

## **The Sustained Impact of Teacher Encouragement on Elementary Students' Vegetable Snack Consumption: Initial Findings from a Wisconsin Study**

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### **ABSTRACT**

#### **Purpose/Objectives**

The purpose of this study was to determine the impact of teacher encouragement on elementary school student vegetable snack consumption.

#### **Methods**

Twelve Wisconsin elementary school teachers were randomly assigned different levels of encouragement procedures during vegetable snack time. The consumption levels of 218 students were measured for three different vegetables over an eight week period (September 19-November 18, 2016). All vegetables were served eight times with teachers providing varying levels of assigned encouragement for the first six servings and refraining from any form of encouragement during the seventh and eighth servings. Consumption outcomes were measured by weighing individual snack cups pre and post snack time. This study reports on the first, seventh, and eighth servings of each vegetable.

#### **Results**

Independent-samples t-tests showed statistically significant higher proportions consumed for day one vegetable servings for the highest level of teacher encouragement vs. no encouragement across all vegetables (tomatoes  $0.563 > 0.265$ ,  $p < 0.01$ ; carrots  $0.845 > 0.618$ ,  $p < 0.01$ ); peppers  $0.507 > 0.274$ ,  $p < 0.01$ ). Statistically significant higher consumption remained for the high level encouragement group compared to no encouragement at the seventh (tomatoes  $0.502 > 0.173$ ,  $p < 0.01$ ; carrots  $0.787 > 0.543$ ,  $p < 0.01$ ; peppers  $0.514 > 0.305$ ,  $p < 0.01$ ) and eighth (tomatoes  $0.506 > 0.184$ ,  $p < 0.01$ ; carrots  $0.800 > 0.590$ ,  $p < 0.01$ ; peppers  $0.443 > 0.288$ ,  $p = 0.05$ ) serving for each vegetable even though all encouragement had ceased.

#### **Applications to Child Nutrition Professionals**

Teacher encouragement is essential when initially implementing elementary school vegetable snack programs because of the strong positive and potentially lasting impact on student consumption.

**Keywords:** vegetable snacks; nutrition; childhood obesity; teachers; elementary schools

### **INTRODUCTION**

The importance of fruit and vegetable consumption on children's health is well documented. Research regarding the determinants of obesity found that eating patterns which lacked fruits and vegetables in childhood contributed to the development of obesity related diseases, including diabetes and hypertension (Popkin & Gordon-Larsen, 2004), and certain cancers (Maynard, Gunnell, Emmett, Frankel, & Smith, 2003; Tantamango, Knutsen, Beeson, Fraser, & Sabate,

2011). Numerous studies have also found that childhood intake of fruit and vegetables impacted consumption later in life (Maynard et al., 2005; Neumark-Sztainer, Wall, Larson, Eisenberg, & Loth, 2011; Nicklaus & Remy, 2013). Despite the multiple benefits, the majority of U.S. children fail to meet suggested fruit and vegetable consumption guidelines levels (Banfield, Liu, Davis, Chang, & Frazier-Wood, 2016; Beck et al., 2015).

Numerous studies have attempted to quantify the success of various programs aimed at changing attitudes and/or behavior of children with respect to fruits and vegetables (Evans, Christian, Cleghorn, Greenwood, & Cade, 2012; Knai, Pomerleau, Lock, & McKee, 2007). Although there has been documented success from such programs, improving vegetable intake has been found to be more difficult compared to fruits (Bartlett et al., 2013; Evans et al., 2012; Jamelske & Bica, 2014; Lin & Fly, 2016). That said, increasing children's vegetable consumption can more effectively address rising obesity because of lower sugar/caloric content compared to fruits (Centers for Disease Control and Prevention, 2012).

This study examined the impact of teacher encouragement activities on elementary school children's consumption of vegetable snacks. In particular, students' vegetable snack intake was compared across randomly assigned levels of teacher encouragement. This study addressed two common issues in the existing literature related to teacher involvement. First, the focus was solely on teacher encouragement without other simultaneously occurring interventions. Two systematic reviews of strategies to improve school children's intake of fruits and vegetables (Dudley et al., 2015; Knai et al., 2006) reported that curriculum-based approaches often had significant impacts on fruit and vegetable preferences and/or intake. However, the vast majority of studies contained multi-component approaches including interventions such as parental involvement, school garden participation and farm visits, making it difficult to understand the specific impact of teacher involvement. A second major concern related to school interventions aimed at improving childhood nutrition is the potential increase of financial and time burdens on already scarce school resources (Dudley et al., 2015; Evans et al., 2012; Sharma, 2007; Stice, Shaw, & Marti, 2006). This study contributed to the literature by examining whether or not simple, relatively non-resource intensive teacher involvement during snack time can, on its own, influence children's vegetable intake.

## **METHODS**

Participants in this study were students and teachers in twelve K-3 classrooms, three classes from each grade from one Wisconsin elementary school (N=218). Student participation consisted of being served vegetable snacks, potentially being exposed to encouragement from teachers and having their consumption recorded. Based on administrative data, boys constituted 54.1% of the student sample with age ranging from five to nine years old with an average age of 7.2 (SD=1.2). In terms of race/ethnicity 97.2% of students identified as Caucasian/White, 2.3% as African American/Black and 0.5% as Asian American/Pacific Islander. Lastly, 28.9% of students were eligible for free/reduced price school meals. These student characteristics were generally consistent across assigned encouragement conditions.

One classroom from each grade was randomly assigned to one of three encouragement conditions as follows: No Encouragement (NE, serve vegetable to students, N=73), Moderate Encouragement (ME, serve vegetable and encourage students to taste/try/eat the snack, N=73), and High Encouragement (HE, additional activities beyond simple positive encouragement, N=72). Teachers' participation consisted of overseeing the snack period in their classroom and encouraging students to taste/try/eat the vegetables as designated by their assigned

encouragement condition. The encouragement activities were in line with current research related to the promotion of healthy eating habits in children (Galloway, Fiorito, Francis, & Birch, 2006; Eliassen, 2011; Birch, Birch, Marlin, & Kramer, 1982). In particular, while teachers often discussed the value of eating vegetables and encouraged children to experience textures and tastes, no incentives for eating nor negative consequences for not eating were implemented. Specific examples of ME activities involved discussing the benefits of healthy eating while distributing the snacks and suggesting that students might enjoy trying at least a bite of the vegetable or maybe even smell and/or lick the vegetable. Examples of the HE activities included more substantial conversation and dialogue between the teacher and students and among students as well as singing vegetable songs during snack time and/or having short educational projects related to the vegetables served in addition to the activities performed by ME teachers.

Teachers assigned to both ME and HE conditions were provided with guidelines including a sample script to follow as they encouraged their students, but were specifically instructed to do things that were natural and comfortable for them and let the process of encouragement evolve spontaneously. The flexibility for teachers to choose which types of encouragement activities fit best within their classroom and teaching style was in line with research highlighting the benefits of teacher driven variation when promoting fruit and vegetable consumption (Rosário et al., 2012). Lastly, ME and HE teachers were also asked to model good behavior by eating the vegetables themselves, which has been shown to encourage healthy eating in children (Eliason, 2001; Galloway et al., 2006). Teachers in the NE condition were told they could eat the snacks, but specifically instructed to not draw attention to themselves if they chose to consume the vegetable.

Over an eight week period, one of three different vegetable snacks (baby carrots, grape tomatoes, and green pepper strips) were served on Monday, Wednesday and Friday from September 19 – November 18, 2016. These three vegetables were chosen because carrots would likely be familiar and liked by children, while both tomatoes and peppers would be less familiar/liked. The study length of 24 days consisting of eight servings of each vegetable resulted from negotiation with the food service director, principal and teachers. This compromise yielded ample data to identify both an immediate effect and short term sustained effect of encouragement on children's vegetable consumption, while also limiting the intrusion of the research project on normal school activities. Additionally, the number of times children need to be exposed to a new vegetable before they potentially change their preferences remains inconclusive. Although one study found more than eight exposures were necessary to change children's opinions of new foods (Lakkakula, Geaghan, Zanovec, Pierce, & Tuuri, 2010), others found that eight servings were enough to positively impact both children's opinion and consumption of certain vegetables (Anzman-Frasca, Savage, Marini, Fisher, & Birch, 2012; Wardle, Herrera, Cooke, & Gibson, 2003).

All snacks were prepared, pre-weighed and delivered to classrooms by researchers in individual cups labeled with unique student ID numbers. No dips or seasonings were added to the vegetables. Great attention was given to providing the same snack serving size within two grams to all students over the entire study period for each vegetable respectively. Students were instructed to not share snacks and to leave all uneaten vegetables in their own cups. Researchers also collected the leftover snacks for post weighing. All observed measured weights including pre-weights, post-weights and empty cup weights were recorded by researchers for each child individually by ID number. For the first six servings of each vegetable, teachers delivered encouragement based on their assigned intervention condition. For the final two servings, all encouragement activities were removed.

This study received Institutional Review Board approval from University of Wisconsin-Eau Claire. No incentives were provided to influence student or teacher participation. Our primary outcome was proportion consumed calculated as  $(\text{pre} - \text{post weight})/(\text{pre} - \text{cup weight})$  yielding an intake measure ranging from 0.00 to 1.00 for each student for each day that each vegetable was served. Each vegetable was analyzed separately using Stata (StataCorp LP, College Station, TX). Independent-sample t-tests were used to assess differences in student consumption across the three encouragement conditions for each vegetable. Key results from the first, seventh, and eighth servings were examined in this study.

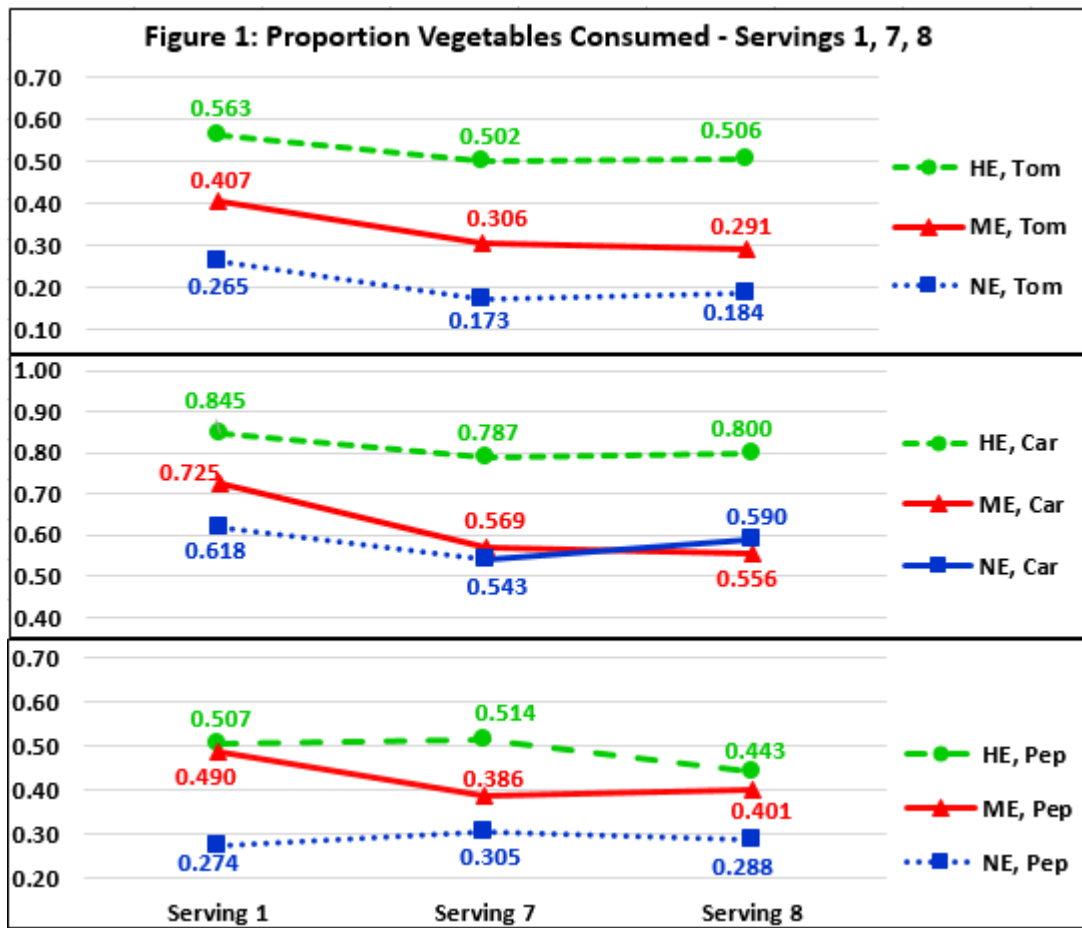
## RESULTS

Tomato consumption for the first serving was significantly higher for HE students compared to NE students ( $0.563 > 0.265$ ,  $p < 0.01$ ) and ME students ( $0.563 > 0.407$ ,  $p = 0.05$ ). The difference in tomato consumption was also significant between ME and NE students ( $0.407 > 0.265$ ,  $p = 0.05$ ). The first serving of carrots yielded a similar pattern with significantly higher consumption for HE students compared to NE students ( $0.845 > 0.618$ ,  $p < 0.01$ ) and ME students ( $0.845 > 0.725$ ,  $p = 0.05$ ). The difference in carrot consumption was not significant between ME and NE students ( $0.725 > 0.618$ ,  $p = 0.12$ ).

Finally, day one consumption of peppers was also significantly higher for HE students compared to NE students ( $0.507 > 0.274$ ,  $p < 0.01$ ), but not significantly higher than ME students ( $0.507 > 0.490$ ,  $p = 0.83$ ). Pepper consumption for ME students was significantly higher than for NE students ( $0.490 > 0.274$ ,  $p < 0.01$ ).

When all encouragement activities were discontinued, consumption on the seventh and eighth servings of each vegetable generally decreased for all groups compared to the first serving, but the pattern of consumption differences across interventions remained similar. Tomato consumption for the seventh serving was significantly higher for HE students compared to NE students ( $0.502 > 0.173$ ,  $p < 0.01$ ) and ME students ( $0.502 > 0.306$ ,  $p = 0.01$ ) with similar results for the eighth serving: HE students compared to NE students ( $0.506 > 0.184$ ,  $p < 0.01$ ) and compared to ME students ( $0.506 > 0.291$ ,  $p < 0.01$ ). The difference in tomato consumption was not significant between ME and NE students for either the seventh ( $0.306 > 0.173$ ,  $p = 0.06$ ) or eighth serving ( $0.291 > 0.184$ ,  $p = 0.12$ ).

Carrot consumption for the seventh serving was also significantly higher for HE students compared to NE students ( $0.787 > 0.543$ ,  $p < 0.01$ ) and ME students ( $0.787 > 0.569$ ,  $p < 0.01$ ) with similar results for the eighth serving: HE students compared to NE students ( $0.800 > 0.590$ ,  $p < 0.01$ ) and ME students ( $0.800 > 0.556$ ,  $p < 0.01$ ). For the seventh serving, although consumption for the ME students was higher than the NE students, the results were not significant ( $0.569 > 0.543$ ,  $p = 0.73$ ). Consumption for ME students was actually less than NE students for the eighth serving, but this difference was also not significant ( $0.556 < 0.590$ ,  $p = 0.67$ ).



**Note:** Consumption is measured as the difference between vegetable snack pre-weight and post-weight presented as the proportion consumed; minimum = 0, maximum = 1.

Similarly, consumption of peppers was significantly higher for HE students compared to NE students for both the seventh ( $0.514 > 0.305$ ,  $p < 0.01$ ) and eighth servings ( $0.443 > 0.288$ ,  $p = 0.05$ ). Although higher, the difference in consumption of peppers for the HE students was not significant compared to ME students for the seventh ( $0.513 > 0.386$ ,  $p = 0.11$ ) or eighth servings ( $0.443 > 0.401$ ,  $p = 0.61$ ). Pepper consumption for ME students was also higher than for NE students during the seventh ( $0.386 > 0.305$ ,  $p = 0.28$ ) and eighth servings ( $0.401 > 0.288$ ,  $p = 0.14$ ), but, again, this difference was not significant. The summaries of consumption levels across all vegetables for servings one, seven, and eight are displayed in Figure 1.

Of note, although not reported in detail in this study, average consumption rates for servings 2-6 of tomatoes, carrots and green peppers remained generally consistent for each encouragement level with the high encouragement group consuming more vegetables and the lower encouragement groups consuming less. Each group also experienced slight declines in average intake for all three vegetables during these middle servings suggesting that all children were settling into their consumption norms.

### APPLICATIONS TO CHILD NUTRITION PROFESSIONALS

Study findings suggest that both moderate and high levels of teacher encouragement had a statistically significant impact on consumption of vegetable snacks the first time they were served to elementary school students. In addition, the pattern of higher rates of vegetable

consumption generally remained statistically significant for the final two servings even after all encouragement activities had ceased. These findings highlight the immediate positive and potentially lasting impact a small amount of teacher involvement can have on children's vegetable consumption in school. While other research has also found that teacher involvement played a significant role in children's vegetable consumption (Dudley et al., 2015; Knai et al., 2005, Rosário et al., 2012), this study separated teacher encouragement during snack time from all other nutrition programs and experiential activities. The findings suggest that impactful activities may not need to be costly or extensive when delivered by a teacher during snack time.

The primary limitation of this study is that it only included data from a single Wisconsin elementary school consisting of a relatively homogeneous population and therefore is not generalizable to the national level. Additionally, the duration of the study covered only 24 servings of three vegetables with only two servings after teacher encouragement activities were discontinued. Thus more research is needed among varied populations and for longer time frames using a wider variety of vegetables to increase the understanding of the impact of teacher encouragement on children's consumption of vegetables for school snack. Finally, teachers assigned to both ME and HE conditions were asked to record their specific encouragement activities as they evolved during the study. However, the information received from them at the conclusion of the study was limited. This highlights the challenges in conducting an experimental study with community partners and suggests that future research should develop a stronger and more structured protocol for teachers to provide this information to researchers.

Nevertheless, these findings illustrate the important role educators can play when introducing elementary age children to healthy snack alternatives in school. Moreover, data show that schools implementing the USDA Fresh Fruit and Vegetable Program (FFVP) tend to serve significantly more fruits than vegetables (Bartlett et al, 2013; Jamelske & Bica, 2014). Further research in the area of teacher encouragement and children's vegetable consumption could influence FFVP schools to incorporate more encouragement and also serve more vegetables through the program. Additionally, these findings could also influence elementary schools that are not participating in the FFVP to find ways to fund and implement their own vegetable snack programs including access to free vegetables and teacher encouragement. Overall, the findings from this study should spur additional research and motivate/empower elementary schools to increase children's access to and consumption of vegetables and, in turn, contribute to improved health outcomes for children.

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