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Children select unhealthy choices when given a choice among snack offerings

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Abstract

Out-of-school-time (OST) programs serve snacks to millions of children annually. State and national snack policies endorse serving more healthful options, such as fruits, yet often allow less healthful options, such as cookies/chips, to be served simultaneously. To date, no studies have examined the choices children make when provided with disparate snack options in OST programs. An experimental study with randomized exposures was conducted that exposed children (5–10yrs) to 3 conditions: 1) whole or sliced fruit; 2) whole/sliced fruit, sugar-sweetened snacks (e.g., cookies) and flavored-salty (e.g., nacho cheese-flavored tortilla chips) snacks; and 3) whole/sliced fruit and less processed/unflavored grain snacks (e.g., pretzels), over a two-week period representing 18 snack occasions (morning and afternoon) during summer 2013. The percentage of children who selected snacks, snack consumption, and percent of serving wasted were calculated and analyzed using repeated-measures analyses of variance with Bonferroni adjustments. A total of 1,053 observations were made. Sliced-fruit was selected more than whole-fruit across all conditions. Fruit (sliced or whole) was seldom selected when served simultaneously with sugar-sweetened (6% vs. 58%) and flavored-salty (6% vs. 38%) snacks or unflavored grain snacks (23% vs. 64%). More children consumed 100% of the sugar-sweetened (89%) and flavored-salty (82%) snacks compared to fruit (71%); 100% consumption was comparable between fruit (59%) and unflavored grain snacks (49%). Approximately 15%–47% of fruit was wasted, compared to 8%–38% of sugar-sweetened, flavored-salty, and unflavored grain snacks. Snack policies that encourage OST programs to serve fruit require clear language that limits offering less healthful snack options simultaneously.

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Keywords

Policy; Translation; Obesity; Afterschool Program; Summer Day Camp; Youth

Introduction

Out-of-school-time programs (OST) across the United States serve millions of children annually. The two largest types of OST programs, afterschool programs and summer day camps, serve approximately 8.4 million¹ and more than 14 million² children during the school year and summer, respectively. These settings typically serve children one or two snacks per day. Snacks represent an important opportunity to promote healthful eating, while also providing sustenance between major meal times.^{3,4} Because of their extensive reach, OST programs are recognized as critical settings that can influence the dietary habits of children. In recent years, national organizations have developed and adopted policies that specifically address the types of snacks OST programs should serve to promote healthful eating.⁴ Three leading organizations, the National Afterschool Association,⁵ YMCA of the USA,⁶ and Harvard School of Public Health Prevention Research Center,⁷ developed policies that recommend serving a fruit or vegetable at every snack. The policies also recommend that grains served should not be refined (e.g., air popped popcorn) or include artificial flavors (e.g., pretzels). Only the National Afterschool Association policy, however, calls for OST programs to eliminate less healthful options, such as sugar-sweetened foods (e.g., cookies, candy) or artificially-flavored snacks (e.g., nacho cheese flavored tortilla chips).

Many OST programs offer children a choice from two or more snack options. Based on current policy, OST providers can comply with snack policy by serving a fruit or vegetable daily, while serving an unhealthful snack simultaneously. Whether children select a more healthful snack, like a fruit or vegetable, when also offered a less healthful option, like cookies or chips, is unclear. Studies of snacking in the home show fruit is selected less often than other types of snacks.⁸ A previous study in the OST setting found that children selected less healthful snacks when provided a choice between more and less healthful options, but this study failed to report the percentage of food items specifically selected.⁹ The reasonable expectation in the OST setting, where children are provided a choice of snacks, is that they would be less likely to select a fruit or vegetable when allowed to choose between the fruit or vegetable and cookies, chips, or candy. This scenario would substantially reduce the intended impact of snack nutrition policies, which are designed to increase children's fruit and vegetable consumption. Additionally, whether children select fruits or vegetables at a greater rate when they are served alongside a less-processed, unflavored grain snack is unknown. Food waste is also a significant concern when serving more healthful foods. School-based studies indicate that 40 to 90% of fruits and vegetables go uneaten and wind up in trash cans.^{10–12} A recent study¹³ found that when school cafeterias provided sliced fruit, consumption increased and waste decreased. Thus, if OST programs are to promote healthful eating, the ways fruits are served (sliced or whole) may affect both children's selection of a snack and rates of consumption and waste.

Information about selection and consumption is critical for both practitioners and policy makers. OST leaders have limited resources to purchase snacks, with estimated budgets ranging from \$0.34 to 0.57 per snack.^{14,15} Serving highly perishable foods, like fruits, to meet snack policies can create a dilemma for program leaders. If children seldom select the fruit, substantial waste will occur from spoilage. Therefore, if fruit or vegetables are served daily, programs need ways to increase consumption and minimize waste. Selection and consumption issues also create difficulties in creating weekly or monthly snack schedules and forecasting annual snack budgets. For policy makers, understanding children's snack selection and consumption patterns can assist in strengthening policy language to clearly define the types of snacks OST programs should serve and how they should be paired, if at all, with other snack options.

The purpose of this study was to determine what snacks children selected when faced with a choice of snacks commonly served in OST programs. A secondary goal was to monitor snack consumption and waste. It was hypothesized that when children could choose between fruit or an alternative snack (i.e., sugar-sweetened or flavored-salty snacks or less processed and unflavored grain snacks), they would be more likely to choose an alternative snack. Further, it was hypothesized that a greater number of children who selected an alternative snack would fully consume the snack, therefore producing less waste, compared to children who selected a fruit.

Methods

Participants and Setting—The participants were children in Kindergarten (K) through 5th grade who attended a day-long (8am to 5pm) summer day camp. The camp was delivered in an elementary school and was one of 15 summer day camps conducted in a large southeastern metropolitan school district. The zip code median household income was \$57,000. Enrollment in the camp took place weekly, with parents signing up their child to attend one week at a time. Maximum enrollment was 80 children per day, with an average of 58 children present at each of the 18 snack occasions (range 33 to 76, see Table 1). The average grade level of participants was 2nd grade. As part of the camp's routine schedule, two snacks were provided – morning (9am or 10am) and afternoon (3pm). Children were responsible for providing their own lunches. The summer camp leader informed all parents of the study procedures. Parents were notified that snacks would be provided to their children by university personnel, and that the snacks would be similar to snacks already offered by the camp. Parents were told that no individual information would be collected about the children, but that snacks selected and the amount consumed would be recorded at a group level. Therefore, individual parental consent and child assent were not collected. These procedures are consistent with school-based studies evaluating consumption and waste.^{10,12,13} All procedures were approved by the Institutional Review Board at the University of South Carolina.

Snack Comparison Conditions

The study took place over 2 weeks (10 days), with a total of 18 snack observation time points (9 morning and 9 afternoon). All snacks served were based on the camp's existing

monthly snack menu. The only difference was the combination of snacks served at any given snack time. Snack serving sizes were based on commonly observed and pre-existing serving sizes.^{4,14,16} Descriptions of the snacks, serving sizes, and nutrient content are provided in Table 1. When whole fruit was served, the whole fruit options were apples, oranges, and bananas. These were selected based on our observations, and those of others, of these fruits being served to children in the school and OST program setting.¹³ When sliced fruit was served, the sliced fruit options were apples and oranges.¹³ Bananas were only served whole. When sugar-sweetened snacks were served, the options consisted of fruit gummie snacks, cream-filled sandwich cookies, and animal crackers. When flavored-salty snacks were served, the options included nacho cheese-flavored tortilla chips, cheese puffs, and cheese-flavored crackers. Finally, when less processed and unflavored grain snacks were served, the options included pretzels, plain corn tortilla chips, and air popped popcorn. At each snack occasion, children were allowed to select only one snack from the options available, consistent with the camp's snack guidelines.

The study used an experimental design with randomized exposures that provided one of three snack combinations to children over a 2-week period, comprising 18 total snack offerings. To test the language of existing national OST program snack policies, the following 3 snack comparison conditions were created that mirrored the types of snack combinations allowable based on national policies: 1) whole or sliced fruit; 2) whole/sliced fruit versus sugar-sweetened and flavored-salty snacks; 3) whole/sliced fruit versus less processed/unflavored grain snacks. An example of a snack comparison was the option of each child to select one of the following snacks: fruit whole (either an apple, banana, or orange), fruit sliced (either apples or oranges), a sugar-sweetened snack (either a cookie, gummies, or animal cracker) or a flavored-salty snack (either nacho cheese-flavored tortilla chips, cheese puffs, or cheese flavored crackers). Each of these conditions was randomly provided at 3 morning and 3 afternoon snack times across 6 days, which comprised 18 snack occasions within the 2-week period. Snack conditions did not appear twice in a single day (i.e., fruit only was not served at both morning and afternoon snack in a single day). Nor did snack conditions appear at the same time on consecutive days (e.g., fruit only morning day 1 and fruit only morning day 2). All snacks were offered during the remaining two snack times; the first morning snack of week one and the last afternoon snack of week two. This was done to ensure a balanced comparison of snack times across the primary 3 comparison conditions.

Prior to each snack time, all snacks were pre-weighed, using a digital food scale (Taylor 3801), and packaged by our research group in clear, pre-labeled bags that identified the snack. This was done to ensure that packaging did not influence snack choice. In addition, many OST programs purchase snacks in bulk and serve them on paper towels or plates (i.e., without wrappers). Twenty portions of each snack option were presented on a table at the front of the elementary school's cafeteria. Extra servings of each snack were added as items were selected to retain 20 on the table at all times. At each snack time, enough of each snack was available to feed all children if they all selected a single item (e.g., 76 children present - 76 apples available, 76 cookies available). The order of snacks presented on the table varied throughout the study to ensure that the order of the display did not influence snack choice. Snack time lasted 15–30 minutes.

Consistent with the camp's snack procedures, children were seated at tables with their respective grade level during snack time. Tables of children were called to go to the snack table and select a single item from the snacks displayed. The quantity of each snack taken was recorded and confirmed based on the quantity remaining. The number of children who consumed food items from home during snack time was also recorded. Children were instructed to leave all trash and any leftover snacks at their tables. The trash cans were removed from the cafeteria to ensure that all waste could be measured.

Immediately following snack time, research staff collected the labeled snack bags and all waste and separated them by snack offering. The quantity of partially- and fully-consumed snacks was then recorded for each item. Fully-consumed snacks were defined as no edible food items remaining with the labeled bags. For whole fruit, fully-consumed was defined as the consumption of everything except the apple core or banana or orange peel. All other leftover snacks were defined as partially consumed. The remaining snack waste was weighed and recorded for each snack to determine the total waste for each item. For the estimated weight of the fruit waste, the weight of the apple cores and banana and orange peels was excluded from the final waste weight. These procedures were repeated at each of the 18 snack occasions over the two-week study.

Data Analyses

The percentage of children who selected each snack and consumed each snack, and the amount of waste per snack, was computed for each snack category at every snack time, with the number of children present serving as the denominator. Initially, comparisons within each snack category between morning and afternoon were made for snack selection, 100% consumption, and percentage wasted to determine if eating habits were different between the two snack times. There was no evidence of differential snack selection, consumption, or waste by time of snack. Because the percentages were non-normally distributed, all percentages were transformed into arcsin values, with all analyses performed on adjusted values. Mixed model analyses of variance were used to compare the percentage of children selecting each snack and consuming 100% of the snack, and the percentage of waste remaining, among snack categories by snack condition, taking into account the lack of independence among children across snack times. Analyses were conducted on the percentage of children selecting each snack, consuming each snack, and the amount of waste remaining. These analyses were aggregated at the snack time level (total N = 18). Where a significant main effect ($p < .05$) was observed, Bonferroni adjusted pair-wise comparisons were made. All analyses were conducted using Stata (v.12.0. College Station, TX).

Results

The percentage of children selecting each snack, percentage consuming each snack, and the waste remaining for each snack, in addition to comparisons among snack offerings and snack selection, 100% consumption, and waste from the ANOVA models, are presented in Table 2. Where fruit (either sliced apples/oranges, whole apples/oranges, or a banana) was served in conjunction with sugar-sweetened snacks or flavored-salty snacks, only 6% of the children selected fruit, while 58% and 38% selected sugar-sweetened snacks or flavored-

salty snacks, respectively. The difference between the percentage of children selecting fruit vs. sugar-sweetened snacks (difference 51%, 95% confidence interval [95CI] 37–66%) and fruit vs. flavored-salty snacks (31%, 95CI 17–46%) was significant ($P < .05$). When fruit was served alongside less processed/unflavored grain snacks, fruit selection increased to 23%, with 64% of the children selecting the unflavored grain option (difference 40%, 95CI 14–67%). When fruit was served alone, 37% of the children selected the sliced apples/oranges, while 17% selected whole apples/oranges and 24% selected bananas. The differences between sliced and whole apples/oranges (20%, 95CI 4–36%) and sliced apples/oranges and bananas (13%, 95CI 2–24%) were significant.

When fruit was served alongside sugar-sweetened snacks, flavored-salty snacks or less processed/unflavored grain snacks, there were no differences in the percentage of children consuming 100% of the snack. When fruit was served alone, a greater percentage of children consumed the entire banana (83%) vs. either whole (33%, difference 50%, 95CI 28–72%) or sliced (39%, difference 44%, 95CI 23–66%) apples/oranges. The waste associated with uneaten snacks was not statistically different for fruit (16%) when served alongside sugar-sweetened snacks (12%) or flavored-salty snacks (8%). No differences in waste were observed when fruit was served with less processed/unflavored grain snacks or served alone. When fruit was served alone, whole apples/oranges were associated with higher waste (47%), compared to sliced apples/oranges (26%, difference 21%, 95CI 6–36%), and bananas (15%, difference 33%, 95CI 10–55%). Waste associated with sliced apples/oranges did not differ from waste associated with bananas.

Discussion

This study was the first to examine national OST policies for snacks, as they are translated into practice in typical OST programs. The primary finding was that when children were offered the choice between fruit or sugar-sweetened snacks, flavored-salty snacks or less processed/unflavored grain snacks, they almost never selected fruit. These findings indicate that when policies recommend serving fruit as a snack, without clearly indicating that alternative snacks cannot be offered simultaneously, they are unlikely to have the desired effect of promoting more healthful eating. Thus, a concerted review of the language and recommendations of existing policies targeting snack quality in OST programs is recommended to ensure that the snacks served “foster the best possible nutrition outcomes for children.”⁵

An important consideration in developing policy language is asking the question, “What is the intended impact of the policy?” Currently, policies from leading OST organizations recommend that OST programs serve a fruit or vegetable daily. If simply serving the fruit (as evaluated in the present study) is the primary focus, then providing a limited number of fruit offerings daily, knowing that no more than a quarter of the children will actually select the fruit, would satisfy this policy requirement. However, the likely intent of the policies is to *improve* the quality of snacks children consume in the program. If an OST program serves both fruit and less healthful choices, as is often the routine practice in OST programs,^{14,16,17} our study suggest that a large majority of children will select the less healthful choice. A similar trend was observed when fruit was served in conjunction with unflavored grain

snacks, with children continuing to select the alternative snack at a significantly higher rate. Given these findings, the language used in existing policies to define the types of snacks OST programs can serve would fail to increase fruit consumption in a majority of children.

If the goal of OST nutrition policies is to increase consumption, not just availability, of healthful foods (i.e., fruit), OST programs could serve fruit (and/or a vegetable) solely, but still provide a choice between two or more types of fruits. In this study, whole apples, oranges, and bananas, along with sliced apples and sliced oranges were provided. Consistent with prior research,¹³ in the fruit-only comparison children selected sliced apples/oranges more often than whole apples/oranges or bananas. However, the percentage of children who did not select a snack (i.e., none taken) was higher for the fruit-only comparison (21%), suggesting some children simply opted not to eat anything when fruit was the only snack option. Strategies to address this issue include offering taste testings, providing alternative fruits (e.g., grapes, melon), encouraging staff to promote eating fruit, and/or providing nutrition education.^{9,18,19} Serving fruit solely might also encourage children to eat foods brought from home. The OST program in this study provided snacks, while children were responsible for packing a lunch. If children do not select a snack, it is reasonable to expect them to eat some of their lunch items or bring a snack from home. Across all of the snack comparisons, we observed only 3 or 4 children eating something other than the snack provided. Thus, the majority of children were not consuming something they brought from home during the fruit-only comparison.

Strengths of this study include the use of direct observation and detailed recording of the number of snacks provided and selected, and the measurement of consumption and food waste. In addition, information was collected during a large number of observations (total 1,053) using a randomized exposure design to expose children to varying snack combinations. Another strength was the comparison of snack selection, consumption, and waste across a wide range of snack types, with snacks based on current OST practice. Thus, our findings represent an accurate reflection of children's normal selection of snacks in this OST program. A weakness of this study is the lack of information on each child's individual snack selection and how this changed across conditions. This was because children could leave the OST program at various times across the days, with some children attending the entire program and others leaving before the afternoon snack. Additionally, not all children were exposed to all the conditions because of leaving the program early or arriving late on any given day. Despite this limitation, we believe the estimates provided represent an accurate reflection of the consumption patterns of children when exposed to different snack choices. Also, we cannot determine if the children who selected fruit were the same across all snack comparisons. Further, it is unknown if the children who selected sugar-sweetened or flavored-salty snacks were the same children who did not select a snack during the fruit-only comparison.

In conclusion, recommendations that afterschool and summer camp programs serve a healthful snack, such as fruit, every day can play an important role in public health policy. Based on the findings of this study, existing policies (as currently worded) are unlikely to impact children's intake of fruit. These findings have policy implications and could inform

the language of these policies, specifically as it relates to serving healthful snacks simultaneously with alternative less-healthful snack options.

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Table 1

Description of snacks served and comparisons across 18 snack times over 10 days

Snack Group	Serving Size (oz)	Calories (kcal)	Total Fat (g)	Saturated Fat (g)	Total Carb (g)	Dietary Fiber (g)	Sugars (g)	Protein (g)	Sodium (mg)	Snack Comparisons			
										1 (Fruit Only)	2 (Fruit vs. Sweet and Flavored Snacks)	3 (Fruit vs. Unflavored Grains)	
Fruit (All)													
Whole													
Apples	6.3	95	< 1.0	0.0	25.1	4.4	18.9	< 1.0	2	●	●	●	
Oranges	6.7	93	< 1.0	0.03	23.9	4.2	16.2	1.7	0				
Bananas ^a	7.5	135	< 1.0	0.03	34.7	4.0	18.6	1.7	1				
Sliced													
Apples	6.3	95	< 1.0	0.03	25.1	4.4	18.9	< 1.0	2				
Oranges	6.7	93	< 1.0	0.03	23.9	4.2	16.2	1.7	0				
Sugar-Sweetened Foods													
Cream Filled Sandwich Cookie	2.0	270	11.0	3.5	41.0	2.0	23.0 <i>b</i>	2.0	316		●		
Fruit Gummie Candy	2.0	240	4.0	0.03	50.0	1.0	14.0 <i>b</i>	2.0	0				
Animal Crackers	0.9	80	0.0	0.03	19.0	0.0	13.0 <i>b</i>	1.0	99				
Flavored Salty Snacks													
Nacho Cheese Flavored Tortilla Chips	1.0	140	8.0	1.0	16.0	1.0	0.0	2.0	210		●		
Cheese Puffs	1.0	150	10.0	1.5	13.0	< 1.0	1.0	2.0	294				
Cheese Flavored Crackers	1.0	140	6.0	1.3	18.0	< 1.0	< 1.0	3.0	170				
Less Processed and Unflavored Grains													
Air Popped Pop Corn	1.5	160	0.03	0.03	35.0	1.0	1.0	4.0	1			●	
Pretzels	1.0	138	6.6	< 1.0	18.6	1.5	< 1.0	2.2	350				
Plain Corn Tortilla Chips	0.5	55	< 1.0	0.0	11.0	2.1	< 1.0	1.8	119				
Number of Snack Times													
Morning Snack										3	3	3	
Afternoon Snack										3	3	3	
Total Number of Days										6	6	6	

Snack Group	Snack Comparisons											
	Serving Size (oz)	Calories (kcal)	Total Fat (g)	Saturated Fat (g)	Total Carb (g)	Dietary Fiber (g)	Sugars (g)	Protein (g)	Sodium (mg)	1 (Fruit Only)	2 (Fruit vs. Sweet and Flavored Snacks)	3 (Fruit vs. Unflavored Grains)
Total number of child observations ^c										351	349	353
Range												
Minimum										33	42	34
Maximum										76	68	75

^a Bananas considered as separate fruit item in comparison between whole (apples and oranges), sliced, and bananas (i.e., fruit only comparison) since bananas are likely to be served intact (i.e., whole) in the programs

^b Represents foods with added sugars (e.g., cookies) versus foods with natural sugars (i.e., fruit)

^c Represents total number of individual observations conducted on the children, with some children are present and observed at multiple snack occasions.

Table 2
Percentage of and differences among snack items selected, consumed, and wasted across the three snack conditions

Snack Condition	Snack Type	Observed Percentage of Children During Each Snack Condition						Percent Difference Among Selection, Consumption, and Waste within a Snack Condition					
		Selection			100% Consumption			Selection			100% Consumption		
		M	SE	M	SE	M	SE	Est.	(95%CI)	Est.	(95%CI)	Est.	(95%CI)
Fruit Only	Banana	24.4	1.9	83.5	4.7	14.9	8.4	7.1	(-2.1, 16.3)	-50.2*	(-72.4, -28.0)	-32.6*	(-55.4, -9.7)
	Whole	17.3	2.8	33.3	8.0	47.5	5.4	-13.1*	(-24.4, -1.8)	-44.2*	(-66.0, -22.5)	-11.5	(-33.4, 10.4)
	Sliced	37.5	4.3	39.2	7.8	26.4	4.0	-20.2*	(-36.2, -4.2)	5.9	(-20.1, 32.0)	-21.1*	(-36.3, -5.9)
Fruit, Grains Flavored, and Sweets	Sugar-Sweetened Foods	57.6	5.9	89.4	5.4	12.1	4.4	-51.4*	(-65.6, -37.3)	18.6	(-23.6, 60.8)	-7.5	(-32.2, 17.2)
	Flavored Grains	37.5	5.2	82.0	4.9	8.2	1.9	20.1*	(0.9, 39.2)	7.4	(-17.3, 32.1)	-3.9	(-10.2, 2.4)
	Fruit	6.2	0.8	70.8	16.4	15.7	13.6	-31.4*	(-45.7, -17.0)	11.2	(-38.5, 60.8)	3.6	(-21.6, 28.8)
Fruit, Grains Unflavored	Unflavored Grains	63.7	7.3	49.3	8.9	38.4	9.4	-40.3*	(-67.2, -13.5)	-9.5	(-32.0, 13.1)	12.7	(-12.4, 37.7)
	Fruit	23.4	3.2	58.8	9.9	26.3	12.3						

Note: Asterisks (*) denote significant differences at $P < 0.05$

^a Comparisons made using transformed percentages (arcsine values) using mixed model analyses of variance