Research Contribution

Journal of Foodservice Management & Education, Volume 11, Number 1, Pages 1– 4 . ©2017
Published jointly by the Foodservice Systems Management Educational Council and the National Association of College & University Food Services

CHILD INVOLVEMENT IN FOOD PREPARATION DURING SCHOOL LUNCH TO IMPROVE VEGETABLE INTAKE: "MIX YOUR OWN SALAD TODAY!"

Andrew Lakanen, MS, RD[1]; Zata Vickers, PhD[2]; Marla Reicks, PhD, RD[3*]

[1]Nutrition Graduate Student, University of Minnesota, St. Paul, MN, USA
[2]Professor, University of Minnesota, St. Paul, MN, USA
[3]Professor, University of Minnesota, St. Paul, MN, USA

ABSTRACT

Involvement in salad preparation was tested as a means to increase salad selection and consumption during lunch in an elementary school. Garden and spinach salads were offered separately as pre-mixed salads, as separate components students could self-mix, and as separate components along with promotion. The proportions selecting self-mixed spinach salads (10.7%), self-mixed spinach salads with promotion (13.4%), and self-mixed garden salads with promotion (16.6%) were significantly greater than the proportions selecting pre-mixed salads. Consumption of spinach salads (self-mixed, and self-mixed with promotion) was slightly increased compared to pre-mixed salads. This approach could potentially improve salad selection and intake among children.

Keywords: vegetable intake, school meals, elementary school children, involvement in food preparation

INTRODUCTION

Vegetable intake has been associated with chronic disease risk reduction and a decrease in meal energy density (Slavin & Lloyd, 2012; Williams, Roe, & Rolls, 2013). However, nationally representative dietary intake data show that U.S. school-aged children typically consume less than one daily serving of vegetables, or less than half of the daily-recommended number of servings (USDA, ARS, 2014). Given the variety of vegetables offered daily in school cafeteria environments, children eating school meals have the potential to develop long-term healthy eating patterns. Although implementation of the new 2012 school meal regulations requiring children to take vegetables and/or fruit with school lunch has resulted in improved vegetable intake (Cullen et al., 2015; Cohen et al., 2014), there is much room for improvement in selection and consumption.

Recent studies show that child involvement in food preparation is associated with improved vegetable intake (Chu, Storey, & Veugelers, 2014; van der Horst, Ferrage, & Rytz, 2014). Children aged 6-11 years who prepared a lunch meal with parental assistance ate 76% more salad than when parents prepared the meal alone (Van der Horst et al., 2014). Children aged 10-11 years who reported they were involved with meal preparation daily reported eating one more servings of vegetables and fruit per day compared to those who reported that they never prepared meals (Chu et al., 2014). Similarly, children reporting more frequent food preparation also reported higher preference ratings based on nine vegetables and higher self-efficacy for selecting healthy foods than those who reported never preparing meals (Chu et al., 2013).

The IKEA effect described by Norton, Mochon, and Ariely (2012) represents effort justification with individuals overvaluing objects they create themselves. This phenomenon may be partially responsible for the positive outcomes regarding vegetable intake observed from programs for children that focus on the development of cooking and gardening skills. For example, after fourth-grade children participated in a school-based program involving cooking lessons and tasting sessions, their preferences for vegetables were higher (Cunningham-Sabo & Lohse, 2013). Children (9-11 years) consumed more vegetables after participating in a cooking skills program compared to a control group (Caraher, Seeley, Wu, & Lloyd, 2013). Furthermore, parents reported that their children (2-15 years) consumed 33% more vegetables after participating in a 7-week community gardening program compared to before the program (Castro, Samuels, & Harman, 2013). These programs were conducted in school classrooms or in a community setting; however, the potential benefits from involvement in food preparation in the school cafeteria during school meals have not been examined. A systematic review of school-based interventions to improve vegetable and fruit intake among children (5-12 years) did not identify any studies that included intervention components addressing food preparation by children within the school meal environment (Evans, Christian, Cleghorn, Greenwood, & Cade, 2012).

The purpose of this study was to determine whether involving children in salad preparation in the school cafeteria during lunch would increase the number selecting a salad and salad consumption among elementary school-aged children. This study tested the hypotheses that the number of students who selected a salad and the amount of salad consumed would differ between three conditions: 1) when pre-mixed salads were offered, 2) when salad components that children could mix together were offered, and 3) when salad components children could mix together were offered along with promotion of the salads by research staff.

METHODS

Participants

The intervention was conducted at one elementary school in Richfield, MN during the 2012-2013 school year. A total of 775 students were enrolled in grades K-5 with 424 males (55%), 351 females (46%), and 480 children of a minority population. Of those minorities, 24 students (3%) were American Indian, 91 (12%) were Asian/Pacific Islander, 179 (23%) were Hispanic and 186 (24%) were African American. The number participating in free meals as part of the National School Lunch Program was 402 (52%), with 64 (8%) paying a reduced-price. The demographic characteristics of children in this school were similar to other elementary schools in the district in terms of race/ethnicity and number eligible for free or reduced priced meals. Previous feasibility studies to improve student dietary intake had also been conducted in this school. Because the study was exploratory in nature, the study was limited to only one school. The research was considered exempt from the University of Minnesota IRB committee review based on Exempt Category 2: Surveys/ Interviews, Standard Education Tests and Observations of Public Behavior. Approval for this research was obtained from the school district and school administration prior to data collection.

*Corresponding Author: Phone: (612) 624-4735; E-mail: mreicks@umn.edu

Table 1. Number of Children Eating Lunch, Number Taking a Salad, and Amount of Salad Consumed by Experimental Condition (n=32)

	Spinach Salad			Garden Salad		
	Day 1 Pre-mixed	Day 2 Self-mixed	Day 3 Self-mixed plus promotion	Day 1 Pre-mixed	Day 2 Self-mixed	Day 3 Self-mixed plus promotion
Number of children eating lunch	583	559	578	614	604	603
Number for whom intake data were missing	5	11	18	6	17	26
Number taking a salad (expressed as percent of all children eating lunch)[1]	28 (4.8)[a]	61 (10.7)[b]	79 (13.4)[b]	54 (8.8)[a]	79 (12.9)[a]	85 (16.6)[b]
Mean amount (grams) of salad consumed per child eating lunch (SD)[2]	2 (11)[a]	4 (17)[b]	4 (16)[b]	3 (14)	5 (17)	5 (18)
Mean amount (grams) of salad consumed per child taking a salad (SD)[3]	41 (36)	45 (37)	37 (33)	38 (31)	41 (31)	39 (36)

[1]Proportion of students taking a salad with different superscript letters are significantly different for each salad type separately when $p < 0.017$ - Bonferroni adjustment applied to the p value ($p < 0.05/3 = 0.017$). Comparisons are only within salad type and not across salad types (not across the entire row).
[2]Amount of spinach salad consumed per child eating lunch with different superscript letters are significantly different when $p < 0.017$ - Bonferroni adjustment applied to the p value ($p < 0.05/3 = 0.017$).
[3]Amounts consumed per child taking a salad were not significantly different ($p < 0.05$).

Procedure

This experimental study included two types of side salads, a garden and spinach salad, and three conditions in which each salad type was served to students. Two salad types were included to learn how children reacted to the opportunity to mix a variety of salad types. Each salad type was served three days, one day for each condition, for a total of 6 days of data collection. These conditions included: 1) a control condition where the salad was pre-mixed by cafeteria staff, 2) the first intervention condition where the salad was served as separate components that students could self-mix, and 3) a second intervention condition where the salad was served as separate components students could self-mix along with promotion by research staff. Research staff were trained to consistently demonstrate how the salads could be mixed and to provide the same level of encouragement to each child.

The garden salad was made with one and a half cups of chopped lettuce and romaine (LRC), one ounce of shredded carrots, and one ounce of thawed, frozen peas. The spinach salad was made with one and a half cups of a mixture of LRC and chopped spinach (half LRC, half chopped spinach), one ounce of shredded carrots, and one ounce of dried cherries. In the control condition, salads were served pre-mixed in individual paper boats and arranged on large serving trays. In the first intervention condition, salads were offered as components (greens, carrots, peas/cherries) in separate paper cups for students to mix themselves. The cups containing each component were placed in a larger paper bowl and positioned as a unit in the same place on the cafeteria line as when they were pre-mixed. Students were required to take all three components as a unit. In the second intervention condition, the salads were offered as components to be self-mixed, along with promotion by research staff. To promote the opportunity to self-mix a salad, researchers stood in two locations in the cafeteria, at the entrance to the cafeteria and in the lunch line. At the cafeteria entrance, a cart was set up with signage indicating that each child could mix their own salad today, with two 8.5" by 11" pictures of the garden or spinach salads, one before and one after mixing the ingredients. A researcher stood behind the cart, saying "You can mix your own salad today!" in an encouraging manner as students entered the hallway and briefly demonstrated how the salads could be mixed in the containers provided. Research staff on the lunch line repeated this encouragement by asking each student as they proceeded through the line, "Would you like to mix your own salad today?"

Each salad type was served once under each condition and in the same order (pre-mixed garden salad then pre-mixed spinach salad, self-mixed garden salad then self-mixed spinach salad, self-mixed with promotion garden salad then self-mixed with promotion spinach salad). Data were collected for three days for each salad type, one day for each condition. The weight of ten salads selected at random from those available on the lunch line was used to determine a mean weight for each salad type on each experimental day based on a standard procedure used previously (Miller et al., 2015). The mean weights for the spinach salads were 154, 161, and 143 grams for the premixed, self-mixed, and self-mixed with promotion conditions, respectively. The mean weight for the garden salads were 165, 158, and 148 grams for the premixed, self-mixed, and self-mixed with promotion conditions, respectively. The menu was matched on control and intervention days so that pizza was served as the main entrée when the garden salad was served and chicken teriyaki was served as the main entrée with the spinach salad. Fried rice, fruit, and a breadstick were also available with the chicken teriyaki meal; raw and cooked vegetables and fruit were served with the pizza meal. Milk was available on all control and intervention days. Students entered the lunchroom by grade.

Control and intervention data collection followed a standardized protocol. After students who took salads sat down at a table in the lunchroom, they were given a small paper card by research staff containing an arbitrary ordinal number. A researcher asked the child for their Personal Identification number (PIN) provided by the school food service system and wrote the corresponding ordinal number next to the child's PIN number on a list of PINs organized by classroom/grade. Each student who took a salad was asked to keep their card on their tray until they finished their lunch. The card was collected along with the salad waste from each student at the dish disposal area as children were leaving the cafeteria. Salad waste was weighed and photographed separately for each child along with the corresponding card containing the ordinal number and grams of waste so the amount of waste could be matched with the PIN number for each student.

Data Analysis

Salad waste (grams) was subtracted from the mean weight of each salad type to calculate amounts consumed. The frequency of selecting a salad and the mean salad consumption weight were calculated by salad type and condition. A pairwise two sample proportion test (two-proportion z-test) was used to compare differences in the number of students who took salads on each day. A Bonferroni correction was applied to adjust the *p* value based on the group of three tests conducted (control vs. first intervention condition, control vs. second intervention condition, and first vs. second intervention condition) ($p < 0.05/3 = 0.017$). Salad consumption data expressed in grams per child eating lunch were not normally distributed; therefore Wilcoxon signed rank tests were used to compare differences in mean consumption by experimental condition with a Bonferroni correction applied to the *p* value ($p < 0.05/3 = 0.017$). Expressing the data on the basis of all children eating school lunch provided an indication of the school-wide impact, which has relevance for school foodservice personnel when making decisions about whether to offer self-mixed salad options in the future. Analysis of variance (ANOVA) was used to compare differences in intake when consumption was expressed in grams consumed by child taking the salad as these data met the assumption of normality with a p value < 0.05 used to determine statistical significance. Statistical Analysis Software (SAS, version 9.4, copyright 2002-2012, Cary, NC) was used to conduct the analysis.

RESULTS AND DISCUSSION

A low percentage of students selected a spinach or a garden salad in the control (pre-mixed) condition, 4.8% and 8.8%, respectively (Table 1). The percentages selecting the self-mixed spinach salad (10.7%) and the self-mixed spinach salad with promotion by research staff (13.4%) were greater than the pre-mixed salads (4.8%) ($p < 0.001$ and $p < 0.001$, respectively). The percentage selecting the self-mixed garden salad with promotion by research staff (16.6%) was greater than either the pre-mixed (8.8%) or the self-mixed (12.9%) ($p < 0.002$ and $p < 0.001$, respectively). The findings supported the hypothesis that the number of students who selected a salad differed by condition, with children selecting more spinach salads in the self-mixing conditions compared to the pre-mixed condition and children selecting more garden salads in the self-mixing condition plus promotion compared to the pre-mixed condition. The increased proportion of children selecting salads is a positive observation regarding the feasibility of employing a food involvement approach in school cafeterias. Novelty of the approach and potential enjoyment may have contributed to the increased selection. Children have been shown to enjoy involvement in food preparation during activities to build these skills in schools (Adab et al., 2014; Cunningham-Sabo & Lohse, 2103), therefore children in the current study may have been motivated to select the self-mixed spinach salad by expectations for an enjoyable experience. The promotion by research staff may also have motivated spinach and garden salad selection based on having an opportunity to experience a novel approach involving food preparation during lunch. Children had not been given this opportunity previously either in the lunch line or from a salad bar, which was not available in this school at the time the study was completed. Providing a salad bar in elementary schools increased vegetable consumption by children (Slusser et al., 2007), but information on how and why children select from a variety of foods offered on a salad bar is limited. The opportunity to select individual components from a salad bar to mix together in preferred proportions may be a factor underlying use of salad bars by children based on a sense of enjoyment or autonomy, similar to what might have motivated children to select self-mixed salads in the current study.

The amount of spinach salad consumed per child eating school lunch in the self-mixed ($p < 0.001$) and self-mixed plus promotion ($p < 0.001$) conditions were significantly greater than in the pre-mixed condition (Table 1). The amount of garden salad eaten per child eating school lunch did not differ across experimental conditions. These findings supported the hypothesis that the amount of salad consumed would differ between conditions, with children consuming more spinach salad in the self-mixing conditions compared to the pre-mixed condition when mean intake was expressed as intake per child eating lunch. This hypothesis was not supported based on consumption data for the garden salads. The amount of spinach and garden salad consumed by students who took a salad accounted for about 23%-32% of the total amount of salad in a serving across all conditions (Table 1). No differences were observed in amount of spinach salad ($p = 0.493$) or garden salad ($p = 0.917$) consumed by students who took a salad by experimental condition.

The small increase in intake of the spinach salad observed in the self-mixed conditions was a less positive indication of the feasibility of employing the food involvement approach in school cafeterias. Factors that may have influenced the amount of salad consumed by children included portion size and time allowed to eat lunch. The portion of salad served after the implementation of the new school meal regulations in the fall of 2012 was between 143-165 grams. Children may not have had time to consume this amount of raw vegetable salad, given the limited time children had to eat lunch in school (about 15-20 minutes in the school in this study). National data from the School Health Policies and Programs Study 2006 showed that a high proportion of schools in the US (79%) allowed students at least 20 minutes to eat lunch, regardless of student enrollment, demographic characteristics or grade (elementary, middle or high school) (Balaji, Brener, & McManus, 2010). However, studies that quantified the time students spent at the table in school cafeterias during the lunch period estimated that only about 7 to 10 minutes was time spent eating whereas the rest of the time was spent engaging in non-eating activities, such as socializing or organizing the eating area (Buergel, Bergman, Knutson, & Lindaas, 2002; Zandian et al., 2012). Students in grades 3 to 8 in an urban, low-income school district who selected vegetables ate 12% less of their vegetable when allowed 20 versus 25 minutes to eat ate lunch (Cohen et al., 2015).

Overall, the selection and consumption of the salads in this school was low, regardless of condition. Strategies to improve selection and consumption of self-mixed salads could include pretesting the concept with an advisory group of students to determine how to better employ the approach in school lunch. For example, although carrots have been rated positively for liking by children in previous studies, green vegetables such as peas and spinach greens have not been rated as highly (Laureati, Bergamaschi, & Pagliarini, 2014; Swenson, 2015). Therefore, children could be given the opportunity to provide input into the selection of vegetables to include in the self-mixed salads that could contribute to less waste. Avoiding vegetable waste is an important priority after implementation of the new school meal regulations (USDA, 2012) requiring children to take vegetables daily (Schwartz et al., 2015).

School lunch has been shown to be an important opportunity for low-income children and adolescents to consume vegetables as part of their daily intake (Longacre et al., 2014), therefore effective strategies are needed to promote consumption. Simple promotional strategies employed in previous studies have included encouragement of fruit or vegetable selection and intake among children in elementary school cafeterias by verbal prompts or signage. These effective strategies involved having a cafeteria staff member verbally

encourage students by asking if they wanted fruit with their lunch (Schwartz, 2007), or placing signs with attractive names for vegetable dishes on the lunch line (Wansink, Just, Payne, & Klinger, 2012). Similarly, in the current study, the promotion of the self-mixed salads through verbal encouragement and demonstration was effective in increasing selection of both salads and intake of the spinach salad above that in the self-mixed condition without promotion. Future studies that examine effectiveness of various approaches to promote salad selection and intake, including cost-effectiveness, are warranted.

Limitations

This study was conducted within one suburban elementary school, thus limiting the ability to generalize findings to other schools. The amount of other raw and cooked vegetables offered on the same day the salads were served was not measured. Therefore, the impact of offering the salad on overall lunch vegetable selection and intake could not be assessed.

CONCLUSIONS AND APPLICATIONS

The number of students selecting the salad was influenced by experimental condition indicating that the self-mixing salad option for food involvement in the school cafeteria may be effective in promoting selection of vegetables. Mean consumption of the spinach salad per child eating school lunch was only slightly increased, whereas consumption of the garden salad did not change as a result of the intervention.

This study expands the literature on child food involvement by focusing on participation in food preparation in the school cafeteria during school lunch, apart from interventions involving the installation of salad bars. The approach was effective in improving intake when applied to all children eating school lunch for one type of salad, which could contribute to an increased intake over time on a cumulative basis. The approach was also effective in increasing selection of salads, which would enable children to consume more vegetables. Although the cost of ingredients was the same across conditions, the labor involved in preparing the self-mixed salads and providing promotion would likely increase the overall cost in the elementary school. However, the cost could be offset to some extent if produce companies would develop cost effective self-mixing salad kits that could be made in large quantities to reduce costs.

REFERENCES

Adab, P., Pallan, M. J., Cade, J., Ekelund, U., Barrett, T., Daley, A., Deeks, J., Duda, J., Gill, P., Parry, J., Bhopal, R., & Cheng, K. K. (2014). Preventing childhood obesity, phase II feasibility study focusing on South Asians: BEACHeS. *BMJ Open*, *4*(4), e004579.

Balaji, A. B., Brener, N. D., & McManus, T. (2010). Variation in school health policies and programs by demographic characteristics of US schools, 2006. *Journal of School Health, 80*(12), 599-613.

Buergel, N. S., Bergman, E. A., Knutson, A. C., & Lindas, M. A. (2002). Students consuming sack lunches devote more time to eating than those consuming school lunches. *Journal of the American Dietetic Association, 102*(9), 1283-1286.

Caraher, M., Seeley, A., Wu, M., & Lloyd, S. (2013). When chefs adopt a school? An evaluation of a cooking intervention in English primary schools. *Appetite, 62*, 50-59.

Castro, D. C., Samuels, M., & Harman, A. E. (2013). Growing healthy kids: a community garden-based obesity prevention program. *American Journal of Preventive Medicine, 44*(3 Suppl 3), S193-199.

Chu, Y. L., Storey, K. E., & Veugelers, P. J. (2014). Involvement in meal preparation at home is associated with better diet quality among Canadian children. *Journal of Nutrition Education and Behavior, 46*(4), 304-308.

Chu, Y. L., Farmer, A., Fung, C., Kuhle, S., Storey, K. E., & Veugelers, P. J. (2013). Involvement in home meal preparation is associated with food preference and self-efficacy among Canadian children. *Public Health Nutrition*, *16*(1), 108–112.

Cohen, J. F., Jahn, J. L., Richardson, S., Cluggish, S. A., Parker, E., Rimm, E. B. (2016). Amount of time to eat lunch is associated with children's selection and consumption of school meal entrée, fruits, vegetables, and milk. *Journal of the Academy of Nutrition and Dietetics, 116*(1), 123-128.

Cohen, J. F., Richardson, S., Parker, E., Catalano, P. J., & Rimm, E. B. (2014). Impact of the new U.S. Department of Agriculture school meal standards on food selection, consumption, and waste. *American Journal of Preventive Medicine*, *46*(4), 388-394.

Cullen, K. W., Chen, T. A., Dave, J. M., & Jensen, H. (2015). Differential improvements in student fruit and vegetable selection and consumption in response to the new National School Lunch Program Regulations: a pilot study. *Journal of the Academy of Nutrition and Dietetics, 115*(5), 743-50.

Cunningham-Sabo, L., & Lohse, B. (2013). Cooking with Kids positively affects fourth graders' vegetable preferences and attitudes and self-efficacy for food and cooking. *Childhood Obesity, 9*(6), 549-556.

Evans, C. E., Christian, M. S., Cleghorn, C. L., Greenwood, D. C., & Cade, J. E. (2012). Systematic review and meta-analysis of school-based interventions to improve daily fruit and vegetable intake in children aged 5 to 12 y. *American Journal of Clinical Nutrition, 96*(4), 889-901.

Laureati, M., Bergamaschi, V., & Pagliarini, E. (2014). School-based intervention with children. Peer-modeling, reward and repeated exposure reduce food neophobia and increase liking of fruits and vegetables. *Appetite*, *83*, 26-32.

Longacre, M. R., Drake, K. M., Titus, L. J., Peterson, K. E., Beach, M. L., Langeloh, G., Hendricks, K., & Dalton, M. A. (2014). School food reduces household income disparities in adolescents' frequency of fruit and vegetable intake. *Preventive Medicine*, *69*, 202-207.

Miller, N., Reicks, M., Redden, J. P., Mann, T., Mykerezi, E., & Vickers, Z. (2015). Increasing portion sizes of fruits and vegetables in an elementary school lunch program can increase fruit and vegetable consumption. *Appetite*, *91*, 426-430.

Norton, M. I., Mochon, D., Ariely, D. (2012). The IKEA effect: When labor leads to love. *Journal of Consumer Psychology, 22*(3), 453–460.

Schwartz, M. (2007). The influence of a verbal prompt on school lunch fruit consumption: a pilot study. *International Journal of Behavioral Nutrition and Physical Activity*, *4*, 6.

Schwartz, M. B., Henderson, K.E., Read, M., Danna, N., & Ickovics, J. R. (2015). New school meal regulations increase fruit consumption and do not increase total plate waste. *Child Obesity, 11*(3), 242-247.

Slavin, J. L., & Lloyd, B. (2012). Health benefits of fruits and vegetables. *Advances in Nutrition: An International Review Journal, 3*(4), 506-516.

Slusser, W.M., Cumberland, W. G., Browdy, B.L., Lange, L. & Neumann, C. (2007). A school salad bar increases frequency of fruit and vegetable consumption among children living in low-income households. *Public Health Nutrition, 10*, 1490–1496.

Swenson, A. (2015). An Exploration of Factors that May Affect Vegetable Intake among Children, 9-12 Years: Availability, Preferences, and Preparation Time. University of Minnesota Thesis. 177 pages.

Williams, R. A., Roe, L. S., & Rolls, B. J. (2013). Comparison of three methods to reduce energy density. Effects on daily energy intake. *Appetite, 66*, 75-83.

United States Department of Agriculture, Agricultural Research Service. (2014). *What We Eat in America*, NHANES 2011-2012, individuals 2 years and over (excluding breast-fed children), day 1 dietary intake data, weighted. Food Patterns Equivalents Database (FPED) 2011-2012. Retrieved February 1, 2015 from www.ars.usda.gov/ba/bhnrc/fsrg.

United States Department of Agriculture. Food and Nutrition Service. Nutrition Standards in the National School Lunch and School Breakfast Programs. Final Rule. Federal Register Vol. 77, No. 17, January 26, 2012. 7 CFR Parts 210 and 220.

van der Horst, K., Ferrage, A., & Rytz, A. (2014). Involving children in meal preparation. Effects on food intake. *Appetite*, *79*, 18–24.

Wansink, B., Just, D. R., Payne, C. R., Klinger, M. Z. (2012). Attractive names sustain increased vegetable intake in schools. *Preventive Medicine, 55*(4), 330-332.

Zandian, M., Ioakimidis, I., Bergström, J., Brodin, U., Bergh, C., Leon, M., Shield, J., & Södersten, P. (2012). Children eat their school lunch too quickly: an exploratory study of the effect on food intake. *BMC Public Health, 12*, 351.