I, Chia-Liang Dai, hereby submit this original work as part of the requirements for the degree of Doctor of Philosophy in Health Education.

It is entitled:
Evaluation of an Afterschool Obesity Prevention Program: Children's Healthy Eating and Exercise Program

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This work and its defense approved by:

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Committee member: Rebecca Vidourek, Ph.D.
Evaluation of an Afterschool Obesity Prevention Program: Children’s Healthy Eating and Exercise Program

A dissertation submitted to the
Graduate School
of the University of Cincinnati
in partial fulfillment of the
requirements for the degree of

DOCTORATE OF PHILOSOPHY

In the Department of Health Promotion and Education
of the College of Education, Criminal Justice, and Human Services

July 2014

By

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Abstract

AN ABSTRACT OF THE DISSERTATION FOR THE DOCTOR OF PHILOSOPHY DEGREE IN HEALTH PROMOTION AND EDUCATION, PRESENTED ON JULY 2, 2014 AT THE UNIVERSITY OF CINCINNATI, CINCINNATI, OH

TITLE: Evaluation of an Afterschool Obesity Prevention Program: Children’s Healthy Eating and Exercise

DOCTORAL COMMITTEE MEMBERS: Dr. Laura A. Nabors (chair), Dr. Keith A. King, and Dr. Rebecca A. Vidourek

For this dissertation two studies were conducted. The first part of the abstract addresses study one and the second part reviews study two. Study one examined the impact of the Children’s Healthy Eating and Exercise program on children’s eating and exercise behaviors. Study two evaluated children’s perceptions of and learning during a yoga program.

Study One Abstract

Introduction: The purpose of this study was to examine the effect of the Children’s Healthy Eating and Exercise Program (CHEE) in an afterschool setting in an elementary school. Methods: Thirty-three children were in the intervention group. Twenty-four children in the comparison group were recruited from afterschool clubs in the same elementary school. The CHEE program consisted of nutrition (20 min) and physical activity (40 min) lessons and was delivered twice a week for three months. Nutrition lessons were adapted from the Traffic Light Diet. Other lessons included MyPlate, my refrigerator, my lunchbox, and a healthy foods tasting celebration. Multiple physical activities were utilized in the program including soccer, dance, relay races, tag, and other fun games. Children were asked about their eating and exercise behaviors 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. Discussion: Future studies are needed to discover barriers to behavior change as well as apply a more rigorous design, such as to conduct a randomized controlled trial, to examine the impact of the CHEE program.

Study Two Abstract

Introduction: Yoga, a low-impact physical activity (PA), can be practiced the child’s entire life, and therefore might provide children with a lifelong activity related to having a healthy lifestyle. The purpose of the current study was to evaluate children’s perceptions of and learning during a yoga intervention implemented during an afterschool program. Methods: The 33 children who participated in the study attended a public school in Cincinnati that serves children residing in low-income families. Children were recruited from an afterschool program at a local elementary school and participated in a three-month, twice per week, yoga program. The group leader used stories and animal names for poses to increase children’s motivation and interest while they were learning different poses. Survey and interview data were collected before the program began, mid-program, and at the end of the program. Results: Baseline data showed that sixty-four percent of children reported they had never practiced yoga and did not know what yoga was. At the mid-intervention survey, 83% of the children reported feeling positive benefits of yoga practice such as feeling happy, having fun, feeling relaxed, and feeling stronger after practicing yoga. Children showed increased perceptions of self-efficacy for performing yoga by the end of the program. The average number of yoga poses children demonstrated was
five, and their favorite yoga pose was the “cobra.” Discussion: Findings inform future
directions for research, providing ideas for integrating yoga practice into current
health promotion programs in schools.
Acknowledgements

I am sincerely grateful to Dr. Laura Nabors for her valuable mentorship and support throughout the dissertation process. I have learned a tremendous amount and am inspired by her enthusiasm for conducting health promotion programs for our community. I would also like to express my deepest appreciation to Dr. Keith King for his helpful insight throughout the project. I am very grateful for the time he spent with me during my education at the University of Cincinnati. To Dr. Rebecca Vidourek, I would like to thank her for her kind feedback and advice in helping to direct the project design. I truly appreciate their encouragement throughout the process. I am very grateful to have such supportive colleagues and classmates in the College of Education, Criminal Justice, and Human Services. Finally, I would like to thank my family, my wife, and my six-month-old daughter for their love throughout my life.
Dedication

The dissertation is dedicated to my late father, Da-Ji Dai.
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Study One: Evaluation of an Afterschool Obesity Prevention Program:

Children’s Healthy Eating and Exercise Program
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. (Ogden, Carroll, Kit, & Flegal, 2014). 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 (World Health Organization [WHO], 2011). Overweight and obesity is responsible for physical effects such as diabetes and mental health issues such as low self-esteem (Zhao, 2008). Children often struggle with poor self-concept and low self-esteem related to a lack of peer acceptance (Puhl & Latner, 2007). Overweight and obesity, as well as the associated negative health consequences, are largely preventable (WHO, 2012). Several studies have been done to investigate predictors of childhood overweight or obesity (Fowler-Brown & Kahwati, 2004; Sharma, Wagner, & Wilkerson, 2006; Sothern, 2004). Findings indicated that at least three behaviors are modifiable and particularly important for children: engaging in regular physical activity, consuming more fruits and vegetables, and eating less “junk food” every day.

One potential barrier to healthy eating and engaging in physical activity is residing in poverty (Edwards, Miller, & Blackburn, 2011). More than one in five children (15.75 million) in the U.S. lived in poverty in 2010 (Macartney, 2011). Children from low-income families are at greater risk for becoming obese and subsequently are at risk for chronic disease (Center for Disease Control and Prevention [CDC], 2010). 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.
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 (United States Department of Health and Human Services [USHHS], 2010).

In addition, academic demands in schools have decreased students’ recess and leisure time (McMurrer, 2007). One strategy to promote health among children is to intervene in the school setting. Gonzalez-Suarez, Worley, Grimmer-Somers, and Dones (2009) indicated that school-based interventions are effective in reducing the prevalence of childhood obesity. School-based programs provide an opportunity for implementing health education programs to educate children about ways to eat healthy and engage in more physical activity (e.g., Beets, Beighle, Erwin, & Huberty, 2009). During afterschool programming staff have the potential to implement programs to increase positive experiences among children who lack access to resources that promote healthy lifestyles (Afterschool Alliance, 2008). However, research on the effectiveness of school-based interventions to prevent obesity is still minimal (Peterson & Fox, 2007).

Moreover, healthy lifestyle habits formed at a younger age can result in profound positive impacts on child health (WHO, 2007). Learning about food and physical activity habits promotes healthy lifestyle behaviors (Ammerman et al., 2007). More information is needed about the impact of health promotion programs with younger children from low-income families. For this project, the Children’s Healthy Eating and Exercise (CHEE) Program was implemented in an afterschool program at a local elementary school where most children were residing in low-income families.

The CHEE Program was developed to disseminate information from the Traffic Light Diet. Leonard Epstein developed the Traffic Light Diet intervention for childhood weight control (Epstein, 2005). Three food groups are used to teach children about the health content of foods.
These include green light foods (e.g., broccoli, tomato, orange, most foods are high in vitamins, fiber and minerals, and low in fat), yellow foods (e.g., dairy foods, pasta, which need to be eaten in moderation), and red light foods (e.g., cookies and fried foods that are high calories and low in terms of nutrition). The Traffic Light Diet has been successfully used to help children with weight loss and behavior change via teaching healthy food choices to obese and overweight children (Epstein et al., 2012). Schetzina and colleagues (2009) implemented the Winning with Wellness (WWW) Program that promoted healthy eating at a rural elementary school. The WWW Program was adapted from the Traffic Light Diet. Findings indicated improved food choices and healthy eating; however, finding time to implement the program during the school day could be challenging (Schetzina et al., 2009).

Nabors and colleagues (2013) delivered the CHEE Program 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 5 groups, whereas the younger children ($M = 8$ years) participated in 6 groups. Groups for the older children lasted for about 45 minutes. Groups for younger children lasted for 90 minutes. Results indicated that participants improved in terms of 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. However, they had less knowledge about yellow foods. There was no significant change in levels of exercise at the end of the program.

School-based interventions to prevent obesity should use a multi-component approach, and emphasize nutrition and physical activity (Peterson & Fox, 2007). For example, in the
APPLE (A Pilot Program for Lifestyle and Exercise) project, the main components of the intervention included physical activity and healthy eating. Before and after the intervention, 173 children (mean age = 11 years old) completed the initial and follow-up measurements. During recess, lunchtime and afterschool, sports equipment was available to increase children’s involvement in free play. Findings showed that children who participated in the intervention were less likely to be overweight (Taylor et al., 2008). Another afterschool obesity prevention program GEMS (Girls Health Enrichment Multi-Site Studies) was conducted twice a week for 12 weeks. Participants were 54 African American girls (8-10 years old). The physical activity intervention included various fun, culturally appropriate, interactive, and hands-on activities, such as dancing, jump rope, relay races, and tag. Results indicated that there was no difference in BMI at the pre and post intervention measurements. But the intervention group showed greater physical activity levels compared to the control group (Story et al., 2003).

The purpose of the current study was to investigate the impact of the CHEE Program, an obesity prevention program delivered in an afterschool program, in an elementary school. The current pilot project emphasized eating more green light foods and fewer red light foods, and added exercise sessions in the gymnasium. This program focused on improving nutrition and physical activity among young students residing in low-income families. There were two specific aims of the project: (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. This research holds significance for researchers and practitioners in the health promotion and education field as it provides guidance for building effective obesity prevention programs specific for afterschool groups as well as contributing to knowledge about enhancing positive lifestyle promotion for school-age children.
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, 10 were African American, 3 were Hispanic, and 3 were biracial. Children self-selected to be members of intervention group. The comparison group was recruited from other afterschool programs at the elementary school. These children did not participate in the CHEE Program. 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, 6 were African American, and 1 was biracial. This study was conducted in an elementary school where seventy-five percent of the families are at low-income or poverty levels. Forty-two percent of the children have BMIs at level 3 or 4, 85% or higher (18% were 85% < 95% and 24% were > 95%). Ethnic groups at the school are 60% Caucasian, 38% African American, and 2% are biracial, Hispanic and Asian.

Description of Lessons

This study was part of quality improvement efforts to improve the CHEE Program. This researcher added new weekly activities, including soccer, yoga, basketball, traffic light relay races, and tag. The sessions were delivered 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.
<table>
<thead>
<tr>
<th>Date</th>
<th>Healthy Eating Lessons</th>
<th>Exercise Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>9/30/2013</td>
<td>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.</td>
<td></td>
</tr>
<tr>
<td>10/2/2013</td>
<td>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 the relay race.</td>
<td>Children learned how to dribble and pass a soccer ball. Then, children elected to play a soccer game.</td>
</tr>
<tr>
<td>10/7/2013</td>
<td>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 the relay race.</td>
<td>Played soccer game, jump rope and kicked shuttlecock.</td>
</tr>
<tr>
<td>10/9/2013</td>
<td>My Refrigerator: completed healthy refrigerator exercise that children drew what was in their refrigerator and discussed what healthy foods could be added.</td>
<td>Played basketball dribble relay race, soccer game, jump rope, and kicked shuttlecock.</td>
</tr>
<tr>
<td>10/14/2013</td>
<td>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.</td>
<td>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 race, soccer dribble relay, frisbee, bowling, kickball, and played basketball.</td>
</tr>
<tr>
<td>10/16/2013</td>
<td>Children were introduced to MyPlate. Children received a MyPlate handout to color a balanced meal with green light foods. Recipe was sent to parents.</td>
<td>Soccer game, jump rope, bowling, and kicked shuttlecock.</td>
</tr>
<tr>
<td>10/21/2013</td>
<td>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.</td>
<td>Follow the leader by doing animal poses (e.g., crab walk, bear walk, python glide, goose walk, elephant walk), soccer dribble relay race, and soccer game.</td>
</tr>
<tr>
<td>10/23/2013</td>
<td>Red and green light foods relay race. Reviewed red and green light foods by developing veggie &amp; fruit cheers. Reviewed fruit and vegetable cheers or dances. Children created their own healthy food cheers dances individually or in small groups.</td>
<td>Relay race, traffic light running/walking, played basketball, and tag.</td>
</tr>
<tr>
<td>10/28/2013</td>
<td>Discussed how to pack a healthy lunch.</td>
<td>Toss and catch the foam ball. Then children played tennis baseball in which children used</td>
</tr>
<tr>
<td>Date</td>
<td>Description</td>
<td>Details</td>
</tr>
<tr>
<td>------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>10/30/2013</td>
<td>Children drew healthy lunches. Healthy food placemats: discussed their favorite food and drew pictures of favorite foods.</td>
<td>a tennis racket to hit a foam ball and ran bases to score runs.</td>
</tr>
<tr>
<td>11/4/2013</td>
<td>Healthy snack: discussed snack and what could be added to make a healthier snack. Red and green light foods relay races.</td>
<td>Traffic light running/walking and then children played different versions of “tag.” (e.g., Sharks &amp; Minnows)</td>
</tr>
<tr>
<td>11/6/2013</td>
<td>Healthy food tasting: reviewed ideas of eating fruits and vegetables as snack.</td>
<td>Free dancing with music: group leader showed children free dance following the music. Children then developed their own dances. Soccer game, jump rope and hula hoop.</td>
</tr>
<tr>
<td>11/13/2013</td>
<td>Red and green light foods relay races. Paper and crayons were available for children to use to draw pictures of their ideas about healthy snacks.</td>
<td>Played kickball, volleyball and basketball.</td>
</tr>
<tr>
<td>11/18/2013</td>
<td>Red and green light foods relay races. Paper and crayons were available for children to use to draw pictures of their ideas about healthy snacks.</td>
<td>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.</td>
</tr>
<tr>
<td>11/20/2013</td>
<td>Paper and crayons were available for children to use to draw pictures of their ideas about healthy snacks.</td>
<td>Kickball, bowling, jump rope and toss foam ball.</td>
</tr>
<tr>
<td>11/25/2013</td>
<td>Red and green light foods relay race. Paper and crayons were available for children to use to draw pictures about healthy eating.</td>
<td>SPUD and handball.</td>
</tr>
<tr>
<td>12/2/2013</td>
<td>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.</td>
<td></td>
</tr>
<tr>
<td>12/4/2013</td>
<td>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.</td>
<td></td>
</tr>
</tbody>
</table>

For the *healthy eating* lessons, weekly sessions focused on discussing green and red light foods. Children in the intervention group were encouraged to consume more green light foods.
(e.g., eating at least four green light foods for every red food). Children learned about packing a healthy lunch, eating a healthy snack and dinner, and consuming more fruits and vegetables. Children also learned about healthy foods to keep in their refrigerator at home (see Appendix A, Figures 1 and 2 for sample art projects).

For the exercise lessons, children and group leaders discussed the importance of exercise and different exercises the children could participate in at home. Engaging in exercise for thirty minutes per day was emphasized. 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 which is similar to Hacky Sack, the game in the program was played in a circle of players who used their feet to kick the shuttlecock to keep the shuttlecock up in the air), and other running games. Exercise equipment (e.g., hula hoop, foam ball, scooter, plastic bowling equipment, and frisbee) was provided. Children were also allowed to create their own fun games, such as developing obstacle courses from materials available in the gym (cones, jump ropes, etc.). Self-improvement (i.e., doing one’s best for oneself) and relaxation were emphasized during activities. The gym was large, and therefore divided into play centers, so several activities were going on at one time.

For parent involvement, parents received handouts about red light and green light foods, newsletters discussing the importance of healthy eating and daily exercise, and recipes for preparing healthy meals.

Procedures

A pre-post design was performed in this study. Institutional Review Board (IRB) approval (see Appendix B) was obtained for a non-human subjects project from the University of
Cincinnati. Parental consent and child assent were required for children to participate in the program. The program was moved to the afterschool program, because there was no time available to conduct the program during the school day. A survey was adapted to assess children’s opinions about their eating and exercise habits (see Appendix C). The baseline surveys were collected at the first session of the program. Questions examined participants’ eating and physical activity behaviors (e.g., “yesterday, did you eat French Fries or chips?” and “on how many days in the past 7 days did you engage in physical activity?”). The follow-up surveys (same questions) were completed at the end of the intervention. Children in the intervention group also provided information about what they learned about healthy eating and exercise on the post-intervention surveys (see Appendix D). Parents completed surveys (see Appendix E) 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, $F (1, 44) = 6.056, p = .018$. Children reported
consuming more vegetables at the end of the program \((M = 2.30, SD = 1.07)\) compared to the beginning of the program \((M = 1.85, SD = 1.05)\), irrespective of which group they belonged to. Therefore, there was no significant difference between intervention and comparison groups (see Table 2).

Table 2. Results for Change in Vegetable Consumption

<table>
<thead>
<tr>
<th></th>
<th>Pre-intervention</th>
<th>Post-intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(M)</td>
<td>(SD)</td>
</tr>
<tr>
<td>Intervention</td>
<td>2.00</td>
<td>1.17</td>
</tr>
<tr>
<td>Comparison</td>
<td>1.59</td>
<td>.795</td>
</tr>
</tbody>
</table>

Repeated measures ANOVAs for other key outcome variables (i.e., consumption of chips, fruits, fruit juice, sweets, exercise, and soda) did not yield significant differences between pre- and post-intervention for the intervention versus comparison group (see Table 3).

Table 3. Results for Key Outcome Variables

<table>
<thead>
<tr>
<th>Variables</th>
<th>Pre-intervention</th>
<th>Post-intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Intervention</td>
<td>Comparison</td>
</tr>
<tr>
<td></td>
<td>(M)</td>
<td>(SD)</td>
</tr>
<tr>
<td>French Fries/chips</td>
<td>1.59</td>
<td>.91</td>
</tr>
<tr>
<td>Fruits</td>
<td>2.34</td>
<td>1.26</td>
</tr>
<tr>
<td>Fruit Juice</td>
<td>2.24</td>
<td>1.15</td>
</tr>
<tr>
<td>Sweets</td>
<td>2.22</td>
<td>1.28</td>
</tr>
<tr>
<td>Exercise</td>
<td>1.18</td>
<td>.39</td>
</tr>
<tr>
<td>Days of Exercise</td>
<td>3.66</td>
<td>3.27</td>
</tr>
<tr>
<td>Soda</td>
<td>2.34</td>
<td>1.23</td>
</tr>
</tbody>
</table>

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. Two children reported that we should eat five green light foods for every two red light foods. One child mistakenly reported that red light foods are healthy food. 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 was not sure about what green light foods were and one child did not respond to this question.

Table 4 presents the details about what children said they learned about exercise.

<table>
<thead>
<tr>
<th>Table 4. Results of Participants’ Answers about Exercises They Learned</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Number of Children</strong></td>
</tr>
<tr>
<td>Keeps you strong/healthy/live longer</td>
</tr>
<tr>
<td>Yoga</td>
</tr>
<tr>
<td>Push-up</td>
</tr>
<tr>
<td>New game</td>
</tr>
<tr>
<td>Exercise everyday</td>
</tr>
<tr>
<td>Nothing</td>
</tr>
<tr>
<td>Sit-up</td>
</tr>
<tr>
<td>Fun</td>
</tr>
<tr>
<td>Don’t know</td>
</tr>
</tbody>
</table>

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 being 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 recipes; however, only two parents replied that they had used
recipes (i.e., a burger meal, taco meal, green light foods meal, and peanut butter cookies) sent home with their child.

**Discussion**

The present study found children in the intervention group were learning about red and green light foods. They also learned about the importance of engaging in daily physical activity. These findings are consistent with other studies (Nabors et al., 2013; Schetzina et al., 2009) indicating the feasibility of the adapted Traffic Light Diet for children. However, their reports of eating behaviors did not change significantly as a result of their participation in the Children’s Healthy Eating and Exercise Program. In fact, children in the intervention and comparison groups were eating more vegetables at the second compared to the first measurement interval. This may have occurred because some of the children in the comparison group were attending another cooking club at the afterschool program. Parents reported that their children were eating more healthy foods at home and exercising more frequently because of participating in the group. The afterschool program coordinator mentioned that attendance in the CHEE Program remained high throughout the term, as children really enjoyed participating.

Results of the study demonstrated that children’s knowledge about healthy eating and the importance of regular exercise were improved, but their engagement 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 (Bandura, 2004). Eating and exercise diaries could be used to document what children consume and what and how much physical activity they are involved in at home. Researchers could also use observations during lunchtime to collect data about
children’s eating behaviors. It is suspected that healthy foods and the safe places for exercise were unavailable at some homes. Future studies could involve parents in the program by educating parents about how to eat healthy foods and increase physical activity levels.

Children in the comparison group could have learned about the intervention and learned about eating in their groups, 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 5 for t values and see Table 3 for means and standard deviations for the intervention group). This is consistent with previous research (Nabors et al., 2013) where vegetable consumption improved, after children participated in the CHEE Program.

Table 5. Post Hoc Analysis - Paired t-tests for Intervention Group

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

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, age differences could affect children’s exercise skills. 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 physical
activities, such as soccer game or kickball. Besides, gender also determined children’s participation in physical activities. The majority of boys tended to be involved in competitive games, while girls preferred different types of activities such as jump rope. Some girls mentioned that they wanted to be involved in certain activities, but they were afraid of being hurt during play. 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. Children also mentioned that there were no sports teams available for them to be involved in at home. Building junior sports programs could improve opportunities for them to become involved in more activities outside of the school setting.

Children with special health care needs, such as Autism or emotional/behavioral diagnoses, frequently suffered from interpersonal problems during the program. Afterschool programs need special education guidance to assist children with special needs. Similarly, Feehan and colleagues (2012) showed that parents of children with special care needs indicated that their children need more supervision to participate in physical activity programs. Another important observation was that children were bonding to certain volunteers. This staff member could be a coach, assisting with children’s behavior change toward their goals, such as engaging in more exercise or consuming more vegetables and fruits.

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 “matched” comparison group for child age or ethnic group. Also, future studies could use participants’ drawings on lessons they learned (e.g., lunchbox, Myplate, placemats) to assess what they learned about healthy eating to capture younger children’s responses. Using physiological measures of exercise, observations of mealtimes, and food or exercise diaries
would give objective information about whether behaviors changed. Also, future research on parents’ eating and physical activity behaviors as well as holding lessons to teach parents about the CHEE Program is warranted.

Results of the study indicated that children and parents were satisfied with the intervention and dissemination of knowledge about Traffic Light Diet was occurring. Children may not learn about healthy eating during the school day, because health and physical education are reduced in scope. This makes afterschool programs an important outlet for children to learn this valuable information. Also, the program was implemented by volunteers and was a cost-effective approach for health education delivery. Involving parents or other family members in the program may result in positive impacts on children’s eating and exercise behaviors (Waters et al., 2011). Childhood obesity is growing at an alarming rate (Ogden, Carroll, Kit, & Flegal, 2014), and thus more health and exercise programming is needed in the regular school curriculum. Moreover, it will be important to continue examining the effect of obesity prevention programs in community settings, such as afterschool programs, to improve children’s knowledge of healthy eating and engagement in physical activity.
References


Increasing fruit and vegetable intake and decreasing fat and sugar intake in families at risk for childhood obesity. *Obesity, 9*(3), 171-178.


Perterson, K. E., & Fox, M. K. (2007). Addressing the epidemic of childhood obesity through school-based interventions: what has been done and where do we go from here? *Journal of*
Law, Medicine, & Ethics, 35(1), 113-130.


Appendix A

Figure 1
Sample Art Project

What is in my Refrigerator?

Figure 2
Sample Art Project

My Lunchbox

Sausage
Corn
Gravy
Potatoes
Grapes
Lax, Juice
Appendix B

Approval from the Institutional Review Board at University of Cincinnati

TO: Laura Nabors, Ph.D.
    Department of Counseling, School of Human Services
    ML #0088

FROM: Mike Linke, Ph.D., Chairman
    University of Cincinnati
    Institutional Review Board #1-2

DATE: January 8, 2012

RE: Children's Project for Healthy Eating and Exercise

Please be advised that I have reviewed the study referenced above as outlined in your submission to the IRB, and have determined that the work described in this project is not research involving human subjects as described in 45CFR46.102(d, e, f).

Thank you for your continued compliance with the Board’s requirements with regard to your research activities.

Please note: This approval is through the U.C. IRB only. You may be responsible for reporting to other regulatory officials (e.g., VA Research and Development Office, UC Health- University Hospitals). Please check with your Institution and Department to ensure you have met all reporting requirements.

An affirmative action/equal opportunity institution
Appendix C

Children’s Healthy Eating and Exercise Survey

Name: ______________________________  Gender: (circle one)  Male  Female
Ethnic Group: _____________________________  Age: __________

Questions:

1. Yesterday, did you eat French fries or chips?

Chips are potato chips, tortilla chips, cheetos, corn chips, or other snack chips.

a. No, I didn’t eat any French fries or chips yesterday.
b. Yes, I ate French fries or chips 1 time yesterday.
c. Yes, I ate French fries or chips 2 times yesterday.
d. Yes, I ate French fries or chips 3 or more times yesterday

2. Yesterday, did you eat any vegetables?

Vegetables are salads; boiled, baked and mashed potatoes; and all cooked and uncooked vegetables. Do not count French fries or chips.

a. No, I didn’t eat any vegetables yesterday.
b. Yes, I ate vegetables 1 time yesterday.
c. Yes, I ate vegetables 2 times yesterday.
d. Yes, I ate vegetables 3 or more times yesterday.
3. Yesterday, did you eat fruit?

Do not count fruit juice.

a. No, I didn’t eat any fruit yesterday.

b. Yes, I ate fruit 1 time yesterday.

c. Yes, I ate fruit 2 times yesterday.

a. Yes, I ate fruit 3 or more times yesterday.

4. Yesterday, did you drink fruit juice?

Fruit juice is a drink, which is 100% juice, like orange juice, apple juice, or grape juice. Do not count punch, kool-aid, sports drinks, and other fruit-flavored drinks.

a. No, I didn’t drink any fruit juice yesterday.

b. Yes, I drank fruit juice 1 time yesterday.

c. Yes, I drank fruit juice 2 times yesterday.

d. Yes, I drank fruit juice 3 or more times yesterday.
5. Yesterday, did you eat sweet rolls, doughnuts, cookies, brownies, pies, or cake?

a. No, I didn’t eat any of the foods listed above yesterday.

b. Yes, I ate one of these foods 1 time yesterday.

c. Yes, I ate one of these foods 2 times yesterday.

d. Yes, I ate one of these foods 3 or more times yesterday.

6. Yesterday, did you exercise or participate in sports activities that made your heart beat fast and made you breathe hard for at least 20 minutes. (For example: basketball, jogging, skating, fast dancing, swimming laps, tennis, fast bicycling, or aerobics)?

a. YES

b. NO
7. On how many of the past 7 days did you exercise or take part in physical activity that made your heart beat fast and made you breathe hard for at least 20 minutes? (For example: basketball, soccer, running or jogging, fast dancing, swimming laps, tennis, fast bicycling, or similar aerobic activities)

   a. 0 days
   b. 1 day
   c. 2 days
   d. 3 days
   e. 4 days
   f. 5 days
   g. 6 days
   h. 7 day

8. I drink soda with sugar.

   Always/All the time  Most of the time/A lot  Once in a while/Sometimes  No, I don’t
   4  3  2  1
Appendix D

Questions for the Intervention Group at Post-Intervention

Name: _____________ Gender: _______ Age: _____ Ethnic Group: __________

1. How much did you learn about healthy eating from our classes?

<table>
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<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
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</thead>
<tbody>
<tr>
<td>Didn’t improve</td>
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<td></td>
<td></td>
<td></td>
<td>Improved a little</td>
</tr>
<tr>
<td>Improved</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Improved</td>
</tr>
<tr>
<td>Improved a lot</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Amazing</td>
</tr>
</tbody>
</table>

2. How much did you learn about exercise from our classes?

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Didn’t improve</td>
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<td>Improved</td>
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<tr>
<td>Improved a lot</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Amazing</td>
</tr>
</tbody>
</table>

3. What new things did you learn about exercise?

4. What did you learn about red light foods?

5. What did you learn about green light foods?
Appendix E

Parent Survey

Your Child’s Name: ________________________ Your Child’s Age: _________

Are you your child’s: mother   father   legal guardian   other ___________________

Please fill out this survey and return with your student. Circle the answer that applies the best to you. Thank you!

Did your child ever talk to you about having healthy eating and exercise goals prior to the program?
Yes    No    Don’t Know

Does your child talk about the healthy eating and exercise after school group without being asked?
Yes    No    Don’t Know

Does your child talk about red and green light foods and healthy eating at home?
Yes    No    Don’t Know

Did you receive the recipes from our group regarding healthy foods?
Yes    No    Don’t Know

Have you cooked any of the recipes given?
Yes    No    Don’t Know

If so, which one? And did you like it?
___________________________________________________________________________
___________________________________________________________________________

Do you think your child is eating more healthy food because of being in the group?
Yes    No    Don’t Know

Do you think that your child is exercising more because of participating in the group?
Yes No Don’t Know

Approximately what is your family income? ________________________________

If you have any questions regarding the Children’s Healthy Eating and Exercise Program, please contact Chia-Liang Dai via email daicg@mail.uc.edu or phone (513) 400-8393, or Dr. Laura Nabors via email naborsla@ucmail.uc.edu or phone (513) 556-5537.
Study Two: Evaluation of an Afterschool Yoga Program for Children
Introduction

Engagement in regular physical activity (PA) benefits physiological, psychological and social health (Strong et al., 2005). PA is important to children’s current and future health. PA is any bodily activity that enhances or maintains physical fitness and overall wellness (United States Department of Health and Human Services [USHHS], 2008). It includes active play, sport, physical education and active living in ways that increase energy expenditure. Establishing a habit of engaging in regular PA is an aid to controlling body weight. It assists in reducing the risk of developing heart disease, type-2 diabetes, and some types of cancers (World Health Organization [WHO], 2010). In addition, PA enhances mood, self-esteem and quality of life, and reduces depression and anxiety (Woods, Tannehill, Quinlan, Moyna, & Walsh, 2010). Researchers have also suggested that PA may improve academic performance (Erwin, Fedewa, Beighle, & Ahn, 2012).

Leisure time, in which children have time to play on their own, is crucial for positive physical and mental development (Adams, 2011). However, several barriers may limit children’s ability to engage in adequate levels of PA during the school day. Students are under pressure to show academic progress, which has led to decreases in recess or leisure time at school (McMurrer, 2007). Additionally, when use of technology becomes a prevalent leisure activity, many students choose sedentary activities, such as using iPads or computers, as their leisure activity. Parent concerns about child safety and a lack of supervision for child leisure activities may further limit children’s opportunities to engage in PA (Stankov, Olds, & Cargo, 2012). Thus, many children engage in low levels of PA and may face increased risk for negative health outcomes (Purcell, 2010). Although it is challenging to find time in the daily school schedule to exercise, afterschool time has been used to implement various interventions to promote positive
development and leisure activities among children (Afterschool Alliance, 2008). Beets, Beighle, Erwin, and Huberty (2009) indicated that afterschool programming is an appropriate avenue to improve levels of PA and fitness among school-age children.

Traditional sports, like football or basketball, have dominated the physical education curriculum for school-age students (Bocarro, Kanters, Casper, & Forrester, 2008). Engagement in contact sports (e.g., football, ice hockey, lacrosse, soccer and basketball) may increase the risk of serious injuries. The rates of sports- and recreation-related injuries (e.g., concussions) have increased since 2001; many states and schools have created policies or campaigns to cope with this trend (Centers for Diseases Control and Prevention [CDC], 2013). Guskiewicz and McLeod (2010) mentioned that sport-related concussions may cause students negative consequences, as they may experience increased school absences, suffer mood issues (i.e., experience negative emotions), and learning problems. Bocarro et al. (2008) suggested that when designing physical education (PE) curriculum or programs, health educators should consider the long-term benefits of PA on student health, because students who participate in activities and sports may be more likely to remain active as they age. As a result, implementing more lifelong physical activities or leisure activities, such as yoga or dance, might reduce the chances that children will be injured and will provide them with a low-impact PA in which they can participate throughout their life.

Yoga also is a non-competitive activity, stressing the integration of physical exercise and relaxation. Yoga postures function as gentle stretching exercises to increase body flexibility and strength (Nešpor, 2001). Yoga has experienced increased popularity as a leisure activity and exercise in the United States (Birdee et al., 2008). The benefits of regular yoga practice have been linked to reduced anxiety (Javnbakht, Hejazi Kenari, & Ghasemi, 2009) and lower perceived stress (Satyapriya, Nagendra, Nagarathna, & Padmalatha, 2009) in adults. In their
review article, Galantino, Galbavy, and Quinn (2008) reported that yoga practice might benefit children by improving their mental ability, motor skills, and social skills. Yoga seems to be a promising health education intervention that could be implemented in schools to facilitate children’s PA.

Chen, Mao, Lai, Li, and Kuo (2009) examined the effect of a yoga exercise program on physical fitness among children with asthma. The program was delivered 3 times per week for 7 weeks. Each 60-minute yoga lesson included 10 minutes of breathing exercises for warm-up, 40 minutes of practicing various yoga postures, and 10 minutes of cool down exercises. Results indicated that the yoga exercise group showed favorable outcomes in terms of flexibility and muscular endurance compared to the control group (Chen et al., 2009).

Participating in yoga could also improve children’s psychological as well as their physical health. For example, O’Neil (2013) implemented a yoga program to promote social skill development among children (N = 105) attending a Head Start preschool. Yoga poses were contextualized in stories of journeys to city landmarks to motivate children. The instructors practiced yoga with the children twice per week for 5 weeks. Results indicated that children showed improved motor skills and strength, and general health, attention, and relaxation.

Finstuen (2010) examined the impact of a 10-session school-based yoga intervention program on anxiety and happiness. Participants (aged between 7 - 11 years old) were enrolled in a public elementary school that served low-income families. Among those 33 participants, 20 met the diagnostic criteria for anxiety disorder and attended the intervention group, and the remaining 13 in the comparison group continued with their school schedule. Results indicated that after completing the intervention, children in the intervention group showed decreased states of anxiety; yet, reports of happiness and satisfaction with life did not change at the posttest. In
another study, Berger, Silver, and Stein (2009) investigated the effects of yoga on inner-city children’s (fourth and fifth graders) well-being. Children who were in the intervention received curriculum based on practicing different yoga postures, breathing, meditation, and relaxation. The program was offered one hour per week for 12 weeks. The comparison group was recruited from another afterschool program in which students selected their favorite physical activities to engage in. Berger et al. (2009) found that participants in the intervention group showed improved negative behavior scores and balance (assessed by children’s performance on the One-leg Standing Test) at post-intervention compared to a comparison group. Additionally, the majority of the participants in the intervention group reported improved well-being.

Some intervention studies have shown that children could enhance their social skills by participating in yoga interventions. For example, Mendelson and colleagues (2010) investigated the impact of a yoga intervention on self-regulatory and peer relationships among youth (fourth and fifth grade) in urban public schools. The program was delivered during “resource time” (a period of the school day where students participated in leisure activities) four days a week for 12 weeks (each session lasted 45 minutes). Intervention components included yoga poses, breathing skills, and learning “guided mindfulness”. The control group consisted of students who were on the waiting list for receiving the intervention. Mendelson et al. (2010) reported that students in the intervention group reported significant increases in coping skills, but there were no significant differences in the peer relationships between two groups. Steiner and colleagues (2013) examined the impact of yoga for children with emotional and behavioral disorders at an urban elementary school. Thirty-seven participants (ages 8-11) completed a yoga intervention twice a week for 3 and half months. The intervention was based on the authors’ “Yoga Ed” Protocol lessons. A typical lesson included four components: relaxation, child-adapted yoga
poses, social (exercises with a partner or in a group), and imagery or meditation skills. Findings showed that 80% of participants reported that they were satisfied with the intervention. In addition, teachers reported improved attention in class and adaptive skills, and reduced depressive symptoms and behavioral problems (Steiner et al., 2013).

The current study aimed to explore the impact of a yoga intervention for young children during an afterschool program. The following research questions were examined: (1) children’s knowledge of different poses they practiced, (2) children’s perceptions of participating in yoga lessons, and (3) children’s reports of how often they practiced yoga at home. Moreover, analyses were conducted to examine gender, ethnic group, and age level differences in responses to the aforementioned questions.

**Methods**

**Participants**

Thirty-three children (15 boys and 18 girls), from 5-9 years of age ($M = 6$ years, $SD = 1$ year) enrolled in the afterschool yoga group. Children self-selected to be members of the group. Eighteen children were Caucasian, 12 were African American, 2 were Hispanic, and 1 was biracial.

**Description of the School Site**

Seventy-five percent of the families are at low-income or poverty levels. Forty-two percent of the children have BMIs at level 3 or 4, 85% or higher (18% were 85% < 95% and 24% were > 95%). Ethnic groups at the school are 60% Caucasian, 38% African American, and 2% are Hispanic, Asian, and biracial (Personal communication, Rayma Waters, October 10, 2013).
Description of Lessons

The sessions were delivered twice a week. Students followed poses demonstrated by the group leader and practiced yoga for 15-20 minutes. A typical session started with a meditation session for approximately 1-2 minutes, and then was followed by instruction on 6-10 yoga poses. Yoga poses that were used in the intervention were tree, mountain, sun salutation, warrior, triangle, dancer, cow, cat, cobra, plane, mountain, tree, sunflowers, downward-facing dog, frog, elephant, duck, child, and other poses including variations of the aforementioned poses. Children practiced a set of yoga poses in each of 20 different sessions (see Table 1).

Table 1. Yoga Lessons and Activities

<table>
<thead>
<tr>
<th>Sessions</th>
<th>Yoga Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 &amp; 2</td>
<td>Sitting meditation, sitting side stretch, sunflower, downward-facing dog, plank, cobra, waist rotation, frog</td>
</tr>
<tr>
<td>3 &amp; 4</td>
<td>Sitting meditation, sitting side stretch, sunflower, downward-facing dog, plank, cobra, waist rotation, frog, warrior, duck, bear</td>
</tr>
<tr>
<td>5 &amp; 6</td>
<td>Sitting meditation, sitting side stretch, sunflower, downward-facing dog, plank, cobra, waist rotation, frog, warrior, elephant waving his/her trunk, cow, cat, child</td>
</tr>
<tr>
<td>7 &amp; 8</td>
<td>Sitting meditation, sitting side stretch, sunflower, downward-facing dog, plank, cobra, waist rotation, frog, warrior, triangle, cow, cat, child, sun salutation</td>
</tr>
<tr>
<td>9 &amp; 10</td>
<td>Sitting meditation, sitting side stretch, sunflower, downward-facing dog, plank, cobra, waist rotation, frog, warrior, triangle, reverse warrior, cow, cat, child</td>
</tr>
<tr>
<td>11 &amp; 12</td>
<td>Standing meditation, standing side stretch, sun salutation, sunflower, downward-facing dog, plank, cobra, waist rotation, frog, warrior, triangle, reverse warrior, mountain, tree, cow, cat, child, push-ups</td>
</tr>
<tr>
<td>13 &amp; 14</td>
<td>Standing meditation, standing side stretch, sun salutation, sunflower, downward-facing dog, plank, cobra, waist rotation, frog, warrior, triangle, reverse warrior, boat, wheel, mountain, tree, child</td>
</tr>
<tr>
<td>15 &amp; 16</td>
<td>Standing meditation, standing side stretch, sun salutation, sunflower, downward-facing dog, plank, cobra, waist rotation, frog, warrior, triangle, reverse warrior, boat, wheel, mountain, tree, child, plane, dancer</td>
</tr>
<tr>
<td>17 &amp; 18</td>
<td>Standing meditation, standing side stretch, sun salutation, sunflower, downward-facing dog, plank, cobra, waist rotation, frog, warrior, triangle, reverse warrior, mountain, tree, child, plane, dancer</td>
</tr>
<tr>
<td>19 &amp; 20</td>
<td>Reviewed all the aforementioned yoga poses</td>
</tr>
</tbody>
</table>
In individual sessions, poses taught in previous lessons were reviewed and 1-2 poses were added at each lesson. During practice sessions, stories were used to create a context for poses to increase children’s motivation and interest; in addition, poses were given creative names to help increase recall. An example of a story was: imagine you are walking into a forest, you see a tree, sunflower and mountain, you see the sunrise and sunset, you see different kind of animals, the frog, snake, and elephant; imagine you are a warrior and/or a dancer. Different poses were introduced using the storyline to help children recall poses. Yoga practice lasted for 10-12 minutes.

**Procedures**

Institutional Review Board (IRB) approval was obtained from the University of Cincinnati. This study was approved as a non-human subjects project. Parental consent and child assent were required for children to participate in the afterschool group; these forms were distributed by the leaders of the afterschool group.

Data were collected at three time points. At baseline, children indicated whether or not they had ever practiced yoga. After participating in 10 practice sessions, which was a mid-intervention point, children completed 3 open-ended questions. First, children defined what yoga was; second, children discussed how practicing yoga made them feel during practice sessions; and third children reported how they felt after practicing yoga. Children indicated their belief that they could perform yoga on a 4-point scale (1 = strongly disagree to 4 = strongly agree). They provided the name of their favorite yoga pose. They responded to 2 questions about yoga practice on a 4-point scale: “How long did you do yoga yesterday?” (0 = not at all, 1 = 1-10 min, 2 = 10-20 min, 3 = 30 min, 4 = longer than 30 min), and “How many days did you do yoga last week?” (0 days, 1-2 days, 3-4 days, and 5-7 days).
After 20 sessions, at the end of the program, children responded to 5 questions. Four of these questions had been asked at the mid-intervention survey. These included: their belief that they could do yoga on a 4-point scale (1 = strongly disagree to 4 = strongly agree), name of their favorite yoga pose, how long did they practice yoga yesterday, and how many days did they practice yoga last week. Children also reported the number of poses they could remember. After completing the questions, the children physically demonstrated the poses they reported they remembered to the principal investigator/yoga instructor.

Data Analysis

All data were analyzed by using IBM-SPSS, version 22.0. Paired t-tests were used to examine change from mid- to post-intervention. Correlation coefficients were run to examine the relationship among age and key outcome variables related to practicing yoga. Independent samples t-tests were used to examine the relationship between gender, ethnic group (Caucasian versus minority group), and key outcome variables.

Results

Baseline

Thirty children responded to the question about previously doing yoga at the beginning of the study. Baseline data showed that 36% children \( (n = 11) \) practiced yoga before, 47% \( (n = 14) \) children had never performed, and 17% \( (n = 5) \) reported that they did not know what yoga was.

Mid- and Post-Intervention Surveys

Only twenty-three children (11 boys and 12 girls) completed the mid- and post-intervention surveys. Ten children were Caucasian, 11 were African American, 1 was Hispanic, and 1 was biracial. Seven children were five years old, 6 were six years old, 6 were seven years
old, 1 was eight years old, and 3 were nine years old. Their mean age was 6.43 years old (Range = 5-9 years old, SD = 1.343).

**Open-Ended Survey Questions at Mid-Intervention**

Twenty-one children provided answers for the question “What is yoga?” at the mid-intervention assessment point. Two children did not answer this question. A majority (n = 20) of children described yoga as a type of workout, exercise, sport, and body stretching or moving; one described yoga as an exercise for “training his muscles.”

Children reported different feelings while they were practicing yoga (i.e., during yoga sessions). Twenty-two children responded while one did not. Seventeen children reported one feeling, and five reported more than one feeling. For children (n = 17) naming one feeling, 7 reported feeling good, feeling happy, or that practicing yoga was interesting; 4 reported feeling calm, relaxed, and said yoga practice was like “massage”; 1 felt his muscles were stronger, 1 felt his body was more flexible, 1 felt “it hurts”, 1 felt tired, 1 felt nothing, and 1 child wanted to stop. Among children (n = 5) reporting more than one feeling, 2 reported feeling good and stronger, 1 felt good and her body was warm, 1 felt warm and sleepy, and 1 child felt good, tired, and angry.

Twenty of the children answered the question assessing how they felt after practicing yoga; 2 children did not respond to this question. Among those who provided one feeling (n = 18), 7 children reported feeling good, having fun or feeling happy after practicing, 7 reported being relaxed, 1 reported feeling stronger, 1 felt tired, 1 felt her body was hot and her heart was beating fast, and 1 mentioned disliking yoga. Two children reported more than one feeling: one reported feeling happy and sad and the other child said she was, “feeling tired out and her body was warm.”
Questions Completed at the Mid- and Post-Intervention Assessment Intervals

There was no statistically significant difference in children’s beliefs about practicing yoga between mid- and post-intervention measurements. Fifteen of the children reported they believed they could practice yoga at the mid-intervention test, while 16 reported their belief in their abilities to perform yoga at the post-intervention assessment.

Children also reported the reasons they thought they could not perform yoga. At the mid-intervention point, 6 children reported having barriers to practicing yoga. At the post-intervention measurement, 7 children reported experiencing barriers in yoga. Table 2 presents the data on children’s responses providing reasons why they thought they could not practice yoga at the mid- and post-intervention measurements.

<table>
<thead>
<tr>
<th>Table 2. Results of Children’s Responses for Barriers to Practicing Yoga</th>
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</tr>
<tr>
<td></td>
</tr>
<tr>
<td>No barriers</td>
</tr>
<tr>
<td>Hurt</td>
</tr>
<tr>
<td>Dislike exercises</td>
</tr>
<tr>
<td>Hate yoga/yoga is not fun</td>
</tr>
<tr>
<td>Can’t do every pose/yoga is hard/fall down</td>
</tr>
<tr>
<td>Did not practice enough</td>
</tr>
</tbody>
</table>

Note: “-” means no child responded to this question.

When children were asked; “Which is your favorite pose?” at the mid-intervention, twenty-seven percent (n = 6) reported that their favorite pose was the upward-facing dog pose, which they called the “cobra.” Approximately 18% (n = 4) reported that the downward-facing dog, which they called the “tunnel” was their favorite pose. At the end of the intervention,
participants’ favorite pose remained the upward-facing dog/cobra. Table 3 presents details about children’s favorite poses at mid- and post-intervention measurements.

| Table 3. Children’s Favorite Yoga Poses at Mid-Intervention and Post-Intervention |
|---------------------------------|---------------------------------|
|                                 | Mid-Intervention \( (n = 22) \) | Post-Intervention \( (n = 23) \) |
| Number of Children              | Number of Children              |
| Downward facing dog/Tunnel      | 4                               | 4                               |
| Bridge/Wheel                    | 3                               | 2                               |
| Camel                           | 1                               | -                               |
| Sitting mediation/Lotus          | 1                               | -                               |
| Plane                           | -                               | 2                               |
| Upward facing dog/Cobra         | 6                               | 5                               |
| Warrior                         | 2                               | 2                               |
| Plank/Push-up                   | 1                               | 1                               |
| Side stretch/Weed in the wind   | 1                               | -                               |
| Lion                            | 1                               | 1                               |
| Jumping Jack                    | 0                               | 1                               |
| Fan                             | 0                               | 1                               |
| Boat                            | 1                               | 2                               |
| Sunflower                       | 0                               | 1                               |
| Hand to big toe                 | 0                               | 1                               |
| Mountain                        | 1                               | -                               |

Results showed that child report of the amount of yoga practiced in the past week increased from the mid-intervention to post-intervention measurement (see Table 4).

| Table 4. Results for Yoga Practiced in the Last Week |
|---------------------------------|---------------------------------|
|                                 | Mid-Intervention \( % (n) \) | Post-Intervention \( % (n) \) |
| 0 days                          | 7.3 % (3)                      | -                               |
| 1-2 days                        | 31.7 % (9)                     | 64.3 % (14)                     |
| 3-4 days                        | 7.3 % (2)                      | 14.3 % (3)                      |
| 5-7 days                        | 19.5 % (8)                     | 21.4 % (6)                      |
Assessment of Number of Yoga Poses Recalled and Demonstrated at the Post-Intervention Measurement

After participating in all of the intervention sessions, children mentioned that they believed they could perform approximately 6 yoga poses ($M = 5.667, SD = 3.706, \text{ Range} = 0-14$ poses). When children were asked to demonstrate the poses that they remembered they could demonstrate an average of 5 yoga poses ($M = 5.304, SD = 3.052, \text{ Range} = 1-13$). Most demonstrated 2 to 5 poses (71% of students) while 1 child demonstrated 13 poses (see Table 5).

<table>
<thead>
<tr>
<th>Number of Poses</th>
<th>Number of Children</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>4.3 %</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>8.7 %</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
<td>17.4 %</td>
</tr>
<tr>
<td>4</td>
<td>5</td>
<td>21.7 %</td>
</tr>
<tr>
<td>5</td>
<td>4</td>
<td>17.4 %</td>
</tr>
<tr>
<td>7</td>
<td>1</td>
<td>4.3 %</td>
</tr>
<tr>
<td>8</td>
<td>2</td>
<td>8.7 %</td>
</tr>
<tr>
<td>9</td>
<td>1</td>
<td>4.3 %</td>
</tr>
<tr>
<td>10</td>
<td>2</td>
<td>8.7 %</td>
</tr>
<tr>
<td>13</td>
<td>1</td>
<td>4.3 %</td>
</tr>
</tbody>
</table>

Mid- and Post-Intervention Differences on Survey Questions

Results of paired t-tests revealed that there were no significant differences at the 2 measurement intervals for the following questions: “do you believe you can do yoga?”, “how long did you do yoga yesterday?”, and “how many days did you do yoga last week?” There also were no significant differences in barriers to practicing yoga.

Mid-Intervention. There was a significant difference in days of yoga practiced between boys and girls at mid-intervention, $t(1, 20) = 3.516, p = .002$. Boys ($M = 2.364, SD = 1.120$)
reported practicing yoga more days in the past week compared to girls ($M = 1.00$, $SD = .632$). There were no other gender differences among questions assessing key variables for yoga practice at the mid-intervention interval. There were no ethnic group or age level differences for the questions at the mid-intervention measurement.

*Post-Intervention*. There were no gender, ethnic group, or age level differences at the post-intervention measurement.

**Discussion**

Results of the study indicated that children’s knowledge of yoga and abilities to perform yoga improved. Children were able to demonstrate several yoga poses after participating in the program. Children also reported positive feelings about practicing yoga, such as having fun and feeling happy, indicating that children experienced positive emotions related to participating in classes. This finding was consistent with positive findings of other yoga programs (i.e., Berger et al., 2009; Ehud et al., 2010). Children’s confidence in performing yoga also increased. The majority of children did not report barriers to practicing yoga. Practically, the children’s reports of having a positive experience indicated that yoga interventions could become a part of their afterschool activities.

Boys reported practicing yoga more days in the past week compared to girls at the mid-intervention measurement interval. This difference was not evident post-intervention, suggesting results were not robust. These findings are different from the results of a national survey conducted by Birdee et al. (2008), which indicated that yoga practice was more predominant in females. Boys could have reported they practiced more because they were learning from a male
teacher with whom they interacted with playing competitive games, such as kicking shuttlecock (similar to hacky sack), during free play following their yoga lesson. In addition, no age level differences were found for any questions at either the mid- or post-intervention assessments. Participants were 5 to 8 years old, and this age range may not have been sufficient to detect age differences, which may be found in future studies with different age groups. No ethnic group differences were observed. The sample size was small and further research is needed to examine differences among ethnic groups.

Children’s reports of time spent practicing yoga on their own did not show significant change from mid- to post-intervention. Most children were practicing yoga for only small amounts of time. It might be that a longer intervention would have inspired the children to practice more often or that providing the children with homework or “practice goals” would have inspired more practice opportunities. In the future, it will be important to document children’s ideas of barriers to practicing yoga while they are at home. Teaching participants to find safe and easy ways to practice yoga at home may be a potential strategy to improve their involvement in yoga at home.

Children reported diverse preferences, in terms of selecting their favorite yoga pose. In fact, all of the poses were named, although the cobra and tunnel seemed to be favorites recalled by some youth. A few children reported barriers to practicing yoga. Among those who perceived experiencing barriers, feeling that performing yoga hurt and feeling yoga was hard to do were common reasons for children to avoid becoming involved in yoga classes. Some children also reported yoga “is not fun,” which limited their participation. Children, especially beginners, should practice yoga under the supervision of an experienced yoga instructor to prevent injuries. Also, it may be important to teach children by small steps, and in short time increments, when
they are learning yoga so that they remain interested and do not experience pain from practicing new poses.

When implementing the program several lessons were learned and these might benefit others conducting yoga programs in school settings. First, children favored yoga poses with animal names or names of familiar objects (e.g., tunnel) and they appeared to enjoy stories about poses. Second, children liked short time intervals for yoga practice. Future studies could integrate yoga as a warm-up or cool-down exercise prior to engaging in sports, such as dodge ball or basketball. Finally, the yoga instructor experimented with a few new ideas for teaching yoga toward the end of the sessions. He found that children liked practicing yoga with some background music and they also liked learning poses by looking at pictures of animals performing yoga poses. Thus, future studies should examine the impact of these factors on children’s learning and enjoyment.

There were several limitations that impacted the generalizability of study findings. First, the sample size was small and there was no comparison group. Moreover, the intervention was of short duration and children may have recalled more poses and had greater lifestyle change and practice had the intervention been longer. Also, future studies could conduct more follow-up measurement intervals to assess the long-term impact of yoga on PA behaviors.

Results of the current study provided some support for the implementation of yoga in an afterschool program, as children reported positive emotions related to participating in yoga classes. Previous research (Galantino et al., 2008) has also supported yoga as an effective intervention in improving physiological and mental functioning for children. In the future, the influence of yoga on children’s abilities to engage in regular exercise and the impact of yoga on lifestyle changes for children needs to be examined. Future yoga-based interventions could also
add mindful eating lessons to the intervention and this might further promote healthy lifestyle changes for children. Thus, this study provided preliminary evidence of the feasibility and possible benefits of a yoga intervention to promote PA among younger children enrolled in an elementary school. Regular PA is the foundation of maintaining a healthy lifestyle, and incorporating yoga -- an easy and cost-friendly exercise -- in afterschool health promotion program may be beneficial for improving children’s PA levels and emotional states or well-being.
References


motor and social skill development. Paper presented at the 141st Annual Meeting of the American Public Health Association: Boston, MA.


