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Fun with Foodella: A Pilot Study for Determining the Efficacy of a 2nd Grade Nutrition and Physical Activity Curriculum

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Abstract: *Fun with Foodella is a nutrition and physical activity workbook designed for elementary-aged youth. The objective was to determine if the Fun with Foodella program increased participant preference for fruit, vegetables, low-fat dairy products, and physical activity. Four intervention (53 students) and four control (68 students) schools participated. Significant results within the intervention group included a positive preference change for cucumbers, celery, pineapple, flavored milk, cheese, yogurt, and physical activity. This pilot Foodella program, coordinated by Extension professionals, demonstrates that promoting nutrition education, taste testing and physical activity in second graders results in positive change.*

Introduction

Childhood obesity is on the rise nationally and in South Dakota (SD). In 2008, 16.9% of United States (U.S.) children ages 2 to 19 were considered obese (Ogden & Carroll, 2010). Following this trend, 16% of all SD school age children were identified as obese during the 2009-2010 school year, while 16.6% of children ages 5 to 8 years were overweight and 13.4% were obese (SD Department of Health, 2010). This epidemic will continue to increase until children and their families make positive long-term dietary, physical activity, and lifestyle changes. According to the SD Department of Health (2010), 30% of second graders are overweight or obese and as they get older, the numbers steadily increase, resulting in 34.7% of SD children ages 15 to 19 being classified as overweight or obese.

The Centers for Disease Control and Prevention (CDC, 2010) indicate that children who grow up overweight or obese are more likely to become overweight or obese as adults, which also results in an increased risk for adult health problems. Overweight children have a higher prevalence of health risks and chronic diseases, including increased stress on weight-bearing joints, heart disease, high blood

pressure, high lipid levels, respiratory problems, abdominal disease, metabolic syndrome, type 2 diabetes mellitus, and many types of cancer (CDC, 2010; Field, Cook & Gillman, 2005; Daniels et al., 2005; Aglony, Acevedo, & Amrosio, 2009; Teitelbaum, Shinha, Micale, Yeung, & Jaeger, 2009; Park et al., 2010; Pan & Pratt, 2008). Consequences of overweight and obesity during childhood affect more than physical conditions and are associated with psychological problems, discrimination, teasing from other children, and low self-esteem (Ritchie et al., 2001; Lytle & Kubik, 2003).

In the past, being overweight or obese was correlated with people of high economic status. In the last decade the pendulum has switched, and the prevalence of overweight and obesity has increased in individuals of low socioeconomic status. Children of lower socioeconomic status follow the dietary intake patterns of their parents, which consist of lower intakes of fruits, vegetables, protein, vitamins, and minerals (Gearhart, Gruber, & Vanata, 2008). They also consume more soft drinks, fried foods, and sugar than children of higher socioeconomic status. Children consume foods that are provided and readily available to them. If healthy foods are not available, they will most likely not be consumed (Gearhart et al., 2008).

The dietary and physical activity patterns of children have been linked as causal correlations and factors in obesity prevalence with inappropriate parent-based and school-based decisions (Gronbaek, Madsen, & Michaelsen, 2009). The National Agricultural Research, Extension, Education and Economics Advisory Board (NAREEEAB) stated that nutrition education programs are seen as the fundamental approach to reducing childhood obesity (2010). Within the school and youth organization initiative, a model wellness plan for schools was developed in accordance with the Child Nutrition and WIC Reauthorization Act of 2004, PL 105-268. Part of the plan recommends schools adopt and implement nutrition and physical education programs (SD Board of Education, 2005).

Education is an essential part of promoting behavior change. In response to the national concerns over health, nutrition education for children is promoted as a way to improve their health now and for the future (Blom-Hoffman, 2003). Implementing nutrition education at the second grade level will help promote healthy food choices in young children and influence lifelong dietary habits.

Fun with Foodella has the potential to reduce childhood obesity by educating the children on the importance of good nutrition and physical activity. *Fun with Foodella*, a workbook of nutrition and physical education lessons, was designed and implemented in SD to strengthen nutrition education of second graders. Funding to support a health intervention is usually contingent on proof that knowledge, attitude, and/or behavior change exists in the target population. The *Fun with Foodella* workbook was designed for elementary-aged youth and has wide teacher support in SD; however, there was no evidence of its effectiveness in changing children's eating and physical activity preferences. The Fun with Foodella program has been implemented in regions of SD where at least half of the students that participate in the National School Lunch Program receive free and reduced price school meals. The children are from low socioeconomic status families that are at higher risk for developing overweight or obesity. The objectives of the Fun with Foodella program were to determine if participation in the program resulted in more children liking fruits, vegetables, low-fat dairy products, and physical activity.

Materials and Methods

Study Population

South Dakota is split into the North, South, and West Extension Districts. The North Extension District was randomly selected to implement the Fun with Foodella program. Eight second grade classrooms in the North District were randomly selected from those that have 50% or greater participation in the free and reduced national school lunch program. The eight selected classrooms were randomly split into four intervention groups and four control groups. The South Dakota State University (SDSU) Office of Research/Human Subjects Committee approved the protocol for the study. South Dakota Extension professionals coordinated and initiated the school-based program. Parental consent and student assent were obtained prior to data collection.

Materials

Pre- and post-pictorial surveys were used to determine success of the Fun with Foodella program. The second grade survey tool was previously used by and obtained from the Iowa Department of Public Health and the Iowa Nutrition Network Promoting Healthy Lifestyles (2008). Character recognition illustrations were modified to include the Fun with Foodella symbol. Participant gender was obtained. The first section of the questionnaire illustrated characters used within the curriculum and determined character recognition. The second section was used to determine how frequently participants selected

the pictured food item based on if they liked the food and if they could choose and prepare the pictured food at home. The last section required children to select a smiley face, a sad face, or a question mark, which represented the child's liking, not liking, or not knowing the pictured food.

The *Fun with Foodella* activity workbook was distributed to all eight schools. The activity workbook contained 12 units, with a total of 50 nutrition and physical activity lessons. Titles of the 12 units were: 1) Eating Right is Fun, 2) Choosing Healthy Foods, 3) Give It a Try, 4) How Do We Grow, 5) Grains for Brains, 6) Balance Food with Activity, 7) See How They Grow, 8) Start Your Day Smart, 9) Healthful Habits, 10) Snack Sense, 11) Good Manners are Fun, and 12) A World of Food. A teacher's guide was distributed along with each lesson. Following program completion, teachers submitted a teacher feedback evaluation form. The teacher feedback is being used to enhance the curriculum.

Methods

From implementation to completion, the *Fun with Foodella* program took 9 months. Extension professionals provided implementation instructions to the teachers within the intervention group. Implementation instruction was completed via email and the Desire 2 Learn course management system. The intervention group teachers were instructed and encouraged to implement 20 lessons from the workbook in the fall of 2009. The selected lessons emphasized fruits, vegetables, low-fat dairy products, and physical activity. Taste testing events were incorporated into the training program for the intervention schools. The teachers of the control group were not instructed on implementation techniques and were not expected to implement any of the workbook lessons. They were simply asked to distribute the workbook to students.

Statistical Analysis

For evaluation of differences between intervention and control groups at baseline, the approach to analysis depended on the nature of the possible responses to a question. For questions having the responses "like," "don't like," and "don't know," the responses "don't like" and "don't know" were pooled to create a dichotomous outcome variable. Lack of a positive response was compared between the intervention and control groups using generalized estimating equations with a binomial link to account for the school-clustered design. This same process was used to control for gender and the baseline percentage for "don't know" and "don't like" combined. For questions having the responses "never," "sometimes," and "always," the different responses were treated as ordinal, and the comparison of intervention and control groups was achieved using generalized estimating equations with a multinomial link to account for the school-clustered design and to control for gender. A p-value of 0.05 was used as a cutoff to indicate statistical significance.

For evaluation of post-intervention differences between intervention and control groups, the approach to analysis again depended on the nature of the possible responses to a question. For questions having the responses "like," "don't like," and "don't know," a change score was determined for responses "don't like" and "don't know" by assigning a value of one for maintenance or improvement in making a food choice (pre- to post-intervention): like to like, don't like to like, don't know to know. A change score of zero was assigned for the following changes (pre- to post-intervention): like to don't like, don't like to don't like, don't know to don't know, don't know to don't like. If a student initially indicated a preference for a food (like or don't like) and then post-intervention indicated a lack of opinion, then the response was omitted from the analysis.

The resulting change scores were used to determine the odds ratio for the association between the intervention and maintenance or improvement of making a food choice. Analysis was completed using generalized estimating equations with a binomial link to account for the school-clustered design, as well as to control for gender and the baseline percentage for "don't know" and "don't like" combined. An odds ratio greater than one indicates the intervention group was more likely to maintain or improve a food choice than the control group; an odds ratio less than one indicates the intervention group was less likely to maintain or improve a food choice than the control group.

For questions having responses "never," "sometimes," and "always," an ordinal change score from 0 to 5 was determined for change in frequency of food consumption. A score less than 3 corresponded to reduction in the frequency of food consumption, a score of 3 corresponded to no change, and a score greater than 3 corresponded to an increase in the frequency of food consumption. The odds ratio describing the association between the intervention and an increase in the frequency of consumption for a food was estimated using generalized estimating equations with a multinomial link to account for the school-clustered design and also to control for gender. An odds ratio greater than one indicates the intervention group was more likely to improve the frequency of consumption than the control group; an odds ratio less than one indicates the intervention group was less likely to improve the

frequency of consumption than the control group.

Results

All eight schools completed the Fun with Foodella program. Of the 144 potential students, 125 participated in the pre-survey. Of the125 that participated in the pre-survey, 121 students completed the post survey. The percentage of boys was 48.8%.

Baseline Characteristics

At baseline the intervention and control groups were different in some areas. Liking cucumber, broccoli, cheese and activity as well as trying different fruits had baseline p-values <0.01. Baseline data for intervention and control schools is shown in Tables 1 and 2.

Table 1.
Baseline Food Preferences in Intervention and Control Groups by Gender. Choices: Like, Don't Like, and Don't Know

	Intervention						Control						
	Male: 60%			Female: 40%			Male: 40%			Female: 60%			
Food	Like	Do Not Like	Do Not Know	Like	Do Not Like	Do Not Know	Like	Do Not Like	Do Not Know	Like	Do Not Like	Do Not Know	P-value*
Like Vegetables													
Avocado	11	21	28	10	17	13	7	18	15	10	18	32	0.39
Cauliflower	19	37	4	15	25	0	15	18	7	28	20	12	0.55
Cucumber	34	19	7	25	13	2	19	13	8	35	19	6	<0.01
Carrots	49	9	2	34	6	0	30	10	0	54	6	0	0.42
Sweet Potato	26	13	21	15	10	15	9	15	16	22	13	25	0.12
Jicama	8	22	30	8	11	21	2	10	28	10	4	46	0.33
Tomato	26	28	6	13	25	2	10	27	3	29	26	5	0.46
Pepper	19	36	5	10	26	4	7	30	3	15	32	13	0.51
Broccoli	40	19	1	23	15	2	25	15	0	48	12	0	<0.01
Radish	11	39	10	15	15	10	8	22	10	19	25	16	0.60
Celery	28	26	6	23	15	2	19	15	6	47	10	3	0.40
Like Fruit													
Orange	56	2	2	38	2	0							0.06
Tangerine	19	15	26	17	4	19	11	7	22	21	10	29	0.29
Kiwi	32	20	8	23	11	6	18	15	7	32	15	13	0.11
Mango	23	11	26	26	6	8	13	12	15	26	8	26	0.12
Cantaloupe	36	13	11	28	2	10	19	9	12	31	15	14	0.46
Cranberry	23	24	13	19	10	11	19	9	12	31	13	16	0.07
Pear	46	14	0	33	5	2	24	13	3	44	10	6	0.16
Pineapple	41	17	2	29	11	0	22	15	3	45	12	3	0.96
Apple													0.14
Like Dairy													

Yogurt	54	6	0	34	6	0	33	7	0	53	6	1	0.76
Cheese	49	11	0	23	17	0	40	0	0	41	19	0	<0.01

* P-value for comparison of intervention versus control for percent "don't like" or "don't know" at baseline, adjusted for sex and school-clustered design, and baseline percent for "don't know" and "don't like" combined.

Table 2.
Baseline Food Preferences in Intervention and Control Groups by Gender. Choices: Never (N), Always (A) and Sometimes (S)

	Intervention						Control						
	Male: 60%			Female: 40%			Male: 40%			Female: 60%			P-value*
Food	N	A	S	N	A	S	N	A	S	N	A	S	
Drink													
White Milk	6	34	20	6	25	9	0	30	10	9	33	10	0.35
Flavored Milk	3	42	15	9	25	6	4	30	6	1	41	18	0.55
Eat													
Cheese	13	34	13	13	13	13	1	33	6	16	29	15	0.05
Yogurt	4	52	4	8	28	4	3	24	13	7	42	11	0.15
Like													
Fruit	5	40	15	2	21	17	6	17	17	0	32	28	0.16
Vegetables	11	19	30	8	21	11	12	9	19	22	19	19	0.14
Activity	2	45	13	0	27	13	1	34	5	1	47	12	0.01
Try													
Vegetables	17	23	20	15	12	13	19	10	11	27	20	13	0.47
Fruit	4	33	23	4	27	9	17	14	9	10	32	18	<0.01

* P-value for comparison of intervention versus control for percent "don't like" or "don't know" at baseline, adjusted for sex and school-clustered design, and baseline percent for "don't know" and "don't like" combined.

Post-Intervention Results

Table 3 shows the significant post intervention survey results. Subjects in the intervention schools were 170% and 90% more likely to change their preferences to "like to eat" cucumbers and celery, respectively, than the subjects in the control schools. The intervention school subjects were also 74% more likely to change their preference to "like to eat" pineapple than the subjects in the control schools. Intervention subjects were 123%, 119%, and 23% more likely to change their preference to "like to drink" flavored milk, "like to eat" cheese, and "like to eat" yogurt, respectively, than the subjects in the control schools. Finally, subjects in the intervention schools were 67% more likely to change their answer to "like to be active" than the control schools subjects.

Subjects in the control school were 71% more likely to change their preference to "like to eat" jicama (a crisp, root, pale-white vegetable) than the intervention school subjects. This was the only evidence of the control subjects changing their preference to "like to eat" over the intervention subjects.

Table 3.
Significant Post Intervention Preference Changes in the Intervention and Control

Groups*

Variable	Odds Ratio	95% Confidence Interval
Intervention Schools		
Changed choice to "like to eat"		
Cucumber	2.7	(1.64, 4.45)
Celery	1.9	(1.14, 3.20)
Pineapple	1.74	(1.24, 2.46)
Cheese	2.19	(1.04, 4.61)
Yogurt	1.23	(1.06, 1.43)
Changed choice to "like to drink"		
Flavored Milk	2.23	(1.04, 4.13)
Changed choice to "like to be"		
Active	1.67	(1.10, 2.53)
Control Schools		
Changed choice to "like to eat"		
Jicama	0.29	(0.12, 0.66)
* Values were adjusted for gender, school clustering design and baseline percentage of don't know/don't like for a school.		

Discussion and Conclusion

The Fun with Foodella data analysis demonstrated evidence of its effectiveness. The increase in cucumber and celery preferences by the intervention schools is an indication that vegetable consumption can increase with further implementation of the Foodella curriculum. An increase in intervention schools liking low-fat dairy products, flavored milk, cheese, and yogurt demonstrates a correlation between preference change with nutrition education implementation. According to Eliassen and Wilson (2007), elementary years are the most crucial time to start developing healthy food choices because changing eating habits becomes more problematic as children age. The intervention group also improved in the liking to be active category as compared to the control group. The Foodella curriculum also demonstrated a positive change in physical activity.

The Iowa State Extension Building and Strengthening Iowa Community Support for Nutrition and Physical Activity (BASICS) program study involved approximately 2,000 first, third, and fifth grade students. Following implementation of the BASICS program, the majority of students improved their awareness of food groups, healthy snack choices and physical activity knowledge (Montgomery, 2010). The BASICS study results are consistent with the Fun with Foodella results in that they also demonstrated positive results with a focused nutrition and physical activity intervention.

The Childhood and Adolescents Trial for Cardiovascular Health (CATCH) Kids Club is a nationwide program that has had much success in grades kindergarten through fifth since it was started in the late 90's. The University of Texas completed a 3-year, post-pilot study of the CATCH program. Within the CATCH study, the students in the intervention showed higher levels of physical activity, consumed fewer calories from fat and showed better knowledge of nutrition (University of Texas, 2011). KidQuest, another school-based intervention that combines nutrition and physical activity promotion, has shown promising results in promoting healthy food selection and behaviors (Jensen, Kattlemann, Ren, & Wey, 2009). The CATCH and KidQuest programs are also school-based programs aimed at promoting healthy nutrition and physical activity. These programs, similarly to Fun with Foodella, reinforce the positive impacts of school based nutrition education programs.

Results from the school-based OrganWise Guys curriculum resulted in significant changes in a subsample of children receiving free and reduced lunches. Those receiving the intervention were more likely to reduce their BMI and weight and stay within normal BMI percentile ranges as compared to those not receiving the intervention (Hollar et al., 2010). The Fun with Foodella curriculum also

resulted in positive changes within children receiving free and reduced lunches.

Nutrition education programs that contain positive messages and food tastings are desirable. Designing a program for a particular age group and ensuring that the content is integrated into the classroom are essential in nutrition education programs (Eliassen & Wilson, 2007). The Fun with Foodella curriculum contains these components and was easily coordinated and implemented by Extension professionals and schools. Results from the pilot Foodella program demonstrated that implementation of nutrition education, taste testing, and promoting physical activity at a young age increases children's preferences for fruits, vegetables, low-fat dairy products and physical activity. In conclusion, the Fun with Foodella curriculum should be implemented and evaluated on a larger longitudinal scale to determine long-term efficacy.

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