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The Effects of a School-Based Nutrition Intervention on Fruit and Vegetable Preferences, Self-Efficacy, and Consumption Among Low-Income, Hispanic and White Middle-School Students

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Please note that this study was published before the implementation of Healthy, Hunger-Free Kids Act of 2010, which went into effect during the 2012-13 school year, and its provision for Smart Snacks Nutrition Standards for Competitive Food in Schools, implemented during the 2014-15 school year. As such, certain research may not be relevant today.

ABSTRACT

Purpose/Objectives

This study examined the effect of the Harvest of the Month (HOTM) nutrition education intervention program on middle-school students' fruit and vegetable preferences, self-efficacy and attitudes, and self-reported consumption. Perceptions of socio-environmental factors and demographic characteristics were also compared to preferences, self-efficacy and attitudes, and consumption.

Methods

The impact of HOTM on fruit and vegetable preferences, self-efficacy and attitudes, and consumption was assessed in low-income, Hispanic and White middle-school students in rural, Northern California. A quasi-experimental study design was employed using state-approved standardized HOTM survey questions before and after a six-month intervention. Seven hundred thirty students completed both pre and post surveys. Analysis of covariance was used for statistical analyses.

Results

The intervention group demonstrated greater improvements in self-efficacy relating to consumption of fruits and vegetables, from pre-survey to post-survey, than the control group. However, no significant differences in preferences, attitudes, or fruit and vegetable consumption were found between the intervention and control groups. Ethnicity was a significant factor associated with fruit consumption; Hispanic students reported significantly more fruit consumption than White students.

Applications to Child Nutrition Professionals

The HOTM intervention appears to have a positive impact on self-efficacy regarding fruit and vegetable consumption in Hispanic and White middle-school students. More research on culturally-appropriate interventions needs be conducted to further improve the impact of fruit and vegetable interventions on dietary behaviors among ethnically-diverse, middle-school children. Socio-environmental factors specific to certain ethnic groups, and their impact on fruit and vegetable intake, also need to be further investigated.

INTRODUCTION

Fruit and vegetable intake among adolescents is often inadequate and continues to decrease throughout the teen years (Larson, Neumark-Sztainer, Hannan, & Story, 2007). Adolescents, especially Hispanic, are particularly at risk for low fruit and vegetable consumption (Unger et al., 2004). The low consumption of fruits and vegetables among Hispanic adolescents appears to be strongly associated with their acculturation into American society. The acculturation process

includes a shift from a traditional diet rich in vegetables, meats, and whole grains to a typical American adolescent diet, which contains more processed, high-fat, and sugary foods (Pérez-Escamilla & Putnik, 2007).

School interventions may play an important role in promoting positive dietary behavior change among adolescents (Lytle et al., 2006). Exposure-based interventions are effective in increasing the consumption of fruits and vegetables (Wardle, Herrera, Cooke, & Gibson, 2003). This type of intervention relies on the repeated exposures to nutrient-rich foods or beverages. Exposures may include, but are not limited to, garden-based lessons, cooking experiences, fruits and vegetables served in school lunch meals, classroom and after-school nutrition education about fruits and vegetables, nutrition information specific to a food or beverage item, and actual tastings of fruits and vegetables.

The USDA-funded, *Network for a Healthy California's* Harvest of the Month (HOTM) program is an exposure-based nutrition education intervention promoting fruit and vegetable consumption in low-income schools. This program highlights a different fruit or vegetable each month during the school year, using student tastings, parent newsletters, educator newsletters, cafeteria posters books provided to teachers, and books available in the school library. A recent small-scale evaluation study of the impact of the HOTM program demonstrated a significant increase of 0.3 servings of fruit pre to post intervention for low-income, middle school students (Voorhees, Goto, Bianco-Simeral, & Wolff, 2011). However, little is known about underlying mechanisms by which this type of intervention may influence fruit and vegetable consumption among different ethnic groups, especially Hispanic adolescents who are a major ethnic group participating in the HOTM program.

Much research, rooted in the Social Cognitive Theory (SCT), has shown the importance of measuring psychosocial factors to understand the characteristics and effectiveness of interventions (Story, Neumark-Sztainer, & French, 2002). Based on the SCT, both the socio-environmental domain (e.g., home availability of fruits and vegetables), and the personal domain (e.g., taste preferences) influence human behavior (e.g., fruit and vegetable intake). Psychosocial measurements are used in many school-based nutrition studies with adolescents. These include attitudes and self-efficacy, which is the belief in one's capabilities to achieve a goal or an outcome (Neumark-Sztainer, Wall, Perry, & Story, 2003). Compared to attitude, which is traditionally defined as positive or negative feelings about a particular object or issue, self-efficacy or "perceived ability" adds more significantly to the prediction of the adolescent's intention to act (Anderson, Winett, & Wojcik, 2007).

It is important to measure psychosocial, demographic, and socio-environmental factors simultaneously to thoroughly understand the characteristics and effectiveness of interventions in different settings and contexts. However, previous HOTM research relied on univariate analyses and failed to control demographic or socio-environmental factors while measuring the impact of the HOTM program on behavior change. Also, while Hispanic individuals make up 37.6 percent of all Californians (U.S. Department of Commerce, Economics and Statiscians Administration, U.S. Census Bureau, 2011), little is known about the impact of exposure-based nutrition interventions on low-income, Hispanic students.

The primary objective of this study was to examine the effect of the HOTM intervention on students' fruit and vegetable preferences, self-efficacy and attitudes, and self-reported consumption among Hispanic and White middle-school students. Associations between those outcomes from pre-intervention data and demographic factors such as ethnicity, gender, and birthplace were also examined to gain a better understanding of appropriate interventions for ethnically-diverse students.

METHODOLOGY

Study Design

The effects of a six-month exposure-based nutrition intervention program were examined using a quasi-experimental design among sixth, seventh, and eighth graders from a middle-school in Northern California. A pre/post survey was administered before and after the HOTM intervention. Students matched in a control site in the same district completed both pre and post surveys.

Permission to administer the surveys was granted by administrators at the district and school levels, and signed parent permission slips were required for student participation. This study was approved by the Institutional Review Board at California State University, Chico.

Measurement of Variables

State-approved standardized HOTM survey questions were used to assess fruit and vegetable preferences, self-efficacy, attitudes, and consumption. The survey included nine statements on fruit and vegetable preference, four statements on self-efficacy, four on health and nutrition attitudes, two on perceptions of socio-environmental factors, and two on self-reported fruit and vegetable consumption for the past 24 hours. One survey statement addressed environmental and psychosocial factors regarding peer pressure and one statement assessed perceived cost of fruits and vegetables. The survey also addressed demographic characteristics including age, birth date, grade, ethnic group, and birthplace. The survey was pilot tested for content and face validity and refined based on pilot-test results.

The response options for the nine fruit and vegetable preference questions, “Please check how much you like these fruits and vegetables,” included “I do not like this,” “I like this a little,” and “I like this a lot.” The consumption questions included “During the past 24 hours (yesterday), how many times did you eat fruits?” and “During the past 24 hours (yesterday), how many times did you eat vegetables?” The self-reported fruit and vegetable consumption scale ranged from 0 (0 time) to 5 (5 times or more).

The four self-efficacy statements included “I think I can eat a vegetable served at lunch,” “I think I can eat a fruit served at lunch,” “I think I can choose a vegetable for a snack,” and “I think I can choose a fruit for a snack.” The four health and nutrition attitude statements consisted of “It is important to eat at least the recommended number of servings of fruits and vegetables a day” and “If I eat the recommended number of servings of fruits and vegetables each day . . . 1) It will help protect my health, 2) I will think better in class, and 3) It will help protect me from getting fat.” The other statements about peer pressure and cost included, “If I eat the recommended number of servings of fruits and vegetables each day, my friends will make fun of me,” and “Fruits and vegetables cost too much for my family to buy very often.” For self-efficacy, attitudes, and socio-environmental statements, a 5-point Likert scale was designated from 1 or “strongly disagree” to 5 or “strongly agree.”

Participants

Participants completing surveys at least one time (pre or post) included 613 sixth, seventh, and eighth grade students at the intervention school and 396 seventh and eighth grade students at the control school. The control school did not have sixth grade classes; therefore sixth grade control students were not available. Both intervention and control schools were low-income schools based on the percentage of children qualifying for free and reduced-price meals.

Intervention

The intervention school, located in Northern California, received the HOTM program intervention from October 2007 to March 2008. Monthly in-class tasting activities consisted of a specific fruit or vegetable provided to all students. The fruits and vegetables used for the monthly tasting activities included apples, pears, kiwis, sweet potatoes, oranges, broccoli, spinach, carrots, and strawberries. On the day of the tasting, education materials providing information about the featured fruit or vegetable were provided to teachers, for incorporation into their curriculum.

Students were also exposed to the HOTM fruit or vegetable through parent newsletters, promotional posters in the cafeteria, a promotional banner, related books provided to the school library, informative pages in the students’ day planners, and regular announcements in the school bulletin. Parent newsletters, both in English and Spanish, were given to each child to take home, to increase parental awareness and reinforcement of the HOTM message. The parent newsletters contained recipes and information such as nutritional value and seasonal availability of the featured fruit or vegetable. Promotional posters were distributed to the intervention schools for display in libraries, hallways, and cafeterias to spotlight the monthly fruit or vegetable.

Data Collection and Analyses

Trained research team members administered surveys to all students at both schools and were

available to answer student questions. A script was read to ensure accuracy and consistency of instruction.

Only data obtained from the students who completed both pre and post surveys were included in the analysis; 454 (74%) intervention students and 276 (70%) control students completed both pre and post surveys. Cronbach's alpha scores provided a measure of internal consistency for the pre and post surveys; preferences, self-efficacy, and attitudes measured 0.70, 0.71, and 0.72, respectively, indicating a high level of internal consistency. Final composite dependent variables included 1) fruit and vegetable preferences, 2) self-efficacy, 3) attitudes toward fruit and vegetable consumption, 4) fruit consumption, and 5) vegetable consumption. Mean scores for these composite variables were calculated as the average of items comprising the scale. The primary data analyses were conducted using analysis of covariance (ANCOVA), comparing post-intervention scores for the intervention and control groups with the baseline score as a covariate (Vickers & Altman, 2001). Analysis of covariance is a more appropriate analysis of absolute change compared to the independent t-test because it corrects for the phenomenon of regression to the mean (Twisk & Proper, 2004). The relationships between the dependent variables from pre-data and other factors such as gender, ethnicity, and place of birth were also examined. Finally, linear regression was conducted to predict behavior changes associated with personal, socio-environmental, and demographic factors. Significance level was set at p ≤ 0.05. Data were analyzed using the Statistical Package for Social Sciences version 15.0.

RESULTS AND DISCUSSION

Characteristics of Participants

At the intervention site, 59% of students identified themselves as Hispanic, compared to 30% at the control site (See Table 1). A greater percentage of students (9.5%) at the intervention site were born in Mexico, compared to students at the control site (5.1%). As shown in Table 1, gender ratios were similar between the intervention and control groups.

Table 1. *Demographic Characteristics of Middle School Students Who Completed Both Pre and Post Surveys*

	Intervention (n = 454[a])		Control (n = 276[a])	
Characteristics	No.	%	No.	%
Grade				
6th				
7th	145	31.9	0	0
8th	151	33.3	137	49.5
	158	34.8	139	50.2
Gender				
Male				
Female	215	47.6	133	48.2
	237	52.4	143	51.8
Ethnicity				
White				
Hispanic	155	36.2	173	64.8
Others	251	58.6	81	30.3
	22	5.1	13	4.9

	Intervention (n = 454[a])		Control (n = 276[a])	
Place of Birth				
United States	407			94.9
Mexico	43	90.0	262	5.1
		9.5	14	

[a] Due to incomplete information provided by some students, n varies by variable

Impact of HOTM on Fruit and Vegetable Preferences

Table 2 shows the results of the impact of the HOTM intervention on the five dependent variables: fruit and vegetable preferences; self-efficacy toward fruit and vegetable consumption; health and nutrition attitudes; fruit consumption; and vegetable consumption. Using ANCOVA, no statistically significant differences were found comparing mean scores of preferences for HOTM fruits and vegetables, or in attitudes toward health and nutrition, between the intervention and control groups. In contrast, gender (not shown in Table 2) was a significant factor associated with fruit and vegetable preferences ($p < 0.001$); female students had a significantly higher preference score (2.26 ± 0.33) than male students (2.16 ± 0.42).

Table 2. *Means and Standard Deviations of HOTM Intervention Outcomes Between Intervention and Control Groups*

	Intervention group (n = 454[d])		Control group (n = 276[d])		P value
Outcomes	Pre	Post	Pre	Post	
Fruit and vegetable preferences[a]	2.25±0.39	2.28±0.36	2.19±0.36	2.21±0.38	0.507
Self-efficacy[b]	3.42±0.83	3.53±0.78	3.32±0.86	3.38±0.91	0.035
Attitudes toward fruits and vegetables[b]	4.77±0.87	4.82±0.90	4.84±0.81	4.89±0.84	0.585
Vegetable consumption[c]	1.91±1.50	2.04±1.62	2.09±1.59	2.13±1.69	0.99
Fruit consumption[c]	2.22±1.45	2.55±1.56	2.29±1.54	2.49±1.60	0.459

[a] Self-reported fruit and vegetable preferences ranged from 1 or “I don’t like it” to 3 or “I like it a lot.” The averages of the final composite variables were calculated. [b]A 5-point Likert scale was designated from 1 (*strongly disagree*) to 5 (*strongly agree*); the averages of the final composite variables were calculated. [c]Self-reported fruit and vegetable consumption for the past 24 hours ranged from 0 (0 times) to 5 (5 times or more). [d]Due to incomplete information provided by some students, n varies by variable.

The Impact of HOTM on Self-Efficacy Related to Fruits and Vegetables

As shown in Table 2, the mean score of self-efficacy was significantly higher in the intervention group compared to the control group, after controlling for the pre-survey scores as a covariate using ANCOVA. This finding was consistent with the findings by Tuuri et al. (2009), in which a school-based wellness intervention positively impacted children's nutrition knowledge and self-efficacy.

Gender was an independently significant factor ($p<0.001$) associated with self-efficacy. Female students had higher self-efficacy scores than male students in the current study. The findings of the

relationship between self-efficacy and gender were consistent with the findings by Beech, Rice, Myers, Johnson, and Nicklas (1999). Also, Beech et al. (1999) demonstrated a relationship between knowledge and self-efficacy for fruit and vegetable consumption among study participants, with female students demonstrating higher scores than male students. In contrast, a previous study by Granner et al. (2004) showed no significant gender difference in self-efficacy for fruit and vegetable consumption among young adolescents. Neither the current study nor the study by Granner et al. measured knowledge of fruits and vegetables among study participants. Future research is needed to examine how differences in knowledge between male and female students affect their self-efficacy.

The Impact of HOTM on Health and Nutrition Attitudes

Table 2 also shows no significant differences in the mean scores of attitudes toward health and nutrition between the intervention and the control groups using ANCOVA. Previous research regarding the relationship between psychosocial factors of food and eating behavior has varied in design and definition. While one research study differentiates self-efficacy from nutrition and health attitudes (Story et al., 2002), others combine knowledge, attitudes, and practices related to fruit and vegetable consumption (Beech et al., 1999; Dittus, Hillers, & Beerman, 1995). Furthermore, survey questionnaires/statements that attempt to capture self-efficacy about fruit and vegetable consumption vary across studies. This variability may explain why the connection between self-efficacy and fruit and vegetable consumption is not consistent.

The Impact of HOTM on Fruit and Vegetable Consumption

As shown in Table 2, although intervention students increased their fruit and vegetable consumption more than control students, this difference did not attain significance. Further analysis with the pre-intervention data was conducted to predict behavior changes in fruit and vegetable consumption from personal (preference, self-efficacy, and attitude), socio-environmental (peer pressure and perceived cost of fruits and vegetables), and demographic (grade, gender, ethnic group, and place of birth) factors. For all students, linear regression analyses revealed that attitude ($p < 0.001$) and preference ($p < 0.001$) were significant predictors of both fruit and vegetable intakes, while self-efficacy, peer pressure, and perceived cost of fruits and vegetables were not.

Finally, ethnicity was significantly associated with self-reported fruit consumption ($p = 0.002$), but not vegetable consumption ($p = 0.131$). Birthplace, grade, and gender were not significantly associated with fruit and vegetable consumption. Tukey's post-hoc tests revealed that Hispanic students had a significantly higher mean score for fruit consumption (2.46 ± 1.50) compared to White students (2.08 ± 1.50) at $p = 0.009$. This finding is congruent with a study which showed that Hispanic individuals in the U.S. consumed, on average, one more serving of fruits and vegetables per day than non-Hispanic White individuals. (Neuhouser, Thompson, Coronado, & Solomon, 2004). Further research is needed to assess whether levels of acculturation among the Hispanic participants play an important role in fruit and vegetable consumption.

CONCLUSIONS AND APPLICATION

Although most school-based, nutrition education interventions generally find students more resistant to increasing vegetable intake than fruit intake, studies that use an exposure-based intervention approach tend to improve self-efficacy and attitude toward consuming both fruits and vegetables (Medina, 2009). The results of this study suggest that fruit and vegetable interventions, specifically the exposure-based HOTM program, may have positive influences on self-efficacy regarding fruit and vegetable consumption among middle-school students.

Finding in this study regarding the relationship between self-efficacy and gender were consistent with the findings by Beech et al. (1999). Females were significantly more likely than males to agree that they "could eat a fruit or vegetable that is served at lunch" when ethnicity, birthplace, and site were controlled. It is clear that efforts are needed to create an intervention that is targeted to adolescent males.

In this study, the positive results of self-efficacy regarding fruit and vegetable consumption did not translate into positive behavior among the HOTM participants. There was no significant difference in

fruit and vegetable consumption between the intervention and control sites as an outcome of the HOTM progam. There are several possible explanations for the lack of relationship between self-efficacy and consumption. Shepherd and Towler (2007) speculate that psychosocial factors such as health and nutrition attitudes, and self-efficacy relating to food choices, will predict the actual consumption of that food. However, other research shows that these psychosocial factors are the first step *before* the actual behavior occurs (Story et al., 2002). If the latter supposition is true, then self-efficacy serves as the intermediate factor between knowledge and behavioral change regarding fruit and vegetable consumption; the current study indicates that HOTM students may demonstrate a significant increase in actual fruit and vegetable consumption with repeated HOTM program exposures. Future research is needed to test this hypothesis.

Research has shown that the lack of connection between self-efficacy and consumption may be due to various socio-environmental factors (Lytle et al., 2006). These factors include exposure to unhealthy foods, lack of fruits and vegetables in the home, food-related parenting practices, and level of acculturation among ethnic minorities. Although the authors did not measure the availability of fruits and vegetables at home, students who perceived that fruits and vegetables cost too much may have less availability of fruits and vegetables at home. Besides cost, the familiarity parents have with U.S. fruits and vegetables may play a role in the availability of fruits and vegetables at home. For example, a qualitative study with Hispanic participants by Yeh et al. (2008) demonstrated the importance of increasing availability and accessibility to fresh fruits and vegetables commonly available in the home countries of Hispanic immigrants. Lack of familiar fruits and vegetables from home countries and tools for traditional preparation styles appeared to limit the total consumption of fruits and vegetables among those immigrants.

The current study, which was conducted in Northern California, demonstrates significantly higher fruit consumption among Hispanic students compared to White students. This may be due to high accessibility of fresh fruits commonly found in the traditional Hispanic diet in this study area. Other possible factors may include family income, more frequent family meals among this Hispanic sample, and the occupations of the students' parents. These socio-environmental factors, which may be specific to the study area, need to be further addressed in future studies when selecting the type of interventions, method(s) of preparation and distribution, and supportive educational activities and materials. Further research should also consider the use of these educational materials at home, as well as an assessment of associated psychosocial factors among parents and other caregivers with different ethnic backgrounds.

Study limitations include only a moderate match between intervention and control middle schools. At almost 60% vs. 30%, the intervention school had a significantly higher proportion of Hispanic students than the control school. Additionally, the control school was comprised of only seventh and eighth grade students. Therefore, no control group was available for the sixth grade students at the intervention school. The second limitation includes differences in the physical setting at the intervention and control schools. A condition of participation imposed by the intervention school was that HOTM tastings and pre/post surveys must be administered in physical education classes. The physical education setting differs from a traditional classroom setting in that all grades are combined, the class is much less structured, students have the opportunity to be more disruptive, and teachers have less ability to incorporate taste-testing activities into normal classroom curricula. Therefore, visual distractions and the casual nature of a physical education environment may have distracted the middle-school students from full participation in HOTM activities, and impeded them from providing honest and accurate answers on the survey. More collaboration between the HOTM program and school staff will be necessary. The HOTM intervention may have had a greater impact on self-reported student preferences, self-efficacy, attitudes, and consumption had the intervention and surveys been administered in a traditional classroom setting. Finally, the number of questions addressing fruit and vegetable consumption may not have been sufficient to adequately measure self-reported fruit and vegetable intake.

In conclusion, the current study findings suggest that the HOTM program may have a positive impact on self-efficacy of middle-school students. More research on culturally-appropriate interventions needs be conducted to further improve the impact of fruit and vegetable interventions

on dietary behaviors among middle-school children. Further avenues to promote fruit and vegetable consumption by considering socio-environmental factors among ethnically diverse students are also needed. Recent research suggests that environmental changes in school cafeterias may make healthier foods more convenient, leading students to select and eat healthier foods (Hanks, Just, Smith, & Wansink, 2012). Thus, strengthening the collaboration between the HOTM program and school nutrition staff when creating environmental changes in cafeterias may contribute to increasing fruit and vegetable consumption.

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