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Using Photovoice to Improve Healthy Eating for Children Participating in an Obesity Prevention Program

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Abstract

Background: Children have benefited from participation in obesity prevention programs. *Aims*: The objectives of this study were to evaluate the impact of a healthy eating intervention for children in after-school programs and to use photovoice to document change in eating behavior. *Methods*: Forty-two children in three after-school programs participated. Children participated in lessons from an existing program to learn about healthy eating. A mixed methods study was conducted, using surveys to assess parent and child perceptions, and photovoice to capture children's perceptions of how they and their family changed eating habits. Member-checking was used to verify themes in the data. Twenty parents completed surveys evaluating the program. *Results*: Findings indicated that children learned program information, were interested in eating healthier (more fruits and vegetables), and quantitative data revealed there was a pre-post trend for eating more fruits at home. They reported that using the photovoice method helped them to monitor their behavior and helped them improve personal and family eating habits. Member checking confirmed themes. A majority of parents were satisfied with the program and reported that their children were discussing what they learned at home. *Conclusions*: Findings suggested that the photovoice methodology helped children to change in a positive way, increasing their agency in improving their own health and that of their family. Assessing longitudinal change in attitudes about healthy eating and eating behaviors will provide information about whether children maintain gains in knowledge and healthy eating over time.

Keywords

children, healthy eating, photovoice, obesity prevention

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Highlights

What Do We Already Know About This Topic?

Healthy eating programs are being implemented with young children and there are positive outcomes; however, we need to learn more about how these programs impact children.

How Does Your Research Contribute to the Field?

This research contributes to the field by evaluating how children implement lessons learned about healthy eating and use a photovoice technique to record their changes and monitor their and their families eating habits.

What Are Your Research's Implications toward Theory, Practice or Policy?

Results of this study support the value of healthy eating programs for children, by showing positive change in young children's attitudes and eating behaviors as a result of an intervention as well as indicating children's abilities to relay information about healthy eating to parents, showing that they can be change agents in improving family eating.

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Introduction

Unhealthy eating, with low intake of fruits and vegetables, contributes to obesity and health problems.[1] Obesity prevention programs can play a role in changing children's attitudes and teaching them healthy behaviors.[2-4] School days are often busy, and after-school programs can be ideal settings for delivering programs when health is not addressed in the school curriculum.[5] The Children's Healthy Eating and Exercise (CHEE) Program is an after-school program with a successful history of improving children's consumption of healthy foods, with children eating more fruits, exercising more, and children and parents learning about nutrition.[2,6-9] More information is needed about how children change their and their family's eating behaviors. The current study focused on delivering and assessing the impact of healthy eating lessons using photovoice to allow children to capture change in eating behaviors.

Photovoice is a participatory action research method that reveals perspectives about persons' lives.[10,11] Those taking the pictures and presenting them can provide their unique perspectives to others who make decisions over their lives, whom they might not typically be able to access.[12] Photovoice has been used in studies to engage children in documenting community conditions that impact their involvement in physical activity and their diets, and, as such, this method can be a tool for evaluation.[13,14] Researchers have shown that youth, primarily adolescents, are able to successfully use photovoice, taking pictures, building presentations and working together to develop explanations of their perspectives in photos, and presenting their findings to their community, to promote community awareness of issues that impact health, school functioning, and well-being.[14-16] Strack et al[14] found that using photovoice empowered youth (adolescents ages 11-17 years), who took pictures to share their views of their community and teen center, and helped them solidify their image as change agents. The current study extends the use of photovoice to a younger age group of elementary school-age children. For this study, children used disposable cameras, taking pictures to capture their perspectives of what they learned about healthy eating (through healthy eating lessons from the CHEE program) and how they changed their eating behaviors as well as their family's eating behaviors. We thought that use of photovoice would promote individual agency (eg, change self-efficacy), and would be a tool to enhance children's abilities to change their behaviors and change their environment (eg, having healthier meals at home), which is consistent with Social Cognitive Theory (SCT).[17,18] Moreover, children would be acting as change agents, imparting knowledge and changing their eating habits, which provides a critical window on how they act upon and construct their worlds.[19,20] In this manner, the photovoice technique would provide information about how children change behaviors, providing data to evaluate the impact of our program and ideas for program improvement.

We thought that children would report that using cameras to document their eating, would encourage them to eat more fruits and vegetables (ie, eat more healthy foods) and encourage their families to eat more healthy foods. Hence, the cameras would function similar to self-monitoring interventions, in that by recording behaviors, participants would be motivated to incorporate more positive habits, which is consistent with the importance of self-regulation and improved behavioral capability in Social Cognitive Theory.[21] Use of photovoice would provide, ". . .tangible and immediate benefits to people [children] and their networks [families, with children driving healthy family change]" and become "advocates for their own and the community's [family's] well-being" (pp. 372-373).[11] The purpose of this study was to evaluate the CHEE program and explore children's use of photovoice to document changes in eating behaviors. We used a mixed methods approach, and thus surveys were also used to assess children's and parents' perspectives of the intervention and changes in eating behaviors, to provide additional data to assess program impact. We expected that children would report that participating in program activities (enhancing knowledge and encouraging goal-setting regarding healthy eating) would result in changes in attitudes about healthy eating as well as positive change in child healthy eating behaviors, which is consistent with improving self-regulation and behavioral capabilities (SCT)[17] and improving intentions and behavioral control (Theory of Planned Behavior).[22,23]

Methods

Participants

Thirty children enrolled in the first (primary) study, 10 at Program or school 1 and 20 at Program or school 2; children participated in the program at their respective schools. Both programs were after-school programs, sponsored by a local recreation commission, conducted at elementary schools. There were 19 boys and 11 girls. Twenty-two were Caucasian, 4 were African American, 2 were Indian, 1 was Hispanic, and 1 was Asian. Ages ranged from 8 to 11 years ($M = 8.65$ years, $SD = .798$). Twenty parents (3 fathers, 17 mothers) provided responses to a survey. Additionally, 12 children (6 boys, 6 girls; 8-10 years; 11 Caucasian and 1 African American) participated in a second study (replication

study) at a third program, in a third school, which was also run by the recreation commission.

Child Survey/Measure

Questions assessing healthy eating were used pre- and post-intervention.[7] The questions assessed consumption of fruits, vegetables, and sweets—"yesterday." Line-drawings of many types of fruits (eg, strawberries, grapes, apples, oranges), vegetables (eg, broccoli, carrots, green beans), and sweets (eg, cake, donuts, cookies, pie, candy bars) accompanied the questions. Children rated their answers on the following scale: (1) "No, I didn't eat any. . ., (2) "Yes, I ate _____ 1 time yesterday," (3) "Yes, I ate ____ 2 times yesterday, and (3) "Yes, I ate ____ 3 times yesterday." Children completed 2 other questions: (1) "I eat healthy" and (2) "Changing my eating habits is important." They rated their response on a five-point scale ("1 = no, 2 = a little, 3 = some, 4 = pretty much, 5 = very much").

Parent Surveys

The first parent survey consisted of 5 questions with "yes" and "no" response options. Questions assessed parent report of whether their child had explained: (1) the Stop Light Diet, (2) needing to eat more fruits or vegetables at home, (3) taught me about red foods that aren't good for us, (4) has talked about things that block healthy eating, and (5) has taught me about green foods that are very good for us. There was a second short survey where parents could report changes in their children's behaviors, rate their satisfaction with the program (low, medium, high), and provide any negative comments about the program.

Ethical Approval and Informed Consent

We obtained ethical approval from the University of Cincinnati Institutional Review Board and this study was determined to be not human subjects research (IRB# 2018-5451). The approval letter stated the study did not meet regulatory criteria for research involving human subjects because it was "QA/QI program to improve healthy choices of children . . . ongoing IRB oversight not required." Written parent permission was required by the school programs for child participation and parents were provided with an information sheet describing the project. Parents returned a signed permission form for their child to be enrolled in the study. Children provided verbal assent in order to attend lessons and use the cameras.

Procedures

Children participated in weekly lessons for 6 weeks, adapted from the CHEE Program.[9] Before the first lesson, children completed surveys. During lesson one, group leaders explained the program and introduced games (eg, charades) to establish rapport. During lesson 2, leaders explained the photovoice project, explained how to use cameras, and began teaching children about the Traffic or Stop Light Diet.[24] Information about lessons 2 through 8 are presented in the Appendix.

For lesson 3, group leaders reviewed the Stop Light Diet and described the SHOW method for collecting data (see Appendix). Group leaders reviewed a modified version of the "SHOW" method (modified from Smith et al[15]; Wang et al[25]). "S" indicated taking pictures to "see what we are eating." For "H" children took pictures of "how I eat" or what they ate for breakfast, lunch and dinner. For "O" children were instructed to take pictures of their obstacles or roadblocks to healthy eating. Finally for "W" children would take pictures of "how I win, eat to win by being healthy at meals and snacks." Each child received a disposable camera (Kodak Fun Saver or Fujifilm Quick Snap Single Use) and group leaders taught the child how to use the camera. Children were instructed to take pictures of food at meals and snacks. The group leaders discussed that children could not take pictures of another person's food without his or her permission and they should not take pictures of people's faces.[11] For week 4, children reviewed the Stop Light Diet and learned about healthy lunch options. During lesson 5, group leaders and children reviewed MyPlate and group leaders worked with each of the children to plan a day of healthy eating (see Appendix). Coaches reviewed the "SHOW" method. They talked with children about taking pictures of what they were eating and pictures of foods that were healthy and helping them overcome roadblocks to healthy eating. They also practiced using the cameras a second time. During lesson 6, coaches taught children about different portion sizes and the food pyramid (see Appendix). Children returned their cameras at week 6. The first author collected the cameras and paid to have the pictures "developed" for the children. Parents responded to the first survey at the end of lesson 6.

For week 7, the first author provided children with their pictures, and then the children made their photo books, answering these prompts: "(1) I eat to win and my family eats to win and be green by. . ., (2) Pictures of what I eat at home and what my family eats at home, (3) obstacles or road blocks to healthy eating for me are. . ., (4) this class helped me learn. . ., (5) things I learned or improved because of this class. . ., and (6)

What I learned using the camera is." The group leaders instructed children to review their pictures and glue the picture they wished to use to answer the prompt to the page. They encouraged the children to write about the photos they selected (explaining why they selected the picture and providing written answers about their photo selection) and to draw a picture representing their answers if they did not have a photo to answer a prompt. The group leaders helped children with spelling and writing information when they needed assistance. For lesson 8, children presented their photo journals to staff and their parents. During week 8, children presented their other work in a final "show" for parents and after-school program personnel. During this presentation, they selected ideas for teaching the "adults" about what they had learned during the program (see Appendix).

During week 9 children completed the survey items and had a party with games and prizes to celebrate the success of their "club." They were provided with pictures to take home and copies of their work products. Parents completed the second short survey during week 9. The first and fifth authors distributed surveys to parents and children. They answered any questions children had while completing surveys.

After the researchers had coded the themes for the data, they developed a "master book" listing the themes for each prompt. During member checking, the first author reviewed the master book with the children and children reported whether themes listed for each prompt were accurate. After this review session, the child received his or her photo book to take home.

Replication Study. Twelve children participated in a replication study, implementing the CHEE lessons again, at a third program. They used the "SHOW" method and took pictures of their meals and they completed the photo books. After themes were developed, L. N. interviewed children to review a master photo book with all the themes (using identical member-checking procedures to those used in the primary study), and children verified the themes developed by coders.

Data Analyses

Repeated measures analyses of variance (ANOVAs) were used to examine change in child eating for quantitative questions for Study 1. The between subjects' factor was "program." Preliminary analyses did not reveal gender differences in children's responses.

A grounded theory approach was used to analyze the qualitative data for each prompt in the children's photo books.[26] There were 3 coders, M. M., C-J. Y., and L. N. Two of the coders (M. M. and L. N.) reviewed children's answers for each of the prompts in photo books for Program 1 and then 2 coders (C-J. Y. and L. N.) reviewed children's answers to the prompts for Program 2. During the initial review coders individually recorded their ideas for key themes in the data for each prompt and for information presented in the "final show" in week 9. Next, over 3 meetings, coders worked together to review their themes for each prompt and the children's final shows. While reviewing and condensing information, coders developed lists of final themes, subthemes, and representative quotes for each prompt and information in the "shows" children presented to showcase their learning. Disagreements were resolved by consensus and coders decided to present the results of the 2 programs separately.

Themes endorsed by children during member-checking when they reviewed the master photo book were reviewed by 2 of the coders [C. L. (fourth coder) and L. N.]. The children's endorsement of themes indicated interrater agreement was 100% for both programs, as all of the children agreed with information in the master photo book. L. N. and C. L. coded data from photo books for the replication study using the same procedures as described earlier in this section. They met 2 times and reached consensus to determine themes in data for the replication study.

Results

Quantitative Results for Child Survey

There was a difference between the 2 programs for vegetable consumption, $F(1, 17) = 4.941$, $p = .04$. Children at Program 2 decreased vegetable consumption pre- ($M^{pre} = 2.17$, $SD^{pre} = 1.12$) to post-intervention ($M^{post} = 1.67$, $SD^{post} = 1.07$). Children at Program 1 increased vegetable consumption ($M^{pre} = 1.57$, $SD^{pre} = .78$; $M^{post} = 2.28$, $SD^{post} = .76$). There was a trend for increased fruit consumption, $F(1,17) = 3.85$, $p = .066$ ($M^{pre} = 1.67$, $SD^{pre} = 1.07$; $M^{post} = 1.95$, $SD^{post} = 1.03$). No differences were found for differences in consumption of sweets ($M^{pre} = .39$, $SD^{pre} = .50$; $M^{post} = .28$, $SD^{post} = .46$). The interaction terms were not significant for consumption of fruits and sweets. There was not a significant main effect for vegetable consumption.

There was a significant main effect, indicating higher ratings at program end, for the question "changing eating habits is important," $F(1, 15) = 9.68$, $p = .007$, $M^{pre} = 2.59$, $SD^{pre} = 1.33$; $M^{post} = 3.76$, $SD^{post} = 1.15$); the interaction term was not significant. There were no significant differences for the "I eat healthy" question ($M^{pre} = 3.67$, $SD^{pre} = 1.14$; $M^{post} = 3.89$, $SD^{post} = 1.02$).

Table 1. Photobook Reponses Representing Themes for Things Children Learned and Changes They Made.

Themes	Subthemes	Program	Quotes (pictures/drawings)
Changing or Improving Diet to Eat More Healthy Foods	Eat "more healthy"/I eat better	Program 1 & 2	"I changed my diet by eating more healthier" (picture of oranges)
			"What I eat healthy. Like Broccli"
			"Improved eating better by eating carrots, strawberries, and apples." (drawing of a carrot, strawberry and an apple)
			"I eat fruit, vegetables, protian, and grains" (picture of apples with cheese and drawing of apple, rice, broccoli, and salami)
			"My sister used to eat cookies for beafrest, but now she doesn't. Also, every time we got pizza I ate 4 pices (pieces) but now I only eat 2." (picture of a pizza box)
	Eating more green foods	Program 1 & 2	"Eating more green foods for lunch and snacks"
			"Improved that I use to eat more red foods now I eat green food" (drawing of ice cream cone with an arrow pointing to a pear)
			"I improved my green food and I limited my red food" (picture of peach)
	Reducing intake or red foods	Program 2	"I used to eat a lot of candy and now I don't"
			"not being so addicted to candy"
			"Not eating red foods. I stopped having donuts every day of the week" (picture of macaroons)
			"I didn't eat quite as many reds or yeelows" (picture of an apple)
	Eat more vegetables	Program 2	"Eating more vegetables"
			"More vegetables and Healthy Bearcats helps you eat more vegetables"
Helping my family to eat more healthy foods		Program 1	"I encouraged my sister to eat more green foods" (picture of a girl eating tomatoes in book)
			"Eating more healthy and helping my family eat more healthy stuff too, like vegetables and fruit." (no visual presented)

Qualitative Results for Children's Data

Coders identified 2 themes for the first prompt, representing what the children learned and changes they made: (1) learning about healthy and unhealthy foods and (2) learning about the Stop-Light Diet. Children at both programs provided examples of healthy foods they were eating and reported learning about the Stop Light Diet. Children usually presented pictures of fruits. Sample quotes written by the children were: "To eat healthy food and also make good chooses ("choices"; child presented a picture of salad)" and "How to eat more healthy foods (picture of strawberries)."

Two themes were identified for prompt 2, where children discussed what eating behaviors improved during the program: improving my diet to eat more healthy foods and helping my family to eat more healthy foods (see Table 1).

The third prompt required children to present pictures of what they eat at home. The theme for this prompt was "show and tell" and children reviewed healthy and unhealthy foods they consumed at home. Meats included meat loaf, bacon, and chicken. Children presented pictures and drawings of spaghetti and meatballs and pizza. They also presented pictures of meals with cooked vegetables and fruits.

Children reported they were eating to win and eating green foods (fourth prompt in their photobooks; see Table 2).

There were 3 themes: (1) eating more fruits and vegetables, (2) eating more green foods and healthy treats, and (3) encouraging family members to eat more healthy foods. Children at both programs mentioned encouraging family to eat healthy.

Children discussed several roadblocks to their healthy eating (prompt 5; see Table 3).

Sweet foods were the chief roadblocks with children listing candy, cookies and cake often. A few children, typically boys, mentioned salty foods (eg, potato chips) as roadblocks.

Coders discovered 4 themes across the programs for what children learned while using the cameras (prompt 6; see Table 4).

These 4 themes were: (1) how to operate an old camera, (2) taking pictures helped the child focus on eating more green foods, (3) learning that healthy eating is good by taking pictures, and (4) thinking about what you are eating by taking pictures.

Table 2. Photobook Reponses Representing Themes for Children's Beliefs about Improved Eating Behaviors.

Themes	Subthemes	Program	Quotes (pictures/drawings)
Fruits and Vegetables		Program 1 & 2	"Eat fruits and vegies like tomatos and broccoli"
			"Apples, also green gala apples. I get noodles only at Piada and Italian street food." (picture of Piada bag)
			"Eating 2 veggies a day"
			"Maximizing the amount of fruit we eat" (drawing of strawberries)
			"Eating more apples, bananas, and pears" (picture of sliced apples)
			"My family wins by eating peppers and tomatoes" (drawing of peppers and tomatoes and also presented a picture of a meal with cucumbers and peppers)
			"I eat to go green is" (drawing of broccoli, tomatoes, blueberries, and oranges)
			"We pick snack from this bowl and its fruits and veggies" (picture of a bowl of fruits and vegetables)
Eating more healthy treats and more green foods	Eat more green foods	Program 1 & 2	"I eat tomatos, brocali, apples and bannanas"
			"Broccoli, lettuce, onions, vegies, fruit" (picture of a fruit bowl)
			"Eating less red foods and eating more green" (picture of chicken, peppers and tomatoes)
			"When we make healthy choices we mostly eat green choose with one other food on or during dinner" (picture of noodles and broccoli)
	Eating Healthy Treats instead of candy and desserts	Program 1 & 2	"Watermelon instead of cookies. Have lots of carrots, apples, and lemons"
			"saying no to diserd [dessert] and candy" (drawing of a child saying no and then a thought bubble with healthy foods)
Helping Family Eat Healthy		Program 2	"I'm trying to get my brother to eat Brocli and cauliflower. I eat cauliflower and carrots with ranch"
			One girl presented a picture of her sister eating green beans (she talked about helping her sister eat more healthy foods, but did not write this in her book)

Table 3. Photobook Reponses Representing Themes for Roadblocks to Healthy Eating for Children.

Themes	Subthemes	Program	Quotes (pictures/drawings)
Sweet Foods	Red foods	Program 1 & 2	"Eating not so much red foods" (drawing of pie)
			"Oreo, Cupcakes. It tastes good, but it is bad." (picture of macaroons and desserts in a case)
			"Sometimes I eat red foods" (picture of a cookie)
	Candy	Program 1 & 2	"I eat a little bit" "I could eat more veggies and chicken nuggets." (picture of candy)
			"Snickers" (picture of candy bars)
			"Mints and Candy. I try to eat fruits and veggies instead" (picture of mints and chocolate bar)
	Cookies and Cake	Program 1 & 2	"Donuts, cupcakes" (drawing on donut and cupcake)
			"Cake pops, cupcake, cake" (picture of cake pops and cookies with frosting)
			"My opsticls are. . ." (drawing of cookies and cake and a picture of a cookie box for "Chips Deluxe")
			"Girl Scout Cookies" (drawing of a box of thin mints)
	Desserts/Treats, especially frozen treats	Program 1 & 2	"Days with desserts"
			"Ice cream and treats" (picture of ice cream carton and picture of York Peppermint Patty Candy Wrapper)
			"Nutella" (picture of Nutella jar)
			"Ice cream and popsycles" (drawing of ice cream and popsicle)
Salty and Savory		Program 1 & 2	Pictures of pringles, buttered popcorn, lunchables presented by boys
			"Cheese Coneys; pizza" (pictures of these foods) boy

Table 4. Photobook Reponses Representing Themes for Lessons Children Learned While Using Cameras.

Themes	Program	Quotes (pictures/drawings)
How to operate a camera	Program 2	"How to use an old camera" (picture of oranges)
		"How to use the camera inside by turning on the flash on"
		"That it was the only camera they had in the 1900's through 2000's. My Mom told me that."
		"That you have to have a good angle or you might get someone or your finger in a picture"
Taking pictures helped the child focus on eating more green foods	Program 1 & 2	"To eat more green foods" (picture of oranges and Welch's fruit snacks)
		"I learned that you need to eat healthy foods. Go Green!" (picture of apples)
		That you go, go, go, green." (picture of a watermelon)
		"You should always use green, maybe yellow, and not red." (picture of bagel and banana with a line to banana)
Healthy Eating	Program 1 & 2	"Healthy eating is good." (picture of an orange)
		"How to use the camera and it kinda wanted me to eat healthy so that when I look back at healthy pictures of food from me I can say I made good changes"
		"I am choseing healthy" (drawing of a lemon with a circle [good choice] and a brownie with an X through it [bad choice])
		"I learned that you need to eat healthy foods. Go Green!" (picture of apples)
		"You should always use green, maybe yellow, and not red." (picture of bagel and banana with a line to banana)
Think about what you are eating	Program 1 & 2	"It is good to review the food you eat. If you ate reasepeses if you review you would probably eat salad next" (no visual presented)
		"To be more aware of the food I ate." (picture of fig bar, fruit juice, and peanuts"

Table 5 presents results of the member-checking at Programs 1 and 2. Inspection of Table 5 indicated that children agreed with the themes developed by coders.

Parent Surveys

Six parents (1 father, 5 mothers) completed surveys at Program 1. Four (67%) stated that their child had discussed the Stop Light Diet. Five of the parents (83%) said their child had explained "red" foods and the need to limit them. All parents indicated the children had reported needing to eat more fruits or vegetables. Five (83%) mentioned that their child had talked about "roadblock foods." Four (67%) said that their child had explained green foods and needing to eat more of them. Two parents completed the second survey. One father mentioned his son was now eating "oatmeal" and the other mother mentioned that her child was, "more aware of quantity/amount of foods that are healthy." Both parents reported high satisfaction with the CHEE Program; no negatives were reported.

Fourteen parents (2 fathers, 12 mothers) completed surveys at Program 2. Seven (50%) children had explained the Stop Light Diet. Eleven (78.6%) said their child had told them about needing to eat more fruits or vegetables. Six (42.9%) said their child had explained about red foods. Eight (57.1%) had mentioned roadblocks to healthy eating. Ten (71.4%) stated that their child had explained green foods. Eleven of the parents at Program 2 completed the second survey. These parents reported that their children were talking about eating more fruits and vegetables and making healthier food choices, while making sure they ate from more food groups (eg, vegetables). Some quotes from parents included: "making healthier food choices," "eating fewer sweets," "eating less sugar," "eating more green foods," and "eating healthier snacks (fruits)." Another parent mentioned, "He learned how he should eat. And he learned about portion size." Eleven parents reported high satisfaction with and no negatives about the CHEE Program.

Replication Study

Themes from the children's photo books indicated they recalled their lessons about the Stop Light Diet, learned about the importance of eating more fruits and vegetables, and about how sweets were roadblocks to healthy eating. Children stated the cameras were fun to use and helped them record what they were eating, while helping them change their behavior.

Discussion

Our findings indicated some preliminary support of our aims. In terms of quantitative findings, children reported more positive attitudes the need to eat healthy foods and there was a pre-post trend for positive change in fruit consumption. There was an increase in

Table 5. Results of Member-Checking: Number of Children at Programs One and Two Confirming Themes in the Master Photobook.

Prompt	*Themes*	*Program 1* n = 8 (4 girls, 4 boys)	*Program 2* n = 11 (5 girls, 6 boys)
This Health Program helped me learn. . .			
	Stop Light Diet	6	10
	How to Eat Healthy	7	9
	Learned about healthy and unhealthy foods	6	10
The things I changed or improved because of this Health Program were. . .			
	I eat better	8	7
	I eat more green foods	6	9
	Help my family eat healthier	3	10
	Eat more healthy	6	8
	Eat more vegetables	6	8
	Eat less red foods	7	9
I eat to win and my family eats to win and be green by. . .	I eat more fruits and vegetables	5	11
	Eat more green foods	5	10
	Helping my family eat healthy	3	8
	Eating healthy treats instead of cake, desserts, and candy	3	9
Obstacles or road blocks to healthy eating for me are. . .	Ice cream	4	9
	Candy	3	9
	Cookies	3	8
	Cake	5	5
	Red Foods	6	6
	Chips	2	7
	Popcorn with butter	3	6
What I learned using the camera is. . .	How to use the camera	5	10
	Eat more green foods	5	8
	Eating healthy	6	9
	Thinking about what you are eating	6	8
	Taking pictures helped me eat green foods	6	7
	Healthy choices	5	9

vegetable consumption for one program. Hence, there was some support, albeit limited, for positive results of the program. This was less conclusive than positive results of previous obesity prevention programs.[2,3,8] It is likely small samples, which limit power, was a factor limiting the potential to detect significant changes using quantitative analyses. However, children were learning new information—about the Stop Light Diet[24] and MyPlate. They did learn about portion size; it may be that repeating lessons about portion size, in order to review information, may be beneficial in future studies. Children showed positive change in their attitudes (eg, higher ratings for the importance of changing eating habits), and they were reporting a willingness to "go green" and encourage their family to eat more fruits and vegetables. Analysis of photovoice data showed children reported eating more fruits and vegetables, and perhaps this information was more informative than quantitative data, with our small sample sizes. Children showed improved attitudes and reported improved behaviors (using qualitative methods), providing some support that their positive intentions (attitudes) and behavioral control improved.[17,22] Children reported that they were taking pictures of "good" (eg, fruit) and "bad" (candy) choices in their photo books, and they reported they were eating "more healthy" foods. Perhaps using concepts of "good choices" and "bad choices" would be messages to include in future iterations of our program. Use of cameras assisted some children in changing their families and their own eating behaviors. Thus, photovoice served as both a method for assessing outcomes and encouraging positive change in health behaviors.[11,21]

Information about fruit and vegetable consumption from child surveys and photo books mirrored results from previous research. Children were consuming more fruit during the intervention, and this was consistent with previous research.[7,9] Intake of vegetables went up for one group and down for another group. A shortcoming of this study is that we are not certain why vegetable

consumption decreased in one program, and perhaps conducting interviews would have provided insight as to why this occurred. In previous research, change in vegetable consumption has been equivocal, sometimes unchanged[8] and other times increased.[6] Increasing fruit intake is a child-friendly way to improve nutrition, and creative ideas are needed to improve vegetable consumption. Sweets were the major roadblock to healthy eating, and this was consistent with previous research.[2] For a few boys, salty and savory treats emerged as tempting foods that blocked healthy eating. Health educators can provide coaching to help children overcome roadblocks to healthy eating. Research on their efforts will advance knowledge in the field.

Several factors may limit the generalizability of study findings. For instance, the sample size was small, and perhaps results would not be replicated with different groups. Or, ratings could be skewed due to one individual's report (eg, one student reporting very high or low consumption). However, we did replicate our findings and our member check confirmed results. Additionally, children could have provided socially desirable responses. On the other hand, parent data corroborated that children were making positive changes. We do not know why parent data was limited at one program, thus future studies should focus on gathering more information from parents. Additionally, some of the children did not take many pictures, and may have struggled to use the camera. Further practice with the camera and having parents help with using cameras may be ways to help children overcome difficulties with using the camera. We did not record detailed observations on difficulties with using the camera or about how many pictures each child took, and this type of information would be helpful in the future. While having direct observation or food diaries might provide more valid data, the photovoice technique is easily used among younger children and is a low-cost and easy to implement way of tracking food consumption. Qualitative results presented in Tables 1 through 4 were fairly consistent, but there were some program level differences. It may be that the program was implemented differently at each program. Implementation studies, evaluating the fidelity of implementing information in the manual, may be needed.

In conclusion, our photovoice technique allowed children to provide their perspectives of what they could do to change their own and their family's behaviors. This was consistent with research showing that children can successfully use photovoice to institute changes in their eating behaviors and those of their family, changing their lives and personal contexts.[13,14,16] Children were also able to identify roadblocks to healthy eating, and they were able to take pictures of themselves overcoming obstacles, typically by eating fruits. Thus, results supported the idea that child agency is critical to child attitude and behavior change.[19,20] Participation in the CHEE Program has the potential to result in change in children's eating and in their attitudes about it being important to eat healthy. Longitudinal data, to document retention of program messages, and change in child eating, will determine if this program has a positive impact over time. The intervention was of short duration. Evaluation of the impact of longer interventions, with children who are overweight, and assessing change in body mass index will provide critical information. Also, greater communication with parents and involving parents in classes may result in more behavior change and may be a mechanism for encouraging increased vegetable consumption. A randomized trial, with groups of students using photovoice and other groups not, would give stronger evidence of the value of photovoice, and a study of this nature would provide further data to advance knowledge in the field.

Appendix. Table of Lessons in the Children's Healthy Eating and Exercise Program.

Lessons	Activities
1	Explained the purpose of the program, established rapport with children.
2	Children drew a picture of items in their refrigerators at home and then circled red, yellow and green foods in their refrigerators. They matched red, yellow and green foods to a traffic light for a second activity.
3	Children used plastic foods arranging them to develop healthy meals. They also designed their own Stop Light Board games, moving ahead if they landed on a square with green foods and moving backward if they landed on squares with red foods.
4	Children reviewed the Stop Light Diet foods, writing the foods on color-coordinated (dark pink, yellow, and green) note cards. Children discussed healthy lunches, while reviewing 2 handouts showing healthy lunches they could bring to school. Then, children drew their own "ultimate healthy lunch" on a blank piece of paper.
5	Review of MyPlate foods and drawing healthy MyPlate meals the children would like to eat. Next, children wrote down or drew healthy meals for a day of healthy eating and the other children voted on meals they liked best in their own "Top Chef" game.

(continued)

Appendix (continued)

Lessons	Activities
6	Children learned about portion sizes and the food pyramid (worksheets from "Chef Solus Choosing Healthy Portions" www.NourishInteractive.com). Children learned about correct portion sizes for grains, meets, starches, sweets, fruits and vegetables.
7	Development of photo books, presenting their pictures for prompts and writing responses to prompts.
8	Presentation of what children learned for staff and parents. The final shows (presentations to parents and personnel) at Program 1 and 2 were similar. Children at Program 1 presented their work products at 3 tables and their peers and group leaders from other clubs came to see their presentation. These children decided to teach peers about: (1) portion sizes (with a tennis ball and ping-pong ball being guides for portion sizes), (2) MyPlate (showing drawings they made), and (3) the Stop Light Diet (children used the pictures of the foods they had taken to show examples of red, yellow, and green foods). Children had a slogan, "Eat 4 green foods for every one red food," which was a common slogan in their group. They also requested that their peers try to eat less candy and sweet treats and eat more healthy foods. Information children elected to share from Program 2 included: (1) MyPlate (they explained this through showing their drawings), (2) Cheers and Commercials that explained the Stoplight Diet and eating healthy, and (3) the Stop Light Diet through drawings of foods and explaining what color on the Stop Light each food was. An example of a cheer was, "Greens keep your body flowing. Yellow foods are O.K., just don't eat them every day. Red foods—stop right there! Only eat them when your parents care!" (eg, birthday parties).

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References

1. Ogden CL, Carroll MD, Lawman HG, et al. Trends in obesity prevalence among children and adolescents in the United States, 1988-1994 through 2013-2014. *J Am Med Assoc*. 2016;315:2292-2299. doi:10.1001/jama.2016.6361
2. Ige TJ, DeLeon P, Nabors LA. Motivational interviewing in an obesity prevention program for children. *Health Promot Pract*. 2017;18:253-274. doi:10.1177/1524839916647330
3. Kastorini CM, Lykou A, Yannakoulia M, Petralias A, Riza E, Linos A. The influence of a school-based intervention programme regarding adherence to a healthy diet in children and adolescents from disadvantaged areas in Greece: the DIATROFI study. *J Epidemiol Community Health*. 2016;70:671-677. doi:10.1136/jech-2015-205680
4. Kelder SH, Mitchell PD, McKenzie TL, et al. Long-term implementation of the CATCH physical education program. *Health Educ Behav*. 2003;30:463-475. doi:10.1177/1090198103253538
5. Dzewaltowski DA, Rosenkranz RR, Geller KS, et al. HOP'N after-school project: an obesity prevention randomized controlled trial. *Int J Behav Nutr Phys Act*. 2010;7:90-101. doi:10.1186/1479-5868-7-90
6. Dai C-L, Nabors LA, King KA, et al. Evaluation of an afterschool children's healthy eating and exercise program. *Int J Child Health Nutr*. 2014;3:156-162. doi:10.4103/0973-6131.158488
7. Nabors L, Burbage M, Pangallo J, et al. Delivery and evaluation of a pilot obesity prevention project for urban Appalachian children. *Open J Pediatr*. 2013;3:300-305. doi:10.4236/ojped.2013.34054
8. Nabors L, Welker K, Pavilack B, Lang M, Hawkins R, Bauer A. Evaluation of an after-school obesity prevention program for children. *Int J Child Health Nutr*. 2018;7:1-8.
9. Nabors L, Burbage M, Woodson K, Swoboda C. Implementation of an after-school obesity prevention program: helping young children toward improved health. *Issues Compr Pediatr Nurs*. 2015;38:22-38. doi:10.3109/01460862.2014
10. Wang C, Burris MA. Empowerment through photo novella: portraits of participation. *Health Educ Behav*. 1994;21:171-186.
11. Wang C, Burris MA. Photovoice: concept, methodology, and use for participatory needs assessment. *Health Educ Behav*. 1997;24:369-387. doi:10.1177/109019819702240 0309
12. Wang C, Burris MA, Ping XY. Chinese village women as visual anthropologists: a participatory approach to reaching policymakers. *Soc Sci Med*. 1996;42:1391-1400. doi:10.1016/0277-9536(95)00287-1
13. Findholt NE, Michael YL, Davis MM. Photovoice engages rural youth in childhood obesity prevention. *Public Health Nurs*. 2010;28:186-192. doi:10.1111/j.1525-1446.2010.00895x

14. Strack RW, Magill C, McDonagh K. Engaging youth through photovoice. *Health Promot Pract*. 2004;5:49-58. doi:10.1177/1524839903258015
15. Smith L, Bratini L, Appio LM. "Everybody's teaching and everybody's learning": photovoice and youth counseling. *J Couns Dev*. 2012;90:3-12.
16. Wayne M, Snyder K, Gådin KG. Photovoice: an opportunity and challenge for students' genuine participation. *Health Promot Int*. 2013;28:299-310. doi:10.1093/heapro/das011
17. Bandura A. *Social Foundations of Thought and Action: A Social Cognitive Theory*. Prentice-Hall, Inc; 1986.
18. Bandura A. Social cognitive theory: an agentic perspective. *Annu Rev Psychol*. 2001;52:1-26.
19. James A., Prout A., eds. *Constructing and Reconstructing Childhood: Contemporary Issues in Sociological Study of Childhood*. 2nd ed. Falmer Press; 1997.
20. Morss JR. The several social constructions of James, Jenks, and Prout: a contribution to the sociological theorization of childhood. *Int J Child Rights*. 2002;10:39-54.
21. McAlister AL, Perry CL, Parcel GS. How individuals, environments, and health behaviors interact. In: Glanz K, Rimer BK, Viswanath K, eds. *Health Behavior and Health Education. Theory, Research, and Practice*. Jossey-Bass, John Wiley & Sons; 2008:169-188.
22. Ajzen I. The theory of planned behavior. *Organ Behav Hum Decis Process*. 1991;50:179-211.
23. Ajzen I. Perceived behavioral control, self-efficacy, locus of control, and the theory of planned behavior. *J Appl Soc Psychol*. 2002;32:665-683.
24. Epstein LH. *The Traffic Light Childhood Weight Control Program: Traffic Light: Kid's Program*. Author; 2005.
25. Wang CC, Yi WK, Tao ZW, Carovano K. Photovoice as a participatory health promotion strategy. *Health Promot Int*. 1998;13:75-86.
26. Strauss A, Corbin J. *Basics of Qualitative Research: Grounded Theory Procedures and Techniques*. Sage Publications; 1990.