

6-1-2007

Modifying Beverage Choices of Preadolescents Through School-Based Nutrition Education

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Recommended Citation

Roth-yousey, L., Caskey, M., 2021-05-01, J., & Reicks, M. (2007). Modifying Beverage Choices of Preadolescents Through School-Based Nutrition Education. *The Journal of Extension*, 45(3), Article 15. <https://tigerprints.clemson.edu/joe/vol45/iss3/15>

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Modifying Beverage Choices of Preadolescents Through School-Based Nutrition Education

Abstract

The study reported here implemented and evaluated a school-based, classroom intervention to improve beverage choices of 3rd-5th grade children. Extension Nutrition Education Assistants provided six weekly classroom lessons and pre-post surveys to assess effectiveness. Fewer students reported usually consuming fruit drinks at breakfast, lunch, and in friends' homes and carbonated soft drinks at dinner after the intervention, while overall consumption of fruit drinks and carbonated soft drinks decreased. Reported availability of fruit drinks and carbonated soft drinks in the home was not changed. Further exploration of family and environmental barriers is necessary to influence healthful beverage selection.

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Introduction

Beverage choices of preadolescent children are of concern because they make positive or negative contributions to diet quality and overall health. The displacement of milk with carbonated soft drinks or fruit drinks/ades negatively affects calcium intake (Frary, Johnson, & Wang, 2004). Higher intake of sweetened beverages such as carbonated soft drinks increases risk for dental decay among children 2-10 years of age (Sohn, Burt, & Sowers, 2006). Greater intake of calorically sweetened beverages is positively associated with weight gain and overweight in children (Malik, Schulze, & Hu, 2006).

When U.S. dietary intake data are compared from 1994-1996 to 1999-2002, beverage intake trends point toward an increase in sweetened beverage consumption (e.g., carbonated soft drinks and fruit drinks/ades) by school-aged children and a decrease in milk intake (Nielsen & Popkin, 2004; Forshee, Anderson, & Storey, 2006). Recent national intake data (1999-2002) show that 6-11 year old children are drinking about the same amount of milk as carbonated soft drinks (approximately 7 ounces/day of each for girls and 9 ounces/day of each for boys) (Forshee,

Anderson, & Storey, 2006).

Intake of fruit drinks/ades and juice follows, with an average daily intake of about 3 ounces/day of each for girls and boys. Results from a Canadian survey show that carbonated soft drink consumption occurs daily in 34% of girls and 42% of boys in sixth grade (Public Health Agency of Canada, 2004). A national survey (conducted through publication in *Dragonfly* magazine) supports this frequency, with 31% of 8-13 year olds reporting that their friends drink carbonated soft drinks three or more times per week (Grimm, Harnack, & Story, 2004).

As children gain access to snack bars in schools, more opportunities to drink sweetened beverages are available, and intake tends to increase (Cullen & Zakeri, 2004). Sweetened beverages can also be consumed as snacks at friends' homes or in fast food restaurants. With increased availability, consuming excessive quantities of sweetened beverages is possible, thereby increasing health risks. Parents can influence beverage consumption through their taste preferences, purchasing habits, and role-modeling (Patrick & Nicklas, 2005). Grimm and colleagues (2004) reported that 80% of children stated that carbonated soft drinks were available in the home and if parents regularly drank carbonated soft drinks, children were almost three times more likely to consume carbonated soft drinks five or more times per week.

The purpose of the study reported here was to implement and evaluate a school-based, classroom intervention based on Social Cognitive Theory as a theoretical framework that would 1) improve individual choices of students based on milk, carbonated soft drinks, 100% fruit juice, and fruit drinks/ades options, and 2) enhance the ability of students to be change agents regarding healthful beverage choices by peers, parents and other family members. The intervention was delivered by University of Minnesota Extension Service Nutrition Education Assistants (NEAs). The NEAs were paraprofessionals employed to work with school students as part of Food Stamp Nutrition Education.

Methods

Classroom Lessons and Newsletter Development

Social Cognitive Theory served as the theoretical framework for the intervention, which involved classroom lessons for children and newsletters for parents addressing individual, environmental, and behavioral factors thought to interact in a reciprocal manner to influence eating behaviors (Baranowski, Perry, & Parcel, 2002). Six lessons were developed by a team of NEAs, Regional Extension Educators, and an Extension Nutritionist for 3rd through 5th grade students. The lessons targeted beverage choices for meals and snacks (at home or at fast-food restaurants).

Educational goals included improving students' knowledge and abilities (individual factors) related to choosing healthful beverages from the dairy, fruit, and vegetable food groups. Lesson activities encouraged students to request more healthful beverages (environmental factor) and limit consumption of fruit drinks and carbonated soft drinks. Simulation activities also allowed students to practice making healthful beverage selections for meals and snacks (behavioral factor) in different eating environments. A series of six newsletters were developed for parents and included activities that parents and children could complete together to reinforce the content of each classroom lesson.

Delivery

Classroom lessons were taught weekly by NEAs within 34 classrooms in rural school districts in one state. In the spring of 2005, 725 students (355 males; 370 girls) in 14 elementary schools participated in the project as part of Food Stamp Nutrition Education. Students in about half of the classrooms were given newsletters to bring home to parents (n=287).

Evaluation Design and Analysis

A pre-post survey design was used to evaluate the effectiveness of the classroom lessons in changing self-reported usual beverage choices and quantities by children. The questionnaire items designed to estimate intake of various beverages were based on the Harvard Eating Survey for Youth (K-95-1) (Harvard School of Public Health & Brigham Young Women's University, 1995) with slight modifications (Figure 1). Consumption frequency options were the same as the K-95-1 items, with the exception of the Fruit drink category, where two response options were merged to six choices to match other beverage frequency questions.

In addition, the K-95-1 asks about the frequency of carbonated soft drinks in terms of cans and fruit drinks in terms of glasses. However, it is currently common practice for children to also consume carbonated soft drinks from glasses poured from a larger bottle and fruit drinks from cans. Therefore, children were allowed to respond to frequency questions about carbonated soft drinks and fruit drinks in terms of cans or glasses. Artificially (diet) and sugar-sweetened (regular) carbonated soft drinks were not separated because intake of diet carbonated soft drinks accounts for only about 7% of the total carbonated soft drink intake for children aged 6-11 yrs according to NHANES data from 1999-2002 (Forshee, Anderson, & Storey, 2006). Time constraints in the classroom also required keeping the evaluation form brief.

Figure 1.
How Often Do You Drink the Following?^a

100% fruit juice	Soda pop
Never or less than 1 glass per month	Never or less than 1 per month
1-3 glasses per month	1-3 cans or glasses per month
1 glass per week	1 can or glass per week
2-6 glasses per week	2-6 cans or glasses per week
1 glass per day	1 can or glass per day
2 or more glass per day	2 or more cans or glasses per day
Milk (what you drink and have with cereal)	Fruit drinks like Sunny Delight, Kool-aid, Capri Sun
Never or less than 1 glass per month	Never or less than 1 per month
1 glass per week or less	1-3 cans or glasses per month
2-6 glasses per week	1 can or glass per week
1 glass per day	2-6 cans or glasses per week
2 - 3 glasses per day	1 can or glass per day
4 or more glasses per day	2 or more cans or glasses per day
^a To calculate consumption: a glass of juice or milk was defined as 8 ounces, while a can or glass of soda pop or fruit drink was defined as 10 ounces = the average between an 8 ounce glass and a 12 ounce can.	

Questionnaire items assessed whether 100% fruit juice, fruit drinks, milk, and carbonated soft drinks were available in the home, at friends' houses, or in fast food restaurants in the past week, and the frequency with which children selected different beverages for meals and snacks. The questionnaire also assessed the frequency with which children reported seeing parents drink each beverage type and requesting that parents purchase these beverages. Few statistically significant differences ($p > 0.05$) were observed in child responses from baseline to post intervention according to whether a parent received a newsletter. Therefore, evaluation data for all children were merged and analyzed together.

Comparison of pre- and post-changes attributed to the classroom lessons in students' usual beverage choices at meals was assessed using McNemar's test of comparison (either yes or no as "usual" intake). The Wilcoxon-matched pairs, signed rank test evaluated the student reported frequency of seeing beverages consumed (i.e., never, some days, or every day) by adults at home and asking adults to purchase beverages before and after nutrition education. A paired t-test compared (group) mean differences in the quantity of daily beverage consumption by children (100% fruit juice, milk, carbonated soft drink, and fruit drink) at baseline and after the intervention. Responses were converted to specific quantities by defining a glass of milk or 100% fruit juice as equivalent to eight ounces, and fruit drink and carbonated soft drink glasses or cans as equivalent to 10 ounces. Differences were identified as significant if p-values were less than or equal to 0.05.

Results

Student Participants

About two-thirds (77% of all students) participating in the project completed both the survey administered before (pre) and after (post) the classroom lessons ($n = 563$ students of which 273 were males, 288 were females, and 2 did not report their gender). The average student age was 9.8 years, with 21% of students ($n=121$) in the 3rd, 54% of students ($n=302$) in the 4th, and 25% of students ($n=140$) in the 5th grade. Most students reported race/ethnicity, and the majority represented non-Hispanic White (89% of students), followed by Native American (6% of students), Hispanic (6% of students), Black (3% of students), and Asian (2% of students).

Beverage Availability at Home

At baseline, milk was reported as being available in the home in the past week by 98% of students, while 78% of students reported that carbonated soft drinks were available (data not shown). Students did not report a significant change in availability of any of the beverage choices ($p > 0.05$) over the course of the intervention.

Frequency of Drinking Beverages in Different Situations

At baseline, most students reported usually consuming milk at meals (74% of students drinking milk at breakfast, 78% of students at lunch, and 71% at dinner), with about one-third drinking 100% juice at breakfast (36% of students) (Table 1). When eating at fast food restaurants and in friends' homes, drinking carbonated soft drinks was most frequently reported at baseline (83% and 53% of students, respectively) (Table 1). The findings for milk and carbonated soft drinks were similar after the intervention ($p > 0.05$), except that the frequency of usually drinking milk for breakfast decreased from 74% to 69% of students.

At baseline, the percentage of students reporting that they usually drank fruit drinks at meals varied from about 16% to 18% of students, with about one-quarter drinking fruit drinks at a friend's house. By mealtime, the most positive changes occurred by reducing the likelihood that students reported usually drinking fruit drink at breakfast and lunch. Students were also less likely to report consuming fruit drinks at friends' homes after the classroom education. In addition, approximately 5% of students were less likely to report usually drinking carbonated soft drinks for the dinner meal. Students did not change their reported frequency of usually drinking carbonated soft drinks while eating at fast food restaurants.

Table 1.
Change in Reported Frequency of Usual Beverage Consumption^a

Beverage Consumed	Breakfast % Yes		Lunch % Yes ^b		Dinner % Yes ^c		Fast Food % Yes ^d		Friend's House % Yes	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
100% Fruit Juice	36	37	12.3	12.5	12.4	14.7	4.8	6.9	17.6	45.8
Fruit Drink	17.6	12.5**	17.6	11.0**	16.4	15.5	9.8	7.1	25.4	21.3*
Milk	73.7	68.9**	77.8	80.8	71.0	70.2	12.3	12.6	34.8	33.6
Carbonated Soft Drink	4.3	3.6	13.9	10.8	23.3	18.8**	83.1	82.2	52.9	52.4

* McNemar X^2 test with p value ≤ 0.05
** McNemar X^2 test with p value ≤ 0.01
^a Students were asked to identify usual beverages consumed at meals (i.e., breakfast, lunch, and dinner), as snacks, in fast food restaurants or at friend's houses. The analysis evaluated responses as a dichotomous variable (i.e., yes or no) for $n=563$ matched pairs except where noted.
^b $n=562$ matched pairs for milk
^c $n=562$ matched pairs each for fruit drink, milk and carbonated soft drink
^d $n=562$ matched pairs for carbonated soft drink

Beverage Consumption

Reported daily consumption decreased significantly for fruit drinks ($p < 0.01$) and carbonated soft drinks ($p < 0.05$) after the intervention, while milk and 100% juice consumption did not change (Table 2).

Table 2.
Change in Reported Student Beverage Consumption^a

Beverage	Pre	Post	Difference ^b
(n =number of matched pairs)	Mean ounces per day \pm SD	Mean ounces per day \pm SD	Mean ounces per day \pm SD
100% Fruit Juice ($n=549$)	6.7 \pm 7.3	6.6 \pm 7.2	-0.08 \pm 8.0
Milk ($n=539$)	19.8 \pm 13.0	20.5 \pm 12.8	0.9 \pm 14.6
Carbonated Soft Drink ($n=553$)	5.5 \pm 7.8	4.8 \pm 6.9	-0.7 \pm 7.5*
Fruit Drink ($n=546$)	7.6 \pm 9.2	6.4 \pm 8.5	-1.3 \pm 9.7**

* Paired t-test with p value < 0.05
** Paired t-test with p value $p < 0.01$
^a Consumption was calculated as follows: a glass of juice or milk was defined as 8 ounces, while a can or glass of soda pop or fruit drink was defined as 10 ounces = the average between an 8 ounce glass and a 12 ounce can. Response options are summarized in Figure 1.

^b Paired t-test mean differences where a negative differences indicates amount decreased

Students as Change Agents

More students were likely to report seeing their mother or another adult female in the household drink fruit juice or milk every day after the lessons compared to baseline ($p < 0.05$) (Table 3). No statistically significant changes were observed in reporting seeing dad (or other male adult) drink fruit juice or milk. The likelihood that students asked their mother (or another adult female) or their father (or other adult male) in the household to buy carbonated soft drinks was significantly lower compared to baseline ($p < 0.05$) (data not shown).

Table 3.
Changes in Student Reported Beverage Consumption of Mom/Other Adult Female^a

Beverage	n matched pairs	Frequency		
		Never %	Some days %	Every day %
100% Fruit Juice	545			
Pre		18	69	13
Post		16	68	15*
Milk	549			
Pre		13	39	48
Post		10	38	52**
Carbonated Soft Drink	545			
Pre		11	59	30
Post		14	57	29
* Wilcoxon-matched pairs, signed rank test with p value < 0.05				
** Wilcoxon-matched pairs, signed rank test with p value < 0.01				
^a Students were asked "How often do you see mom or other adult female drink [beverage]?"				

Discussion

The overall change in healthful beverage consumption was positive, with the average reported daily consumption of fruit drinks and carbonated soft drinks decreasing in 3rd-5th graders after our 6-week school-based, educational program. After participating in our program, children were also less likely to report usually drinking carbonated soft drinks at dinner and fruit drinks at breakfast, lunch, and while at a friend's house.

Nutrition education efforts such as the current school-based program can successfully influence the frequency that sweetened beverages are chosen by children at various occasions and the quantity consumed. The co-evolving trends for an increase in sweetened beverage consumption and a decrease in milk consumption (Nielsen & Popkin, 2004; Forshee, Anderson, & Storey, 2006) among school-aged children require a better understanding of the personal and environmental factors that underlie these trends. This improved understanding can enhance the effectiveness of nutrition education efforts designed to address the shift in beverage choices that are related to poorer diet quality and negative health outcomes for children.

While most outcomes from our program were positive, the number of children who reported that they usually drank milk at breakfast decreased, but overall milk consumption (ounces per day) did not decrease. Several studies have indicated that breakfast is strongly correlated with milk intake (Bowman, 2002) and calcium intake (Ortega, Requejo, Lopez-Sobaler, Andres, Quintas, Navia, et al., 1998). Therefore, nutrition education programs should continue to focus on breakfast beverage choices both at home and school, and potential factors that influence drinking milk at breakfast.

Students in the study reported seeing mothers/other female adults in the home drink carbonated soft drinks less often after the intervention, but this finding conflicted with students' perceptions that availability of carbonated soft drinks at home did not change over the same time period. Intake of other family members could be responsible for this discrepancy in findings and reinforces the need to target parents and families with nutrition education as well as children in school. A broader audience is needed to effectively address the necessary positive environmental changes in the home as suggested by others (Patrick & Nicklas, 2005).

One lesson in our program focused solely on healthful beverage selection at fast food restaurants;

however, reported usual consumption of carbonated soft drinks in this setting did not change after the program. Fast food use has been associated with higher intakes of carbonated soft drinks and a lower intake of milk by children (Bowman, Gortmaker, Ebbeling, Pereira, & Ludwig, 2004; Paeratakul, Ferdinand, Champagne, Ryan, & Bray, 2003). While milk and water are offered in fast food restaurants, other factors such as marketing carbonated soft drinks as part of a meal package, the presence of friends (i.e., peer-pressure), convenience, and exposure to advertisements may limit changes initiated in a short-term nutrition education intervention.

Limitations of the current study include the limited generalizability of results based on the use of self-reported data from a convenience sample of children from rural schools in one state. Questionnaires included instructions to children to provide the answer that was the best response for the child to eliminate the possibility that children would only provide socially desirable answers. In addition, other unforeseen factors may have affected beverage consumption during the intervention, such as changes in individual school policies regarding access and marketing.

Application

Overall, the practical implications of the current study are that nutrition education delivered by Extension staff in schools can help guide children's beverage choices and encourage a limited intake of carbonated soft drinks and fruit drinks. This can be supported by the implementation of recent school wellness policies that promote healthful beverage consumption at school. Some wellness policies also address school access to less healthful beverages and marketing of these beverages to children in school. These positive changes may enhance the effectiveness of nutrition education that promotes healthful beverage selection.

The nutrition education sessions were designed so that common nutrition topics (e.g., food groups) could address beverage choices along with improving intake of nutrient dense foods. This study influenced intake of healthier beverages in different environments (i.e., home, school, fast food restaurants, and friend's houses) by changing knowledge and perceived behaviors on a short-term basis in 3rd-5th graders.

Extension paraprofessionals play an important role in providing nutrition education to children in schools; however, education to improve beverage choices for children should also address the home environment. The lessons developed for children could be expanded by adding a parental component and presented at community sites to parents or in the school during the evening as part of community education efforts.

Acknowledgments

Authors would like to thank the nutrition education assistants who delivered the intervention: Pat Ervasti, Joy Janzen, Mary Flynn, Betty McAllister, Dianne Davis, Deb Dilley, Nancy Winter, Katie Nelson, and Stephanie Hakes.

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