Evaluating CYCLE kids: a bicycling and nutrition health promotion curriculum delivered as a component of school based physical education

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Thesis

EVALUATING CYCLE KIDS: A BICYCLING AND NUTRITION HEALTH PROMOTION CURRICULUM DELIVERED AS A COMPONENT OF SCHOOL BASED PHYSICAL EDUCATION.

by

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B.A., University of Florida, 2012

Submitted in partial fulfillment of the requirements for the degree of Master of Science
2015
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EVALUATING CYCLE KIDS: A BICYCLING AND NUTRITION HEALTH PROMOTION CURRICULUM DELIVERED AS A COMPONENT OF SCHOOL BASED PHYSICAL EDUCATION.

STEPHANIE A. MONTENEGRO

ABSTRACT

Childhood is a critical time point in determining adult health. Healthy habits that are formed during childhood can not only prevent medical conditions and illnesses in adulthood, but also allow a child to learn, grow, and become a healthy adult. The importance of healthy childhood habits has been discussed in U.S. Health Department of Health and Human Services’ Healthy People 2020 initiative and numerous scientific studies regarding the importance of promoting child health and physical activity at an early age to ensure that these habits continue into adulthood.

The purpose of this retrospective, qualitative study is to analyze the effectiveness of CYCLE Kids, a school-based bicycling and nutrition curriculum, in promoting physical activity and healthy behaviors in children. The CYCLE Kids program is implemented as eight physical education classes for students in the fourth and fifth grade. It was evaluated using self-reported pre- and post- curriculum assessments to determine if students showed measurable behavioral changes or knowledge gains. The assessments also contained open-ended questions to further understand the students’ point of view on what they were learning and what they enjoyed most. For the evaluation, the assessment questions were divided into bicycle skills and safety, bicycling frequency and physical
activity, and nutrition and physical fitness. The study sample included 1,575 children ages 8-12 years (mean 10.2 years) from public schools in Cambridge and Somerville, Massachusetts. The demographics of the students were 30% Caucasian, 16% Latino, 19% African American, 10% Asian, and 2% American Indian or Alaskan Native. Teachers and police officers involved in the implementation of the CYCLE Kids program were also surveyed to ascertain perceptions of the strengths and weaknesses of the curriculum, and to discern the perceived benefits of participating in the program. A total of 15 teachers responded to the survey (60%) from partner schools in eight states across the United States where the CYCLE Kids curriculum is being taught.

Results from the student assessments indicate that students showed the most knowledge gain in bicycle and safety skills, with a 39% increase in the proportion of students who reported knowing how to use hand signals when riding a bicycle by program completion. This trend remained prominent in students’ post-assessment open-ended responses where bicycle skills and safety made up more than three-quarters (78%) of the responses to the two most important things learned in the program. Bicycling frequency and physical activity showed moderate increases; an increase by 4% (from 76% at baseline to 80% after the unit) in the proportion of students who own a bicycle at home, an increase by 7% (from 39% to 46%) in the proportion of student who rode their bikes weekly, and an increase by 10% increase (from 68% to 78%) in the proportion of students who were exercising and playing sports more often. In the nutrition and physical fitness category, children showed only minor improvement with the greatest gains in this
category for knowing how to take their heart rate and wanting to learn more about healthy eating.

Teachers perceived that the CYCLE Kids program increased a student’s self-confidence, helped students overcome fears, and got students excited about riding a bicycle. Additionally, all but one teacher who participated in the survey reported perceived behavioral changes in their students. Teachers also noted several implementation obstacles to the curriculum delivery including not having enough classroom time to fully teach the lessons, the difficulty of doing textbook lessons in the gymnasium, and the logistics of moving the bicycles from storage to riding areas.

Overall, the student and teacher feedback indicated that the CYCLE Kids program increases bicycle knowledge and safety skills in addition to increasing self-confidence of participants. Teaching children to safely and properly ride a bike develops a life skill that they can carry far into the future. However, it is unclear if participation in the CYCLE Kids program prompts students to be more physically active. A long-term study analyzing students’ behaviors and physical activity levels several years after program participating in the program is warranted. Ongoing work will revise several of the CYCLE Kids curriculum components and address implementation logistics uncovered by this evaluation.
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INTRODUCTION

There is increasing recognition in policy, research, and clinical practice that early and middle childhood provide the physical, cognitive, and social-emotional foundation for lifelong health, learning and well being. The behavioral patterns established during childhood influence a child’s risk for developing chronic diseases in adulthood; research on a number of adult health and mental health conditions points to predisease pathways that begin in childhood. Healthy People 2020 has set goals around health promotion and obesity risk reduction for the population, including increasing the proportion of elementary schools that have cumulative instruction in health education that meets the US National Health Education Standards. These goals support the formation of healthy behavior patterns in early childhood. The key is to recognize the important role this period in life plays in adult health and focus on preventing the conditions and illnesses that limit children’s ability to learn, grow, and become healthy adults.

This introduction will provide a description of the current levels of childhood physical activity in the United States, the consequences of physical inactivity during childhood, and the importance of a healthy diet in promoting health and preventing chronic disease. It will then discuss the role of schools in educating students on healthy habits and increasing physical activity among children.

BACKGROUND

Physical Activity in Childhood

Physical activity in childhood has been proven to directly affect adult health, and physical activity behaviors in childhood influence those in adulthood. For instance,
engaging in regular physical activity in childhood is correlated to maintaining a healthy skeleton in adulthood. A recent study showed that 60% of the risk for developing osteoporosis is based on the amount of bone mass an individual has when they enter adulthood. The impact load of physical activity building bone mass and enhancing bone structure is most evident during childhood when pre-pubertal growth favors more bone gains. This suggests that even if children reduce their physical activity levels as they age, benefits that were realized as a result of childhood activity will persist.

In addition to having health benefits, physical activity has also been linked to improved academic performance. According to the Center for Disease Control, scientific reviews show that school health programs can have positive effects on academic performance, as well as health-risk and health outcomes. The National Association of State Boards of Education reported on the importance of ensuring that students and staff are healthy in order for schools to effectively educate students. A child’s ability to succeed is therefore directly related to his or her overall health, including their nutritional, physical activity, and emotional status. It is a public health goal that children strive to meet the recommended 60 minutes of daily physical activity.

Participating in physical activity is associated with multiple health benefits, however many children do not meet the national recommendations. The U.S. Department of Health and Human Services recommends that young people aged 6-17 years old participate in at least 60 minute of physical activity daily. According to the Centers for Disease Control and Prevention, less than 3 in 10 high school students get at least 60 minutes of physical activity every day. This low level of activity is a concern
since physical inactivity is an important contributor to noncommunicable diseases and early death. The World Health Organization estimates that approximately 3.2 million deaths each year are attributable to insufficient physical activity.\textsuperscript{5} In developed countries, sedentary activity is usually in the form of watching television, surfing the Internet, and playing video games. According to national surveys in the United States, children between 8 and 18 spend an average of 7.5 hours daily viewing media, and those under age six spent about two hours per day.\textsuperscript{6} Childhood physical inactivity can not only be detrimental to a child’s academic success, but it is a contributor to the development of childhood obesity and numerous chronic diseases such as type 2 diabetes, fatty liver disease, and even adult obesity. Recently, childhood physical inactivity was shown to also be a precursor to osteoporosis, a disease that occurs in later adulthood.\textsuperscript{9}

**Nutrition**

The 2010 Dietary Guidelines for Americans recommends that children be encouraged to eat a variety of fresh, canned, or frozen fruits and vegetables as opposed to drinking fruit juices, which can be high in sugar.\textsuperscript{12} Children should be encouraged to choose whole grains foods, such as oatmeal, quinoa, brown rice, or whole-wheat bread more often than refined grains.\textsuperscript{12} Dairy is recommended, with an emphasis on low-fat milk, yogurt, cheese, or fortified soy beverages for children over the age of 2.\textsuperscript{12}

The 2010 Dietary Guidelines for Americans recommends limiting the number of calories that come from solid fats and added sugar.\textsuperscript{11} Consumption of problematic nutrients like sodium, sugar, and trans fats or saturated fats should be kept to a minimum. Furthermore, the guidelines cite strong evidence showing that children and adolescents
who consume more sugar-sweetened beverages have higher body weight compared to those who drink less.\(^{11}\)

Research indicates that more than 90% of children 2-5 years of age in a nationally representative U.S. sample consumed fruit on a given day.\(^{13}\) However, there is a steady decline as children move through childhood to reach adolescence with only two-thirds (66\%) of those 12-19 years of age consuming fruit on a given day (Figure 1). There are similar trends that exist in vegetable consumption by age.\(^{13}\) Interestingly, the decrease in fruit and vegetable intake starts to occur when children are between 6-11 years of age, which corresponds to the time when they typically begin going to school for the majority of the day.

![Figure 1. Percentage of children 2-19 years old who consumed fruit on a given day in the United States 2009-2010.](figure_taken_from_national_center_for_health_statistics)\(^{13}\)
Childhood Obesity

When children are not consuming a nutritious diet or participating in regular exercise, they are at risk for becoming overweight or obese. Obesity is one of the leading causes of preventable death in the United States, and is a public health concern of epidemic proportions. Body mass index is a measure of weight in kilograms relative to height in meters squared, and is used to determine whether an individual is of healthy weight. Children and adolescents are still growing; therefore their body mass index is plotted on growth charts for sex and age. A child or adolescent with a body mass index equal to or greater than the 95th percentile is considered obese. Similarly, a child or adolescent with a body mass index between the 85th and 95th percentile is considered overweight. The body mass index percentile designates where the child’s weight to height ratio falls in relation to other children of the same sex and age.

According to the Centers for Disease Control and Prevention, in 2011-2012, 8.4% of 2-5 year-olds were obese compared with 17.7% of 6-11-year-olds and 20.5% of 12-19 year-olds. The rate of obesity doubles from ages 2-5 to ages 6-11, consistent with when children are beginning to consume fewer fruits and vegetables and replace them with other less nutritious foods in the diet. By 2020, the goal is to reduce childhood obesity to 15.7% for children aged 6-11 years old, a 2% reduction from 2012.
There are several contributors to the risk of obesity among children 6-11 years of age. Not only do children in this age group consume lower quality diets, but between 8 and 18 years of age age spend almost four times as many hours in sedentary activity as those under the age of 6. Most at risk for overweight and obesity are children from low socioeconomic families and ethnic minorities. The World Health Organization estimates that 70 million young children will be overweight or obese by 2025 if current trends continue. The Center for Disease Control estimates that annual medical costs for adults who are obese are $1,429 higher than those of normal weight, with the annual medical cost of obesity in the US exceeding $147 billion in 2008, making this both an economic and societal problem.
Chronic Diseases

Childhood obesity is a risk factor for developing cardiovascular disease, metabolic disease, central nervous system disease, and adult obesity (Figure 3). By reducing the risk for obesity, there is a parallel decrease in the risk for developing obesity-related comorbid diseases, such as hypertension or type 2 diabetes.\(^\text{18}\)

**Figure 3. The effect of childhood obesity on developing other diseases.** (Figure taken from Barton M. Childhood obesity: a life-long health risk, 2012)\(^\text{19}\)

A 40-year follow-up study of overweight children showed that increased health risks are apparent even when individuals are overweight, and not yet obese.\(^\text{20}\) Early intervention can improve the prognosis for overweight and obese children. Table 1 displays the psychosocial problems that overweight and obese children face, demonstrating that obesity is much more than a medical problem, but one that can affect a child’s self-esteem and self-confidence which in turn can affect academic achievement.
Table 1. Medical and psychosocial problems of childhood obesity

<table>
<thead>
<tr>
<th>Medical Problems</th>
<th>Medical Problems</th>
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<tbody>
<tr>
<td>Metabolic syndrome, type 2 diabetes, insulin resistance, subclinical inflammation, polycystic ovarian syndrome, adulthood obesity, non-alcoholic fatty liver disease, hypertension, high cholesterol, gallstones, dyslipidemia, obstructive sleep apnea syndrome, early puberty or menarche, eating disorders, skin infections, pseudotumorcerebri, orthopedic disorders, asthma and other respiratory diseases.</td>
<td></td>
</tr>
<tr>
<td>Psychosocial Problems</td>
<td>Psychosocial Problems</td>
</tr>
<tr>
<td>Discrimination, social stigmatization, subject to bullying, poor body image, low self-esteem, low self-confidence, stress, depression, anxiety, emotional fallout, poor learning.</td>
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(Table taken from Kar SS, Dube R, Childhood obesity—an insight into preventive strategies 2014)¹⁰

School-Based Interventions

Overweight and obese children are likely to remain overweight as adults; therefore unique, engaging programs are needed to address the growing obesity epidemic.

Most children spend a large portion of their time in school. In fall 2014, 35.1 million students attended school in prekindergarten through eighth grade in the United States. In many cases, life-long habits and behaviors are formed during the elementary and middle school years. Elementary schools provide a unique opportunity to address obesity risks for children in the vulnerable 6-11 year old age group described above. Moreover, there is evidence to support increasing physical activity in pre-pubertal (age 6-11) children to prevent adult diseases such as osteoporosis. Schools can play an important role in child health promotion when they provide nutrition education and physical education to students. The National Health Education Standards aim to develop health-enhancing behaviors among students in all grade levels by providing eight standards that serve as guidelines for the design of health education curriculum plans (Table 2). Nutrition education and physical education have decreased over the years and few students are
receiving sufficient physical activity in school. Nutrition education is highly variable, not mandated or standardized, and often goes unaddressed in schools. Yet, research shows that school-based intervention strategies that are multi-component, addressing nutrition, physical education, and opportunities for before school and or after school physical activity can achieve measurable reductions in obesity-related risk factors.

Table 2. US National Health Education Standards and Performance Indicators

| Standard 1 | Students will comprehend concepts related to health promotion and disease prevention to enhance health. |
| Standard 2 | Students will analyze the influence of family, peers, culture, media, technology, and other factors on health behaviors. |
| Standard 3 | Students will demonstrate the ability to access valid information, products, and services to enhance health. |
| Standard 4 | Students will demonstrate the ability to use interpersonal communication skills to enhance health and avoid or reduce health risks. |
| Standard 5 | Students will demonstrate the ability to use decision-making skills to enhance health. |
| Standard 6 | Students will demonstrate the ability to use goal setting to enhance health. |
| Standard 7 | Students will demonstrate the ability to practice health-enhancing behaviors and avoid or reduce health risks. |
| Standard 8 | Students will demonstrate the ability to advocate for personal, family, and community health. |

(Table taken from http://www.cdc.gov/healthyyouth/sher/standards/)

The CYCLE Kids Program

The CYCLE Kids program is a school-based health promotion curriculum that provides students with a physical activity skill that can become a lifelong habit, bicycling. In addition, the curriculum provides nutrition education to teach and empower healthy food choices. Julianne Idlet, an avid cyclist who recognized that childhood obesity was an escalating problem, founded the CYCLE Kids program in 2004 to share her passion for cycling. Since its inception, CYCLE Kids has evolved to encompass a
holistic model of health addressing nutrition, physical activity, intellectual stimulation, and emotional well-being. The CYCLE Kids curriculum is being taught in eight states across the United States. This thesis is a compilation of findings from a program evaluation of data collected over four years.

The CYCLE Kids curriculum is typically taught as eight lessons, over four weeks as a physical education unit on bicycling. The program is designed for students in fourth and fifth grade, although a few schools have implemented the curriculum as young as third and as old as sixth grade. The CYCLE Kids nutrition curriculum was developed in collaboration with Dr. Paula Quatromoni, Associate Professor of Nutrition at Boston University’s Sargent College for Health and Rehabilitation Sciences, and was evaluated through research funded by the American Heart Association. The curriculum was first introduced in the afterschool setting, and is now taught in eight states across the U.S. The school districts that implement the CYCLE Kids program continue to sustain it, and the program has grown, since 2005 to become a mandatory component of the physical education curriculum for all elementary schools in Cambridge and Somerville Massachusetts.

**SPECIFIC AIMS AND OBJECTIVES**

The objectives of this study were twofold: (1) to evaluate the measurable impact of the CYCLE Kids program on student outcomes of short-term knowledge gains, attitudes, and personal behaviors regarding bicycling, physical activity, nutrition, and food choices, and (2) to assess the feasibility, acceptability, and enthusiasm for the curriculum using
qualitative methods. Students in Cambridge and Somerville, Massachusetts who participated in the CYCLE Kids program between the years of 2010-2014 constituted the study population. Qualitative feedback was solicited from teachers in all eight states where the program is taught across the U.S. We hypothesized that students would gain knowledge and skills and would increase healthy habits related to food choice and physical activity as a consequence of participation in the CYCLE Kids program. Further, we set out to evaluate implementation logistics, to define obstacles in the school environment that challenge implementation, and to characterize perceived benefits of the curriculum.

We hypothesized that this study would demonstrate a positive outcome between students’ participation in the CYCLE Kids program and an increase in physical activity and healthy habits. Our goal was to shed light on the role of school based physical education interventions in overall student health and wellness. We also aimed to gain a better understanding of the strengths and weaknesses of the current curriculum, and any obstacles that teachers and school administrators may be facing when implementing the CYCLE Kids program.

METHODS

This retrospective, qualitative study explored the effect of participating in the CYCLE Kids program on elementary school students in Cambridge and Somerville, Massachusetts. The overall objective of the CYCLE Kids program was to provide students with a physical activity skill that can become a lifelong habit, as well as nutrition
education to teach and foster sustainable healthy habits. The CYCLE Kids program aimed to meet these objectives by providing communities with the knowledge and materials needed to deliver the hands-on education to children and, through the CYCLE Kids textbook, disseminate information home to their families. The materials included: 50 student textbooks, 10 mountain bikes, 25 bicycle helmets, an hour long teacher training administered via a video conference call, a program license and program support. Children in a CYCLE Kids program have their own copy of the CYCLE Kids Student and Parent Textbook. This textbook includes activities to help a child and their family learn basic facts about the importance of physical activity in their daily lives and healthy eating habits.

**Study Sample**

The study sample was comprised of all students in third through sixth grade who were participated in the CYCLE Kids program in Cambridge and Somerville, Massachusetts between the years of 2010-2014. All eligible students who participated were included; no one was excluded.

**Data Collection Methods**

Pre- and post- assessments were designed to reflect the learning objectives of the CYCLE Kids program. The assessments were administered anonymously, and were designed to address students’ knowledge, attitudes, and personal behaviors regarding bicycling, physical activity, nutrition, and food choices. The assessments also included
open-ended questions that gave students an opportunity to provide their reactions to the program and a more detailed description of their experiences. All assessments were designed by Dr. Paula Quatromoni of Boston University, the Director of Research for CYCLE Kids, in partnership with Julianne Idlet, the Chief Executive Officer of CYCLE Kids. The assessments were pilot tested prior to 2010, were revised, and have been updated over time. Identical assessments were used in this study, from 2010-2014. The assessments were sent annually to schools once they placed their textbook orders for the following year. Each academic year in physical education classes, teachers administered both the pre- and post-assessments and then mailed them to the CYCLE Kids office where project staff coded the student responses. The responses were tallied annually, from 2010-2014 excluding the 2012-2013 academic year because of a different programmatic focus that affected data collection in that year. Data for this study therefore, includes three academic years: 2010-2011, 2011-2012, and 2013-2014.

Teacher Survey

Physical education teachers and police officers involved in the implementation of the CYCLE Kids program in all eight states were emailed a link to an anonymous online survey consisting of 29 questions administered via Survey Monkey. There was no compensation or incentive for the teachers to complete the survey. The link was sent out to 25 organizations, including schools, the YMCA, and the Better Boys Foundation in eight states including: Massachusetts, New York, Texas, California, Georgia, North Carolina, Illinois, and Washington. The survey was designed to better understand the
strengths and weaknesses of the current curriculum, any obstacles teachers may have faced, and teachers perceptions of how their students were benefiting from the CYCLE Kids program. In Cambridge, MA we had to engage in a lengthy process to get approval from the school board prior to sending out the teacher survey, therefore no survey results from teachers in Cambridge were obtained or included in this study.

Data Management and Analysis Plan

Pre- and post- curriculum student assessments were analyzed within each school year of administration to assess short-term changes in student responses over the eight lesson (4-week) intervention period. Project staff coded student answers to the pre- and post- assessments, and an Excel spreadsheet was developed per school per year with individual student responses recorded. Survey data from all students taught in three academic years were compiled for this analysis.

Questions from the student assessments were summarized into the following content areas: into 1) bicycle and safety skills, 2) bike frequency and physical activity, and 3) nutrition and physical fitness. The open-ended questions in the student assessments were analyzed qualitatively, and key words or phrases were used to categorize and tally responses. Given that all student assessments were administered anonymously, we were unable to match a pre-assessment to a post-assessment; nor were we able to limit the analysis to students who provided surveys at both time points. Furthermore, there was no formal hypothesis testing since there was no control or
comparison group. As such, only descriptive statistics are presented and changes from pre- to post-assessment were not tested for statistical significance.

RESULTS

Demographics

A total of 1,575 students were included in the study from 18 public elementary schools located in Massachusetts (11 in Cambridge and 7 in Somerville) over three academic years (between 2010-2014). Post-assessments were obtained from 92% (1,451) of participants. The ages of the participants ranged from 8-12-years old. The mean age of students, collected from the post-assessments, was 10.2. More than half, 53% (772) of the students were male and 45% (653) were female, with 2% (26) not stating their gender. Of the participants who provided their race (n=1,387), 30% were Caucasian, 19% were African American, 16% were Latino, 10% Asian, and 2% American Indian or Alaskan Native. More detailed demographic information on study participants is shown in Table 3.

Table 3. Demographics of CYCLE Kids participants (n=1,451)

<table>
<thead>
<tr>
<th>Gender</th>
<th>Grade Level</th>
<th>Age</th>
<th>Ethnicity</th>
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<tbody>
<tr>
<td>Male</td>
<td>Grade 3</td>
<td>8</td>
<td>3% (42)</td>
<td>African</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>American/Black</td>
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<tr>
<td>Female</td>
<td>Grade 4</td>
<td>9</td>
<td>16% (226)</td>
<td>Asian or</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>Asian American</td>
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<tr>
<td>NR</td>
<td>Grade 5</td>
<td>10</td>
<td>43% (630)</td>
<td>Latino/Hispanic</td>
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<td></td>
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<tr>
<td></td>
<td>Grade 6</td>
<td>11</td>
<td>30% (434)</td>
<td>Caucasian/White</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>NR</td>
<td>12</td>
<td>5% (72)</td>
<td>Pacific Islander</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>NR</td>
<td>3%</td>
<td>American Indian</td>
<td>2%</td>
</tr>
</tbody>
</table>


NR = No response

**Bicycle and Safety Skills**

The pre- and post-assessment questions related to bicycle skills and road safety are summarized in Table 4. The largest gain was observed for hand signals, which almost doubled from 43% of students knowing proper hand signals prior to starting the CYCLE Kids program to 83% at program completion. Another notable result was the proportion of students who reported knowing how to adjust the height of their bicycle seat, which increased from 65% to 86%. Notably, almost all students (97%) reported knowing how to fit their helmet correctly by the end of the program. There was an increase in the proportion of students who indicated feeling more safe (+10%) and confident (+8%) when riding. Although there was a 9% increase in the proportion of students who indicated always wearing a helmet when riding a bicycle, the proportion of students remained low with fewer than half (47%) of the students reporting that they always wore a helmet. Overall there was an average of a 12% increase in the proportion of students who answered favorably to questions in the bicycle and safety skills category.

<table>
<thead>
<tr>
<th>Race/Ethnicity</th>
<th>Pre-Assessment Average (n=1575)</th>
<th>Post-Assessment Average (n=1451)</th>
</tr>
</thead>
<tbody>
<tr>
<td>or Alaskan Native (47)</td>
<td></td>
<td>NR (4% (64))</td>
</tr>
<tr>
<td>Other/Multi-Race (25)</td>
<td>19% 278</td>
<td></td>
</tr>
</tbody>
</table>

**Table 4. Bicycle and safety skills, 2010-2014 averages**
<table>
<thead>
<tr>
<th>Question</th>
<th>Pre-Assessment Average</th>
<th>Post-Assessment Average</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you know how to ride a bicycle? (Yes)</td>
<td>85% (1335)</td>
<td>94% (1357)</td>
<td>+9%</td>
</tr>
<tr>
<td>When riding a bicycle, do you wear a helmet (Always)</td>
<td>38% (594)</td>
<td>47% (682)</td>
<td>+9%</td>
</tr>
<tr>
<td>When riding a bicycle, do you wear a helmet? (Always, sometimes)</td>
<td>74% (1157)</td>
<td>84% (1223)</td>
<td>+10%</td>
</tr>
<tr>
<td>Do you know how to wear a helmet correctly? (Yes)</td>
<td>90% (1420)</td>
<td>97% (1405)</td>
<td>+7%</td>
</tr>
<tr>
<td>Do you know how to choose the right height for your bicycle seat? (Yes, I do)</td>
<td>65% (1030)</td>
<td>86% (1245)</td>
<td>+19%</td>
</tr>
<tr>
<td>Do you know how to use hand signals when riding a bicycle? (Yes)</td>
<td>43% (685)</td>
<td>82% (1190)</td>
<td>+39%</td>
</tr>
<tr>
<td>Do you feel sake riding a bicycle? (Yes, I do)</td>
<td>70% (1110)</td>
<td>80% (1157)</td>
<td>+10%</td>
</tr>
<tr>
<td>Do you think there are things you could learn about riding a bicycle? (Yes, I do)</td>
<td>40% (632)</td>
<td>38% (553)</td>
<td>-2%</td>
</tr>
<tr>
<td>Do you feel confident in yourself when you ride a bicycle? (Yes, I do)</td>
<td>73% (1151)</td>
<td>81% (1171)</td>
<td>+8%</td>
</tr>
</tbody>
</table>

**Figure 4. Bicycle and safety skills, 2010-2014 averages**
**Bicycling Frequency and Physical Activity**

Table 5 shows the pre- and post-assessment results for students’ current and desired biking frequency and physical activity levels. Most notably, there was a 10% increase in the proportion of students who reported exercising and playing sports every day or every week by the end of the program, and a 3% increase in the proportion who stated that they exercised every day. Students indicated that they were riding their bikes more often than they were before the CYCLE Kids program, with a 7% increase in students who rode every day or every week at program conclusion. Further there was an 8% increase in the proportion of students who reported riding a bicycle as often as they would like to by the end of the program. Adults who lived with students also increased their bike riding frequency, with a 7% increase in the proportion of students who indicated that adults who live with them were riding bikes at the end. This suggests that participating in the CYCLE Kids program may be encouraging families to be more active as well. Less encouraging, however, was the low proportion of students that reported exercising everyday (33% at baseline, and 36% at follow-up).

There were two questions that showed a decrease from pre- to post-assessment: 1) Do you wish you could exercise or play sports more often, and 2) Do you want to ride a bicycle. This may be that students saturated their desire to ride bicycles during the 8-week CYCLE Kids program, or that they are exercising more frequently and thus have no need to exercise more. Questions on bicycling frequency and physical activity showed an average increase of 4% in the proportion of students who answered positively.
Table 5. Bicycling frequency and physical activity, 2010-2014 averages

<table>
<thead>
<tr>
<th>Question</th>
<th>Pre-Assessment Average (n=1,575)</th>
<th>Post-Assessment Average (n=1,451)</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you have a bike at home? (Yes)</td>
<td>76% (1,195)</td>
<td>80% (1,161)</td>
<td>+4%</td>
</tr>
<tr>
<td>How often do you ride your bike? (Every Day)</td>
<td>13% (200)</td>
<td>15% (223)</td>
<td>+3%</td>
</tr>
<tr>
<td>How often do you ride your bike? (Every Day, Every Week)</td>
<td>39% (610)</td>
<td>46% (661)</td>
<td>+7%</td>
</tr>
<tr>
<td>Do you ride your bike to school (Yes, most of the time, Yes, sometimes)</td>
<td>13% (199)</td>
<td>18% (258)</td>
<td>+5%</td>
</tr>
<tr>
<td>Do any of the adults who you live with ride bicycle? (Yes)</td>
<td>60% (950)</td>
<td>67% (971)</td>
<td>+7%</td>
</tr>
<tr>
<td>Do you want to ride a bicycle? (Yes I do)</td>
<td>84% (1,327)</td>
<td>81% (1,175)</td>
<td>-3%</td>
</tr>
<tr>
<td>Do you ride a bicycle as often as you would like to? (Yes, I do)</td>
<td>40% (624)</td>
<td>48% (700)</td>
<td>+8%</td>
</tr>
<tr>
<td>How often do you exercise or play sport? (Every Day)</td>
<td>33% (513)</td>
<td>36% (525)</td>
<td>+3%</td>
</tr>
<tr>
<td>How often do you exercise or play sport? (Every Day, Every Week)</td>
<td>68% (1,067)</td>
<td>78% (1,130)</td>
<td>+10%</td>
</tr>
<tr>
<td>Do you wish you could exercise or play sports more often? (Yes, I do)</td>
<td>57% (900)</td>
<td>53% (763)</td>
<td>-4%</td>
</tr>
</tbody>
</table>
Figure 5. Bicycling frequency and physical activity, 2010-2014 averages

Nutrition and Physical Fitness

Table 6 demonstrates student responses to questions pertaining to nutrition and physical fitness. There was an average increase of 5.8% in the proportion of students answered positively in this category. The most significant changes from pre- to post-assessment were an 11% increase in the proportion of students who could correctly identify one cup of food, a 12% increase in the proportion of students who wanted to learn more about healthy eating, and a 17% increase in the proportion of students indicating that they knew how to take their heart rate. More indirect methods of assessing children’s knowledge and concern for health and nutrition were assessed with food intake responses. This was accomplished using questions related to the
consumption of 6 food groups (protein, fruit, vegetable, dairy, grains, and healthy fats) along with questions regarding the expansion of healthy food variety in their diet. Less than two-thirds (61%) of children who indicated that they ate vegetables on the day prior to the survey, and fewer than half (43%) reported consuming healthy fats yesterday. Less than one-third of students had tried a new vegetable (31%) or fruit (28%) within the past week. These findings are concerning given that the Dietary Guidelines recommend that children consume 3-4 servings of fruits and vegetables per day. About 40% of students in the sample did not eat any vegetables on the survey day, and 20% did not eat any fruit. Another indicator of nutritional vulnerability is the observation that almost one-third of students skip breakfast at least occasionally.

Table 6. Nutrition and physical fitness, 2010-2014 averages

<table>
<thead>
<tr>
<th>Question</th>
<th>Pre-Assessment Average</th>
<th>Post-Assessment Average</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you know what to eat to give your body energy to exercise? (Yes, I do)</td>
<td>73% (1,152)</td>
<td>80% (1,156)</td>
<td>+7%</td>
</tr>
<tr>
<td>Do you want to learn more about healthy eating? (Yes, I do)</td>
<td>40% (631)</td>
<td>52% (761)</td>
<td>+12%</td>
</tr>
<tr>
<td>Did you eat dairy yesterday? (Yes)</td>
<td>73% (1,154)</td>
<td>78% (1,133)</td>
<td>+5%</td>
</tr>
<tr>
<td>Did you eat protein yesterday? (Yes)</td>
<td>75% (1,175)</td>
<td>78% (1,138)</td>
<td>+3%</td>
</tr>
<tr>
<td>Did you eat fruits yesterday? (Yes)</td>
<td>77% (1,122)</td>
<td>81% (1,174)</td>
<td>+4%</td>
</tr>
<tr>
<td>Did you eat vegetables yesterday? (Yes)</td>
<td>59% (925)</td>
<td>61% (882)</td>
<td>+2%</td>
</tr>
<tr>
<td>Did you eat grains yesterday? (Yes)</td>
<td>74% (1,167)</td>
<td>76% (1,098)</td>
<td>+2%</td>
</tr>
<tr>
<td>Did you eat healthy fats yesterday? (Yes)</td>
<td>36% (570)</td>
<td>43% (622)</td>
<td>+7%</td>
</tr>
</tbody>
</table>

When was the last time you tried eating a

21
new vegetable? (Last week, yesterday, or today) | (500) | (443) | -1%
---|---|---|---
When was the last time you tried eating a new fruit? (Last week, yesterday, or today) | 32% (501) | 28% (409) | +1%
How many days a week do you eat breakfast? (Every Day) | 70% (1,101) | 72% (1,038) | -2%
Correctly identified 1 cup of food | 51% (803) | 62% (894) | +11%
Do you know how to take your heart rate? (Yes) | 31% (494) | 49% (708) | +17%
Does exercise and healthy eating affect your heart? (Yes) | 45% (701) | 49% (718) | +4%

<table>
<thead>
<tr>
<th>Open Ended Questions</th>
</tr>
</thead>
</table>

In the pre-assessments, students were asked what they hoped to learn in the CYCLE Kids program. Over one-third, 38% (567) of students mentioned bicycle skills:
responses related to riding, equipment fitting, bicycle maintenance, and general bicycle knowledge were included in this category. Safety was mentioned by 17% (264) with responses indicating general safety, road safety, and safety equipment. Only 5% (74) of students mention health skills as what they hoped to learn in CYCLE Kids; responses from these students included themes on nutrition, exercise, heart rate, and general well being. Personal growth made up the smallest proportion of responses with just 1% (11) of children describing fun, teamwork, determination, confidence, or interactions with others in their response. The majority of responses, 39% (584), fell into the other category and consisted of students not knowing what they wanted to learn, students reporting they had nothing to learn, miscellaneous responses, and students who chose not to respond at all.

![Pie chart showing student responses to "What do you hope to learn in the CYCLE Kids program?"

<table>
<thead>
<tr>
<th>Category</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bicycle Skills</td>
<td>38%</td>
</tr>
<tr>
<td>Safety</td>
<td>17%</td>
</tr>
<tr>
<td>Health Skills</td>
<td>5%</td>
</tr>
<tr>
<td>Personal Growth</td>
<td>1%</td>
</tr>
<tr>
<td>Other</td>
<td>39%</td>
</tr>
</tbody>
</table>

Figure 7. Pre-assessment student responses to “What do you hope to learn in the CYCLE Kids program?”

In the post assessment, students were asked to report the two most important things they learned in the CYCLE Kids program. Since each student named two things, the percentages were computed by dividing by the total number of student responses, not
by the number of students. As displayed in Figure 8, the majority, 44% (1,277) of students mentioned bicycling safety. Bicycle skills were the next most prominent response, offered by 33% (942) of students. Healthy skills remained low with only 6% (161) of students mentioning nutrition, exercise, or general well being. Personal growth made up the smallest proportion of responses, with 3% (86) of students indicating they learned teamwork, determination, or self-confidence. The other category made up 14% (398) of the student responses and consisted of 2% (51) miscellaneous responses, 2% (63) students reporting they had not learned anything, and 10% (275) of students who did not respond to the question.

![Chart](image.png)

**Figure 8. Post-assessment student responses to “What are the two most important things learned in the CYCLE Kids program?”**

Figure 9 displays the students’ responses to the open-ended question asking them to describe their favorite part of the CYCLE Kids program. The majority of students mentioned riding bicycles; 59% (851) of total respondents mentioning riding related
topics in their answers. More than half, 52% (748) of all responses included general statements about “riding bikes” and 10% (139) riding bikes outside or on classroom trips to the local parks or rivers. Additionally, 8% (109) of students mentioned the learning process as their favorite part of the CYCLE Kids program, and 5% (70) of students indicated that the best part of the CYCLE Kids program was that it was fun. Personal growth was the least mentioned response, with 3% (50) stating that the best part of the CYCLE Kids program was the experience of personal growth, confidence, teamwork, and friends. Of the remaining responses, 23% fell into the other category comprised of 2% (31) students stating they liked everything about the CYCLE Kids program, 16% (231) students who did not respond, and 3% (39) students who reported not having a favorite part of the CYCLE Kids program. There were also a few, 2% (29) responses that had nothing to do with CYCLE Kids and thus were categorized as miscellaneous.
Figure 9. Post-assessment student open-ended responses to “What was your favorite part of CYCLE Kids program?”

Teacher Survey

The teacher survey was emailed out to 25 schools located in eight states, with a response rate of 60% with (n=15) participants. One participant was excluded because he had not yet taught the CYCLE Kids curriculum; therefore data from 14 respondents were analyzed. Of the 14 participants, 8 were physical education teachers, 1 was a health and wellness teacher, and 4 were academic classroom teachers. One participant did not respond to this specific question, and none of the police officers surveyed responded. Six had been teaching the CYCLE Kids program for one year, one had taught it for two years, three taught it for 3-5 years, and four taught it for more than 5 years. The majority of teachers, (13/14) taught in an urban school district, with only 1 teacher from a suburban school district. All 14 teachers taught in public schools; 57% were from Somerville, MA.

Teacher’s Perceived Benefits of the CYCLE Kids Program

Teachers unanimously agreed that the CYCLE Kids program increased their students’ desire to bike outside of school. More than three-quarters of the participants agreed that the CYCLE Kids program increased physical activity knowledge/awareness (79%), taught bike skills (86%), and improved balance (79%). Less than a third of teachers perceived that the CYCLE Kids program improved student academic performance (14%), improved student focus and energy in academic classrooms (29%), or increased academic classroom participation (21%). However, as one teacher stated, “Physical education teachers may be unable to answer questions [about academics].”
The majority of teachers (93%) indicated that they observed behavior changes in their students as a result of the CYCLE Kids program. Behavior changes described include an increase in self-confidence, excitement about exercising, and enthusiasm for riding bicycles. Additionally, one teacher reflected on her students after they completed the CYCLE Kids program,

“Students are more accepting of different levels of experience. Those [students who are] new to biking are now more willing to tackle challenging projects.”

Table 7. In what ways does the CYCLE Kids program benefit students? (Check all that apply)

<table>
<thead>
<tr>
<th>Benefit</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increases physical activity levels</td>
<td>71% (10)</td>
</tr>
<tr>
<td>Increases physical activity knowledge/awareness</td>
<td>79% (11)</td>
</tr>
<tr>
<td>Increases nutrition knowledge/awareness</td>
<td>71% (10)</td>
</tr>
<tr>
<td>Improves nutrition choices</td>
<td>43% (6)</td>
</tr>
<tr>
<td>Builds bike skills</td>
<td>86% (12)</td>
</tr>
<tr>
<td>Improves balance</td>
<td>79% (11)</td>
</tr>
<tr>
<td>Improves core strength</td>
<td>36% (5)</td>
</tr>
<tr>
<td>Improves motor skills</td>
<td>64% (9)</td>
</tr>
<tr>
<td>Increases desire to bike outside of school</td>
<td>100% (14)</td>
</tr>
<tr>
<td>Increases academic classroom participation</td>
<td>21% (3)</td>
</tr>
<tr>
<td>Increases activity in physical education classes</td>
<td>50% (7)</td>
</tr>
<tr>
<td>Improves student focus and energy in academic classrooms</td>
<td>29% (4)</td>
</tr>
<tr>
<td>Improves student academic performance</td>
<td>14% (2)</td>
</tr>
<tr>
<td>Other (please specify)</td>
<td>7% (1)</td>
</tr>
</tbody>
</table>

Teachers were asked to indicate how the CYCLE Kids program benefited their students emotionally as shown in Figure 10. Respondents unanimously agreed that the CYCLE Kids program increased a students’ self-confidence and helped students overcome fears. More than two-thirds (71%) agreed that students developed
collaborative and empathetic behaviors towards peers and that the CYCLE Kids program improved student-teacher relationships. Less than half (43%) reported that the CYCLE Kids program improved student-police officer relationships. However, this statistic is biased because only three teachers who participated in the survey actually had a police officer teaching the CYCLE Kids program with them and because no police officers responded to our survey.

Figure 10. Teachers perceived emotional growth for students after participating in the CYCLE Kids program.

Teachers were asked to rate their students on several characteristics from “a lot less,” to “a lot more” judging their perceptions after they had completed the CYCLE Kids program, compared to before (Figure 11). Excitement about riding a bicycle, confidence in riding a bicycle, and enthusiasm for the CYCLE Kids program were top responses, with 79%, 79% and 64% of responses respectively, reporting an increase of “a lot more.” All categories contained at least 57% (8 teachers) who agreed that their students had changed by “slightly more” or “a lot more.” Only one teacher, reported that the students’
behavior, citizenship, and leadership in class decreased to “slightly less” after participating in the CYCLE Kids program. There was no teacher who selected “a lot less” for the change in their students’ characteristics after completing the program.

Figure 11. Teachers perceived student changes after participate in the CYCLE Kids program.

Table 8 addresses the teachers’ perceived impact of the CYCLE Kids program on various aspects of a students’ well being. More than three-quarters of teachers agreed that the CYCLE Kids program had a possible positive impact or an observed positive impact on a students’ physical well being (86%), social well being (93%), and emotional/psychological well being (86%). There were over two-thirds, 71% (10) of teachers who agreed that the CYCLE Kids program had a possible or observed positive
impact on a students’ academic/intellectual well being. No teachers reported an observed negative impact or possible negative impact of participation.

Table 8. Teachers perceived impact of the CYCLE Kids program on their students.

<table>
<thead>
<tr>
<th></th>
<th>Observed negative impact</th>
<th>Possible negative impact</th>
<th>No impact</th>
<th>Possible positive impact</th>
<th>Observed positive impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical well being</td>
<td>0% (0)</td>
<td>0% (0)</td>
<td>14% (2)</td>
<td>64% (9)</td>
<td>21% (3)</td>
</tr>
<tr>
<td>Social well being</td>
<td>0% (0)</td>
<td>0% (0)</td>
<td>7% (1)</td>
<td>71% (10)</td>
<td>21% (3)</td>
</tr>
<tr>
<td>Emotional/psychological</td>
<td>0% (0)</td>
<td>0% (0)</td>
<td>7% (1)</td>
<td>57% (8)</td>
<td>29% (4)</td>
</tr>
<tr>
<td>well being</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Academic/intellectual</td>
<td>0% (0)</td>
<td>0% (0)</td>
<td>29% (4)</td>
<td>64% (9)</td>
<td>21% (1)</td>
</tr>
<tr>
<td>well being</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

More than three-quarters (86%) of teachers stated that the CYCLE Kids program affected community interest and support for health and wellness. When asked to elaborate on how it affected the community, teachers commented on both parental and community interest in the CYCLE Kids program:

“Parents are asking about it [the CYCLE Kids program], and other grade levels are wanting to participate in riding bikes which we now offer at recess once a week for grade 3-6.”

“We have informed students on where to ride and how to stay active. We have three mountain bike trails within 5 miles of our schools. We plan to build a short trail here also.”

“When we teach our children, they in turn take it outside to their friends and family. Which is for the betterment of the community.”

30
In addition to getting the attention of the community, 71% (10) of teachers indicated that they received support from school administration to teach the CYCLE Kids program. One teacher stated,

*My principal is very positive about the [CYCLE Kids] program. She has given approval to take kids on an off campus [bike] ride at the end of the program as a “graduation” gift.*

When teachers were asked about their overall experience with the CYCLE Kids program, all responses were positive, however 29% (4) skipped this question. A few of their responses are listed below, highlighting how passionate teachers were about the CYCLE Kids program in addition to the logistical challenges they faced.

*“Greatest elementary school program.”*

*“Excellent! The kids loved it…the curriculum was straightforward and easy to use.”*

*“I love the part about teaching non riders how to ride. It is one of the most rewarding things I have experienced in my 22 years. However the way it is set up is super stressful – there is not really adequate time to get the kids on the bikes. It would be better if for eight weeks they could have an hour class once a week in addition to their regular PE class.”*

**Obstacles to CYCLE Kids Implementation**

The teachers were asked to think about how well the CYCLE Kids program works within the physical education classes. As seen in Figure 10, more than one-third,
(36%) of teachers reported that some lessons might benefit from being taught in the classroom, 2 teachers indicating that they only ended up teaching a few of the lessons due to time constraints. No teacher reported that the CYCLE Kids program did not work well in his or her setting, or should be taught altogether in the classroom setting.

![Pie chart showing responses to the question: How well do you think the CYCLE Kids program works within Physical Education classes?]

- 29%: It fits in very well and requires little to no modifications.
- 21%: It works well but some lessons might benefit from being taught in the classroom.
- 14%: It works well but I end up only teaching a few of the lessons.
- 36%: It does not work well and should be taught in a classroom setting.
- Other (please specify)

**Figure 12. How well does the CYCLE Kids program work within Physical Education classes.**

The main obstacle teachers faced when implementing the CYCLE Kids program was not having enough time. Over half, or 9 of teachers reported they had experienced obstacles when implementing the CYCLE Kids program, and described the obstacles faced, including needing assistance when teaching the program.

“It is almost impossible for one teacher to teach this without consistent assistance. The best way to teach this would be if the kids could have it as an addition to physical education and not solely in class. Additionally, trying to do
the workbook as well as getting helmets on and teaching so many kids to ride is extremely difficult in a 40 minute time frame.”

“Only 40 minutes for PE classes, storage of bikes, the logistics of moving bikes to riding area, another PE class before and after CYCLE Kids class, storage of bikes in some schools, conducting workbook lessons in the gym, etc”

DISCUSSION

The CYCLE Kids program had a measurable impact on students and helped them obtain bicycle and safety skills, have fun while exercising, and improve their overall well-being. Cumulative short term results from students participating in the four week curriculum indicate that the CYCLE Kids program is successful in teaching students how to ride a bicycle, and how to do so safely by knowing how to wear a helmet correctly, choosing the correct height for their bicycle seat, and using hand signals when riding. This new knowledge translated into a higher proportion of students who reported feeling safe and confident when riding a bike. Data indicates that students are being more active, with a higher proportion of students owning a bicycle at home, riding their bike more frequently, and reporting that they exercise or play sports more often upon the completion of the CYCLE Kids program. From the teachers’ perspective, the CYCLE Kids program is not only imparting new physical activity knowledge and building bicycle skills, but is inspiring behavioral changes. Overall, teachers had positive remarks on the CYCLE Kids program with no teachers reporting any possible negative impact on their students.

Nutrition and physical fitness showed lower improvements, which may be due to the implementation of the CYCLE Kids program in a physical education classroom.
where the emphasis is traditionally more on physical activity and keeping students active as opposed to having children learn and understand health and wellness lessons.

Certainly, textbooks are rarely used in PE class, nor is homework typically assigned. Further evidence to support this is that perspective is that one in three teachers agreed that the physical education setting might not be the most conducive setting for the CYCLE Kids program, indicating that some lessons might benefit from being taught in the classroom. Additional, a few teachers surveyed reported that they only ended up teaching a few of the lessons. Taken together, half of the teachers were either not able to teach all of the lessons or agreed that the CYCLE Kids program needs additional classroom support.

A surprising result was that less than half of students reported *always* wearing a helmet when riding a bicycle at home even after having been taught the importance and the skill in the CYCLE Kids program. In the program, students are not allowed to ride a bicycle unless they are wearing a helmet. To further illustrate the importance of helmets for safety, it could be recommended that teachers use the optional lesson in the CYCLE Kids teachers guide where students are challenged to construct a helmet to protect an egg and then perform an egg drop experiment to realize the consequences of inadequate (or no) protection. Another possibility is that students who participate in the CYCLE Kids program are not wearing helmet when they ride outside of school because they do not have access to one. A recent study on teaching children about bicycle safety in New Jersey noted that 82% of children surveyed in schools owned a helmet, but only 36% of
children in summer camps owned a helmet; likely reflecting the lower household income of children in summer camp.\textsuperscript{24}

Findings from this study concur with the literature on childhood obesity risks. The majority of students are not meeting the requirements for physical activity or daily fruit and vegetable intake. Only 36\% of students at the completion of the CYCLE Kids program reported exercising or playing sports every day. This concurs with the Center for Disease Control’s report that only 3 in 10 high school students meet the daily recommendation of 60 minutes of physical activity.\textsuperscript{8} Less than a third, (30\%) of students stated that they had consumed a new fruit or vegetable within the last week. These findings point to the vulnerability of urban children in this age group and substantiate the importance of interventions such as the CYCLE Kids program for ensuring that students are taught healthy habits at an early age.

The findings of this study are unique and add to the current literature, since most as most of the on bicycling behavior in children focus only on active commute to and from school. Of the studies that evaluated bicycling curriculums, most were designed for middle school aged children; such as BikeSafe, which aims to reduce the number of injuries and fatalities of bicyclists hit by cars in Miami-Dade County.\textsuperscript{25} Introducing children to bicycling through the CYCLE Kids program at school can teach students to ride a bicycle more safely and correctly so that upon completion, students can use their new or enhanced bicycling skills to be more physically active. It is clear that CYCLE Kids students are obtaining new skills that will help them bike to school and ride more confidently. However, it is unclear if the participating in the CYCLE Kids program
translates into more physical activity in the long run. A long-term study analyzing students’ behaviors and physical activity levels after participating in the program is warranted.

**Limitations:**

This qualitative study has several limitations. The first limitation is that the CYCLE Kids program was a brief intervention consisting of eight 40 minute lessons. This may not be enough intensity to impact long-term lifestyle changes in students. However, areas where students did show improvement corresponded with the CYCLE Kids program core objectives, bicycle and safety skills. The second limitation of our study is that we did not have matched student assessments. Without any identifiers on the surveys, it was impossible to determine if we had the same students answering surveys at program completion as we did at the start. This discrepancy can explain why some values decreased in the post program assessments, but by the same token it does not allow us to confidently state how many students actually showed improvement since we are working with proportions of students. Furthermore, as displayed in Table 9, there were 11% (180) of students who indicated that they had participated in the CYCLE Kids program prior to the assessment that was used in this study. This may have influenced our results, but it is impossible to know in which direction. Repeat students may have experienced greater gains overall; or gains could be diminished within one assessment cycle because they were realized in the prior exposure. Nonetheless, it is notable that 80% of participants experienced the curriculum for the first time during this investigation.
Table 9. Number of students with previous exposure to the CYCLE Kids curriculum.

<table>
<thead>
<tr>
<th></th>
<th>Number of students 2010-2011</th>
<th>Number of students 2011-2012</th>
<th>Number of students 2013-2014</th>
<th>Total number of students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students who have never participated in CYCLE Kids program.</td>
<td>304</td>
<td>482</td>
<td>453</td>
<td>1,239 (79%)</td>
</tr>
<tr>
<td>Students who have participated in CYCLE Kids program.</td>
<td>32</td>
<td>49</td>
<td>99</td>
<td>180 (11%)</td>
</tr>
<tr>
<td>Students who did not respond.</td>
<td>19</td>
<td>67</td>
<td>70</td>
<td>156 (10%)</td>
</tr>
<tr>
<td>Total number of students</td>
<td>355</td>
<td>598</td>
<td>622</td>
<td>1,575</td>
</tr>
</tbody>
</table>

Another limitation relates to missed attendance at school. As displayed in Table 10, 12% (166) of students attended fewer than half of the CYCLE Kids classes. Therefore, these students did not receive the full intervention dose as intended. This scenario may cause our interpretations of program impact to be somewhat conservative.

Table 10. Student attendance in the CYCLE Kids program.

<table>
<thead>
<tr>
<th></th>
<th>Number of students 2010-2011</th>
<th>Number of students 2011-2012</th>
<th>Number of students 2013-2014</th>
<th>Total number of students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attended 2 or fewer CYCLE Kids classes.</td>
<td>25</td>
<td>0</td>
<td>0</td>
<td>25 (2%)</td>
</tr>
<tr>
<td>Attended 3-4 CYCLE Kids classes.</td>
<td>26</td>
<td>55</td>
<td>60</td>
<td>141 (10%)</td>
</tr>
<tr>
<td>Number of students who did not respond.</td>
<td>9</td>
<td>43</td>
<td>33</td>
<td>85 (6%)</td>
</tr>
<tr>
<td>Total number of students.</td>
<td>318</td>
<td>550</td>
<td>583</td>
<td>1,451</td>
</tr>
</tbody>
</table>

Finally, the lack of an observational evaluation of students demonstrating skills acquired is a limitation. This type of evaluation would verify the self-reported skills that
students are saying they obtained on the surveys and would enhance the evaluation of the CYCLE Kids program.

Future studies should aim to expand the sample population to include students from the seven other states where the CYCLE Kids program is currently being implemented. It would also be interesting to see how students who have had repeated exposures to the CYCLE Kids program score in comparison to those who have only had one exposure. In addition, a control group should be utilized to differentiate between correlation and cause and effect from the data. Lastly, administering pre- and post-assessments with an identifier to allow the pre- and post-assessments to be matched would provide for a stronger data set.

The CYCLE Kids curriculum will be revised to address the lack of time and obstacles that teachers are facing. Additionally, there will be more emphasis on establishing connections between the CYCLE Kids program and the local communities and students’ families. Communities are at the cornerstones for promoting healthy behaviors and habits. Partnerships between CYCLE Kids, and the communities and schools can promote and reinforce healthy habits for students and families.

With the feedback provided by physical education teachers and the results from this study, CYCLE Kids is well-equipped to revise the curriculum in order to more effectively engage and benefit students.
APPENDIX

Baseline Assessment

Name: ______________________________
Date: ______/_______/________
Grade: _______________________
School: _______________________

Before you begin the CYCLE Kids program, we want to know a little bit about you. Your answers to this survey are important to us! There is no right or wrong answer, so just answer each question as truthfully as you can.

Instructions:
Please put a Check [ ] in the Box for the answer that best describes your opinion.

Sample Question:
Do you like to listen to music?
☐ Not really   ☐ Kind of   ☐ Yes, I do   ☐ Don’t Know

Before we begin...
Have you participated in a CYCLE Kids program before?
☐ Yes   ☐ No

Please Turn Over →
1. Do you know how to ride a bicycle?
   - Yes
   - No
   If yes, how old were you when you learned? ____________

2. Do you have a bicycle at home?
   - Yes
   - No (If NO, Go To Question #5)

3. How often do you ride your bike?
   - Every Day
   - Every Week
   - Less than once a week

4. Do you ride your bike to school?
   - Yes, sometimes
   - Yes, most of the time
   - No

5. Do any of the adults who you live with ride bicycles?
   - Yes
   - No

6. When riding a bicycle, do you wear a helmet?
   - Always
   - Sometime
   - Never

7. Do you know how to wear a helmet correctly?
   - Yes
   - No

8. Do you know how to choose the right height for your bicycle seat?
   - Yes
   - No

9. Do you know how to use hand signals when riding a bicycle?
   - Yes
   - No

10. Do you feel safe riding a bicycle?
    - Not really
    - Kind of
    - Yes, I do
    - Don't know

11. Do you think there are things you could learn about riding a bicycle?
    - Not really
    - Kind of
    - Yes, I do
    - Don't know

12. Do you want to ride a bicycle?
    - Not really
    - Kind of
    - Yes, I do
    - Don't know

13. Do you ride a bicycle as often as you would like to?
    - Not really
    - Kind of
    - Yes, I do
    - Don't know

14. Do you feel confident in yourself when you ride a bicycle?
    - Not really
    - Kind of
    - Yes, I do
    - Don't know
15. Do you know what to eat to give your body energy to exercise?  
☐ Not really  ☐ Kind of  ☐ Yes, I do  ☐ Don’t know

16. Do you want to learn more about healthy eating?  
☐ Not really  ☐ Kind of  ☐ Yes, I do  ☐ Don’t know

17. Check off all the types of foods from this list that you ate yesterday.  
☐ Dairy - such as milk, yogurt, cheese  
☐ Protein - such as meat, poultry, fish, beans, peanut butter, eggs  
☐ Fruit - such as an apple, orange juice, banana, canned fruit, applesauce  
☐ Vegetable - such as spinach, collard greens, carrots, broccoli, tomato  
☐ Grain - such as whole wheat bread, oatmeal, pasta, cereal  
☐ Healthy fat - such as nuts, olive oil

18. When was the last time you tried eating a new vegetable?  
☐ Today  ☐ Yesterday  ☐ Last week  ☐ Last month  ☐ Last year  ☐ Don’t Know

19. When was the last time you tried eating a new fruit?  
☐ Today  ☐ Yesterday  ☐ Last week  ☐ Last month  ☐ Last year  ☐ Don’t Know

20. How many days a week do you eat breakfast?  
☐ Every Day  ☐ Some days  ☐ Only on the weekend  ☐ Less than once a week

21. Imagine a measuring cup full of food, what common item is about the same size?  
☐ A bowling ball  ☐ A quarter  ☐ A marble  ☐ A baseball  ☐ A volley ball

22. Do you know how to take your heart rate?  
☐ Yes  ☐ Kind of  ☐ Not really  ☐ No  ☐ Don’t know

23. Does exercise and healthy eating affect your heart?  
☐ Yes  ☐ Kind of  ☐ Not really  ☐ No  ☐ Don’t know

24. How often do you exercise or play sports?  
☐ Every Day  ☐ Every Week  ☐ Less than once a week

Please Turn Over
25. Do you wish you could exercise or play other sports more often?
   □ Not really    □ Kind of    □ Yes, I do    □ Don’t know

26. Do you have any food allergies, or are there foods you are not allowed to eat?
   □ No    □ Yes (please specify)______________________________

27. What do you hope to learn in CYCLE Kids?

28. Are you a: □ Boy    □ Girl

29. What grade are you in? □ 4th    □ 5th    □ 6th

30. How old are you?____________

31. Are you...
   □ African American/Black    □ Asian or Asian American    □ Latino/Hispanic
   □ Caucasian/White    □ Native Hawaiian or Other Pacific Islander
   □ American Indian or Alaskan Native    □ Other (please specify)__________________________

Thank you for taking this survey and helping us continue to develop programs that are fun and educational for everyone!
Follow-Up Assessment

Name: ___________________________________________
Date: __________/________/___________
Grade: _________________________________________
School: _________________________________________

cyclekids
FIT KIDS ARE HAPPY KIDS

Follow-Up Assessment

CYCLE Kids
5 JFK Street
Cambridge, MA 02138

Now that you have completed the CYCLE Kids program, we want to know what you think about it and how helpful it was to you.

Your answers to this survey are important to us! There is no right or wrong answer, so just answer each question as truthfully as you can!

Instructions:

Please put a Check ☑ in the Box for the answer that best describes your opinion.

Sample Question:
Do you like to listen to music?
☐ Not really    ☐ Kind of  ☐ Yes, I do  ☐ Don't Know

Before we begin...
Please tell us how many CYCLE Kids classes you attended?
☐ 2 or fewer  ☐ 3-4    ☐ 5-6    ☐ 7-8

Please Turn Over
1. Do you know how to ride a bicycle?
   □ Yes    □ No
   If yes, how old were you when you learned? ____________

2. Do you have a bicycle at home?
   □ Yes    □ No (If NO, Go To Question #5)

3. How often do you ride your bike?
   □ Every Day
   □ Every Week
   □ Less than once a week

4. Do you ride your bike to school?
   □ Yes, sometimes
   □ Yes, most of the time
   □ No

5. Do any of the adults who you live with ride bicycles?
   □ Yes    □ No

6. When riding a bicycle, do you wear a helmet?
   □ Always
   □ Sometimes
   □ Never

7. Do you know how to wear a helmet correctly?
   □ Yes    □ No

8. Do you know how to choose the right height for your bicycle seat?
   □ Yes    □ No

9. Do you know how to use hand signals when riding a bicycle?
   □ Yes    □ No

10. Do you feel safe riding a bicycle?
    □ Not really
    □ Kind of
    □ Yes, I do
    □ Don't know

11. Do you think there are new things you could learn about riding a bicycle?
    □ Not really
    □ Kind of
    □ Yes, I do
    □ Don't know

12. Did the CYCLE Kids program teach you new things about riding a bicycle?
    □ Not really
    □ Kind of
    □ Yes, it did
    □ Don't know

13. Do you want to ride a bicycle?
    □ Not really
    □ Kind of
    □ Yes, I do
    □ Don't know

14. Do you ride a bicycle as often as you would like to?
    □ Not really
    □ Kind of
    □ Yes, I do
    □ Don't know
15. Do you feel confident in yourself when you ride a bicycle?
   - Not really  - Kind of  - Yes, I do  - Don't know

16. Do you know what to eat to give your body energy to exercise?
   - Not really  - Kind of  - Yes, I do  - Don't know

17. Do you want to learn more about healthy eating?
   - Not really  - Kind of  - Yes, I do  - Don't know

18. Check off all the types of foods from this list that you ate yesterday.
   - Dairy - such as milk, yogurt, cheese
   - Protein - such as meat, poultry, fish, beans, peanut butter, eggs
   - Fruit - such as an apple, orange juice, banana, canned fruit, applesauce
   - Vegetable - such as spinach, collard greens, carrots, broccoli, tomato
   - Grain - such as whole wheat bread, oatmeal, pasta, cereal
   - Healthy fat - such as nuts, olive oil

19. When was the last time you tried eating a new vegetable?
   - Today  - Yesterday  - Last week  - Last month  - Last year  - Don't Know

20. When was the last time you tried eating a new fruit?
   - Today  - Yesterday  - Last week  - Last month  - Last year  - Don't Know

21. How many days a week do you eat breakfast?
   - Every Day  - Some days  - Only on the weekend  - Less than once a week

22. Imagine a measuring cup full of food, what common item is about the same size?
   - A bowling ball  - A quarter  - A marble  - A baseball  - A volley ball

23. Do you know how to take your heart rate?
   - Yes  - Kind of  - Not really  - No  - Don't know

24. Does exercise and healthy eating affect your heart?
   - Yes  - Kind of  - Not really  - No  - Don't know

Please Turn Over
25. How often do you exercise or play sports?
   - ☐ Every Day
   - ☐ Every Week
   - ☐ Less than once a week

26. Do you wish you could exercise or play other sports more often?
   - ☐ Not really
   - ☐ Kind of
   - ☐ Yes, I do
   - ☐ Don't know

27. Does what you've learned in the CYCLE Kids program give you confidence to do other kinds of exercise or play other sports?
   - ☐ Not really
   - ☐ Kind of
   - ☐ Yes, it does
   - ☐ Don't know

28. What are the TWO most important things you learned in the CYCLE Kids program?
   1) __________________________________________
   2) __________________________________________

29. What was your favorite part of the CYCLE Kids program?

30. Are you a: ☐ Boy  ☐ Girl

31. What grade are you in?  ☐ 4th  ☐ 5th  ☐ 6th

32. How old are you? __________

33. Are you...
   - ☐ African American/Black
   - ☐ Caucasian/White
   - ☐ American Indian or Alaskan Native
   - ☐ Asian or Asian American
   - ☐ Latino/Hispanic
   - ☐ Native Hawaiian or Other Pacific Islander
   - ☐ Other (please specify) _______________________

   Thank you for taking this survey and helping us continue to develop programs that are fun and educational for everyone!

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Teacher Assessment

CYCLE Kids Teacher Survey

Please reflect on your experiences with the CYCLE Kids program and answer every question as truthfully as possible. Your answers will be completely confidential.

Thank you for your participation in this important project. Your anonymous responses will help us continue to develop and improve the CYCLE Kids program.

* How well do you think the CYCLE Kids program works within Physical Education classes?
  1. It fits in very well and requires little to no modifications.
  2. It works well but some lessons might benefit from being taught in the classroom.
  3. It works well but I end up only teaching a few of the lessons.
  4. It does not work well and should be taught in a classroom setting.
  5. Other (please specify)

Why are you only able to teach a few of the lessons?

* How do your students use the student textbooks when you teach the CYCLE Kids program?
  1. In class only
  2. At home only
  3. Both in class and at home
  4. We do not use the student textbooks

* Have you experienced any obstacles when implementing the CYCLE Kids program?
  1. Yes
  2. No
**CYCLE Kids Teacher Survey**

Please describe the obstacles you faced when implementing the CYCLE Kids program.

![Obstacles Description](image)

*Do you observe behavior changes in your students as a result of the CYCLE Kids program?*

- Yes
- No

Please describe the behavior changes you observe in your students as a result of the CYCLE Kids program.

![Behavior Changes Description](image)

*On a scale of 1 (least) to 5 (most), how would you rate your students on the following characteristics after they have completed the CYCLE Kids program compared to before participating in the CYCLE Kids program.*

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>(1) A lot less</th>
<th>(2) Slightly less</th>
<th>(3) Unchanged</th>
<th>(4) Slightly more</th>
<th>(5) A lot more</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excitement about riding a bike</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Confidence in riding a bike</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Desire to be physically active</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interest in healthy eating habits</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enthusiasm for the CYCLE Kids program</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Behavior in my class</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Citizenship in my class</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leadership in my class</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**CYCLE Kids Teacher Survey**

*In what ways does the CYCLE Kids program benefit your students? (check all that apply)*

- Increases physical activity levels
- Increases physical activity knowledge/awareness
- Increases nutrition knowledge/awareness
- Improves nutrition choices
- Builds bike skills
- Improves balance
- Improves core strength
- Improves motor skills
- Increases desire to bike outside of school
- Increases academic classroom participation
- Increases activity in physical education classes
- Improves student focus and energy in academic classrooms
- Improves student academic performance
- Other (please specify)

*In what ways does the CYCLE Kids program benefit your students emotionally? (check all that apply) (check all that apply)*

- Develops leadership skills
- Develops collaborative and empathetic behavior towards peers
- Fosters mutual respect among students
- Helps students overcome fears
- Improves student-teacher relationship
- Improves student-police officer relationship
- Other (please specify)
**CYCLE Kids Teacher Survey**

*Based on your experience teaching CYCLE Kids and observing its impact on your students, does the program have an effect on the following outcomes?*

<table>
<thead>
<tr>
<th>Observed (Certain) Negative Impact</th>
<th>Possible Negative Impact</th>
<th>No Impact at All</th>
<th>Possible Positive Impact</th>
<th>Observed (Certain) Positive Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical well-being</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social well-being</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emotional/psychological well-being</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Academic/intellectual well-being</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Has the CYCLE Kids program affected community interest and support for health and wellness?*

- Yes
- No

How has the CYCLE Kids program affected community interest and support for health and wellness?

![Comment Box]

*What do you believe parents would like to learn about CYCLE Kids?*

![Comment Box]

*What is the best way to share CYCLE Kids information with parents?*

- Email
- Regularly distributed printed newsletter
- Letter sent home at the start of the program
- Other (please specify)
**CYCLE Kids Teacher Survey**

**How helpful do you find:**

<table>
<thead>
<tr>
<th></th>
<th>I did not use it</th>
<th>Not very helpful</th>
<th>Does not add or hinder the program</th>
<th>Somewhat helpful</th>
<th>Very helpful</th>
</tr>
</thead>
<tbody>
<tr>
<td>The police involvement in the CYCLE Kids program?</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>The CYCLE Kids teaching curriculum?</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>The CYCLE Kids student textbook?</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>The support from CYCLE Kids?</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

*Do you receive support from school administration to teach the CYCLE Kids program?*

- Yes
- No

Please provide a brief description of the kind of support you receive from school administration.

Is there anything you would like to see removed from the CYCLE Kids curriculum?

Is there anything you would like to see added to the CYCLE Kids curriculum?

Do you have any suggestions for how families can adopt the CYCLE Kids lessons at home?

Is there anything else we should know that will help make the CYCLE Kids program a better experience for you and your students?
**CYCLE Kids Teacher Survey**

What was your overall experience with the CYCLE Kids program?

### Demographics

*How would you describe your school district?*
- Rural
- Suburban
- Urban

*What type of school do you teach in?*
- Public School
- Charter School
- Private School

*Is your school located in Cambridge or Somerville?*
- Yes
- No

*What kind of teacher are you?*
- Physical Education
- Health and Wellness
- Academic Classroom
- N/A (ex: Police Officer)

*Does a police officer teach the CYCLE Kids program with you?*
- Yes
- No

*How many years have you been teaching CYCLE Kids?*
- 1 year
- 2 years
- 3-5 years
- More than 5 years
REFERENCES


VITA

STEPHANIE A. MONTENEGRO

Address: 16360 SW 77 Terrace
Miami, FL 33193
305-528-0674

Email: stephanie.montenegro@gmail.com

Year of Birth: 1990

Education: University of Florida
Bachelor of Science in Biology
Minor in Nutritional Sciences

Boston University School of Medicine
Candidate for Master of Science in Medical Sciences, May, 2015

Work Experience

Emergency Department Scribe, Ocala, FL  March 2012 – July 2013

• Documented patients’ medical records throughout their stay in the emergency department.

Volunteer Experience

Shands Hospital, Gainesville, FL  January 2009 – January 2010
Volunteer

• Prepared syringes, disposed of expired medications, delivered medications throughout the hospital.

• Interacted with patients ensuring that they were comfortable throughout their stay in the hospital.

Collegiate Health Service Corps, Gainesville, FL  January 2011 – October 2011
Volunteer

• Participated in a mobile clinic providing health care to underserved, rural areas.
• Conducted a windshield survey of health care availability in a suburban neighborhood outside of Gainesville, FL.

**Camp Boggy Creek**, Eustis, FL  September 2011  
*Family Pal Volunteer*

• Camp counselor for chronically ill children.

**Shadowing**, Gainesville, FL  July 2011 – July 2013

• Observed several procedures in the pediatric emergency department including intubations, lumbar punctures, and laceration repairs.

**Research Experience**

**Maternal Child Health and Education Research and Data Center**, Gainesville, FL  January 2010—January 2011  
*Volunteer*

• Developed lesson plans to promote a healthy lifestyle in local elementary schools.

• Surveyed local recreational parks and evaluated correlation between park condition and local childhood obesity rates.

**Lupus Gene Expression in Mice**, Gainesville, FL  January 2011 – January 2012  
*Academic Research Credit*

• Designed primers for genes thought to be linked to the onset of lupus.

• Performed reverse transcription polymerase chain reactions in addition to real time polymerase chain reaction.

**Leadership And Activities**

**University of Florida Premedical American Medical Association**, Gainesville, FL  August 2009 – May 2012  
*Pediatric Interest Committee Director, Dance Marathon Delegate*

• Recruited and guided members participating in Dance Marathon, a yearlong fundraiser for Children’s Miracle Network.

• Organized volunteering events including Ronald McDonald House, and Hope Lodge, exposing members to medicine while advocating for the health and well being of children.