

A Classroom Intervention Improves College Students' Perceptions and Use of Canned Vegetables

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Abstract

This intervention in a college nutrition course included tasting three recipes made with canned vegetables, accompanied by brief instruction about the advantages of canned vegetables. The design was a pretest-posttest quasi-experiment with a nonequivalent control group. We collected data from intervention and control groups through an on-line survey one week before intervention students tasted the first sample and one week after they tasted the third sample. Compared to controls, students who tasted all three samples improved significantly in their perceptions of canned vegetables overall, canned vegetables' nutrient contributions, and canned vegetables' contribution to the Dietary Guidelines for Americans. They also increased their use of canned vegetables in the previous three days. Interventions that combine food tasting with information about the foods have the potential to improve perceptions about and use of those foods.

Keywords: canned vegetables, taste test, college students

Introduction

The 2010 Dietary Guidelines for Americans (DGA) recommends that Americans eat more fruits and vegetables (Center for Nutrition Policy and Promotion 2014), but few adults, including college students, meet the goal of five or more fruits or vegetables daily (Behavioral Risk Factor Surveillance System 2014; The American College Health Association 2006). According to a recent survey, only 42 percent of Americans realize that canned foods count toward meeting recommended daily nutrition goals (Canned Food Alliance 2013a). This survey also reported that consumers had misconceptions about canned foods' nutrient and sodium contributions, the extent of processing, and the use of preservatives. If some misconceptions about canned food could be

corrected, intake of vegetables and fruits might increase, thus nudging people closer to achieving recommended intakes for fruits and vegetables. Promoting canned vegetables in an introductory nutrition course might be one way to increase college students' intake of these foods and help them apply the nutrition principles they are learning.

Nutrition education that focuses on tasting food samples has rarely been described in interventions with college students. Two interventions have been reported with basic nutrition courses: one intervention based on the Transtheoretical Model (Brown et al. 2011; Prochaska, Redding, and Evers 2008) and the other based on the Social Cognitive Model (Ha and Caine-Bish 2009; McAlister, Perry, and Parcel 2008). A third intervention was a campus-wide social marketing campaign (Shive and Morris 2006; Storey, Saffitz, and Rimon 2008). All three interventions reported small but significant increases in vegetable and/or fruit intake, stage of change, or self-efficacy. The purpose of our study was to conduct an intervention with a novel, less time- and labor-intensive approach that focused on tasting recipes made with canned vegetables, and to determine its effect on college students' perceptions and use of canned vegetables.

Methods

Research design

The research was a pretest-posttest quasi-experimental design with a nonequivalent control group. We asked all students enrolled in the introductory nutrition course in winter semester 2013 to complete two brief on-line surveys (Qualtrics Labs Inc., Provo, UT) for 5 points toward the 570-point course total. No students opted for an alternate assignment, an option the Institutional Review Board (IRB) required, for the same number of points. We randomly selected one of the five sections of the course as the intervention group and students in the other four sections served as the control group. Students gave informed consent at the beginning of the survey. The University IRB reviewed and approved the research protocol.

Survey

We created the short survey by writing statements about advantages of canned food identified through research (Canned Food Alliance 2013b), with responses on a Likert scale from strongly agree (5) to strongly disagree (1), and with reversed wording on four of the eight statements. The survey also included demographic questions and a question about the student's recent use of canned vegetables. Nutrition professors reviewed the survey for face validity. We piloted the pretest with students not enrolled in the nutrition course. The on-line pretests and posttests were similar, except that on the posttest students in the intervention section of the nutrition course also reported which of the three samples they tasted.

Theoretical Model

We based the intervention on the Practical, Foods, Positive theoretical model suggested for short interventions (Brown 2011). This model identifies three continua (Practical-Abstract, Foods-Nutrient, and Positive-Negative) and postulates that nutrition instruction emphasizing the Practical, Foods, and Positive aspects of recommendations is more likely to be actionable by consumers. The constructs at either end of the continua are interrelated, but our focus was primarily on the tangible Foods and Positive constructs as students tasted recipes chosen for their taste and ease of preparation. Brief instruction on food-tasting days also highlighted Positive and Practical constructs of the model by describing the possible advantages of using canned vegetables. The advantages included potential cost savings compared with other forms of vegetables, and the speed, ease, and convenience of using canned vegetables. In class, we described the simple, flexible recipes students tasted and we distributed printed copies to students who wanted them. Additional Positive, Practical information that we taught was that canned vegetables leave little food waste, they do not take up refrigerator space, and they have a long shelf life: all of these are advantages for students living in apartments. We included the Nutrient construct by pointing out that canned vegetables do count toward meeting the DGA recommendations and that canned vegetables have good nutrient retention, especially compared with the relatively rapid nutrient loss for fresh produce (Rickman et al. 2007). The Nutrient construct also addressed sodium content by comparing the sodium in canned vegetables with the much higher amounts of sodium in many highly processed foods.

Intervention

During class, the intervention group tasted samples of three recipes made with canned vegetables while learning about the advantages of canned foods generally. We chose the recipes by searching the internet for recipes made entirely from canned ingredients. We tested several recipes and chose these three for their good taste, low cost, and ease of preparation: vegetable salsa, vegetable chili, and chicken barbecue vegetable soup. We implemented the intervention in class on three days over a five-week period in mid-semester. Two senior nutritional science students prepared and served the samples; both had food handlers' permits. The samples were served in small tasting cups with a spoon but without chips for the salsa or crackers for the chili or soup. Not all students present in class on tasting days chose to taste the samples, so we analyzed the data according to the number of tastes for intervention group students (0, 1, 2, or 3 tastes, or "intervention levels") compared to the control group. The control group received no information about advantages of canned vegetables and they did not taste any samples. All students completed the on-line pretest 1 week before the intervention started and the on-line posttest 1 week after the last tasting day. We matched pretest and posttest data for students to calculate the change in each student's responses. We did an analysis of covariance of the levels

of intervention with pretest scores as a covariate, and we performed Tukey adjusted post-hoc pairwise tests of the levels of interventions with $P \leq .05$ level of significance.

Results

Participants

A total of 628 students took at least one of the on-line surveys, and matched pretest and posttest data were available for 496 students. More than half (63 percent) of participants were female, and 91 percent were white (compared to 86 percent white at the university). Students' mean age was 20.4 ± 3.3 years. Students from majors throughout the university enrolled in the course, but approximately 63 percent were in health-related majors. Students in the intervention and control sections of the course were not significantly different, according to Chi-square analysis. (Table 1)

Findings

The mean changes in perceptions and recent use of canned vegetables, from pretest to posttest for levels of intervention and the control group, are in Table 2.

Table 1. Total number of students in control and intervention groups and their distribution by demographic categories

¹ No significant differences in distributions between control group and intervention group (Chi-square analysis, all $P > .05$)

Demographic category	Control n (%)	Total intervention n (%)	Level of intervention			
			No tastes	1 taste	2 tastes	3 tastes
Total	375 (76%)	121 (24%)	12	34	26	49
Gender¹						
Males	128 (34%)	55 (45%)	4	14	13	24
Females	247 (66%)	66 (55%)	8	20	13	25
Age¹						
17-27 years	369 (96%)	121 (100%)	12	34	26	49
28-50 years	6 (2%)	0 (0%)	0	0	0	0

Major¹						
Health-related	244 (65%)	76 (63%)	5	22	14	35
Not health-related	131 (35%)	45 (37%)	7	12	12	14

Table 2. Mean changes and standard error of the mean (SEM) in perception and use of canned vegetables, comparing each intervention level to the control group

Statements on survey, Overall Perception of Canned Vegetables, and Use of canned vegetables in last 3 days	Control n=375	Level of intervention							
		No tastes n=12		1 taste n=34		2 tastes n=26		3 tastes n=49	
	mean ±SEM	mean ±SEM	P	mean ±SEM	P	mean ±SEM	P	mean ±SEM	P
Recipes prepared with canned vegetables are comparable in nutrition to those prepared with fresh and frozen vegetables.	.2 ± .04	.7 ± .25	.23	.8 ± .15 ¹	<.001	1.0 ± .17 ¹	<.001	.9 ± .12 ¹	<.001
Canned vegetables generate more food waste compared to fresh vegetables in home food preparation. ²	.0 ± .05	-.1 ± .26	.97	.4 ± .15	.24	.5 ± .18	.054	.2 ± .13	.57
Recipes prepared with canned vegetables are less tasty than recipes	.2 ± .05	.6 ± .26	.67	.6 ± .15	.087	.8 ± .18 ¹	.013	.5 ± .13	.17

prepared using fresh and/or frozen vegetables ²									
Canned vegetables can contribute to the fruit and vegetable Dietary Guideline recommendation for fruits and vegetables.	.0 ± .03	.3 ± .17	.69	.1 ± .10	1.00	.3 ± .12	.084	.3 ± .08 ¹	.011
Fiber content is similar in canned, fresh, and frozen vegetables.	.1 ± .04	.6 ± .22	.24	.3 ± .13	.41	.6 ± .15 ¹	.014	.4 ± .11	.17
Canned vegetables are often less expensive than fresh and frozen vegetables.	.0 ± .04	.2 ± .22	.92	-.1 ± .13	1.00	.4 ± .15	.11	.2 ± .11	.22
Canned vegetables are inconvenient to use in cooking. ²	.1 ± .04	.3 ± .21	.81	.0 ± .13	.93	.4 ± .14	.29	.3 ± .11	.26
Canned vegetables contribute a significant amount of sodium to the American diet. ²	.0 ± .04	.3 ± .23	.71	.0 ± .14	1.00	-.1 ± .16	.99	.2 ± .12	.59
Overall perception of canned vegetables³	.7 ± .14	2.8 ± .80	.09	2.0 ± .48	.07	3.8 ± .55 ¹	<.001	3.0 ± .40 ¹	<.001
Use of canned vegetables in last 3 days	.5 ± .05	.1 ± .26	.49	.7 ± .16	.81	.5 ± .18	1.00	.9 ± .13 ¹	.036

¹Significantly different from control

²Scoring reversed

³Includes responses to all statements

Control students' perceptions and use of canned vegetables did not change from pretest to posttest, but we observed changes among students related to the number of samples they tasted. Students who tasted three samples improved significantly in four outcomes when compared to controls. They changed their perceptions of canned vegetables overall ($P < .001$), canned vegetables' nutrient contributions ($P < .001$), and canned vegetables' contribution to the DGA ($P = .011$). They also increased their use of canned vegetables in the previous three days ($P = .036$). Tasting two samples also was associated with four significant changes in perceptions compared to control students: overall perception ($P < .001$), nutrient contributions ($P < .001$), taste ($P = .018$), and fiber content ($P = .014$). Tasting one sample was associated with a significant improvement in perception of nutrient contributions ($P = .001$). We found no significant differences between control and intervention levels in changes in perceptions regarding expense, convenience in cooking, food waste, or sodium content in canned vegetables. Students who tasted no samples did not change their perceptions even though they may have been in class on some tasting days to hear information about canned foods; these students' responses were not significantly different from the control students who received no instruction. In summary, students who tasted any samples significantly improved their perception of the nutritional value of canned vegetables, and students who tasted three or two samples improved in their overall perception of canned foods.

Discussion

This intervention, which included tasting recipes made with canned vegetables accompanied by brief instruction about the practical advantages of canned foods, resulted in modest but statistically significant improvements in college students' perceptions and use of canned vegetables. Even at the lowest level of one taste and minimal instruction, students' attitudes about the nutritional contributions of canned vegetables significantly improved. These outcomes were achieved with a simple, inexpensive, relatively small intervention incorporated into an existing course. Each of the three tastes involved only about 10 minutes of class time for tasting while the professor briefly described the advantages of canned foods. The \$55 total cost paid for the food and for printing recipes distributed to students. The food science taste panel lab at our university donated the sample cups, spoons, and napkins. The two nutritional science students working on this project spent about 10 hours total to buy food, test recipes, prepare the samples, and clean up on tasting days; they received course credit for this research project but were not paid. A paid undergraduate teaching assistant who already attended class every day helped distribute samples.

Other interventions that involved college students tasting foods also resulted in positive results, but those interventions appear to be longer and more complex than ours (Brown et al 2011; Ha and Caine-Bish 2009; Shive and Morris 2006). In a general education nutrition course, Brown et al. (2011) combined tasting four recipes made with vegetables during the semester with on-line videos which emphasized skills related to buying, storing, and preparing vegetables. That intervention resulted in increased self-efficacy and progression in stage of change for vegetable preparation. It also increased intake of asparagus (one of the tasted vegetables) but produced no change in overall vegetable intake.

The semester-long intervention incorporated into a basic nutrition course (Ha and Caine-Bish 2009) included taste testing whole grain products, along with other food-related activities such as introducing simple recipes of vegetables and fruits, assigning home cooking, and tasting healthful snacks. Instructors also asked students to try any new dish containing vegetables and submit a written report. This intervention, although not focused specifically on vegetables and fruits, resulted in significant improvements in mean intakes of vegetables and fruits overall as well as specifically in fresh forms. The report did not mention any specific vegetables or the use of canned foods.

The 2-month campus-wide social marketing campaign (Shive and Morris 2006) included demonstrating fruit smoothies in various campus locations and distributing 100 percent fruit juice and a brochure with a fruit smoothie recipe. Information about health benefits of fruit and overcoming barriers to intake were also included in the brochure and on table tents, posters, and in other media materials. The campaign led to small but significant pretest to posttest increases in means for yesterday's fruit intake and typical fruit intakes, when comparing the intervention campus with a control campus.

Each of these food-tasting interventions for college students, including ours, differed in their focus and activities, but all resulted in small but significant changes in fruit and/or vegetable intake. The common elements in all four seemed to be food tasting, exposure to recipes, and learning practical applications through supporting information. Although the other three interventions did not explicitly identify Practical, Foods, and Positive constructs, their activities were consistent with this model. Our study was unique in that it was a very short, simple, inexpensive intervention and it focused specifically on canned vegetables. The resulting positive perceptions of canned vegetables may help these students come closer to meeting the DGA recommendations.

Limitations

This study has several limitations. We could not separate the impact of tasting foods from the impact of instruction about the advantages of canned foods. We do not know how much

instruction each student received or how many samples each saw, as class attendance is not recorded. The intervention section of the course met at 8 a.m., which is not a typical time for tasting salsa, chili, or soup. More students may have tasted the samples if served with chips or crackers. The survey had face validity, but it was not formally validated. The data about canned food use was self-reported and limited to the short time frame of the previous three days. The intervention involved one nutrition course, and the results cannot be generalized broadly to college students.

Implications

One implication of these interventions is that exposure to recommended foods through tasting them and learning simple ways to prepare them appears to increase students' intakes of those foods. Also, an intervention such as ours might be reproduced relatively easily in other settings. Research could explore the threshold for the minimum number of tastes and kinds of foods needed to help students and other consumers implement various dietary recommendations. Future research might also explore whether other small, easy-to-manage food-tasting interventions can achieve the same results as larger-scale interventions. Longer follow-up would also be useful to assess the lasting impact of food tasting interventions on consumers' use of canned vegetables and fruit in food preparation.

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