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A Randomized Controlled Trial of Students for Nutrition and eXercise: A Community-Based Participatory Research Study

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A B S T R A C T

Purpose: To conduct a randomized controlled trial of Students for Nutrition and eXercise, a 5-week middle school-based obesity-prevention intervention combining school-wide environmental changes, multimedia, encouragement to eat healthy school cafeteria foods, and peer-led education.
Methods: We randomly selected schools (five intervention, five waitlist control) from the Los Angeles Unified School District. School records were obtained for number of fruits and vegetables served, students served lunch, and snacks sold per attending student, representing an average of 1,515 students (SD = 323) per intervention school and 1,524 students (SD = 266) per control school. A total of 2,997 seventh-graders (75% of seventh-graders across schools) completed pre- and postintervention surveys assessing psychosocial variables. Consistent with community-based participatory research principles, the school district was an equal partner, and a community advisory board provided critical input.
Results: Relative to control schools, intervention schools showed significant increases in the proportion of students served fruit and lunch and a significant decrease in the proportion of students buying snacks at school. Specifically, the intervention was associated with relative increases of 15.3% more fruits served ($p = .006$), 10.4% more lunches served ($p < .001$), and 11.9% fewer snacks sold ($p < .001$) than would have been expected in its absence. Pre-to-post intervention, intervention school students reported more positive attitudes about cafeteria food ($p = .02$) and tap water ($p = .03$), greater obesity-prevention knowledge ($p = .006$), increased intentions to drink water from the tap ($p = .04$) or a refillable bottle ($p = .02$), and greater tap water consumption ($p = .04$) compared with control school students.
Conclusions: Multilevel school-based interventions may promote healthy adolescent dietary behaviors.

IMPLICATIONS AND CONTRIBUTION

Few studies have used rigorous community-based participatory research (CBPR) methods to test the effects of middle–school-based obesity prevention interventions. A randomized controlled trial (RCT) of Students for Nutrition and eXercise (SNaX)—a middle school–based obesity-prevention intervention combining school-wide environmental changes, multimedia, encouragement to eat healthy cafeteria foods, and peer-led marketing—showed effects on students' eating behaviors.

Trial Registration: A randomized controlled trial of Students for Nutrition and eXercise, clinicaltrials.gov identifier NCT01914471.

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More than 20% of U.S. adolescents aged 12–19 years are obese [1]. Policymakers have targeted schools as an ideal setting for obesity prevention. The 2010 Healthy Hunger-Free Kids Act

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Table 1
SNaX intervention components

Component	Activity	Explanation
School food environment changes	Greater variety of sliced/bite-sized fruits and vegetables at lunch[a]	Sliced/bite-sized fruits and vegetables (e.g., sliced apples, grapes, and baby carrots) showed large effects in pilot; was adopted immediately by LAUSD (before RCT). Based on research showing that increased variety of food choices leads to greater purchasing and consumption [24–26]
	Free chilled filtered water in or near cafeteria at lunchtime	Water stations filled from filtered cafeteria tap; disposable cups available for students; and reusable water bottles given to peer leaders. Based on SNaX's formative work showing students' poor access to water at mealtimes [15,16] and research in which household provision of water and other noncaloric beverages led to weight loss among obese/overweight youth, especially Latinos [27]. SNaX's formative research prompted CA SB1413, which requires districts to provide free drinking water during mealtimes in cafeteria areas.
	Cafeteria point-of-sale food signage and posters	Developed in partnership with LAUSD; shows food offerings' nutritional values and food label explanations. Based on research showing that posting nutritional information is associated with youths' healthier eating [28]
Peer-leader club and social marketing	5-week peer-leader club and lunchtime sessions (two sessions/week total), and peer-leader discussion of SNaX messages during lunch and at home	Facilitator conducts five weekly sessions in which seventh-grade peer leaders are taught to discuss SNaX messages (regarding cafeteria, water, SSBs, fruits/vegetables, physical activity/inactivity) with peers and family using a motivational interviewing (MI) style. (MI is a nonconfrontational and nonjudgmental style for changing health behaviors [29].) During lunchtime for five weeks, peer leaders (wearing tee-shirts with the SNaX logo) conduct taste tests and give out promotional items (SNaX wrist bands, key chains, etc.)
	The SNaX League: kick-off film	30-minute film shown in school-wide assembly; introduces key SNaX messages; scripted story provides examples of youth leadership on obesity prevention
	The SNaX League: trailer	Trailer for film; shown in-class to help recruit peer leaders/increase excitement for SNaX
	Physical activity posters	Posted near gymnasium
	Parent–student activities	Given to all seventh graders to bring home to parents
	Handouts	Information on cafeteria and fast food nutrition, food labeling, and SNaX. Given by teachers to seventh graders and by peer leaders to peers and family
	Bookmarks	Contain key SNaX messages; given by peer leaders to students and family

LAUSD = Los Angeles Unified School District; RCT = randomized controlled trial; SNaX = Students for Nutrition and eXercise.
[a] Based on the success of our pilot, LAUSD began disseminating this component before the RCT test; thus, in the RCT, we modified the sliced/bite-sized fruit and vegetable components to be tested as 50–100 additional servings/day of fruits and vegetables that were not on the planned cafeteria menu (e.g., if orange slices were already being served, SNaX added 50–100 servings of grapes).

(S.3307) [2] improves school food nutritional standards and requires free water provision at mealtimes (to reduce sugar-sweetened beverage consumption) [3]. School-based nutritional policy changes, as well as interventions that have improved the school nutritional environment, have shown encouraging results for reducing body mass index (BMI) and sugar-sweetened beverage consumption and increasing fruit and vegetable intake [4–12]. Expert medical committees have called on clinicians to advocate for school nutritional policy changes [13,14].

We used principles of CBPR, partnering with the Los Angeles Unified School District (LAUSD) to conduct a RCT of SNaX, a 5-week middle-school intervention combining school-wide environmental changes, multimedia, encouragement to eat cafeteria food (because of school policies to provide healthier food), and student advocacy (Table 1) [15–29]. We used as a conceptual basis social-cognitive theories, which specify that changes in attitudes, norms, and self-efficacy lead to behavior changes [22], and recognized the importance of ecological influences (e.g., food availability) in constraining and facilitating healthy behaviors [23]. Because research suggests that peer leaders can be change agents in middle school, when peer influence is increasing [30], we trained peer leaders to promote and model healthy behaviors and engage other students in discussions to change eating and physical activity norms. Cafeteria managers offered chilled, filtered water and a greater variety of healthier options (sliced/bite-sized fruits/vegetables). In a SNaX pilot, students in an intervention school (vs. a matched comparison school) selected more fruit and healthier entrées at lunch [17].

The purpose of the present study was to conduct an RCT of SNaX. We hypothesized that SNaX would lead to a higher proportion of students served in the cafeteria (because SNaX markets cafeterias' healthy foods); increased fruit and vegetable servings (because SNaX increases access to sliced/bite-sized fruits and vegetables); decreased school store snack sales; and greater water consumption. We also hypothesized that SNaX would lead to more positive attitudes about the cafeteria and water, improve obesity-prevention knowledge, and increase intentions to drink water.