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Increasing Vegetable Intake in Mexican-American Youth: A Randomized Controlled Trial

CRAIG A. JOHNSTON, PhD; JENNETTE L. PALCIC, PhD; CHERMAINE TYLER, PhD; SANDRA STANSBERRY; REBECCA S. REEVES, DrPH, RD, FADA; JOHN P. FOREYT, PhD

ABSTRACT

Despite the health benefits, vegetable intake in youth remains below recommended levels. The purpose of our study was to compare two methods for increasing vegetable consumption. It was hypothesized that participants randomized to both the exposure-only and the pairing condition would increase their vegetable consumption and increase the variety of vegetables consumed. A total of 78 Mexican-American middle school-aged children from a charter school in Houston, TX, were randomized to a pairing condition (n=40) or an exposure-only condition (n=38) during the Spring 2009 semester. Children in the pairing condition were provided a preferred taste (peanut butter) paired with vegetables weekly at school during a nutrition class for 4 months. Children in the exposure-only condition received vegetables weekly during a nutrition class that covered the same material as the pairing condition. After 4 months, the pairing condition participants demonstrated significant increases in vegetable consumption (F=13.40, P<0.001) as well as variety of vegetables eaten (F=13.69, P<0.001) when compared to those in the exposure-only condition. The findings of this study suggest that the pairing of vegetables with a preferred taste, such as peanut butter, may be an effective technique in increasing consumption, especially in children who report being resistant to eating vegetables.
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C. A. Johnston is an assistant professor, J. L. Palcic and C. Tyler are instructors, and S. Stansberry is a research coordinator, US Department of Agriculture Agricultural Research Service Children's Nutrition Research Center, Department of Pediatrics-Nutrition, Baylor College of Medicine, Houston, TX. R. Reeves is an assistant professor, and J. Foreyt is a professor, Department of Medicine, Atherosclerosis and Vascular Medicine, Baylor College of Medicine, Houston, TX.

Address correspondence to: Craig A. Johnston, PhD, USDA/ARS Children's Nutrition Research Center, Department of Pediatrics-Nutrition, Baylor College of Medicine, 6655 Travis, Mail Stop 320, Houston, TX 77030. E-mail: caj@bcm.edu

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Epidemiologic evidence suggests that diets rich in vegetables protect against numerous chronic conditions, including cardiovascular disease and some cancers (1,2). Despite the many health benefits of eating vegetables, consumption in children remains well below recommended levels (3,4). According to the Youth Risk Behavior Surveillance Survey, only 21.4% of children consume the recommended five servings of fruits or vegetables daily (5). French fries are the leading source of vegetables, accounting for 28% of total vegetable intake (6). A major health objective of Healthy People 2020 is to increase the proportion of children and adolescents who consume the recommended number of daily servings of vegetables (7).

Establishing healthy eating habits, such as preferences for fruits and vegetables, early in life is important because childhood habits are predictive of those in adulthood (8-10). In addition, poor childhood eating habits may increase the risk of developing chronic disease later in life (11,12). Given children's tendency to view eating vegetables as aversive (13) and the increased health risks associated with poor eating patterns, there is a clear need to identify effective methods for increasing vegetable consumption earlier in the life cycle.

There have been numerous programs and interventions designed to increase vegetable consumption in children and adolescents. These various interventions use a number of approaches. For example, increased exposure to vegetables has been demonstrated to increase acceptance and liking of these foods (14). Nutrition education and hands-on experience (eg, taste tests) are some of the methods used to increase exposure. In addition, stealthier techniques to mask the bitter taste of vegetables, such as pureeing vegetables and incorporating them into foods unbeknownst to children, have been shown to increase consumption (15).

The bitter taste of many vegetables is one reason why children tend to view vegetables as aversive (16). Combining vegetables with a preferred flavor is another method of increasing their consumption. For example, children have been shown to prefer vegetables paired with sweeteners compared to vegetables alone (17). Despite the potential effect of pairing vegetables with a dip or other preferred flavor to increase consumption, few studies have employed this technique.

The purpose of our study was to compare two methods (multiple exposures to vegetables vs pairing vegetables with a preferred taste) of increasing vegetable consumption in youth. It was hypothesized that participants ran-

domized to both the exposure-only and the pairing condition would increase their vegetable consumption and increase the variety of vegetables consumed. An exploratory aim of the study was to assess the effect of the two methods of increasing vegetable consumption for children who reported being resistant to eating or trying vegetables.

METHODS

Participants

This investigation was conducted at a charter school in Houston, TX, that serves an urban student population that is 95% Mexican American. Approximately 81% of students are low-income and qualify to receive free or reduced lunch. The study was a component of a larger 24-week school-based weight-loss study (18). Only sixth graders who were randomized to the treatment condition of the larger weight-loss intervention were included in this investigation (n=78). The students assigned to the treatment condition of the weight-loss study were further randomized into two classrooms. One classroom (n=40) was assigned to a pairing condition and the other classroom (n=38) was assigned to an exposure-only condition. Participants were between the ages of 11 and 13 years and included 41 girls (52%). The authors chose to intervene with students of this age because considerable evidence exists for the efficacy of various obesity prevention interventions within this group (19).

Children were identified as "vegetable resistant" if they reported no intake of vegetables in the past week according to a self-report food frequency questionnaire (described in the Measures section). To avoid discriminating against children with obesity, children of all weight ranges participated in the larger study and as a result, children of any weight classification (eg, normal weight, overweight) were eligible to participate in the vegetable consumption study. The Figure provides a detailed schematic of the study design and participant flow. This study was approved by the Institutional Review Board for Human Subjects at Baylor College of Medicine. Parental consent and child assent were obtained.

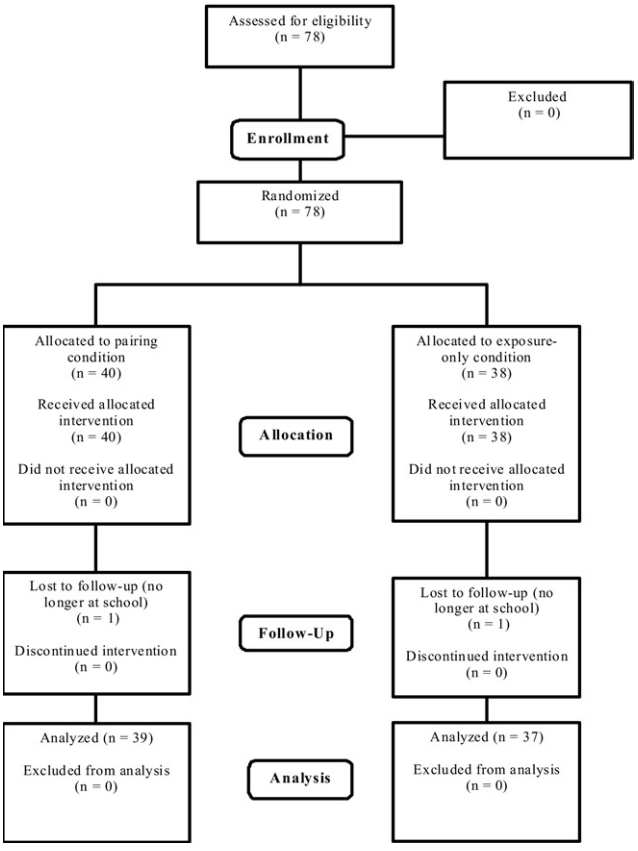

Figure. Participant flow diagram for sixth-grade students randomized to one of two conditions designed to increase vegetable consumption: A condition pairing vegetables with a preferred flavor or an exposure-only condition.

Procedure

Both classes received an identical weight-loss intervention led by the same instructors. The weight-loss intervention included one day of nutrition instruction and 2 or more days of physical activity per week. Students attended the intervention during a class period as part of a typical school day. This intervention has been described in detail elsewhere (18). During the first 12 weeks of the weight-loss intervention, students were taught basic nutrition information such as how to categorize commonly eaten foods into groups with varying degrees of health benefit. The food groups were labeled "big bite," "portion rite," and "little bite." Big bite foods consisted of fruits and nonstarchy vegetables. Children were encouraged to eat as much of the foods from this category as they wanted, while limiting the amounts of foods eaten from the portion rite and little bite categories. During the last 4 months of the weight-loss study, the following procedures for the investigation were implemented during nutrition instruction time: In addition to providing exposure to vegetables, the nutrition class used behavior strategies to encourage children to increase healthy eating habits. For example, a token economy system for reinforcing children's changes was implemented in which they received points for participation and making specific healthy changes, including increasing vegetable consumption outside of the current vegetable consumption study. Students had opportunities to trade in points weekly for small trinkets. During the vegetable consumption study, students did not earn points for increasing vegetable consumption. This was done consistently across groups.

At baseline of the current study (the last 4 months of the weight-loss intervention), participants were presented with three varieties of raw vegetables that were premeasured in 1-oz portions and packaged in plastic bags. Carrots, celery, and broccoli were selected because they were the most recognized vegetables among the students and were consistently available across local supermarkets. Children were allowed to choose the bag number and types of vegetables to consume. Variety of vegetable and number of bags requested were not restricted during the class period. Students were allowed to leave their seats to get more vegetables at any time.