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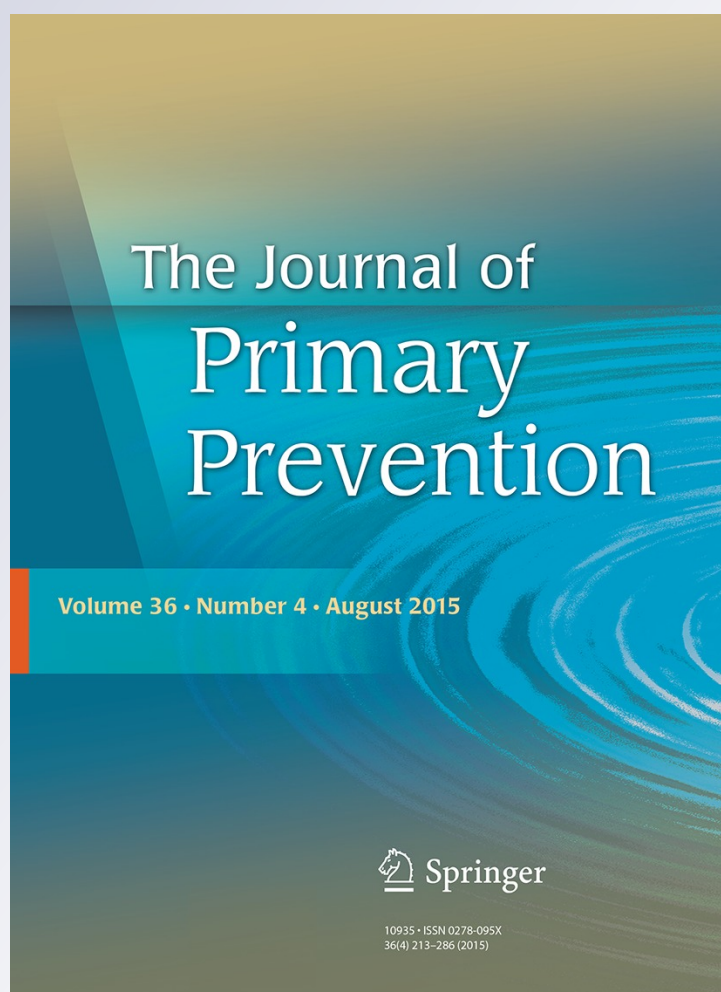
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Feasibility and Acceptability of Brighter Bites: A Food Co-Op in Schools to Increase Access, Continuity and Education of Fruits and Vegetables Among Low-Income Populations

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Abstract Intake of fruits and vegetables (F&V) continues to be low in children in the United States. The purpose of this study was to conduct a pilot feasibility evaluation of Brighter Bites, a school-based food co-op to provide access to fresh F&V and nutrition education to low-income children and their families. Brighter Bites is a 16-week school-based food co-op consisting of: (1) Weekly distribution of 50–60 servings of fresh F&V; (2) Weekly bilingual parent handouts and recipe demonstrations; and (3) implementing CATCH, a coordinated school health program in schools. Brighter Bites was pilot tested

using a pre-post evaluation design in one charter school in Houston, TX, USA ($n = 57$ 3rd grade parent-child dyads; 94.1 % Hispanic, 91 % low-income). Evaluation, at baseline, midpoint, and post-intervention, included self-reported child and parent surveys on psychosocial factors, dietary habits and mealtime practices. Pearson's Chi square test, Fisher's exact-test or paired t test were used to determine changes pre- to post-intervention (at $p < 0.05$). Process data using parent surveys, teacher surveys, attendance logs, and produce cost data were used to determine feasibility and acceptability of program. Participants received on average 61 servings of F&V weekly for 16 weeks at the cost of \$4.31/family/week. Results showed significant increases in child reported self-efficacy, outcome expectations and attitudes towards consuming F&V ($p < 0.05$). We found significant increases in child exposure to F&V and child preference of various F&V from baseline to post-intervention ($p < 0.05$). Parent surveys showed significant improvements in mealtime practices at home: decrease in children eating while watching TV, increase in eating dinner with the family, less fast food, less sugary drinks with meals, more children asking for F&V as snacks. Process data showed 98 % retention rate and high parent acceptability of program components. Brighter Bites is a promising strategy to increase F&V access and education in low-income populations using existing infrastructure of schools and food banks.

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Introduction

Consuming a diet high in fruits and vegetables (F&V) has protective effects against obesity and other chronic diseases (Boeing et al., 2012). However, lower income and minority children have the lowest intake of these healthful foods compared to higher income and other racial/ethnic groups (Lorson, Melgar-Quinonez, & Taylor, 2009). Several factors, including low sustained availability to fresh produce, family environment, and low food literacy contribute to the poor intake of F&V (Pearson, Biddle & Gorely, 2008). To have sustained impact, programs increasing access and education regarding F&V are needed (Rasmussen et al., 2006). We report a pilot feasibility evaluation of Brighter Bites, a school-based co-op program providing access to fresh F&V and nutrition education to increase demand and intake of F&V among low-income children and their families.

Methods

Brighter Bites is a 16-week school-based program grounded in the Social Cognitive Theory (Bandura, 1986) and the Theory of Planned Behavior (Ajzen, 1991) constructs of behavioral capability, self-efficacy, environment, attitudes, beliefs, and social support, to provide access to fresh F&V and nutrition education to low-income children and their families. It comprises three components: (1) Weekly distribution of fresh F&V sent home with parents. Each family receives 50–60 servings (~30 pounds) of a variety of fresh F&V weekly. Access to fresh produce at a minimal cost of \$0.04–\$0.16/pound is possible by collaboration with the Houston Food Bank (HFB). (2) School-based health education using Coordinated Approach to Child Health (CATCH), an evidence-based coordinated school health program with proven obesity prevention effects in children (Hoelscher et al., 2010). (3) Parent–child nutrition education implemented weekly at produce pick-up time, including bilingual weekly hand-outs, recipe cards, and recipe demonstrations of produce given in the bags.

Study Design

We pilot tested Brighter Bites at one elementary school in Houston, TX, USA (97 % Hispanic, 91 % on free or reduced-price school lunch program, an indicator of low socio-economic status). We used a pre-post evaluation design in which three of the five 3rd grade classrooms received Brighter Bites over 16 weeks in the 2012–2013 school year ($n = 57$ parent/child dyads). Master trainers trained 3rd grade teachers ($n = 3$) and a school PE coach in CATCH. Every week, parents picked up fresh, seasonal F&V, nutrition handouts and recipe cards at the end of the school day, and viewed a recipe demonstration. As part of the co-op, parents participated in bagging and distribution of the weekly produce. We obtained informed consent from parents and children. Investigators obtained approval to conduct the study from the University of Texas Health Science Center Committee for Protection of Human Subjects.

Measures

Child Anthropometrics

We measured height and weight at baseline for all participating students using digital platform scales (Tanita Professional Digital Scales, BWB-800S) and portable stadiometers (Perspective Enterprises Unit PE-AIM-101). Prevalence of obesity was computed using age and gender specific BMI percentiles (Centers for Disease Control and Prevention, 2009).

We administered child self-report surveys at baseline (prior to intervention), midpoint (8 weeks) and end of the 16-week intervention (post-intervention) during regular school hours. Surveys measured frequency of consumption of various foods, psychosocial factors including self-efficacy, attitudes and outcome expectations (Thiagarajah et al., 2008), and preference for a variety of F&V (Cullen et al., 2003).

We administered parent self-report surveys at baseline (prior to intervention), midpoint and post-intervention. Surveys ascertained child demographics, child dietary behaviors and home mealtime practices (Baranowski et al., 2000). Pre-post data were obtained from 35 (62 %) of 57 consenting parents.

We conducted a process evaluation to measure program dosage, fidelity, cost, feasibility and acceptability using weekly logs completed by program staff

on amount and type of F&V distributed, recipe demonstrations conducted, handouts and recipe cards distributed. We conducted teacher surveys for CATCH implementation, and obtained produce cost from HFB. Finally, we conducted parent surveys on perceived effectiveness of program components at midpoint ($n = 52$ parents) and post-intervention ($n = 54$ parents).

Data Analysis

We conducted data analysis using STATA 13.0 software (STATA Inc. College Station, TX, USA). Baseline to midpoint (end of 8 weeks), and baseline to post-intervention (end of 16 weeks) changes in outcome variables were conducted using a Pearson's Chi square test, Fisher's exact test (if cell size was <5), or a paired t test as appropriate. Significance was set at $p < 0.05$. Intervention dosage, reach and fidelity were measured weekly using average number of F&V servings distributed, number of nutrition education materials received and recipe demonstrations, and CATCH implementation. Average cost of produce per family per week was calculated.

Results

At baseline, participating 3rd grade children were 94.1 % Hispanic, 60 % boys and 7–9 years old; 39.5 % spoke only English, and 14 % only Spanish; 15.7 % were overweight (BMI ≥ 85 th to <95 th percentile), and 31.4 % were obese (BMI ≥ 95 th percentile).

Results showed that, as compared to baseline, there was a significant increase in children's: (a) self-efficacy for eating fruit as a snack instead of candy at midpoint ($p < 0.01$) and post-intervention ($p < 0.01$), and playing outside instead of watching television at midpoint ($p = 0.03$); (b) outcome expectations of eating healthy foods ($p = 0.03$) at mid-point, and physical activity post-intervention ($p = 0.01$); and (c) attitudes towards taste of healthy food post-intervention ($p = 0.01$), and towards school lunches served in the cafeteria at mid-point ($p = 0.03$) and post-intervention ($p < 0.01$).

While we found no significant changes in overall child-reported exposure to or preference for F&V when

assessed as summative scales, we did find significant increase at midpoint and post-intervention in the child preference of individual F&V including grapefruits, bananas, peaches, plums, pineapple, apples, cauliflower, cucumbers, onions, avocados, and various greens ($p < 0.05$). There was no significant change in child-reported frequency of F&V intake.

For the parent-reported home environment, as compared to baseline, we found a significant: (a) decrease in the percent of children watching TV while eating their evening meal at midpoint only ($p = 0.005$); (b) increase in percent of children who helped prepare the evening meal at midpoint ($p = 0.002$) and post-intervention ($p = 0.047$); (c) decrease in the frequency of serving sugar-sweetened beverages (SSB) at the evening meal at midpoint ($p = 0.004$) and post-intervention ($p = 0.022$). We also found significant increases in parental self-efficacy regarding their child choosing: (a) broccoli instead of French fries ($p = 0.001$); and (b) carrot sticks instead of chips at midpoint ($p = 0.012$), but not post-intervention; and (c) fruit instead of candy at midpoint ($p = 0.021$) and post-intervention ($p = 0.016$).

Finally, we found significant increases, as compared to baseline, in the number of parents reportedly having rules at home about: limiting portion sizes at midpoint ($p < 0.001$) and post-intervention ($p = 0.017$); no meals while watching TV/DVDs at midpoint ($p = 0.002$) and post-intervention ($p = 0.029$); eating family dinners at mid-point ($p = 0.009$) and post-intervention ($p = 0.001$); limiting fast food at midpoint ($p = 0.006$) and post-intervention ($p < 0.001$); and no SSBs with meals at midpoint ($p = 0.030$) and post-intervention ($p = 0.029$).

Table 1 shows the results of Brighter Bites program dosage, fidelity and acceptability. Brighter Bites provided on average 61 servings (35 lbs.) of fresh F&V over 16 weeks, with an average cost of F&V \$4.31 per family/week. The program had 16-week retention rates of 96 %. Ninety-six percent of parents reported that their family ate all/most of the F&V sent home; 83 % reported reading all/most of the handouts; and 99 % found the handouts to be helpful. Over 85 % found the distribution of F&V effective, 82 and 84 % found the education materials and recipe cards, respectively, effective in influencing F&V intake. All (100 %) of the four 3rd grade teachers and one PE coach reported implementing CATCH classroom curriculum and PE components (data not shown).

Table 1 Results of Brighter Bites program dosage, reach, fidelity and acceptability

	Fall	Spring	Mean of fall and spring
	<i>n</i> (%)	<i>n</i> (%)	Mean %
Average cost of produce per family per week (mean \pm <i>SD</i>)	\$7.02 (6.6)	\$1.61 (0.06)	\$4.31 (5.3)
Average number of servings of F&V provided per family per week (mean \pm <i>SD</i>)	68.1 (16.2)	53.1 (9.9)	60.6 (15.1)
<i>Parent process survey evaluation (n = 52 surveys in Fall 2012; n = 54 surveys in Spring 2013)</i>			
How many weeks did you receive the produce as part of this program?			
0–6 weeks	0 (0.0 %)	0 (0.0 %)	0 % (0.0)
7–8 weeks	51 (100.0 %)	53 (100.0 %)	100 % (0.0)
Describe your overall experience using the fruit.			
My family ate all or most of the fruit every week	46 (95.8 %)	50 (96.2 %)	96.0 % (0.2)
My family ate less than half or none of the fruit	2 (4.2 %)	2 (3.9 %)	4.0 % (0.2)
Describe your overall experience using the vegetables			
My family ate all or most of the veggies every week	46 (95.8 %)	48 (96.0 %)	95.9 % (0.1)
My family ate less than half or none of the veggies	2 (4.2 %)	2 (4.0 %)	4.1 % (0.1)
How many educational materials did you receive?			
0–6 handouts	9 (18.4 %)	16 (33.3 %)	25.9 % (10.6)
7–8 handouts	40 (81.6 %)	33 (66.7 %)	74.1 % (10.6)
How much of the education material did you read?			
All or most pages	31 (81.6 %)	45 (84.9 %)	83.2 % (2.3)
A few pages	7 (18.4 %)	7 (13.2 %)	15.8 % (3.7)
None	0 (0.0 %)	1 (1.9 %)	0.9 % (1.3)
Describe your overall impression of the education materials			
Helpful	39 (100.0 %)	51 (98.1 %)	99.0 % (1.4)
Not helpful	0 (0.0 %)	1 (1.9 %)	1.0 % (1.4)
Rate the effectiveness of the fruit provided as part of this program to influence your child's intake of F&V			
Very effective	36 (94.7 %)	45 (84.9 %)	89.8 % (7.0)
Somewhat effective	2 (5.3 %)	7 (13.2 %)	9.2 % (5.6)
Not effective	0 (0.0 %)	1 (1.9 %)	0.9 % (1.3)
Rate the effectiveness of the vegetables provided as part of this program to influence your child's intake of F&V			
Very effective	33 (91.7 %)	43 (81.1 %)	86.4 % (7.5)
Somewhat effective	2 (5.6 %)	8 (15.1 %)	10.3 % (6.7)
Not effective	1 (2.8 %)	2 (3.8 %)	3.3 % (0.7)
Rate the effectiveness of the education materials to influence your child's F&V intake			
Very effective	30 (85.7 %)	39 (78.4 %)	82.1 % (5.1)
Somewhat	5 (14.3 %)	10 (19.6 %)	17.0 % (3.8)
Not effective	0 (0.0 %)	1 (2.0 %)	1.0 % (1.4)
Rate the effectiveness of the recipe cards to influence your child's F&V intake			
Very effective	31 (86.1 %)	43 (82.7 %)	84.4 % (2.4)
Somewhat effective	5 (13.9 %)	8 (15.4 %)	14.6 % (1.1)
Not effective	0 (0.0 %)	1 (1.9 %)	1.0 % (1.4)

F&V—fruits and vegetables

Discussion

Overall, pilot evaluation of Brighter Bites showed strong feasibility, acceptability, and positive effects on parent–child psychosocial factors. To our knowledge, this school-based program is the first to provide weekly access to a variety of fresh F&V combined with nutrition education to low-income families. In this pilot study, Brighter Bites distributed, on average, 61 servings of fresh F&V per week (8–10 varieties of produce weekly) over 16 weeks at no cost to the families, sufficient to supplement the F&V intake of a family of four by two servings per person per day. By collaborating with the HFB and using their repository of donated produce and infrastructure for delivery, food costs were low, averaging \$4.31/family/week. A limitation of school-based interventions is engagement of families (Story, Nannery, & Schwartz, 2009). Brighter Bites uses a co-op concept engaging the parents in the program delivery. Furthermore, CATCH (Hoelscher et al., 2010) enhances the school health environment.

Easy availability of F&V positively influences F&V intake (Blanchette & Brug, 2005). However, few studies have combined food access with education in school-based settings in low-income populations (Coyle et al., 2009; Fogarty et al., 2007; Jamelske, Bica, McCarty, & Meinen, 2008; Prelip et al., 2012). These studies along with ours show improvements in child psychosocial factors related to diet, physical activity and health, and increased child preference for some F&V. Interestingly, in our study, while preference for some F&V increased, preference for other vegetables decreased. Children may have had low levels of exposure to some produce prior to the intervention, emphasizing the need for long-term exposure of new F&V. Our study also shows significant improvements in parent-reported child mealtime behaviors, overall snack-time practices and home nutrition environment. However, child F&V intake remained unchanged which is likely because of small sample size or could be that the children are not consuming the produce sent home. Other limitations include the lack of a control group, and the low (62 %) response rate of the parents on the midpoint and post-intervention surveys. However, parents who responded were not significantly different at baseline from those who did not.

In summary, Brighter Bites was feasible, acceptable, provided the fresh produce at a low-cost, and a

majority of parents found the program to be effective in improving their family's F&V intake.

Conclusion

Brighter Bites is a promising strategy to provide access to fresh F&V and nutrition education using a co-op concept among low-income populations.

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Conflict of interest The authors declare that they have no conflict of interest for the current study.

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