



Impact of schoolchildren's involvement in the design process on the effectiveness of healthy food promotion materials☆

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ARTICLE INFO

Article history:

Received 23 August 2016

Received in revised form 6 March 2017

Accepted 20 March 2017

Available online 23 March 2017

Keywords:

Diet

Vegetables

Marketing

Behavioral economics

Child

Nutrition

ABSTRACT

Marketing techniques may improve children's vegetable consumption. However, student participation in the design of marketing materials may increase the material's salience, while also improving children's commitment and attitudes towards healthy eating.

The impact of student-led design of vegetable promotional materials on choice and consumption was investigated using 1614 observations of students' vegetable choice and plate waste in four public elementary schools in Kearney, Nebraska. Data were collected on children's vegetable choice and consumption in four comparison groups: 1) control; 2) students designed materials only; 3) students were exposed to promotional materials only; and 4) students designed materials that were then posted in the lunchroom. Vegetable choice and consumption data were collected through a validated digital photography-based plate-waste method.

Multivariate linear regression was used to estimate average treatment effects of the conditions at various time periods. Dependent variables were vegetable choice and consumption, and independent variables included the condition, time period, and interaction terms, as well as controls for gender and grade.

Relative to baseline, students in group 4 doubled their vegetable consumption ($p < 0.001$) when materials were posted. Vegetable consumption remained elevated at a follow-up 2–3 months later ($p < 0.05$). Students in group 3 initially increased the quantity of vegetables selected ($p < 0.05$), but did not increase consumption. In the follow-up period, however, students in group 3 increased their vegetable consumption ($p < 0.01$). Involving elementary-aged students in the design of vegetable promotional materials that were posted in the lunchroom increased the amount of vegetables students consumed.

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1. Introduction

Over one-third of American 6–19 year-olds are overweight or obese (Ogden et al., 2014). Sustained improvement of dietary quality is a priority for reducing overweight and obesity, conditions that are known to contribute to long-term health problems (Reilly and Kelly, 2011). In particular, fruit and vegetable consumption among youth is well below recommended levels (Banfield et al., 2016). Marketing techniques, which have been used by food manufacturers to promote processed foods, are thought to have contributed to the obesity epidemic (Nestle, 2006); consequently, some oppose their use in any context (Gosliner and Madsen, 2007). Recently conducted research suggests that marketing techniques adapted to promote healthy foods can effect positive change in food choice (Wansink et al., 2012; Hanks et al., 2016), and there have been calls among health-focused groups to employ

healthy food promotional materials to increase healthy food intake. In the past few years, groups including the Institute of Medicine and the Partnership for a Healthier America—founded in conjunction with Michelle Obama's Let's Move initiative—have promoted or initiated marketing campaigns (IOM, 2013). The Partnership for a Healthier America has worked with the Produce Marketing Association and Sesame Workshop to use Sesame Street characters to promote fruits and vegetables, and has created “FNV”, an effort to “brand” fruits and vegetables, a phrase the abbreviation “FNV” is meant to evoke, complete with celebrity promotions (Partnership for a Healthy America, 2017).

While the use of marketing techniques to promote healthy diets shows promise, its effectiveness may be limited in the target audience until a threshold level of exposure to the materials has been reached (Hanks et al., 2016). Standard marketing campaigns are typically rolled out through multiple media (e.g., television, radio, and Internet) and are frequently reinforced by in-store displays. Research has found the effects of marketing efforts aimed at increasing fruit and vegetable consumption to be minor for students with the lowest level of exposure to the materials, with similar limitations observed when using branded mascots to encourage more physical activity (Hanks et al., 2016; Olesen

☆ Study sponsors had no role in study design; collection, analysis, or interpretation of data; writing the report; or the decision to submit the report for publication.

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et al., 2016). Until healthy food marketing campaigns are rolled out systematically, healthy food marketing interventions may not meet expectations.

Self determination theory provides a basis for the hypothesis that students' participation in the creation of promotional materials may enhance the materials' effectiveness (Ryan and Deci, 2000). Self determination theory suggests that participation can increase intrinsic motivation and commitment to decisions (Ryan and Deci, 2000). The process of designing the materials with other students may also establish group norms about attitudes and preferences towards healthy food consumption (Sharps and Robinson, 2016). Empirical studies show that students' participation in decision-making makes a difference in healthy food consumption. For instance, youth offered choices among vegetables (e.g. carrots and celery)—rather than one vegetable (carrots) only—increase vegetable consumption, even when the students all choose carrots (Just and Wansink, 2009). Children's participation in gardening has also been found to improve attitudes, willingness to try, and preferences for vegetables (Carney et al., 2012; Gatto et al., 2012; Ratcliffe et al., 2011). Children's participation in meal preparation also yields positive outcomes for preferences and consumption (Chu et al., 2013; van der Horst et al., 2014).

In this article, we investigate a simple, low-cost intervention by involving students in the creation of vegetable marketing materials. We examine the effect of student participation in the design of vegetable promotional materials on food choice and consumption in three conditions at different schools: a *participation and marketing* condition, in which students designed promotional materials, which were subsequently posted in the lunchroom; a *participation only* condition, where students designed promotional materials only (the materials were not posted); and a *marketing only* condition, in which students were exposed to materials that they had no role in designing. Food choice and consumption were also monitored in a control school.

2. Methods

University of Nebraska-Lincoln IRB approved this study. Researchers obtained written consent from parents and verbal assent from students to observe students' food choices and consumption in the school lunchroom. Researchers only gathered data from those students whose parents provided written consent for their participation and who themselves assented to participation. Researchers identified participating students by placing a number, which uniquely identified students who met informed consent/assent requirements, on the students' trays.

Students in four public elementary schools (kindergarten–5th grade) in a rural Nebraska community of approximately 30,000 people participated in the study. The four schools were selected because they were closely matched on key socio-economic and demographic variables, including the proportion of the student body qualifying for free or reduced school lunches and the racial/ethnic composition of the schools. Similar socio-economic profiles were sought to minimize baseline differences in vegetable choice and consumption. The student population in these four schools is largely white (77%); 54% of students qualify for free or reduced school lunches. Schools were assigned randomly to one of four conditions: 1) *control* (enrollment of 246 students); 2) *participation only* (enrollment of 246 students); 3) *marketing only* (enrollment of 355 students); or 4) *participation and marketing* (enrollment of 211 students). Students at both schools in a *participation* condition (conditions 2 and 4) designed promotional posters for vegetables as a voluntary, take-home school activity.

All students in every grade in the *participation and marketing* school and the *participation only* school were invited to create characters representing vegetables served on the schools' salad bars. Students were provided with a list of eligible vegetables on a poster sheet, which included room for them to complete their drawing, and were free to choose which vegetable or vegetables they wanted to focus on. Students designed and drew the characters on their own time, and

had a two-week time frame within which to create their drawings. This activity was not accompanied by nutrition education. Researchers selected drawings to ensure that posters were available for each vegetable served. Posters selected from the materials submitted by students in the *participation and marketing* school were printed and mounted on the salad bar above the vegetable represented in the poster in the *marketing only* and *participation and marketing* schools. Promotional materials were rotated so that the posters matched the vegetables available on the salad bar on a given day. Ultimately, 182 students created and submitted posters, 128 of which were submitted by students in the *participation and marketing* condition (or 61% of the student body), while students in the *participation only* condition created 54 of the posters (22% of the student body). The large difference in the number of posters submitted per school may be due to the fact that students were not blinded to the condition they were in. Researchers selected 19, or approximately 15%, of the 128 posters submitted by students at the *participation and marketing* school to print.

Posters designed by students in condition 4 (*participation and marketing*) were subsequently professionally printed and displayed in schools in condition 3 and 4 to control for the content and design of the posters. Researchers collected a total of 1614 observations on students' choices and plate-waste data, which can be used jointly to calculate consumption, on two days during each study period at each school, and additionally recorded each student's gender and grade level. The periods were: a) *pre-intervention* (October 2014); b) *design*, in which students in condition 2 and 4 designed the materials (November 2014); c) *promotional*, in which consumption data were collected shortly after the posters were displayed in lunchrooms in condition 3 and 4 (February 2015); and d) a *follow-up* period two months after the implementation of the promotional materials (April 2015). Students from all grades (kindergarten–5th grade) were eligible to participate, and researchers randomly selected students from the population of eligible students on days on which they collected data. Students at all schools saw the same selection of vegetables each day, which always featured a mixed lettuce salad and one or more additional vegetables, including carrots, garbanzo beans, celery, cucumbers, cauliflower, broccoli, green peppers, and Bibb lettuce. Table 1 presents the number of students observed in each condition and time period.

Data on food choice and consumption were collected using a digital photography-based plate waste method, which has been found to produce results that closely match data produced from weighed plate waste methods (Williamson et al., 2003). Researchers took digital photographs of students' plates at two time points: 1) after they had selected their food, but before beginning to eat, and 2) after the students had finished eating and were returning their trays. Numbered stickers were placed on students' trays to identify the same tray before and after food had been consumed. Researchers created reference plates displaying a full serving of each vegetable—one cup for lettuce and one-half of a cup for all of the other vegetables (Dietz and Stern, 2011)—that was offered. This included references for combinations of vegetables with differing serving sizes (e.g. Bibb lettuce and broccoli). Two research assistants received training on assessing the food taken and remaining as the percentage of a standard serving from photographs, and independently assessed pre- and post-meal photographs to create food choice

Table 1
Number of students observed in each condition and time period.

	Condition			
	Control	Participation	Marketing	Participation and Marketing
Pre-intervention	71	107	109	148
Design	79	136	102	153
Promotion	83	117	97	121
Follow Up	64	68	75	84

Data were collected in elementary schools in Kearney, NE in 2014–15.

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