

# Evaluation of an Afterschool Children's Healthy Eating and Exercise Program

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**Abstract:** *Background:* The purpose of this study was to examine the feasibility of the Children's Healthy Eating and Exercise Program (CHEE) in an afterschool program of an elementary school.

*Methods:* Students in a low-income elementary school were recruited to participate in the program. Thirty-three children were in the intervention group. Twenty-four children in the comparison group were recruited from after school clubs in the same elementary school. The CHEE Program consisted of 18 sessions, featuring nutrition (20 min) and physical activity (40 min) lessons. Nutrition lessons were adapted from the Traffic Light Diet. Other lessons included MyPlate, my refrigerator, my lunchbox, and a healthy foods tasting activity. Multiple physical activities were utilized in the program including soccer, dance, relay races, tag, and other fun games. Data were collected at the beginning and end of the program.

*Results:* Children in both groups reported eating more vegetables at the post-intervention measurement. Children in the intervention group indicated that they learned about healthy eating and new physical activities due to their participation in the program.

*Conclusions:* Future studies are needed to discover barriers to behavior change as well as apply a more rigorous design to examine the impact of the CHEE Program.

**Keywords:** Afterschool health education program, low-income children, healthy eating, nutrition education, physical activity.

## INTRODUCTION

Childhood obesity is a nationwide problem and is steadily affecting children's health in the United States (U.S.). Approximately, 18% of children are obese, and more than one third of children and adolescents are overweight or obese in the U.S. [1]. The consequences of obesity are among the most serious public health challenges. Overweight and obese children and adolescents suffer from both short-term and long-term health consequences [2]. Overweight and obesity is responsible for physical effects such as diabetes and mental health issues such as low self-esteem [3]. Children often struggle with low self-esteem which is attributed to a lack of peer acceptance [4]. Overweight and obesity, as well as the associated negative health consequences, are largely preventable [5]. Several studies have been done to investigate predictors of childhood overweight or obesity [6-8]. Findings indicated that at least three behaviors are modifiable and particularly important for children, which are engaging in regular physical activity, consuming more fruits and vegetables, and eating less "junk food."

One potential barrier to healthy eating and engaging in physical activity is residing in poverty [9]. More than one in five children (15.75 million) in the U.S. lived in poverty in 2010 [10]. Children from low-income families are at greater risk for becoming obese and developing chronic disease [11]. Children from disadvantaged family backgrounds are frequently exposed to negative influences such as: decreased educational opportunities, lack of availability of nutritious foods, inadequate exercise, and inaccessible recreational facilities. These factors may have negative influences on their physical and psychological development [12]. Hence, a new vision for Healthy People 2020 is to emphasize health equity for all and afford all groups with information about healthy lifestyle habits [13].

One strategy to promote health education among children is to intervene in the school setting. Research has indicated that school-based interventions are effective in reducing the prevalence of childhood obesity [14]. School-based programs provide an opportunity for implementing health education programs to educate children on ways to eat healthy and engage in more physical activity [15]. During afterschool programs, the staff has the potential to implement programs to increase positive experiences among children who lack access to resources that promote healthy lifestyles [16]. However, research on

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the acceptability and feasibility of afterschool-based interventions to prevent obesity is still minimal [17].

This study evaluated the impact of the Children's Health Eating and Exercise Program (CHEE) developed to disseminate information from the Traffic Light Diet [18]. Three food groups are used to teach children about its health content. These include green light foods (e.g. broccoli, tomatoes, oranges, foods that are high in vitamins, fiber and minerals, and low in fat), yellow light foods (e.g. dairy foods, pasta, which should be eaten in moderation), and red light foods (e.g. cookies and fried foods that are high in calories and low in nutrients). The Traffic Light Diet has been successfully used to help children with weight loss and behavior changes by teaching about healthy food choices to obese and overweight children [19]. The Winning with Wellness (WWW) Program was implemented to promote healthy eating at a rural elementary school. The WWW Program was also adapted from the Traffic Light Diet. Findings indicated improved food choices and healthy eating, but results also suggested that finding time to implement the program during the school day could be challenging [20].

The CHEE Program was delivered to 36 urban Appalachian children and adolescents in a community setting. In addition to emphasizing eating more green light foods and fewer red light foods, the CHEE Program also emphasized the importance of daily exercise in maintaining health. The older children ( $M = 16.21$  years) participated in five groups, whereas the younger children ( $M = 8$  years) participated in six groups. Sessions for the older group lasted for about 45 minutes while sessions with the younger children lasted for 90 minutes. Results indicated that participants improved in healthy eating, such as consuming more vegetables and fewer French Fries and chips (i.e. snacks). Results also indicated that children displayed knowledge of the green and red light food categories, but were less knowledgeable about yellow light foods. There was no significant change in levels of exercise at the end of the program [21]. Thus, the current study added a more intensive physical activity program, having more equipment available for children to use and more time to engage in physical activities at each session. In addition, younger participants were recruited, which extended knowledge about the program. Activities were fun and culturally appropriate, such as jump rope, tag, etc., as previous research has shown that engagement in these types of activities improved children's activity levels [22]. Thus,

there were two specific aims of the program evaluation: (1) to gain an understanding of what children learned from the intervention, and (2) to assess whether eating and exercise behaviors changed in the intervention versus the comparison group.

## METHODS

### Participants

There were 33 (13 boys and 20 girls) children in the intervention group ranging from 5-10 years of age ( $M = 6$  years,  $SD = 1$  years). Seventeen children in the intervention group were Caucasian, ten were African American, three were Hispanic, and three were biracial. Children self-selected to be members of intervention group. The comparison group was recruited from other afterschool programs held at the elementary school. A total of 24 (13 boys and 11 girls;  $M = 6$  years,  $SD = 1$  years, range = 5-9 years) children were in the comparison group. Seventeen were Caucasian, six were African American, and one was biracial. This study was conducted in an elementary school where seventy-five percent of the families are at low-income or poverty levels.

### Description of Lessons

The sessions were conducted twice a week in the school gymnasium. A typical session included education about: (1) healthy eating [for 20 minutes], (2) exercise [for 35 minutes], and (3) wrap-up discussion on the importance of healthy eating and exercise [for 5 minutes]. Children were recognized or awarded for their participation with a snack, such as raisins. The weekly lessons are described in Table 1.

For the *healthy eating* lessons, weekly sessions focused on discussing green and red light foods. Children learned about packing a healthy lunch, eating a healthy snack, cooking healthy, and consuming more fruits and vegetables. Children also learned about and healthy foods to keep in their refrigerator at home.

For the *exercise* lessons, group leaders involved the children in a variety of activities including soccer, basketball, relay races, jump rope, tag, kicking a shuttlecock (a traditional Asian game, with similar objectives to hacky sack), and other running games. Exercise equipment (e.g. hula hoops, foam balls, scooters, plastic bowling equipment, and Frisbees) was provided. Children were also allowed to create their own fun games, such as creating obstacle courses from materials available in the gym (cones, mats, etc.).

**Table 1: Weekly Plan: Healthy Eating Lessons and Exercise Activities**

Lesson	Healthy Eating Lessons	Exercise Activities
1	Pre-intervention survey was completed. Children played tag after the survey. Board and card games were also available, such as "Uno" and "Chutes and Ladders." Paper and crayons, and play food items (e.g. vegetables, hamburgers) were also provided.	
2	Learned about red and green light foods. Play food items were used to illustrate red and green light foods. Children practiced categorizing red and green light foods and ran a lap in a relay race.	Children learned how to dribble and pass a soccer ball. Then, children elected to play a soccer game.
3	Reviewed red and green light foods. Used play food items to develop healthy meals. Red and green light foods relay race: children viewed pictures of red and green light foods, decided category of foods, and ran a lap in a relay race.	Played soccer game, jump rope and kicked shuttlecock.
4	My Refrigerator: completed healthy refrigerator exercise. Children drew what was in their refrigerator and discussed what healthy foods could be added.	Played basketball dribble relay race, soccer game, jump rope, and kicked shuttlecock.
5	Children made placemats. They divided a sheet of paper in half and drew red light foods on one side with green light foods on the other. Children practiced fruit and vegetable cheers or dances.	Traffic light running/walking: children listened to a whistle -- one sound meant "go," and two sounds meant "pause." They ran or walked with one sound of the whistle and stopped on two whistles. Basketball dribble relay, soccer dribble relay, frisbee, bowling, kickball, and played basketball.
6	Children were introduced to MyPlate. Children received a MyPlate handout. Recipe was sent to parents.	Soccer game, jump rope, bowling, and kicked shuttlecock.
7	Red and green light foods relay race. Healthy eating coaching: reviewed red and green light foods, encouraged children to have four green light foods for every one red food.	Follow the leader by doing animal poses (crab walk, bear walk, python glide, goose walk, elephant walk), soccer dribble relay race, and soccer game.
8	Red and green light foods relay race. Developed fruit and vegetable cheers or dances. Children created their own healthy food cheers dances individually or in small groups.	Relay race, traffic light running/walking, played basketball, and tag.
9	Discussed how to pack a healthy lunch.	Toss and catch the foam ball. Then children played tennis baseball in which children used a tennis racket to hit a foam ball and ran bases to score runs.
10	Children drew healthy lunches. Healthy food placement: discussed their favorite food and drew pictures of favorite foods.	Traffic light running/walking, and then children played different versions of "tag" (e.g. Sharks & Minnows).
11	Healthy snack: discussed snack and what could be added to make a healthier snack.	Free dancing with music: group leader showed children free dance following the music. Children then developed their own dances. Green and red light foods relay race. Soccer game, jump rope and hula hoop.
12	Healthy foods tasting activity: reviewed ideas of eating fruits and vegetables as snack. Children sampled various options of fruits and vegetables (strawberry, blueberries, banana, celery, radish, carrot, cranberry and sweet bean) as snack. Red and green light foods relay races.	Played kickball, volleyball and basketball.
13	Paper and crayons were available for children to use to draw pictures of their ideas about healthy snacks. Red and green light foods relay races.	Dancing (Taiwanese Indigenous dance): group leader showed children about a traditional dance in Taiwan and then children practiced it. Children also developed their own dances. Tossed foam ball, and jump rope.

(Table 1). Continued.

Lesson	Healthy Eating Lessons	Exercise Activities
14	Paper and crayons were available for children to use to draw pictures of their ideas about healthy snacks.	SPUD (children were assigned a number, and then the group leader tossed the soft ball and called a number and everyone ran away. The student with the number had to catch the ball and then everyone stopped moving. The student could move 4 steps and threw the soft ball to the person he/she targeted.). Tag, handball, jumping jacks and soccer were other activities.
15	Paper and crayons were available for children to use to draw pictures of their ideas about healthy snacks.	Kickball, bowling, jump rope and toss foam ball.
16	Paper and crayons were available for children to use to draw pictures about healthy eating. Red and green light foods relay race.	SPUD and handball.
17	Post-intervention survey was completed. Children played tag after the survey. Board and card games were also available, such as "Uno" and "Chutes and Ladders." Papers, crayons, and play foods were also provided.	
18	Scooters, jump ropes, soccers and foam balls were provided. Paper and crayons were also available. Children also played red and green light foods relay race and tag.	

For *parent involvement*, parents received handouts, newsletters discussing the importance of healthy eating and daily exercise, and recipes for preparing healthy meals.

### Procedures

Institutional Review Board (IRB) approval was obtained from one Midwestern university. Parental consent and child assent were required for children to participate. The program was implemented and evaluated by a team consisting of one faculty member from the health promotion and education program, and graduate students with a major in community health. A survey that has been utilized [21] was adapted to assess children's opinions about their eating and exercise habits before and after program participation. Questions examined participants' eating and physical activity behaviors. For example, "Yesterday, did you eat French Fries or chips?" The anchor points of the scale were: 1 = no, 2 = one time, 3 = two times, 4 = three or more times. For the questions examining the children's exercise regime, children indicated "How many of the past 7 days did you exercise that made you breathe hard for at least 20 minutes?" (0 = 0 day to 7 = 7 days). The follow-up surveys consisting of the same questions were completed at the seventeenth session of the program instead of the scheduled eighteenth session due to several participants were leaving school for their winter break during the last week of the semester. Children in the intervention group also provided information about what they learned about healthy eating (e.g. what did you learn about green light foods?) and exercise (e.g. what new things did you learn about exercise?) after participating

in the program. Assessors read questions for younger participants with limited reading abilities. Parents were given surveys and responded to questions (e.g., do you think your child is eating more healthy food because of being in the group?) on a three-point scale (1 = yes, 2 = no, 3 = don't know) to assess their impressions of the CHEE Program.

### Data Analysis

All data were analyzed using IBM-SPSS, version 22.0. Quantitative data were analyzed using repeated measures ANOVAs. Repeated measures ANOVAs were used to compare pre- and post-intervention consumption of French Fries and chips, vegetables, fruits, fruit juice, sweets, soda, and pre- and post-intervention physical activity participation for the intervention versus the comparison group. Data about what children learned about healthy eating and exercise, and parent responses are also presented.

### RESULTS

Results of the repeated measures ANOVA for change in vegetable consumption indicated a significant difference from pretest to posttest,  $F(1, 44) = 6.056, p = .018$ . Irrespective of whether they were in the intervention or comparison group, children reported consuming more vegetables at the end of the program ( $M = 2.30, SD = 1.07$ ) compared to the beginning of the program ( $M = 1.85, SD = 1.05$ ). Means and standard deviations for pre- and post-intervention change in survey questions are presented in Table 2. Repeated measures ANOVAs for other key outcome variables (i.e. consumption of chips, fruits, fruit juice, sweets, exercise, and soda) did not yield significant findings.

**Table 2: Results for Changes in Key Outcome Variables**

Variables	Pre-intervention				Post-intervention			
	Intervention		Comparison		Intervention		Comparison	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
French Fries/chips	1.59	.91	1.78	1.00	1.69	1.00	2.06	1.21
Vegetables	2.00	1.17	1.59	.795	2.41	1.15	2.12	.93
Fruits	2.34	1.26	2.17	.99	2.59	1.18	2.39	1.09
Fruit Juice	2.24	1.15	1.50	.71	2.28	1.22	2.00	1.14
Sweets	2.22	1.28	2.00	1.19	2.11	1.16	1.67	1.19
Soda	2.34	1.23	2.00	1.19	1.76	1.15	2.06	1.16
Exercise	1.18	.39	1.22	.43	1.36	.49	1.39	.50
Days of Exercise	3.66	3.27	3.83	2.53	4.59	2.89	3.89	2.68

At the posttest, children ( $n = 29$ ) responded to questions addressing what they learned about red light and green light foods. Twenty-eight children (97%) correctly discussed what red light foods were, and twenty-six children (90%) were able to describe what green light foods were. Children's answers about red light foods included comments such as, red light foods are not healthy, are foods that are sweetened and fat, are "No No" foods, and are foods we should stop eating or eat less frequently. The majority of children indicated that green light foods are healthy, are vegetables and fruits, are "Yes Yes" foods and we should eat more of them. One child did not correctly identify red and green foods.

Table 3 presents the details about what children said they learned about exercise.

**Table 3: Results of Participants' Answers about Exercises They Learned**

	Number of Children	Percent
Keeps you strong/healthy/live longer	5	20 %
Yoga	5	20 %
Push-up	4	16 %
New game	4	16 %
Exercise everyday	2	8 %
Nothing	2	8 %
Sit-up	1	4 %
Fun	1	4 %
Don't know	1	4 %

Surveys were sent to parents of children in the intervention group. Six parent surveys were collected.

Five parents said that prior to the program they had talked to their child about healthy eating and exercise. Five parents mentioned that their child had talked to them about having healthy eating and exercise goals prior to beginning the program. All of the parents reported that their child talked about red and green light foods and healthy eating, and were eating more healthy foods at home because of participating in the program. Five of six parents (83%) stated that their child was exercising more because of participating in the program. All of the parents reported that they received the recipes; however, only two parents replied that they had used the recipes (i.e. a burger meal, taco meal, veggie meal, and peanut butter cookies).

## DISCUSSION

Findings indicated that children in the intervention group were learning about red and green light foods. These findings are consistent with other studies indicating the acceptability and feasibility of the adapted Traffic Light Diet for children [21, 22]. Children in the intervention and comparison groups were eating more vegetables at the post-intervention assessment. This may have occurred because children were talking to each other about the program or learning about healthy eating in other school programs. Parents reported that their children were eating more healthy foods at home and exercising more frequently because of participating in the group.

Children in the comparison group could have learned about the intervention, obscuring differences between groups. Therefore, we conducted a post hoc analysis of pre- and post-intervention changes for the intervention group. Results indicated that they ate more vegetables and drank less soda with sugar when

assessed at the posttest than at pretest (see Table 4 for *t* values and see Table 3 for Means and Standard Deviations for the intervention group).

**Table 4: Post Hoc Analysis - Paired *t*-Tests for Intervention Group**

Variable	<i>t</i>	<i>p</i>
French Fries/chips	-.451	.655
Fruits	-.925	.363
Vegetables*	-3.36	.002
Fruit Juice	-.128	.899
Sweets	.350	.729
Exercise	-1.724	.096
Days of Exercise	-1.448	.159
Soda*	2.174	.038

Note. \*denotes significant difference between mean scores. See Table 3 for means and standard deviations for healthy eating and exercise questions pre- and post-intervention for the intervention group.

Several lessons were learned from conducting the program. For example, the program leader observed that younger children (5 to 6 years old) and older children (7 to 9 years old) had different levels of skills for engaging in physical activities. Moreover, there were gender differences in the involvement in the physical activity that may have impacted results. Many of the boys tended to become involved in competitive games, while girls preferred different types of activities such as jump rope and dance. Future interventions should separate children into different groups based on their age, gender, or interests, and play stations could be used to provide different options for children. Results of the study demonstrated that children's knowledge about healthy eating and the importance of regular exercise was improved, but their engagement several types of in healthy eating and exercise behaviors did not change. Hence, it is crucial for health educators to intervene to help fill the gap between cognitive and behavior change by motivating children and families to engage in more health behaviors [23]. Eating and exercise diaries could be used to document what children consume as well as what and how much physical activity they are involved in at home.

Several factors limited the generalizability of the findings of the study. First, the sample size was small, and the comparison group was selected based on convenience. Future studies should use a comparison group with matched child age or ethnic group. Using physiological measures of exercise, observations of mealtimes, and food or exercise diaries would have

provided more objective information about whether behaviors changed. Second, other strategies could be applied to increase response rate for parent surveys, such as providing a gift card for completion of the survey. Also, future research on parents' eating and physical activity behaviors as well as holding lessons to teach parents about the CHEE Program is crucial for children's learning about and the implementation of healthy lifestyles at home.

Results of the study indicated that children and parents were satisfied with the intervention and dissemination of knowledge about the Traffic Light Diet was occurring. Involving parents or other family members in the program may result in positive impacts on children's eating and exercise behaviors [24]. Childhood obesity is growing at an alarming rate [1], more health and exercise programming is needed in the regular school curriculum. Moreover, it will be important to continue examining the feasibility of obesity prevention programs in community settings, such as afterschool programs, to improve children's knowledge of healthy eating and engagement in physical activity.

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