60 +/- 2.86	5.163 +/- 3.75
Healthy Eating Index	58.53 +/- 13.76	59.17 +/- 12.20	60.03 +/- 12.75	64.30 +/- 13.20

The participants who completed their lessons via distance education were asked to complete an additional five-question assessment tool. The results of that survey are presented in Table 3. When asked why the participants chose to complete the NEP lessons using distance education, as opposed

to the traditional face-to-face method, 59.4% answered that they could complete the lessons at a more convenient time. Furthermore, 26.5% selected "other" as the reason, and, when analyzing the provided answers, common responses included NEP staff not available in my area, time constraints, and lack of child care. When asked if the distance education lessons increased the participant's knowledge of nutrition, an overwhelming 94.3% answered yes. Of the 5.7% who stated "no," common responses for "why" included that they obtained their nutrition knowledge from other places such as school and reading. When asked if the lessons were presented in an order that was easy to understand, 100% of participants stated they were.

The fourth question asked the participants to explain one way that they were able to improve their nutrition or the nutrition of their family as a result of these lessons. When analyzing this qualitative data, participant responses included many commonalities such as increasing fruits and vegetables, improved portion control, increasing whole grains, improvements in meal planning/preparation, weight loss, improvements in label reading, improvements in feeding children, decreased sugar intake, and increased physical activity. The final question addressed self-efficacy and asked the participants about their comfort level when it came to making healthy choices for themselves and their families as a result of the distance education lessons. When asked, 45% of participants stated that they were "very sure" that they now had the abilities.

Table 3.

Frequencies of Responses for Distance Education Survey

Survey for Distance Education Participants (n=106)	
<i>Question #1: Why did you complete the NEP lesson through the mail or online as opposed to meeting with an NEP staff member to learn about nutrition?</i>	
A. Travel convenience	9.4%
B. Personal pace	4.7%
C. Time convenience	59.4%
D. Multiple factors or other	26.5%
<i>Question #2: Did the mail/online lessons increase your knowledge of nutrition?</i>	
A. Yes	94.3%
B. No	5.7%
<i>Question #3: Did you feel that each lesson was presented in an order that was easy to understand?</i>	
A. Yes	100%
B. No	0%
<i>Question #5: As a result of the NEP mail/online lessons, how sure are</i>	

<i>you that you have the knowledge and abilities to make healthy food choices for yourself and your family?</i>	
A. Not sure at all	.9%
B. Not too sure	.9%
C. Sure	21.7%
D. Very Sure	45.3%
E. Completely Sure	29.2%

Implications for Extension

The results of the study reported here demonstrate that graduates in Nebraska from two Extension-based programs, EFNEP and SNAP-Ed were able to improve nutrition-related behaviors and intakes after being taught via distance education. This data demonstrates that the EFNEP and SNAP-Ed programs are able to help limited resource clients change their behaviors, even when self taught using the NEP distance lessons. The behaviors improved in the study were food resource management practices (planning meals ahead of time, comparing prices of food, shopping with a grocery list, and use of a written budget), nutrition practices (reading the nutrition facts label, eating breakfast, and preparing foods without salt), and food safety practices (not thawing foods at room temperature and hand washing). Additionally, when analyzing 24-hour food recalls, an increase was shown in Healthy Eating Index scores, indicating improvement in nutrient intakes for these clients. These results reveal that the use of the NEP distance lessons are an effective means for teaching nutrition education, especially when barriers to traditional face-to-face methodologies exist.

Future Research

Additional areas for future research include performing a 6-month and/or 1-year follow-up to see if desired changes continue to occur. Furthermore, it would be interesting to develop a tool to research motivation levels of the distance education participants. Finally, in order to decrease error associated with 24-hour food recalls, it would be helpful to develop pictures of average serving sizes to assist the distance education participants with completing their food recalls.

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