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Impact of After-school Nutrition Workshops in a Public Library Setting

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Objective: To determine if after-school nutrition workshops conducted in public libraries were related to lasting changes in food choice.
Methods: "Snack Smart" workshops, based on Social Cognitive Theory, were conducted in 8 branch libraries. Quasi-experimental design assessed changes in consumption of targeted foods by pretest, posttest and follow-up food frequency questionnaires designed by the authors, and analyzed using the Friedman test for repeated measures and Wilcoxon signed ranks.
Results: In a convenience sample of 49 ethnically diverse children ages 9 to 14, intake of milk, vegetable, and water significantly increased at 3-week posttest ($P < 0.05$), but only water intake showed a significant change from pretest to follow-up 3 months later.
Conclusions and Implications: This low intensity program did not produce lasting behavior change, as measured by changes in food frequency at 3 months post intervention. The study supports the need to critically evaluate out-of-school nutrition programs for lasting impact.

INTRODUCTION

Nutrition education programs for children are being integrated into non-traditional educational settings including community clubs, churches, private and government sponsored after-school childcare, and public libraries. These community-based programs, offered on weekends, after-school, and in the summer, have potential for improving children's health through leisure-time learning, increased physical activity, and influence on food choices.

Snacks are of particular interest because they are often offered to children attending these programs. Since most children consume an average of 2 snacks a day, accounting for about 25% of their daily caloric intake, and since over 40% of added sugars may be consumed at snack-times, primarily from beverages (1-3), teaching children to consume more healthful snacks such as fruits, vegetables and dairy products could significantly improve their diets. This is important because as school-age children mature, their diet quality declines, with an overall drop in fruit, vegetable, and milk intake, and an overall increase in consumption of soft drinks (4). Eighty percent of American teens consume fewer than 5 servings of fruits and vegetables daily (5). Nutrition education and healthful snacks offered in non-academic environments provide ideal opportunities for social learning and improving dietary behaviors.

It is not clear, however, if these out-of-school programs are able to effect long-term measurable behavioral changes in children's food choices due to lack of evaluation. Over a 10-year period (1998-2007), of 10 peer-reviewed studies evaluating dietary behavioral change in out-of-school programs in the United States, 9 evaluated short-term change (6-15). Only one evaluated intake 4 months post-intervention, demonstrating possible lasting impact (10). No intervention took place in a public library.

This study presents findings from "Snack Smart", a series of library workshops based on Social Cognitive Theory (16), designed to address healthful snacking in a multi-ethnic group of children. It examined whether these after-school workshops were related to lasting changes in intake of targeted foods and beverages as measured by a food frequency questionnaire.

METHODS

Staff from the City of San José public library system joined with faculty and students from the nutrition department of San José State University to develop and implement the "Snack Smart" program in 8 branch libraries. The target audience was children of various ethnicities living in San Jose, which has no single race/ethnic group majority, but has the largest Vietnamese population of any city in the United States, as well as a large Hispanic population (17). Children were 9 to 14 years of age, who regularly spend afternoons in the library unsupervised by parents, and who enjoy the venue as a safe, free place to finish homework, read books, use computers, and eat snacks. Unlike most public libraries where eating is prohibited, libraries in San José encourage eating. Recently installed vending machines selling only healthful foods and beverages, as defined by state regulations (18,19), provide an environmental component to the library's efforts to promote healthful eating.

Librarians recruited "Snack Smart" participants by posting flyers in English, Spanish, and Vietnamese, notifying local schools, and utilizing local media. The program consisted of a 3-week, 6-hour series of 5 workshops repeated in 8 different branch libraries over 3 months. Weekly 90-minute after-school nutrition workshops were book-ended by two 45-minute weekend workshops—the first involving parents and the last engaging parents and children. All workshops for children were presented in English, but one parent-attended workshop was presented in Spanish and another offered Vietnamese interpretation. The second author designed the program content. Eleven nutrition students, enrolled in an upper division practicum community nutrition class, team-taught the 40 workshops. Authors provided bi-monthly trainings on lesson plans, and demonstrated interactive activities. On-site visits were conducted throughout the duration to monitor program delivery.

Application of Social Cognitive Theory (16) constructs is described in Table 1. Program features were an experiential focus utilizing materials from 5-A-Day, MyPyramid.gov, and EatFit (20-22), and novel, active games developed by the second author: Beverage Pyramid Relay Race and Knock Down the Worst Choice (a Nutrition Facts label game). Three snacking themes (snacks at home, portable snacks and buying snacks) incorporated messages about specific food groups with the goal of increasing intake of healthful foods and beverages.

The San José State University Institutional Review Board approved this study. The purpose was to learn whether "Snack Smart" was related to lasting changes in participant intake of targeted foods 3 to 4 months after program completion. Research employed a pretest-posttest design with a repeat posttest (follow-up) to measure within-person changes; participants were their own controls. The independent variable was attendance at 2 or more 90-minute after-school workshops. The dependent variable was frequency of consumption of targeted foods and beverages. Study participants were a convenience sample of children who attended workshops, met the age criteria (9 to 14 years old), and who completed all 3 questionnaires, administered at workshops before and after the 3-week intervention, and repeated by telephone 3 to 4 months later. Children were reminded that the food frequency questionnaire was not a test and that completion was voluntary. They were instructed to circle the answer that best matched how they normally ate, and that there was no correct answer, "just what you do." To prevent social desirability effects, telephone interviewers reinforced these messages. The questionnaire assessed consumption of targeted foods and beverages (fruit, vegetables, French fries, soda, water, milk, sport drinks, and snacks in general) by asking how often they normally ate the food

(twice a day or more, once a day, every few days, and not very often). Data were analyzed for individual foods and beverages. Questions without responses were excluded.

The raw data were ordinalized with values of 0 through 3, with the most beneficial intake for health given a 3 and the least beneficial 0. For example, a soft drink intake of twice a day or more was ordinalized to 0 but a vegetable intake of twice a day became a 3. Data were analyzed for significant differences between pretest, posttest and follow-up using the Friedman Test for repeated measures. When a significant difference was found, further analysis by Wilcoxon Signed Ranks Test for differences between pretest and posttest and between pretest and follow-up was conducted. Data were analyzed using Statistical Package for the Social Sciences version 16.0 for Mac (SPSS, Inc., Chicago, IL, 2008). Results were considered statistically significant at $P < 0.05$.

RESULTS

A total of 232 children and 76 parents attended "Snack Smart" workshops. Fifty children (25%) attended the whole series: the 3 weekday workshops and the final parent-child weekend workshop. However, only 18 of these children completed pre, post and follow-up questionnaires and were included in the analysis. Another 31 children who attended at least 2 of these 4 workshops and completed all questionnaires were also included. Demographic characteristics of program completers and non-completers were not different. Further, a post hoc comparison of pre-intervention median food frequency responses of children who did not continue attendance at "Snack Smart" workshops with those of evaluation participants showed no differences in initial food choices (data not shown). The 49 study participants (36% male, 64% female; mean age 11.1 $\pm$ .3 yrs) reflected the region's ethnic diversity, and included 32% Asian, 29% Latino, 12% Caucasian, and 2% African Americans; 19% reported "other" or did not respond.

Results indicated significant differences in frequency of intake between pretest, posttest, and follow-up for milk, vegetables, and water (Friedman Test of repeated measures: milk, $\chi 2(2, n = 26) = 11.38$, $P = .003$; vegetables, $\chi 2(2, n = 26) = 7.36$, $P = .025$; and water, $\chi 2\ (2, n = 14) = 7.00$, $P = .03$). For milk and vegetables, further analysis revealed a significant difference between posttest and pretest but not between follow-up and pretest (Table 2). In contrast, water intake was significantly higher only at follow-up compared to pretest. There was no significant change in intake for fruit, French fries, soda, sport drinks, and snacks. Thus, no foods or beverages tested, except water, showed a significant change from pretest to follow-up.

Table 1. Application of Social Cognitive Theory in the "Snack Smart" Intervention

Theory Construct	Application in the "Snack Smart" Intervention
Outcome expectations	• Parents and children viewed videos regarding benefits of consuming a healthful diet, e.g., reduced risk of overweight and type 2 diabetes. • Parents discussed how to overcome perceived negative outcomes (barriers) such as inconvenience or cost.
Observational learning/modeling	• Children viewed films starring teen role models. • Children observed preparation of Veggie Wraps and Smoothies, and then participated in preparation.
Behavioral capability	• Children received nutrition knowledge necessary for taking action through interactive lessons, handouts and videos. • Children expressed knowledge during discussions and games and by creating recipes. • Children exercised label-reading skills to differentiate healthful snacks from other snacks based on nutrition information while participating in activities and games.
Self-efficacy	• Children were challenged to choose achievable, small changes in consumption of targeted foods and beverages. • Children tasted and identified foods that they liked, e.g., fruits, vegetables, dairy products and whole grains. • Children told parents about healthful foods they liked.
Goal setting	• Children, with guidance from instructors, set realistic, measurable goals for bringing healthful snacks to school and sporting activities, and for preparing them at home.
Environmental/ reciprocal determinism	• Children tasted healthful snack options available in library vending machines and provided their "expert" ratings.
Cognitive restructuring	• Children realized how they could choose healthful snacks by discussing, preparing, and sampling new snacks.
Social support	• Parents and children participated in discussions to strengthen social support networks. • Children observed one another consuming healthful snacks and observed the behavior was socially acceptable.
Reinforcements	• All children received gifts at the end of each workshop; those completing the entire program received a book of participant-developed recipes and were entered into a drawing for a valuable prize.

Table 2. Change in Intake of Milk, Vegetables and Water

Dietary behavior		Posttest - Pretest	Follow-up - Pretest
Milk intake	Z	-2.308[a]	-.033
	Asymp. Sig. (2-tailed)	.021*	.974
Vegetable intake	Z	-2.124	-1.173
	Asymp. Sig. (2-tailed)	.034*	.241
Water intake	Z	-1.000	-3.507
	Asymp. Sig. (2-tailed)	.317	.000*

[a] based on negative ranks

* P < .05 (Wilcoxon signed ranks test)

DISCUSSION

The "Snack Smart" intervention, designed to address healthful snacking in an ethnically diverse group of children in a unique setting—the public library—sought to effect lasting behavioral change in consumption of targeted foods and beverages. Results indicated significant differences in milk, vegetables, and water intake following the intervention, but significant changes were not maintained 3 to 4 months later. For milk however, further analysis of percent distribution for the 4 possible responses for intake showed that at follow-up there were fewer responses of "not very often" and more responses of "once every few days" compared with pretest. Similarly, percent distribution for vegetable intake responses showed some low consumers of vegetables at pretest shifted to higher consumption at follow-up with more responding they eat vegetables "once a day". This indicates that although there were no significant lasting changes for the overall group, there were important changes in milk and vegetable intake for some individuals with initial low intakes.

The only significant increase noted at follow-up was for water intake, likely a seasonal effect since follow-up was conducted during the summer. A post hoc Wilcoxon signed ranks analysis separating responses of "Snack Smart" participants who attended sessions that ended in March (n=14) from those that ended in May (n=13) revealed children completing workshops in May consumed significantly more water at posttest compared with pretest, while those completing workshops in March consumed the same amount posttest as pretest. This suggests changes in water intake at follow-up were likely due to the confounding variable of seasonality. It is interesting to note that intake of soda and sport drinks was not influenced by season.

The fact that participants were interviewed for follow-up during the summer, when school was not in session, may have influenced milk and vegetable consumption. Children's intake during the school year may differ from intake during summer months. Though we did not determine how many children participating in "Snack Smart" also participated in school meal programs, between 43% and 89% of children in the areas surrounding the libraries where workshops were held receive free and reduced price meals. Participation in summer feeding programs was unknown. Thus, possible change in availability of milk and vegetables at home

during the summer could account for failure of increased milk and vegetable intake to be maintained 3 to 4 months later.

This study is limited by the content validity and sensitivity of the food frequency instrument, i.e., its ability to detect important changes in children's intake. The "Snack Smart" questionnaires were given at 2 time periods, 3 weeks apart, and may not have clearly distinguished between pre- and posttest food intakes because children were asked about "usual intake" as opposed to specific intake "this past week". The ability of children to accurately recall food intake was not evaluated in this study but was assumed.

The dropout rate for "Snack Smart" workshop attendance was high; only 25% of children completed all workshops despite qualification for a valuable prize with perfect attendance. This may be the result of the program's flexibility, allowing children to participate when they desired. Even if a child went to the library regularly after school, within the library itself "Snack Smart" workshops competed with computer access. Despite these factors, the average attendee participated in 2 workshops amounting to 3 hours of exposure to the intervention. Process data suggested average exposure per child might have been higher for a single 3 to 4 hour after-school session, since weekend "Snack Smart" workshops had the lowest attendance. Parent attendance at these weekend workshops was low; this was not a surprise as program planning occurred without a needs assessment or input from families. Additional limitations include language barriers, and possible differences in teacher implementation and style affecting intervention dose (i.e., the extent to which workshops were taught as designed).

In conclusion, lasting behavior change, as represented by measurable changes in food and beverage intake at 3 to 4 months post-intervention, was not related to this low intensity, after-school nutrition program in a public library.

Implications for Research and Practice

Community-based nutrition programs can respond to specific needs of the local population. As public health efforts respond to child health issues with multiple community-based approaches, opportunities are provided to explore evidence for successful interventions through careful evaluation of community-based and small-grant programs for youth. Publication of outcomes on innovative approaches to nutrition education is needed to assist the spread of successful interventions.

Since the goal of nutrition education is ultimately behavior change, follow-up assessment of food intake months after an intervention may more critically evaluate impacts on behavior than an immediate posttest. Out-of-school nutrition interventions that do not guarantee a sufficient time/experience exposure by means of both program design and continued attendance may not be effective in creating lasting changes in food choice. Implementation of nutrition learning activities within the structure of on-going out-of-school programs could ensure more reliable attendance and thus greater exposure to interventions. Research that compares impact of increasing levels of exposure to nutrition interventions on behavioral changes may prove helpful for future planning of successful out-of-school nutrition education programs.

Nutrition screeners with validated short food frequency questionnaires are available (e.g. the School Physical Activity and Nutrition (SPAN) Project (23) questionnaire which requires recall of several food types eaten just "yesterday" or the National Cancer Institute All-Day Screener (24) which asks about frequency of foods eaten in the last month). Development of a simple validated food frequency questionnaire designed for out-of-school settings may assist

community-based nutrition education programs in implementing standardized follow-up evaluations and would make comparisons of outcomes and methods easier. Critical evaluations of novel out-of-school nutrition programs, leading to dissemination of effective methods for motivating lasting behavior changes in children are strongly recommended.

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