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Contents lists available at ScienceDirect

# Food Quality and Preference

journal homepage: [www.elsevier.com/locate/foodqual](http://www.elsevier.com/locate/foodqual)

## Eat your veggies: A chef-prepared, family style school lunch increases vegetable liking and consumption in elementary school students

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### ARTICLE INFO

#### Article history:

Received 31 March 2016

Received in revised form 8 July 2016

Accepted 15 August 2016

Available online 16 August 2016

#### Keywords:

Mere exposure

Liking

Neophobia

Vegetable

School lunch

Consumption

Healthy eating

### ABSTRACT

School lunches provide an opportunity to introduce children to healthy foods in ways that might result in both short- and long-term healthier eating. This study compared vegetable consumption and liking for vegetables in 8–10 year old children at two schools, one with a traditional lunch service (61–84 students in School B) and the other (24–26 students in School A) which devoted one day each week to the “Eatiquette Program”, which incorporates chef-prepared food, non-disposable plates and cutlery, and family style service including an adult at each table. Consumption of target vegetables (cauliflower and sweet potato “fries”) was recorded in the lunchroom at the beginning and end of the school year, and a subset of children provided rankings and ratings of liking for those and six other vegetables in separate assessments at those times. Consumption of sweet potato fries was higher in children in the Eatiquette lunch than in the children at the control school at the beginning of the year. Although initial consumption of the cauliflower was not significantly higher in the Eatiquette lunch than in the control school, consumption increased from the beginning to the end of the school year for children eating the Eatiquette lunch. In addition liking for and ranking of the cauliflower increased from the beginning to the end of the year for the children in the Eatiquette (n = 6) program but not for those eating the traditional lunch (n = 22). The Eatiquette program increased consumption of and liking for vegetables. Aspects of the Eatiquette program including food palatability and the presence of an adult at each table may be responsible for these increases.

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### 1. Introduction

Eating fruits and vegetables has been found to help prevent illnesses such as cancer and cardiovascular disease (Boeing et al., 2012; Joshipura et al., 1999; Ness & Powles, 1997; Van Duyn & Pivonka, 2000). In addition, intake of a greater quantity and variety of vegetables might help prevent obesity (Field, Gillman, Rosner, Rockett, & Colditz, 2003; McCrory et al., 1999; Tohill, Seymour, Serdula, Kettel-Khan, & Rolls, 2004).

However, many children do not eat enough vegetables because they reject foods they find to be unpalatable (Baxter & Thompson, 2002) and vegetables are the least liked category of food (Cooke & Wardle, 2005). This is at least partly due to the fact that vegetables are often bitter and that bitterness negatively influences their acceptance (Dinehart, Hayes, Bartoshuk, Lanier, & Duffy, 2006).

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Neophobia might also contribute to low consumption of and liking for vegetables (Cooke, 2007) due to the strong relationship between familiarity and liking for foods (Cooke & Wardle, 2005). More familiar foods are better liked than less familiar ones and many vegetables are rarely consumed. In fact, consumption of vegetables other than potatoes, head lettuce, and tomatoes is very low in the US (Kantor, 1999). The increase in liking with exposure is called the “mere exposure effect” and has been found with a variety of stimuli (Zajonc, 1968). According to the mere exposure effect, the more children are exposed to a variety of vegetables, the more likely they are to like those vegetables (Birch & Marlin, 1982). Since exposure increases liking for foods including vegetables (Anzman-Frasca, Savage, Marini, Fisher, & Birch, 2012; Cooke, 2007; Hausner, Olsen, & Moller, 2012; Mennella, Nicklaus, Jagoline, & Yourshaw, 2008; Wardle, Herrera, Cooke, & Gibson, 2003; Wardle et al., 2003) and liking increases consumption (Baxter & Thompson, 2002; Birch, 1979), finding ways to repeatedly expose children to vegetables which they might initially find somewhat unpalatable is crucial to increasing their liking and consumption. If children taste a vegetable for the first time and the

sensory experience is negative it might be difficult to increase exposure to that vegetable and increase liking.

One place where many children have the opportunity to be exposed to a variety of vegetables is in the school lunchroom. Many students in the US consume two meals a day (breakfast and lunch) and approximately a third of their daily calories at school (Briefel, Wilson, & Gleason, 2009). Instituting changes to the school lunch to increase exposure to vegetables is therefore a reasonable way to increase vegetable consumption and liking in children.

A number of studies have investigated manipulations that increase vegetable consumption in lunchrooms. These include the labels given to vegetables (e.g., Special Mix for Superheroes – Morizet, Depezay, Combris, Picard, & Giboreau, 2012; X-ray Vision Carrots – Wansink, Just, Payne, & Klinger, 2012), reinforcement (Hendy, Williams, & Camise, 2005), school gardens (McAleese & Rankin, 2007; Parmer, Salisbury-Glennon, Shannon, & Struempfer, 2009), increase in vegetable portion size (Miller et al., 2015), and forcing students to choose vegetables from a few options rather than simply being given one particular vegetable (Hakim & Meissen, 2013). These have all been found to increase vegetable consumption and/or selection.

One manipulation that has been found to increase vegetable selection and consumption is having a trained chef in charge of the school lunch (Cohen et al., 2012, 2015). In these studies, increased selection and consumption of vegetables were seen, both versus baseline (Cohen et al., 2015) and versus non-chef-involved control schools (Cohen et al., 2012), which suggests that the vegetables were immediately more palatable in the chef-involved schools than in schools without chef involvement.

In one chef-involved study, Cohen et al. (2015) investigated the change in vegetable selection and consumption over the course of seven months of exposure to chef-involved meals. The increase seen in both measures over the course of the school year (approximately 43% increase in selection and 24% increase in consumption) might reflect a change in liking for the taste of the vegetables due to repeated exposure (i.e., the mere exposure effect). An increase in liking of vegetables due to exposure might translate into a longer-lasting increase in vegetable consumption since children eat what they like (Baxter & Thompson, 2002).

A shift in liking seems a probable source of the increased selection and consumption of vegetables seen in Cohen et al. (2012) and Cohen et al. (2015). But neither study measured children's initial liking for the taste of the vegetables or any growth in liking in the chef-involved schools. If the vegetables in the chef-involved schools are initially more palatable, that might not only increase initial consumption and liking of those vegetables, but might also make repeated consumption more likely. That, in turn, would increase the chances that an increase in liking due to mere exposure would occur (see Liem & de Graaf, 2004). This study investigates the effect of a chef-involved school lunch program (Eatiquette program – <http://www.vetricommunity.org/what-we-do/eatiquette/>) on liking for and consumption of vegetables in both the short-term and over the course of a school year. The program is run by a chef's (Marc Vetri) non-profit foundation. The food served is prepared by chefs at the schools according to recipes produced by chefs at the foundation using fresh foods and from-scratch cooking. The lunch differs from a more traditional lunch in that, among other things, the food is served family style at round tables, which include an adult. Food is served by the children and non-disposable plates, utensils, glasses, and serving dishes are used for the meal.

In the present study consumption of, liking for, and ability to identify vegetables were measured at a school using the Eatiquette program and another school using a more traditional school lunch service at both the beginning and end of the school year. Target vegetable measures were compared between the schools at both

times and were also compared within the schools from the beginning to the end of the year to see if there was an increase in consumption and liking due to repeated exposure.

## 2. Method

The current study included a preliminary assessment of equivalency of vegetable consumption and two main methods of data collection in the two different schools. See Table 1. One was a lunchroom observation, where the amount of target vegetables consumed by individual children was observed and recorded. The second method, individual interviews, assessed children's knowledge of, and liking and ranking of eight common vegetables, including the target vegetables observed in the lunchrooms.

This study was approved by the Montclair State University Institutional Review Board.

### 2.1. Subjects

The subjects were 3rd and 4th grade students (8–10 years of age) attending two urban schools in Philadelphia, PA, USA. The preponderance of students in both schools were African-American (in one school there were 2 Caucasian students) and of low socioeconomic status. This population has been found to have higher rates of obesity and diabetes than the US population as a whole (Ogden, Carroll, Kit, & Flegal, 2014). All students in both schools qualified for a government subsidized free school lunch.

### 2.2. School lunchroom descriptions

In School A, the food in the Eatiquette meals, served one day per week, was made from scratch with fresh ingredients. The day's menu was placed on each table so that the children knew what food they would be served that day. In addition, prior to the meal being served, the chef came into the lunchroom and explained the meal and how it was prepared, so that the children were aware of what they would be eating.

The Eatiquette lunch used family style service, with children seated at round tables seating 4–5 people including an adult. Children were assigned to a table. Based on prior assignment, one child served as the table captain for that table. Table captains arrived before the other children donning a chef-coat appropriate for their sizes and were responsible for setting the table, including pouring the water into the glasses. Non-disposable plates, glasses and cutlery were used. Once the other children arrived, the table captain brought the food to the table. The table captains served the food to each person at their tables (often with the assistance of an adult seated at each table) and then sat down to eat with their tablemates. After the main course was eaten the table captain served the dessert course, which consisted of a fruit preparation. Although the 4th graders ate lunch with the 5th graders and the 3rd graders ate with the 2nd graders, any one table had students from the same grade (with the exception of one 3rd grader who ate with 2nd graders).

School B served a traditional school lunch five days per week that included some components of the Eatiquette program. Table captains set round tables with non-disposable glasses and cutlery prior to the arrival of their classmates. The table captains then served the food to the other children on individually prepared plates where all the meal elements (including dessert) were served simultaneously. The other components of the Eatiquette program, including the chef-prepared food, family-style serving, separate dessert course and adults at the table were not part of this lunch.

All lunch meals were 30 min in duration. The lunches served at the two schools met the USDA requirements for school lunches (Nutrition Standards, 2012).

**Table 1**  
Design of experiment. Children in two schools were observed in the lunchroom and interviewed individually at both the beginning and end of the school year.

	Beginning of school year		End of school year	
	Lunchroom observation of vegetable consumption	Individual student interviews (subgroup of students)	Lunchroom observation of vegetable consumption	Individual student interviews (subgroup of students)
School A (Eatiquette)	Sweet potato fries (n = 24) Cauliflower (n = 26)	Rating & ranking of 8 vegetables (n = 6)	Sweet potato fries (n = 26) Cauliflower (n = 26)	Rating & ranking of 8 vegetables (n = 6)
School B (Traditional)	Sweet potato fries (n = 72) Cauliflower (n = 84)	Rating & ranking of 8 vegetables (n = 22)	Sweet potato fries (n = 61) ----- <sup>a</sup>	Rating & ranking of 8 vegetables (n = 22)

<sup>a</sup> Cauliflower was not observed in School B at the end of the school year.

### 2.3. Target Vegetables

The target vegetables for the main part of the study were sweet potato “fries” (these were sweet potato sticks that were baked, but were called “fries”) and cauliflower. The vegetables were chosen because they were being served in the traditional school (School B) at the beginning of the school year. Although the experimenters had control over what vegetables were served in the Eatiquette school (School A) they had no control over those served in School B (few vegetables that were not mixed with other vegetables were served). Cauliflower was not a well-liked vegetable and had not been served during prior years in the Eatiquette meals. However, sweet potato fries had been served in prior years in both schools. Unfortunately cauliflower was not served at the end of the school year in School B.

The preparation of the cauliflower differed at the two schools. The Eatiquette preparation at School A consisted of fresh cauliflower florets coated in canola/olive oil, seasoned with salt and pepper and roasted. In the traditional preparation at School B the cauliflower was steamed unseasoned florets. The sweet potato fries in the Eatiquette preparation were fresh sweet potatoes cut into slices, coated with olive oil, seasoned with cinnamon, cumin, salt and pepper and baked. Although we are not sure of the exact preparation of the sweet potato fries in the traditional school it appeared that they were a frozen, commercially prepared oil-coated product, baked and seasoned with salt.

The two target vegetables were never served at the same time in either school. Over the course of the year, the cauliflower was served in the Eatiquette meal (School A) and in the traditional meal (School B) four times. The sweet potato fries were served five times in the Eatiquette meal (School A) and eleven times in the traditional meal (School B). These two vegetables were never served at School A during the heat-and-serve meals the students received during the 4 days a week they did not get the Eatiquette meal.

### 2.4. Preliminary test of consumption equivalence between the two schools

In order to ensure that any difference in consumption between the school having the Eatiquette program (School A) and the control school with the traditional lunch (School B) was not the result of children at one school liking vegetables more, or simply eating more than the children at the other school, consumption of green beans was observed at the two schools at the beginning of the school year only. Consumption of this vegetable was observed on a day when School A did not have the Eatiquette prepared lunch but instead had a heat-and-serve lunch (which they had 4 out of 5 days a week) which served vegetables similar to the traditional lunch in School B.

### 2.5. Lunchroom observations

All students who were in the two lunchrooms on the days when either the cauliflower or the sweet potato fries were served were

observed and their consumption was recorded. Twenty-four to 26 students were observed in School A on any given day. Sixty-one to 84 students were observed on any given day in School B.

Observations of an individual child’s consumption in the lunchroom does present some problems such as making sure that one child is not eating another child’s vegetable and individual observer’s differing in their estimation. However, observers were trained and their observations checked against other observers for consistency. In addition, any one observer only had a few children to observe so any movement of food from a child’s plate for any reason other than consumption would have been noticed.

Lunchroom consumption of sweet potato fries and cauliflower in Eatiquette (School A) and traditional (School B) preparations was observed at the beginning of the school year (one day each). Consumption of sweet potato fries was observed at the end of the school year in both preparations however cauliflower was only observed in the Eatiquette (School A) preparation. Cauliflower was not served at the end of the year in School B (traditional).

Children were observed during their 30-min lunch period at the beginning and end of the school year. While the children were eating their meal, observers recorded how much of the target vegetable for that day was consumed by the children during the meal. There were many adults walking around both lunchrooms and the children were not aware of the fact that the observers were interested in their vegetable consumption. A child’s consumption was recorded as falling into one of three categories. If the children ate none of the vegetable, or only tasted it, their consumption was recorded as “none”. If they ate some of the vegetable, but less than all of it, their consumption was recorded as “some”. If they ate all of the serving put on their plate or they consumed seconds (which was often possible with Eatiquette meals due to their family style service and traditional meals due to sharing between children) their consumption was recorded as “all/seconds”.

In addition to the consumption observations, liking ratings for the cauliflower and sweet potato fries were obtained in the lunchroom at the end of the school year in the Eatiquette lunchroom (School A) only. Collection of the liking ratings were not allowed in School B. Each child received a golf pencil and a small slip of paper with visual depictions of four faces, each with a word label of affective value beneath it, and a checkbox available for selection of the proper face, that served as a rating scale. One face was smiling a lot (labeled “really good”), one face was smiling a little (labeled “a little good”), one face was frowning slightly (labeled “a little bad”), and one face was frowning a lot (labeled “really bad”). Such faces are easily used by children 7–10 years of age to report their liking for food (Popper & Kroll, 2005). The observers asked the children to provide liking ratings toward the end of the lunch period.

### 2.6. Individual interviews

Students who participated in this part of the study were a subset of the students from the two schools who were observed in the lunchrooms. Only those children whose parents gave consent for

them to participate and who agreed to participate were included in the interview portion. In School A, six subjects (3 male and 3 female) participated. Four were in 3rd grade and two were in fourth (age  $M = 8.5$  years). In School B, 22 subjects (12 male and 10 female) participated. Fourteen were in 3rd grade and eight were in 4th grade (age  $M = 8.7$  years).

Individual children sat with individual researchers at separate tables in various multipurpose rooms at each school. Each child was interviewed once at the beginning of the school year (October–November) and once at the end of the school year (April–May).

Researchers had an opaque file box filled with eight individual cups of raw vegetables for presentation, data sheets for recording responses, and four table-tents with the rating scale children used in their liking assessments. Each opaque file box contained samples of eight raw vegetables in 6-oz Newspring brand translucent containers for children to view (not to eat): raw baby carrots, cucumber slices, sweet potato sticks, asparagus tops, trimmed green beans, halved/whole Brussels sprouts, cauliflower florets, and broccoli florets. Vegetables were kept chilled with ice packs until presentation time to preserve their appearance over the testing session.

The four Plexiglas table tents each measured 4" × 6". Each table tent had a piece of paper inside with one of the pictures of the faces and word labels used in the Eatiquette lunchroom to measure liking (see above). These were always arranged in order on the table with "really good" on the left to "really bad" on the right.

Children were asked to provide demographic information including their name, age, and grade. Then researchers pulled cups of vegetables out of their file box in random order, removed the top of the container for better viewing, and asked children if they knew what the vegetable was called. When not correctly identified the correct name was provided to the child. Children were then asked if they had ever eaten the vegetable. Then the child was asked to place the cup containing the vegetable in front of one of the four faces of the rating scale to indicate how they thought it would taste if it were prepared for them in any manner they would want. This is therefore an "expected liking" measure since children could imagine a vegetable prepared in many ways. While this might have increased the variability of ratings, it also gave a measure of how the child thought about the taste of the vegetable. We were not interested in how much they liked the taste of the vegetables when uncooked or prepared in any specific way. This procedure was repeated for all eight vegetables. Finally, children were asked to rank the vegetables. If they had rated more than one vegetable "really good", they were asked which was their favorite vegetable, next favorite, and so on. The same procedure was followed for those vegetables rated "a little good", then "a little bad", then "really bad", until all vegetables were ranked from best (1) to worst (8). Children were thanked for their participation and offered a piece of fruit to take back to their classrooms or lunch.

### 3. Data analysis

Consumption data (number of subjects eating none, some, or all/seconds of the vegetable for the day), both in the preliminary test of consumption equivalency and also the tests of consumption of the two target vegetables, were analyzed using chi-square tests. Cramer's  $V$  was used to compute the effect size. This test was used to compare the consumption patterns of a particular vegetable between children at the two schools. It was also used to compare consumption patterns of the target vegetables within a school at the beginning and the end of the school year. Although the chi-square test is a test for independent samples we used it when comparing consumption in children in the same school (mostly the same children) at two different points in time. Since we were not

allowed to identify the children in the lunchroom we had no way to compare a particular child's consumption at the beginning of the year with their consumption at the end of the year. We were also not able to determine how many of the children ate lunch on both of the days we were comparing. Since comparing the same subjects at two different points in time in such a test should reduce the likelihood of finding a significant difference in consumption (we would expect a child's consumption of a particular vegetable would tend to be similar on the two occasions) using this test should be somewhat conservative. Bonferroni corrections were used to adjust the  $\alpha$ -level for both the sweet potato and cauliflower data (corrected  $\alpha = 0.01$ ). In addition, we report the number and percentage of subjects who ate none, some, or all of the vegetables.

In the interview part of the study the change in number of vegetables identified correctly between the beginning and the end of the school year was analyzed for each school. Paired  $t$ -tests compared the number of correctly identified vegetables from the beginning to the end of the year.

Also in the interview part of the study each child's rating and ranking of each vegetable at the end of the year was subtracted from their rating and ranking for that vegetable at the beginning of the year. This allowed us to compare the size of the change in ratings and rankings for the vegetables between subjects in the two schools. The change scores for School A children receiving the Eatiquette lunch were compared to the change scores for the children in School B using  $t$ -tests. Cohen's  $d$  was used to measure effect size. Since eight vegetables were tested the  $\alpha$ -level was adjusted using the Bonferroni correction ( $0.05/8 = 0.006$ ).

## 4. Results

### 4.1. Preliminary test of consumption equivalency

The green bean consumption of the children at School A on a day they received heat-and-serve lunch was not significantly different from that of the children at School B getting the traditional lunch,  $\chi^2(2) = 1.04$ ,  $p = 0.59$ , Cramer's  $V = 0.11$ . At both schools a large proportion of the students ate none of the green beans (School A – 75%, School B – 66%).

### 4.2. Lunchroom observation consumption

There was a significant difference in the patterns of consumption of the sweet potato fries served at the two schools at the beginning of the year,  $\chi^2(2) = 9.6$ ,  $p = 0.008$ , Cramer's  $V = 0.32$ . See Table 2. While only 12.5% of the students ate none of the sweet potato fries served at the Eatiquette lunch in School A, almost half (46%) ate none at School B's traditional lunch. The same pattern was seen for the cauliflower, although the difference between the schools was not statistically significant,  $\chi^2(2) = 4.62$ ,  $p = 0.10$ , Cramer's  $V = 0.20$ . See Table 3.

Although both sweet potato fries and cauliflower were served at both schools at the beginning of the school year, the cauliflower

**Table 2**

Percentage (number) of subjects at School A (Eatiquette) and School B (Traditional) who consumed none, some, or all/seconds of the sweet potato fries at the beginning and end of the school year.

Amount consumed	Beginning of year		End of year	
	School A (Eatiquette)	School B (Traditional)	School A (Eatiquette)	School B (Traditional)
None	12.5% (3)	46% (33)	19% (5)	61% (37)
Some	50% (12)	37.5% (27)	31% (8)	18% (11)
All/seconds	37.5% (9)	17% (12)	50% (13)	21% (13)



**Table 3**

Percentage (number) of subjects at School A (Eatiquette) and School B (Traditional) who consumed none, some, or all/seconds of the cauliflower at the beginning and end of the school year. Note that School B was not served cauliflower at the end of the school year.

Amount consumed	Beginning of year		End of year	
	School A (Eatiquette)	School B (Traditional)	School A (Eatiquette)	School B (Traditional)
	None	31% (8)	55% (46)	8% (2)
Some	38% (10)	24% (20)	23% (6)	—
All/seconds	31% (8)	21% (18)	69% (18)	—

was not served in School B during the Traditional lunch at the end of the school year. We therefore only have data comparing consumption of the sweet potato fries in the two schools at the end of the year. As at the beginning of the year, the consumption pattern was significantly different between the Eatiquette lunch in School A and the traditional lunch in School B at the end of the year,  $\chi^2(2) = 12.85$ ,  $p = 0.002$ , Cramer's  $V = 0.38$ . As at the beginning of the year, fewer students refused to eat any of the sweet potato fries when served in the Eatiquette lunch at School A (19%) than when served in the traditional lunch at School B (61%). See Table 2.

The consumption patterns for the two schools from the beginning to the end of the year were different for the two schools for the sweet potato fries. There was a marginally significantly different pattern of consumption of sweet potato fries from the beginning to the end of the year in the traditional lunch,  $\chi^2(2) = 6.14$ ,  $p = 0.04$ , Cramer's  $V = 0.21$ . By the end of the year there were more children eating none of the fries (61%) than at the beginning (46%). There were also fewer children eating some of the fries. See Table 2.

However, there was no difference in the pattern of consumption of the sweet potato fries from the beginning to the end of the year when served in the Eatiquette lunch,  $\chi^2(2) = 1.95$ ,  $p = 0.38$ , Cramer's  $V = 0.20$ . When the children were asked to rate how much they liked the sweet potato fries at the end of the year 77% indicated that the fries were good (50% really good) while only 23% thought they were bad (only 4% really bad).

Although there was no change in the pattern of consumption for the sweet potato fries in the Eatiquette lunch over the course of the year, there was, a significant change in the pattern of consumption for the cauliflower when served in the Eatiquette lunch,  $\chi^2(2) = 8.45$ ,  $p < 0.015$ , Cramer's  $V = 0.40$ . See Table 3. This is a vegetable that was new to the students in the Eatiquette lunch. Unlike the sweet potato fries, they had never had cauliflower in an Eatiquette lunch prior to the observed school year. Only 8% of the children ate none of the cauliflower by the end of the year (compared to 31% at the beginning). In addition, by the end of the year 69% were eating all of the cauliflower on their plate or taking seconds whereas at the beginning of the year only 31% had done so. When the children in the Eatiquette lunchroom were asked to rate how much they liked the cauliflower at the end of the year 81% said it was "really good", 15% said it was "a little good", and only one child said it was "a little bad".

### 4.3. Individual interviews

#### 4.3.1. Vegetable identification accuracy

The children at both schools were able to accurately identify significantly more of the eight vegetables they were shown at the end of the school year than at the beginning [School A –  $t(5) = 2.74$ ,  $p = 0.04$ ; School B –  $t(21) = 4.17$ ,  $p = 0.0004$ ]. In both schools, vegetable identification accuracy increased by about one vegetable, from six to seven of the eight total vegetables.

**Table 4**

Mean (standard deviation) of the hedonic ratings (1 = really good to 4 = really bad) of all vegetables at the beginning and the end of the year at School A and School B.

Vegetable	School A (Eatiquette) (n = 6)		School B (Traditional) (n = 22)	
	Beginning	End	Beginning	End
	Green bean	1.42 (0.49)	1.17 (0.41)	1.82 (0.85)
Asparagus	2.33 (0.52)	2.33 (1.03)	3.00 (1.11)	3.00 (1.15)
Cauliflower <sup>a</sup>	3.00 (1.26)	1.00 (0)	2.50 (1.06)	2.48 (1.03)
Cucumber	1.58 (0.80)	1.00 (1.0)	1.71 (1.06)	1.64 (0.73)
Sweet potato	2.00 (1.26)	1.50 (0.55)	2.09 (1.15)	1.77 (0.87)
Brussels sprouts	2.17 (0.98)	2.17 (1.17)	2.68 (1.17)	2.45 (1.34)
Broccoli	1.17 (0.41)	1.00 (0)	1.50 (0.67)	1.86 (0.84)
Carrot	1.25 (0.42)	1.17 (0.41)	1.41 (0.67)	1.64 (0.79)

<sup>a</sup> Indicates a statistically significant difference between the schools in the degree of change in rating from beginning to end of the school year.

#### 4.3.2. Hedonic ratings of the eight vegetables

The children in School A (Eatiquette) showed a significantly larger increase in their hedonic rating of the cauliflower ( $M = 2$ ,  $SD = 1.26$ ) than did School B (Traditional) children who showed no change in hedonic rating from the beginning to the end of the year ( $M = 0$ ,  $SD = 1.04$ ),  $t(25) = 3.97$ ,  $p = 0.0005$ , Cohen's  $d = 1.84$ . See Table 4. In School A (Eatiquette) the rating of the cauliflower went from a mean of 3 (corresponding to "a little bad") to 1 ("really good"). Out of the six children interviewed, five increased their rating of the cauliflower (one child rated it as a 1 at the beginning of the year). All six rated it as 1 ("really good") in the final interview.

There were no other significant differences in the size of the shift in hedonic ratings for any of the other vegetables between the two schools (all  $p > 0.15$ ). In particular, there was no difference in the change in liking from the beginning to the end of the year between the two schools for the other target vegetable, sweet potatoes,  $t(26) = 0.35$ ,  $p = 0.73$ , Cohen's  $d = 0.16$ . At testing at the beginning and the end of the year children rated the sweet potatoes as well liked in both schools (Eatiquette School A –  $M_{pre} = 2$ ,  $M_{post} = 1.5$ ; Traditional School B –  $M_{pre} = 2.1$ ,  $M_{post} = 1.8$ ). See Table 4.

Most students had previously eaten the vegetables offered. The one vegetable, which many children (13 of 28) indicated they had never eaten, was Brussels sprouts. The hedonic ratings for the Brussels sprouts did not differ between those students who said they had eaten them and those who said that they hadn't,  $t(26) = 0.94$ ,  $p = 0.36$ , Cohen's  $d = 0.36$ .

#### 4.3.3. Hedonic ranking of the eight vegetables

In addition to showing an increase in their liking ratings for the cauliflower, the children in School A (Eatiquette) showed a significantly larger increase in their rankings of the cauliflower

**Table 5**

Mean (standard deviation) of the ranking (1 = most liked to 8 = least liked) of all vegetables at the beginning and the end of the year at School A and School B.

Vegetable	School A (Eatiquette) (n = 6)		School B (Traditional) (n = 22)	
	Beginning	End	Beginning	End
	Green bean	3.50 (1.87)	3.33 (1.97)	4.27 (1.80)
Asparagus	5.83 (1.47)	7.17 (0.75)	6.36 (2.17)	6.50 (1.94)
Cauliflower <sup>a</sup>	6.67 (2.42)	2.83 (2.14)	5.32 (2.17)	5.41 (1.84)
Cucumber	3.83 (1.94)	3.33 (1.37)	3.77 (2.41)	3.5 (1.99)
Sweet potato	4.67 (2.25)	5.17 (2.79)	4.09 (2.35)	4.04 (2.44)
Brussels sprouts	6.33 (1.63)	6.33 (2.25)	5.82 (2.02)	4.91 (2.45)
Broccoli	2.33 (1.21)	3.83 (1.60)	3.14 (1.28)	4.00 (1.90)
Carrot	2.83 (1.83)	4.00 (1.90)	3.23 (1.92)	3.82 (2.42)

<sup>a</sup> Indicates a statistically significant difference between the schools in the degree of change in ranking from beginning to end of the school year.

( $M = 3.83$ ,  $SD = 2.64$ ) than did School B (Traditional) children who showed no change in ranking of the cauliflower ( $M = -0.09$ ,  $SD = 2.41$ ) from the beginning to the end of the year,  $t(26) = 3.46$ ,  $p = 0.002$ , Cohen's  $d = 1.60$ . In School A (Eatiquette), the children's ranking of the cauliflower went from a mean rank of 6.7 at the beginning of the year to 2.8 at the end. See [Table 5](#).

As expected, there were no other significant differences in the size of the shift in rankings for any of the other vegetables between the two schools (all  $p > 0.25$ ). In particular, there was no difference in the change in ranking from the beginning to the end of the year between the two schools for the other target vegetable, sweet potatoes,  $t(26) = 0.32$ ,  $p = 0.75$ , Cohen's  $d = 0.15$ . See [Table 5](#).

## 5. Discussion

The chef-involved school lunch (Eatiquette) resulted in greater consumption of the target vegetables at both the beginning of the year and the end of the year. The greater consumption of the target vegetables at the beginning of the year (only significant for the sweet potato fries) in the chef-involved Eatiquette lunch suggests that some factor(s) of the Eatiquette meal increases initial consumption. Since no difference in green bean consumption was seen between the same children in the same two schools during days when the Eatiquette lunch was not served in School A, it appears that some aspect of the Eatiquette meal service, rather than differences in some other factor at the schools, is responsible for the children eating more vegetables. Although there are many aspects of the program that could be responsible for this initially greater consumption, we suspect that the palatability of the food is one primary driver as found in the studies of [Cohen et al. \(2012\)](#) and [Cohen et al. \(2015\)](#).

While the amount of cauliflower consumed by children in the Eatiquette school was a bit higher than in the school serving the traditional lunch when initially served, the amount consumed increased significantly over the course of the year. Also, the children in the Eatiquette program showed an increase in liking and ranking of cauliflower from the beginning to the end of the school year whereas no such increases occurred among the children eating the traditional meal. These results suggest that the longer-term effects are not entirely the result of the palatability of the vegetables. In addition, we think that the mere exposure effect was at work ([Birch & Marlin, 1982](#)). Research has shown that increases in liking and consumption can occur with as little as one exposure ([Birch, Gunder, Grimm-Thomas, & Laing, 1998](#)) but most studies use five to 10 exposures (see [Cooke, 2007](#)). Our target vegetables were served four to 11 times in the lunchroom. However, unlike most studies of mere exposure where children are given a "taste" of food our children were served a lunch-size portion, which could result in multiple "tastes". This might facilitate the mere exposure effect.

Whatever the cause, the increase in liking for the cauliflower in the Eatiquette lunch was quite dramatic. Children getting the Eatiquette lunch indicated that the cauliflower was "a little bad" at the beginning of the year (prior to being served the vegetable) and ranked it as the worst of the eight vegetables, by the end of the year its hedonic rating had increased to "really good" and its ranking improved to the best vegetable out of the eight. Even the children seemed surprised by their shift in liking for the cauliflower. This was made clear at the beginning of the final cauliflower lunchroom observation of the Eatiquette lunch. At that lunch one of the children who had been interviewed at the beginning of the year motioned to an observer that she wanted to talk to her. The student, distressed, said, "When you asked me if I liked cauliflower I said I didn't but I *really like* this cauliflower!" She was assured that she would be asked again about how much she likes cauliflower and could change her answer if she wanted to do so.

Clearly certain aspects of the Eatiquette program resulted in increased tasting of the cauliflower (mere exposure), which led to increased consumption (resulting in more exposure) and ultimately increased liking for the cauliflower over the school year. One of those aspects of the Eatiquette lunch which increases tasting of the vegetables, is the encouragement by the adult at the table to taste all of the components of the meal. In a traditional school lunch meal, although the students have the vegetable on their plate or tray, they do not have to eat it and are generally not encouraged to try it by someone involved enough to make sure they do. That was certainly the case in the traditional School B meal. If the children never had eaten a particular vegetable or if they had it prepared in an unappetizing way, they would be hesitant to eat it and might well not even taste it. That is what we noticed in many cases in the traditional lunchroom where many students dumped the vegetables (and much of their meal) in the garbage without tasting them. In the Eatiquette lunch, encouragement to try the vegetable led to tasting it. That allowed the children to find out that the vegetable did not taste as bad as they expected and also began the exposure process leading to the ultimate increase in both consumption and liking.

While we found a very large effect of the Eatiquette program on consumption of and liking for the cauliflower, the effect was not as pronounced with the sweet potato fries. Consumption of the sweet potato fries was greater in the Eatiquette lunch than in the traditional lunch, but there was no difference in liking for sweet potatoes. Also, there was no significant increase in consumption of or liking for the sweet potato fries over the course of the year in the Eatiquette lunch. The failure to see an increase in any of the measures for this vegetable in the Eatiquette lunch is most likely due, in part, to the fact that this vegetable was not novel. The children had eaten sweet potato fries in previous years so that vegetable was as well-liked as it was going to be. It should be noted that the high consumption of the sweet potato fries was maintained in the Eatiquette lunch over the course of the year, however there was a decrease in consumption in the traditional lunch despite the fact that children in the traditional lunch received this vegetable twice as often as those getting the Eatiquette lunch. It is possible that this shift is due to overexposure ([Stang, 1975](#)) since the children eating the traditional lunch had sweet potato fries 11 times during the year and the children eating the Eatiquette lunch only had that vegetable five times.

### 5.1. Limitations

Clearly more research on the effectiveness of this program is needed since the current study was only able to test the change in consumption for one novel vegetable in one school. Further research is needed on more vegetables, in more schools with larger numbers of students, looking at changes in liking and consumption over time and focused on specific aspects of the program. It would also be interesting to test the Eatiquette vegetable preparations and more traditional vegetable preparations in the same children at the same time so that the children could compare the two preparations. Since other studies have found increases in vegetable consumption with chef-prepared meals ([Cohen et al., 2012, 2015](#)) and serving the fruit as a separate dessert course ([Zellner & Cobuzzi, 2016](#)), both components of the Eatiquette lunch, we believe that those two aspects of the Eatiquette program contribute to the current results. Others, such as the adult at the table and the family-style service, should be examined.

Implementing some but not all of the components of the program might be easier to realize in more schools. Many schools are resistant to a lunch program such as Eatiquette. One reason often given for not implementing such a lunchroom service is cost. An Eatiquette lunch's food costs are the same or only slightly more

per student (\$0 to \$0.50 USD) than the average school lunch. Additional costs might be incurred in labor costs since scratch food requires more preparation and real plates and silverware require dishwashing. The Eatiquette lunch program is run by a nonprofit that provides training for kitchen staff in the preparation of the food (including recipes) and volunteers who help in the preparation of the food. They also provide recipes to other schools with whom they are not directly involved for a small fee on a sliding scale (based on income level of the students they serve).

Similar nonprofit organizations might be able to help schools in other areas implement similar programs. In addition, further research might shed light on certain factors in the program that could be implemented in a more traditional lunchroom to increase vegetable consumption. A little more cost might be worthwhile in the long-run if it improves people's health.

## 5.2. Conclusions

What we can conclude from this study is that the Eatiquette program resulted in increased consumption of and liking for vegetables in 3rd and 4th grade children. The increased consumption is important for reducing food waste and for the short-term nutrition of these students. In addition, we hope that the increase in reported liking for the cauliflower will increase long-term cauliflower consumption. If the children consider themselves to be individuals who like cauliflower they are more liable to seek it out and eat it when it is available. Unfortunately, if a child's only exposure to a vegetable is in an unpalatable preparation, they might interpret that to mean that they don't like the vegetable prepared in any manner and never try it again. We think that the Eatiquette program can teach the child that there is not a bad-tasting vegetable, just a bad preparation. So even if they encounter cauliflower which is prepared in such a way as to render it unpalatable they will, one can hope, realize that they don't like that particular cauliflower but do like cauliflower prepared differently.

While more research is needed to investigate different aspects of this program, we think that the adoption of such a program in schools has the potential to have a positive impact on the health and well-being of children now and when they are adults. This is particularly important among African-Americans who were the preponderance of our subjects. The rate of obesity and diabetes is higher in this population than in the US population as a whole (Ogden et al., 2014). Since eating a lot of fruits and vegetables reduces the risk of obesity (Field et al., 2003; McCrory et al., 1999; Tohill et al., 2004) and thus diabetes (Ford, Williamson, & Liu, 1997; Golay & Ybarra, 2005), instituting such a program in the schools might increase both the short-term and long-term health of the children.

Since about a third of the daily calories of many children are eaten in the school (Briefel et al., 2009), children in lunch programs which increase consumption of healthy foods will be getting the nutrition they need for the day. Unfortunately, although the US school lunch program requires that students put a nutritious meal on their plate (Nutrition Standards, 2012), that doesn't mean that they will eat it. If they don't eat it, the only outcome of having them put nutritious food on their plate is an increase in food waste. It does not by itself increase the health of the children now, or later when they are adults.

## Acknowledgments

This project was conducted while Debra Zellner was on sabbatical leave from Montclair State University and working as a Visiting Scientist at the Monell Chemical Senses Center in Philadelphia, PA, USA.

The authors would like to thank the Barra Foundation and the Vetri Foundation for Children (now Vetri Community Partnership) for their support of this study. In particular, we would like to thank Kelly Herrenkohl, Jennifer Wheeler, Sarah Cullen, Carla Norelli, and Tia McDonald. We would also like to thank Eric Jones, Beth Vaccaro, Heather Lewis, David Davis, Francine Alston, and Chrystina Volcy at the Community Partnership School in Philadelphia and Jamal Elliott at the Wissahickon Charter School for allowing us to do research in their school's lunchroom. We also thank Carol Christensen, Jenifer Trachtman and Gary Beauchamp at the Monell Chemical Senses Center for making this project possible, Rebecca Patenaude for her valuable assistance with data collection, Scott Parker for his statistical advice and helpful comments on this manuscript and Richard Popper for consulting on the hedonic face scale.

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