

Evaluation of an After-School Obesity Prevention Program for Children

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Abstract: Dissemination of obesity prevention programs in different settings is needed. Moreover, new outreach tools to teach parents healthy eating and exercise lessons provided in these programs are important to develop. The pilot studies presented in this paper examined the implementation of the Children's Healthy Eating and Exercise Program in two different after school programs in 2015 and 2016. Participants were elementary school-age children and their parents. Eight lessons were presented at each school. Child perceptions of healthy eating and exercise goals were examined as well as child knowledge retention and perceptions of behavior change. Parent perceptions of the program were analyzed. Results indicated that children reported improved knowledge and behaviors. Parents reported satisfaction with the program, but remained hard to reach. Children recalled key components of the healthy eating lessons at long-term follow-up assessments. In the second pilot study, children served as health coaches for teaching parents about family goals. Children believed they were successful at coaching parents, but they requested help in developing family eating and exercise goals. Improving outreach to parents and involving siblings remains a goal for future studies as does beginning to examine changes in eating and physical activity using food diaries and accelerometry.

Keywords: Prevention, children, obesity, after-school program, motivational interviewing.

INTRODUCTION

Childhood obesity is a health problem in the United States. About 17% of children in the United States are overweight or obese [1]. Childhood overweight is related to health problems in adulthood [1-3]. Unhealthy eating, sedentary lifestyles, and less physical activity (PA), are related to overweight [4]. Children's behaviors can be changed through knowledge about increasing levels of PA and healthy eating [4-6]. A concentration on instructional time may make it difficult to incorporate obesity prevention programs during the school day and, as such, after-school programs are an outlet for teaching children [5, 7-11]. Moreover, obesity prevention efforts need to be multi-pronged approaches to address individual and family determinants of obesity [12]. Thus, after-school programs need to pilot new ideas for providing information to parents.

The current pilot studies are applications of the Children's Healthy Eating and Exercise Program (CHEE), an after-school obesity prevention program for elementary school-age children [10, 11]. The CHEE program incorporates components from the Traffic Light Diet [13], the Coordinated Approach to Child Health Program (CATCH)[14], the Let's Move Program

(<https://letsmove.obamawhitehouse.archives.gov/>; accessed 2/19/2018), and MyPlate (<https://www.fns.usda.gov/tn/myplate>; accessed 2/19/2018). In previous studies, evaluators found that children participating in the CHEE program reported knowledge gains and behavior change [5, 10, 11, 15]. Children who participated reported eating more fruits and vegetables as well as fewer sweets [10, 11, 15]. Children's involvement in PA also improved [11, 15]. Parents reported their children were highly satisfied with the program and that their children were trying to follow the Traffic Light Diet and exercise more at home [10, 11].

Coaches for the CHEE program use motivational interviewing (MI) to set weekly eating and PA goals with children [5, 11]. MI is a client-centered approach used to enhance intrinsic motivation through exploration and resolution of ambivalence to change [16, 17]. A component of Social Cognitive Theory [18], agency promotes participation in self-development for children [19, 20]. The incorporation of MI in the CHEE Program promotes agency in child participants.

For the current projects coaches delivered the CHEE program and implemented methods for parent outreach and used surveys and interviews to assess knowledge retention at follow-up assessments. The first pilot study implemented the CHEE program with children and transmitted information to parents via telephone contacts. Children were involved as family health educators for the second pilot study. They

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became were coaches, teaching weekly healthy eating and PA goals to their families.

METHOD

Study One: Participants and Study Procedures

Nine girls and five boys in the second through fifth grades (eight to eleven years; majority were Caucasian) participated in fall, 2015. This study was approved by a university-based Institutional Review Board (IRB). Parent permission and child assent were obtained for a convenience sample.

Children participated in eight hour-long weekly lessons (see Table 1).

Children worked with their coaches in weeks three, four, five, and seven to identify healthy eating and exercise goals, roadblocks to reaching goals, and ideas for overcoming the roadblocks they identified. A group leader contacted parents by telephone each week to transmit information about the program. Parents also received bi-weekly handouts reviewing program activities, healthy recipes, and a newsletter during the fifth week of the program.

Children completed surveys to report on their satisfaction and learning during their final group. The questions were: (1) "How do you feel about your

nutrition?" (2) "My coach listened to me", (3) "My coach asked my opinion about things", (4) "My coach helped me think about why changing my eating habits is important", and (5) "My coach helped me think about why changing my exercise habits is important." Children answered questions on a 7-point Likert scale ("one" as "very low" and "seven" as "very high"). Children also answered a sixth question to describe what they learned from the program.

Parents completed a survey at the end of the program. Questions addressed their satisfaction with the program (ratings were on a four-point scale from "low" to "very high"), whether they believed their child had made progress in the program ("yes" or "no"), and their ideas about the behavior changes their child was making because of program participation.

Four months after the program ended, ten of the children completed a healthy eating questionnaire to assess their recall of the Traffic Light Diet categories. Children were given green, red and yellow crayons and were instructed to highlight 41 foods as being either green, yellow or red. Of the names of the 41 foods listed, 13 were green foods (e.g., vegetables and fruits), 10 were yellow foods (e.g., pasta and oatmeal), and 18 were red foods (e.g., cookie, pie). The questionnaire was scored by adding the number of correctly colored responses provided by each child.

Table 1: Weekly Lessons for Study One

Week	Sex		Healthy Eating Lesson	Healthy Activity Lesson
	Boys	Girls		
1	3	2	Icebreaker activity and introduce Traffic Light Diet and explain goal setting	Kickball
2	5	7	Review Traffic Light Diet and complete the What's in my refrigerator activity	Tag games and relay races
3	4	9	Learn about MyPlate and children drew their version of MyPlate	Discuss types and amounts of PA that children can do at home; relay races, tag, and kickball
4	4	6	Review Traffic Light Diet and MyPlate	Dodge ball
5	4	6	Learn how to read food labels (how to find fats, calories, and sodium) and discuss portion sizes; children make silly food labels	Tag and sharks and minnows running game
6	3	9		Discussion of the importance of PA; 60 minutes a day as critical; dodge ball and tag
7	3	9	Find the hidden sugar in foods; discuss the natural sugar in foods versus sugar in candy bars; count the sugar cubes to equal the amount of sugar in different types of foods	Outdoor running games
8*	3	6		

Note. *In week 8 the group participated in a party and completed certificates to congratulate them for participating in the program. Children had variable attendance.

Table 2: Weekly Lessons for Study Two

Week	Participants		Healthy Eating Lesson	Goals	PA
	Boys	Girls			
1	16	9	Healthy food throw; discussion of how to be physically active at home, such as running, use scooter, bike riding, walking, dancing	Introductory ideas about goal sheets; explain purpose	Dodge ball, basketball, and tag
2	12	8	MyPlate	Children selected family goals (see Table 4)	Basketball, dodge ball, tag
3	14	11	Discuss ideas for healthy lunches and snacks, discuss physical activities to engage in at home such as dancing, tag, jumping jacks, walking and bike-riding	Children selected family goals (see Table 4)	Dodge ball; four-square
4	15	9	Discuss what protein is and why protein in foods is important for children;	Meeting with group members: children requested that leaders develop and write down goals each week; children requested sessions to learn how to discuss goals with parents	Floor hockey, basketball, kickball, tag, jump rope
5	17	8	Role play with children about how to be a health coach for parents; children played the role of themselves as coach and one of their parents as a "learner" during role play	Exercise outside as a family; eat more vegetables.	Children took turns swinging on swing set, tag, football, four-square
6	16	10	Role play coaching parents and brothers and sisters about health goals; played Candyland games in small groups	Drink 3 cups of milk per day; reduce screen time (computer and television time)	Dodge ball, tag, football, four-square
7	17	6	Fish for healthy food facts and read the healthy facts on the back of the fish; role play coaching parents and siblings about family goals	Eat small portions of junk foods, like chips; eat more vegetables	Freeze tag, relay races
8	16	7	Discuss the vitamins in different foods, such as different types of fruits, vegetables, dairy products, and meats (protein); discussion of portion sizes		Dodge ball, tag, football, four-square

Note. Children had variable attendance.

Study Two: Participants and Procedures

Seventeen boys and 11 girls in the third through sixth grades volunteered to participate in fall, 2016. Twenty-one children were Caucasian, five were African American, one was Hispanic, and one was Indian.

Weekly lessons and activities are presented in Table 2.

During weeks two and three the children developed their family goals. This information was recorded on a family goal sheet, which children took home¹.

During week four, after a member-checking session, the children requested that group leaders develop family goals and write them on the family goal sheets. Children asked group leaders to teach them how to

review goal sheets with their parents. During weeks five, six, and seven the group leaders developed family goals and the children role-played sharing family goals with parents and siblings. During week eight the children requested a review of information about vitamins in different foods and suggested portion sizes for different types of foods. Weekly outreach to parents occurred via email. Nine of the children's parents (eight mothers, one father) volunteered to receive email updates.

At week nine, the children completed surveys to evaluate the program. They answered questions ("yes" or "no") about whether they learned something new in the program and whether they discussed the family goals with their parents. Children also wrote about which goals and lessons they talked about at home.

Parents were asked to complete surveys to assess their satisfaction with the program, describe what their child learned, and provide information about changes in

¹Information is available from the first author.

Table 3: Weekly Goals Developed by the Children for Study One

Sex	Time	Healthy Eating Goals	Health Exercise Goals	Roadblocks to Goals	Ideas for Overcoming Roadblocks
Boy	(1)	Carrots and ranch	Sit-ups and push-ups	If it snows and gets icy	Not to eat red food for a day
	(2)	Eat strawberries	Run around and do five push-ups	Snow, rain and being grounded	Try everyday
Girl	(1)	Drink milk and no candy	Walk	Grounded or someone died or family outing	Tell parents
	(2)	Eat grapes	Play for an hour outside and do jumping jacks	Grounded or bad weather	
	(3)	Drink milk	Play soccer	Family outings	
Girl	(1)	Eat fruit everyday	Play on the trampoline for an hour a day		I'm awesome
	(2)	I'm going to eat more vegetables 5 days a week	I'm going to do 15 push-ups every morning		
	(3)	Eat peas	Do 30 push-ups		Pack my lunch
Girl	(1)	Eat corn			Pack my lunch; eat veggies at dinner
	(2)	Eat carrots every day	2 hours of play on the playground	I get grounded	Do it every day or at least try to
Boy	(1)	Eat less chips	Go to the park at least once	Friends want to hang out instead of exercise	Setting date (to achieve goals by) and going to the park on the weekend get grains
	(2)	Do it every day or at least try to	Ride bike more	Rainy days	Go to the store with my Mom to get grains
	(3)	Eat more fruit	Play with friends	Cooler weather, have fast food for dinner	Wear warm clothes and tell Mom and Dad ahead of time (to buy healthy dinner)
Girl	(1)	I'm going to eat healthier every day	I'm going to run up and down my street	Do my homework more (then I can go outside)	
	(2)	Eat more strawberries	Do 30 push-ups a day		
Girl	(1)	Eat more grapes and strawberries	Jog and run	School	Timer for running
	(2)	Cut down on candy	Running	Lots of candy out	Eat 2 candies at dinner
Boy	(1)	Drink milk everyday	Run around as long as I can	If I get in trouble	
	(2)	Drink any fruit juice for dinner	Run around for an hour and do 5 jumping jacks	Get grounded	Do it (each) and every day
Girl	(1)	Eat less candy	Jumping jacks	Parents	
	(2)	Cut down on juice and pop	Push sister around in stroller for 3 times a week	Forgetting	Put goals on fridge; write goals in my plan book
Girl	(1)	Pick an orange over chips 3 times a week	Jump on the trampoline every day	Not getting in trouble	Don't talk back
Girl	(1)	Salad every day and oranges 3 times a week	Do 20 jumping jacks every day before I go to sleep	Baby sister keeps me busy	Do it (exercise) while my sister is sleeping
Boy	(1)	Try steamed carrots	Play tag for 2 hours	Being sick	Play with friends and eat carrots at dinner

(Table 3). Continued.

Sex	Time	Healthy Eating Goals	Health Exercise Goals	Roadblocks to Goals	Ideas for Overcoming Roadblocks
	(2)	Cut down on chick-letts	Play in the woods 4 times a week	Don't have enough money to go to the store	Talk with parents
Girl	(1)	Eat more fruit	Play outside	Parents not having fruit/getting grounded	Save money/be respectful
	(2)	Cut down on junk food and choose veggies	Jumping jacks in front of the television	Parents won't let me go outside	Don't get grounded
	(3)	Eat whole grain bread instead of white bread	Play outside with friends everyday	Parents ground me	Don't get in trouble
Girl	(1)	Eat healthier foods, such as salads, fruit and cut back on bread	Walk 3 times a week	Mom not letting me go outside	Walk around the house
	(2)	Cut back on eating Crave cereal by eating fruit without bagels	Walk three times a week	Mom	Try working out in the house
Girl	(1)	Vegan	Do more physical activities	Food/weather/being busy	Buying vegan food
	(2)	Try Vegan	Play more in the day	Chores/homework/babysitting	Play with friends
Girl	(1)	Eat fruit at lunch every day	Do 10 push-ups a day		
Girl	(1)	Eat vegies at least twice a week	Try to play as much as possible	Chores/homework/fishing with siblings	Tell (my) Dad
Girl	(1)	Eat less cheerios	Walk the dogs	Cold weather/brothers eat all the healthy food	Play some games inside
	(2)	Eat a cup of fruit at least twice this week	Go outside and play with friends at least twice a week	Parents leave, can't go outside	Play games inside/walk dogs

Note. Some children did not provide ideas for overcoming roadblocks.

their child's eating and exercise behaviors. Parents also responded ("yes" or "no") about whether they implemented family goals.

RESULTS

Study One

Children's ideas for goals, ideas of roadblocks and ways to overcome them are presented in Table 3.

A common goal was to eat more fruit, such as grapes or strawberries ($n = 12$). Eight of the children made a goal to eat more vegetables. In terms of exercise goals, children often selected running, walking, doing push-ups and jumping jacks, and increasing playtime with their friends. Roadblocks to obtaining goals were "being grounded" and not being able to go outside and exercise, bad weather (snow, cold), and having a lot of junk food at home. Ideas for overcoming roadblocks were to exercise with friends, exercise inside (the home), and to ask parents to have healthy foods on hand for snacks and to fix healthy meals (see Table 2).

Eleven of the children completed surveys to evaluate the program. There were two boys and nine girls (eight to eleven years; all were Caucasian). Their mean ratings for the four survey questions were: (1) coach listened to me ($M = 6.91$, $SD = .30$, range 6-7), (2) coach asked my opinions ($M = 6.0$, $SD = 1.18$, range 4-7), (3) coach helped me think about changing eating habits ($M = 6$, $SD = 1.34$, range 3-7), and (4) coach helped me think about changing my exercise habits ($M = 6$, $SD = 1.95$, range 1-7). Ten of the children wrote about what they learned. In terms of what was learned, being healthy was equated with being "stronger" and "getting to do more things" ($n = 3$). Two of the children reported that they learned to read about carbohydrates on food labels. Five reported learning about the Traffic Light Diet and "red, yellow, and green foods." Four reported learning more about the value of exercise.

Four mothers and one female guardian completed surveys at the end of the program. Three caregivers were highly satisfied with the program and one was very highly satisfied. All of the caregivers reported that

their children were independently discussing the CHEE program at home. Healthy changes that their children made were: (1) “My girls (this mother had two girls in the program), try to suggest more active activities”; (2) “She’s more aware (of the importance of healthy eating and exercise) and she learned to read food labels”, (3) “She is eating more fruits and veggies”; and (4) “She drinks less soda, eats more veggies and fruits.”

Ten of the children completed the healthy eating quiz to determine their recall of colors for different foods. The average of their scores was 34.7 correct identifications (*SD* = 1.8, Range = 32-37). Children did comment that some of the foods could fall into two categories, being either “yellow-green” or “yellow-red.”

Study Two

Table 4 presents the goals that the children developed for their parents during weeks two and three.

Children’s eating goals often focused on eating more fruits and vegetables. Children developed goals focusing on eating more proteins and reducing intake of unhealthy foods, such as “hot dogs” and “chocolate-flavored milk.” In terms of exercise, children mentioned doing push-ups, gymnastics, riding bikes, and walking the dog.

Twenty-two children (15 boys, 7 girls) completed surveys at the end of the program. Eighteen (82%) reported that they learned new information and wrote that they discussed goals with parents.

Five of the mothers completed surveys. Four were “highly” satisfied with the program and one was “very highly satisfied.” Their sons were learning: (1) to eat less junk food, (2) about portion size, (3) “he says he now knows why he should eat veggies,” (4) “healthy food and lifestyle habits, and (5) “nutrition facts and how to live a healthy lifestyle.” Four of the five mothers

Table 4: Family Goals Developed by Children for Study Two

Week	Eating Goals	Exercise Goals	Help Me Reach My Goals By
2	Eat more fruits and veggies (<i>n</i> = 4) We need more dairy (<i>n</i> = 3) We need less soda pop (<i>n</i> = 2) Less candy More grains (<i>n</i> = 3) More fruits (<i>n</i> = 4) More proteins (<i>n</i> = 2) Eat more tomato Eat carrots and other veggies Eat healthy (<i>n</i> = 3) Keep up the good work on vegetables Don't drink chocolate-flavored milk Don't eat hot dogs	Play with the neighbors more. Run Push-ups Ride my bike (<i>n</i> = 2) Walk dog (<i>n</i> = 2) Exercise (<i>n</i> = 6) Fly Frisbees Keep up the good work on walking	Ask for more fruits and veggies (<i>n</i> = 2) Play with neighbors more. Go with my Mom on a run. Not watch TV (<i>n</i> = 2) Spend time with me on these goals (<i>n</i> = 4) To play with my family You need to buy more healthy food (<i>n</i> = 2) Go to the gym with me Make me healthy meals Ride bikes with me (<i>n</i> = 2) Take me on a run Let me go outside Taking walks with me and buying more fruit Making healthy dinners Remind me to exercise
3	Eat more veggies (<i>n</i> = 4) More grain Eat good stuff and healthy (<i>n</i> = 4) Eat healthy desserts Eat more fruits (<i>n</i> = 2) Less desserts Less unhealthy snacks Eat bread Buy healthier foods Eat salad for lunch Eat more broccoli	Play outside Play 60 minutes Exercise more (<i>n</i> = 4) Stop tackling without a helmet and shoulder pads Dance (<i>n</i> = 2) Play inside for 30 minutes Fastest runner of fifth grade Ride bikes (<i>n</i> = 6) Walk dog Run (<i>n</i> = 2) Push ups Do gymnastics Walking	Playing with me more (<i>n</i> = 3) Play longer Stop tackling on grass Not eating fudge cake Remind me to exercise Exercise with me, doing them with me (<i>n</i> = 5) Ask my parents for more fruits and veggies Play with neighbors more Go with my Mom on a run Not watch TV Eat apples, fruits and vegetables Getting my bike from Grandpa's house Ride bikes and eat healthier foods with me Doing morning jogs Buying more fruits

Note. During week two all of the children completed goal sheets. During week three two children did not want to complete goal sheets and several complained about the writing demand and asked if coaches could write goals. Thus, the member-checking meeting was held in week four.

reported that their sons were already “very” active; therefore, they did not see change in their son’s PA levels.

In terms of changes in eating behaviors, one mother reported, “He stopped asking for chips for snack.” Another mother stated, “He’s more into veggies and fruits.” Another mother stated that her son, a very picky eater, was “Eating more fruits and veggies and trying new foods.” The other two mothers reported that their sons had healthy eating patterns before the program. All five reported that they had reviewed the family goal sheets with their son.

DISCUSSION

Consistent with previous evaluations, these applications of the CHEE program were successful in enhancing child learning about healthy eating and the value of daily exercise [5, 10, 11]. Results lend support to the growing body of research showing that after-school settings are appropriate ones for presenting knowledge about healthy eating and exercise to young children [7-11]. Family outreach, by contacting parents, was important in both studies. Family goal setting was implemented in the second pilot study, extending the program to changing family eating habits. Children needed support in developing family goals and learning how to convey goals to parents. Engaging parents remained challenging, and this is consistent with previous studies [10, 11]. Parent training sessions at the schools, with incentives for attendance, may be needed to fully engage parents.

Children demonstrated long-term recall of the Traffic Light Diet [13]. Interestingly, children reported that several foods belonged to two categories rather than in the discreet category (i.e., being simply a red, yellow or green food). That is, children identified some foods as being in a green-yellow (e.g., whole wheat bread) category or a yellow-red (reduced fat ice cream) category rather than being representative of only one category. Simple classification systems, such as the Traffic Light Diet, may need to be updated to have more categories for classifying foods.

Information about children’s personal goal setting was obtained in study one. Similar to previous research, children were more likely to select goals to improve fruit intake rather than discussing eating more vegetables [5]. While improving fruit intake is a critical step in promoting health, future coaching efforts should consider placing a high priority on increasing vegetable consumption. Similar to previous research, children

identified a lack of healthy food in the home as a roadblock to healthy eating and not having exercise partners as a roadblock to exercise [5]. Children reported that shopping with their parents and encouraging them to purchase “healthier” foods would help them achieve their eating goals. Being “grounded” or punished by not being able to engage in PA outdoors was a new roadblock. Communicating with parents about the consequences of punishments, which restrict children’s engagement in PA, is a goal for future studies.

Several factors limited the generalizability of our results. For example, sample sizes were small and samples of convenience were recruited; however, these were pilot studies. Moreover, a social desirability bias could have influenced children and parents to respond positively about the program. Formal assessment of knowledge gained by parents needs to be examined in future studies. There was not a comparison group in either study. The after-school program directors wanted as many of the children to participate as possible. They saw the intervention as valuable, and therefore a comparison group was not possible in either pilot study.

In summary, results indicated that children and parents were satisfied with the program and saw positive change in child eating habits and support of their involvement in PA. With the help of their coaches and with practice through role-plays, children were able to teach their parents about healthy eating and exercise goals, revealing a new method for disseminating information to the home setting. Children were change agents and were active in determining their own health habits [18-20]. However, efforts at family outreach and parent involvement need to be continued. Dissemination of programs to broader community settings is critical to the success of health programming.

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CONFLICT OF INTEREST

The authors have no conflicts of interest to declare.

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