Kids Can BIKE!
A Parks and Recreation Program to Promote Youth Cycling

A Thesis
Presented for the
Master of Science
Degree
The University of Tennessee, Knoxville

Jessica Lynn Chandler
August 2012

Acknowledgement

Dr. David R. Bassett: Where do I start? Thank you for everything. Thank you for allowing me to come into your office what seems like 10 times a day. Thank you for being full of wonderful research ideas and allowing us to work on them with you. Also, thank you for being one of the smartest people I know. Knowing you were my major advisor felt like I was best friends with a celebrity. I will value these past two years more than you know.

Dr. Fitzhugh: Thank you for being you. You are amazing at what you do, even if you do ask the hardest questions in the department.

Dr. Waller: Thanks for having the most calming voice ever. I am grateful for your help in my knowledge gain of the evaluation process.

Dr. Thompson: Thank you, finally, for our life talk.

Dr. Coe: Thank you for introducing me to the world of Pediatrics. You are an awesome teacher and friend. Thank you for answering all of my ridiculous questions when passing by my "office".

To our class: I just need to say one last time that we were the most amazing class ever. Thank you for the laughs, the study nights, and all the support anyone could ever need. Without our dynamic, this program would have been very different.

To my family, friends, and loved ones: Thank you for you support in and out of my academic life. Without you all, these two years wouldn't have gone so smoothly.

ABSTRACT

Physical inactivity is a major concern, and is believed to contribute to the high prevalence of childhood obesity in U.S. schoolchildren. To address this problem, the Knoxville Area Coalition on Childhood Obesity launched a 'Kids Can BIKE!' program in 2012. The bicycling program is seven weeks long and is designed to increase physical activity, teach safe cycling skills, and explore Knoxville parks and greenways while having fun. The program targeted children in grades 4 and 5 who were already enrolled in an afterschool or summer program. Once a week, the children were transported to a location where they could safely ride. The city Department of Parks and Recreation transported the bicycles to the site in a 24-foot enclosed trailer, and provided staffing. The instructors were trained to deliver a safe cycling curriculum that included both physical activity and education components each week. The children were surveyed at the beginning and end of the program to determine the impact of the bicycle program on changes in bicycle knowledge and to evaluate their attitudes towards the program as a whole. There was a significant increase in the percentage of correct answers for all of the items combined ($p=0.008$). The children indicated high levels of satisfaction with the program. Bicycle education programs can be successfully integrated into existing afterschool and summer programs and may help children acquire the skills and knowledge to become lifelong bicyclists.

Table of Contents

LIST OF TABLES ..... **V**

CHAPTER1 ..... **1**

CHAPTER 2 ..... **4**

LITERATURE REVIEW **4**

2.1 After-School Programs and Physical Activity 5

2.2 Types of Youth Bicycle Programs in the U.S 11

METHODS **19**

Program Description 19

Data Analysis 22

RESULTS **22**

Program Participant Characteristics 22

Program Evaluation 24

Assessment of Bicycling Knowledge 24

DISCUSSION **25**

Future Implications 28

REFERENCES **29**

APPENDICES **31**

VITA **42**

List of Tables

Table 1. Descriptive Characteristics of Program Participants (N= 13)

Table 2. Previous Bicycle Experience of Program Participants.

Table 3. Participants Attitudes Towards Program Elements and Self-Efficacy.

Table 4. Bicycling Knowledge (as Determined by Percentages of Correct Responses) in Pre- and Post Survey Questions.

Chapter1

Introduction

Obesity rates in U.S children have increased over the past 50 years and between 1999-2000 and 2009-10, they increased in boys but not girls [1]. In 2010, 31.8% of U.S. children (ages 6-19) were either overweight or obese, defined as at or above the 85th percentile for body mass index (BMI) on the CDC growth charts [2, 3]. In addition, 16.9% of children were obese, defined as at or above the 95th percentile[4]

In order to control children's weight so these comorbidities aren't a concern, proper physical activity and nutrition must be obtained [5]. A review published by Strong et al.,[6] found that 60 minutes a day of moderate to vigorous physical activity (MVPA) was the most beneficial for school-aged children. This evidence-based paper was influential in shaping the current public health recommendations for physical activity in youth. The 2008 National Guidelines for Physical Activity for children and adolescents (ages 6-18 years) include aerobic, bone strengthening, and muscle strengthening recommendations[6, 7]. Children aged 6-17 should engage in 60 minute or more of moderate-to-vigorous aerobic activity. Muscle strengthening and bone strengthening activities should be incorporated at least three days per week, and can make up part of the 60 minutes of aerobic activity. Only 41.4% of U.S children meet these recommendations[8].

Over half of U.S children are not meeting the recommendations for physical activity and 47.3% of children are exceeding the recommendations for sedentary time [8]. The immense increase in sedentary time can be tied to the decrease in active transport and the

increase in technological advances [9]. Technological advances range from the ownership and placement of televisions, computers, gaming systems, telephones, washing machines and even automobiles. Changes in active transport and electronic entertainment have made it easy for children to become inactive.

Sedentary screen time is recommended not to exceed two hours per day [10, 11]. Nearly 47% of all U.S children report more than two hours of sedentary time per day[10]. These rates are worse for obese children with 62.3% of obese boys and 54.7% of obese girls exceeding the recommended two hours of sedentary time

Afterschool programs provide a good opportunity for children to acquire more physical activity. From 1985 to 1998, the percentage of children with both parents working increased from 63 to 71%, thus increasing the demand for afterschool programs[12]. Currently 8.4 million youth participate in afterschool programing[13]. The prevalence of obesity was significantly lower for afterschool program participants compared to nonparticipants at 21 and 33% respectively[13]. Further, the afterschool setting has been identified as an adequate setting for increasing physical activity in youth [14].

Thus, more programming to promote physical activity in youth should be offered. Using the afterschool setting in combination with age appropriate activities can allow youth to acquire their daily physical activity [6]. School aged children should not be participating in the same activities as the 2.5 year olds [6]. Generally, bicycling has been thought to be an age-appropriate and developmentally sound activity for elementary age children as long as proper safety measures are taken.

Bicycling can also be considered a useful skill to maintain throughout life. Learning the rules of the road such as which side of the street to ride, turn signals, and bicycle laws is

not something that every child has the opportunity to learn. Als0, having the knowledge to maintain and upkeep a bicycle is something that can carry a person and a bicycle further than the simple knowledge of riding

Bicycle can further the healthy development of children, and serve as a mode of transportation. Engaging in this age-appropriate activity can help children achieve recommended levels of daily physical activity, and in turn, help combat the childhood obesity epidemic. Learning these skills and habits as a child is important in developing a healthy lifestyle.

Chapter 2

Literature Review

The percentage of overweight and obese children in the U.S has increased greatly over the past 50 years and has leveled out for the time being [1]. In 2009-2012, the prevalence of overweight and obese in U.S. children was 31.7% and 16.9% respectively. Obesity can lead to a variety of health problems in children [15-17]. Several factors contributing to the obesity epidemic are: a lack of adequate physical activity, poor nutrition, and an increase in sedentary time [10].

Childhood obesity can have detrimental health implications [15, 16]. Obese children have an increased risk for cardiovascular complications such as high blood pressure, high cholesterol levels and abnormal glucose tolerance) [16, 18, 19]. Another epidemic is the increased number of children being diagnosed with Type 2 diabetes, which was previously termed "adult onset diabetes"[16, 17]. Type 2 diabetes manifests itself as increased glucose intolerance and decreased insulin sensitivity. Hyperlipidemia is also of concern to obese children. With higher levels of LDL and lower levels of HDL, obese children may be at an increased risk of future cardiovascular disease. Childhood obesity can also result in orthopedic problems[15]. The bone and muscle strength of a child is not equipped to handle excessive body weights. Carrying the extra weight can cause osteoarthritis, bowing of the tibia and femur, and ultimately Blount's Disease [15]. These issues can have lifetime effects on youths. Overweight and obese children have higher risks of developing asthma; 52% and 60% respectively [20]. Hepatic steatosis, also referred to as fatty liver, is due to

high concentrations of liver enzymes, which can be resolved after weight reduction [21]. Obese children are more likely to suffer from sleep apnea [19].

In addition to these physical problems, obese children are also subject to psychological problems. Obese children are often subjected to teasing and bullying, which has detrimental psychological effects on a child. Children who are obese tend to be more likely to have poor body image and higher rates of loneliness, sadness, and nervousness. A study assessing depressive symptoms in third grade students found that overweight concerns were significantly associated with depressive symptoms [22]. Self-image and social acceptance are important to children, and being overweight or obese can negatively affect both[16]. Ensuring that children acquire adequate physical activity and nutrition can help combat these obesity related health implications.

Afterschool programs have been identified as an adequate setting for increasing physical activity levels using age appropriate activities for youth [13]. Bicycling is an aerobic activity that is well suited to a child's pattern of physical activity, which tends to have short "spurts" of activity interspersed with rest [23]. This review of literature will discuss the effects of afterschool programs as related to children's physical activity. It will also review bicycle programs for youth across the U.S.

2.1 After-School Programs and Physical Activity

With decreased budgets and extra time in schools, physical education and activity time are being cut. The National Afterschool Association (NAA) recognizes this and helps advocate and push for a better, more useful experience for children afterschool. They publish recommendations, such as checklists for productive afterschool programs, in order

to give ideas on how to enhance children's learning and skill development during the hours between school and dinner. There are many recommendations made by the NAA including art, academic, technology and physical activity. Their position is that it takes a collaboration of all of these aspects and all leaders of a child's day (parents, school teachers and principal, and afterschool leaders) to create a fully integrated day[24]. There have been several studies focused on evaluating all aspects of the afterschool day, but this review will focus on the physical activity outcomes.

Howe et al.[25] evaluated a 10-month physical activity intervention's effect on cardiovascular fitness and the prevention of excessive age-related increases in body fatness. The participants were African American boys, ages 8-12. The major outcome variables were body composition, physical activity and cardiovascular fitness. The intervention consisted of 30 minutes of homework followed by 80 minutes of physical activity. Participants were randomized into either the intervention group or control group. The control group did not receive the intervention and were not allowed to stay after school for the intervention. The investigators split the data into groups regarding attendance rates. Each participant either belonged to the control group, intervention group that participated in greater than 60% of sessions (compliant, or ATT), or intervention group that did not participate in at least 60% of sessions (non-compliant, or NATT). The average energy expenditure during the entire 80-minute physical activity portion was about 370 kcals. The physical activity portion of the program included skill development such as dribbling a basketball, vigorous physical activity including basketball, tag softball and relay races, and a toning and stretching component. Physical activity increased in the ATT group by nearly 35 minutes of MVPA, but no change was reported in the NATT and

control group. The boys in the ATT group had a significant reduction in body fat, body mass index (BMI) and fat mass compared to the NATT and control group[25]. The important finding of this study was the 35-minute of vigorous physical activity accounting for more than half of the caloric expenditure during the entire two-hour session. Only the participants in the ATT had significant positive results[25].

Barbeau et al. [26] evaluated the same 10-month intervention as Howe et al., but reported on the girls who were invited to participate. The same objectives and outcome measures were reported. Girls in the intervention group experienced a greater decrease in BMI and body fat percentage, and a greater increase in bone mineral content, bone mineral density, cardiovascular fitness, moderate physical activity and moderate-to-vigorous physical activity. All of these improvements were significant. Vigorous physical activity increased, however not significant. In addition, the change in body fat percentage was linked to the attendance rates. Those participants that attended 80% or more of total sessions had the greatest change in body fat percentage. Taken together, these two studies help to show that adherence is important and having higher intensity activities can help reach the objectives of the intervention.

Coleman et al. [27] evaluated an alliance of afterschool programs in Kansas. The alliance consisted of seven Boys and Girls Club programs. The programs were selected to be part of an intervention called Healthy Opportunity for Physical Activity and Nutrition (HOP'N). The data from this article are the pre-intervention data. The primary aim of HOP'N was to improve the quality of afterschool programs to prevent childhood obesity. The researchers used System For Observing Fitness Instructor Time (SOFIT) to assess the content of the afterschool programs. Over the course of once year of observations, results

were that 15-minute of snacking, 47 minutes of activity, 41 minutes of enrichment and 36 minutes of academics were observed. Of the 47 minutes of activity, 49% was during organized or teacher-led play and 51% in free play. Another finding of the observations is related to the encouragement given by instructors to either be physically active or not. Discouragement of physical activity was usually during instruction or management time and was usually in the form of standing. The leaders asked the children to stand and listen while instructions were given, attendance was taken, and other sorts of management tasks were conducted. To be expected, the leaders discouraged physical activity during organized time more than during free play. Overall, encouragement of physical activity was more common than discouragement, but because the leader discouraging during organized activities, children missed opportunities to acquire needed physical activity [35]. In the organized sessions of the program, children spend 8% more time sitting and 9% more time standing than in free-play time. Leaders were observed discouraging physical activity more during organized time than free time. Thus, it is important that the leaders of afterschool programs are trained how to implement structure and discipline while encouraging physical activity to children.

Dzewaltowski et al. [28] reported on the Healthy Opportunity for Physical Activity and Nutrition (HOP'N) after school program. The intervention included 30 minutes of organized daily physical activity, a daily healthful snack including a fruit or vegetable (FV) and a weekly nutrition and physical education experience. Children from seven schools were assessed for body mass index z scores (BMIz), physical activity and sedentary behaviors. The program was assessed via System for Observing Fitness Instructor time (SOFIT) for healthy eating and physical activity opportunities. Activities were classified

into one of four different sessions as mentioned before [27]. After two years, BMIz scores had no significant change. There was a trend, however, toward improvement in the BMIz scores in overweight/obese children. The control groups BMIz scores increased by 0.4 units while the intervention group had no change. This trend was noted in the first year only. There were no significant changes in BMIz scores between groups at baseline, one year or two-year time points [28]. At control sites, the moderate to vigorous physical activity (MVPA) in overweight/obese children decreased by 9.65 minutes over the two years while it showed a trend of increasing by 5.92 minutes in the intervention group. During active recreation time, overweight/obese children were more sedentary than normal weight children, but there were no differences in sedentary activity in intervention year 1 and 2. Additionally, the difference seen at baseline in MVPA, between overweight/obese children and normal weight children in the intervention group diminished by intervention year two[28].

This study is one of the first to show that weight status moderated the effectiveness of the after school intervention. The overweight and obese children seemed to gain the most out of the intervention by increasing their MVPA by 6 minutes and by decreasing their sedentary time. However, no improvement in BMIz scores were was seen, but the authors noted the possibility that in order to significantly change them, more than 30 minutes of physical activity is needed. This is important in light of the above-mentioned finding that obese and overweight children were the ones reached through this intervention.

Kelder et al. [29] reported on an idea that was originally implemented throughout the school day: Coordinated Approach to Child Health (CATCH). The CATCH Kids Club is an extension of the original physical activity programming into afterschool programs. Kelder

et al. [29] assessed 16 different sites implementing this program. The three components of the program included education, physical activity and snack. The main outcome variable was time spent in varying activities. The activities included everything from sedentary to vigorous levels of activity. These results were compared to control schools in which there was no intervention. Results were reported in percentage of afterschool time spent in each activity. In the intervention schools, 29.46% of time was spent in MVPA at baseline versus 56.84% at posttest. On the other hand, sitting time went from 24.36% of the time to 8.84% of total time. There were numerous other findings regarding educational and snack components, but clearly the program was successful in terms of increasing physical activity[29].

Focus groups were held to better understand what was enjoyable and not so enjoyable about the CATCH after school program, from the participants and leaders' perspectives. Both students and teacher reported in focus groups that they enjoyed the program. The younger children enjoyed simpler activities such as beanbags compared to complex activities involving multiple equipment pieces. The leaders reported that five days a week of a structured activity was too much, and requested only doing two or three days a week. They also reported the children seemed to not like the educational component of the program as much as the physical activity. This preference for the physical activity component was possibly be due to the children not wanting to sit in a class during an afterschool program as soon as the school day ended. Also, the children liked the healthy food preparation [29].

An issue noted was turnover of staff and its effects on the participants. This article points out that staff turnover does affect the success of the program. If the staff is not

trained properly or does not believe in what is being done, the success of the program is a stake. While this was not measured, it was mentioned in the focus groups.

Weintraub et al. [30] evaluated the feasibility, acceptability and efficacy of an after school team sports program for reducing weight gain in children. Co-ed soccer was chosen as the sport based on previous research showing its acceptability and feasibility of teaching the sport. The program was offered four days a week for two and a half hours. Seventy-five minutes of the session was spent doing physical activity. The intervention group experienced beneficial effects on BMI and BMIz scores. What children reported liking most about the program was having fun, making friends and being part of the team. They also reported liking the coaches and learning about health and exercise. Results were modest, but the feedback on what was enjoyable to children is important. Moderate to vigorous physical activity, moderate physical activity and vigorous activity changed minimally, but knowing the thoughts of the children helps build the literature on afterschool efforts to promote physical activity.[30] The children liked that they were part of a team and making friends. These responses from children should be used when developing physical activity intervention. While changes in physical activity are the desired outcome, it is also essential that the activities are age appropriate and well received by the children.

2.2 Types of Youth Bicycle Programs in the U.S

Strong et al.[6] recommended that children should receive at least 60 minute of moderate to vigorous physical activity per day, and that these should be age-appropriate activities. Elementary school-aged children should not be participating in the same

activities as the 2-5 year olds or high school youth [6]. Bicycling is an age-appropriate activity for elementary school-aged children as long as proper safety measures are taken.

Bicycling is a useful skill that can be learned in childhood and maintained throughout life. The motor skills necessary to ride a bicycle, once mastered, are never forgotten. Children also need to learn the rules of the road such as which side of the street to ride on, hand turn signals, and bicycle laws. They also need to acquire the knowledge to maintain and repair a bicycle, which will stay with them into adulthood. There are different types of youth bicycling programs throughout the country that contribute to youth's knowledge and skills of bicycling.

There are nearly 80 earn-a-bike programs in the U.S. Earn-a-bike programs allow children to acquire an old bike, fix it up to working condition, and actually keep the bicycle for transportation or recreation use at the end of the program [31]. The programs usually teach mechanical aspects of bikes so that kids can upkeep their bike once the program is over. Children learn to take apart, clean, reassemble and adjust different working systems of the bicycle. This helps them have the full working knowledge of a bicycle [31]. While the main goals of these programs are not necessarily physical activity gain, it can be a secondary positive outcome.

A program based out of New York, 'Recycle-A-Bicycle' [32] is dedicated to health, development, stewardship, and empowerment of New York youth ages 10-17. Their youth program includes the teaching of bicycle mechanics and repair techniques. The leaders teach the students to promote environmental stewardship by bicycling and caring for the community. The Earn-A Bike program that Recycle-A-Bicycle offers starts with classes teaching a specific bicycle curriculum not described in detail on their website. However, the

hours spent in the sessions are counted towards “credits” in order for these participants to “purchase” their own bicycle frame. The participants are able to earn more credits by working on more of the bicycles, volunteering, and attending classroom sessions [32].

The Kids Ride Club, through ‘Recycle a Bicycle’, teaches youth aged 10-17 years safe cycling and group riding on the streets of New York. In addition to learning about cycling, they learn the benefits of eating well and living a healthy and active lifestyle. These rides occur in the months from April to October. Collectively, more than 100 kids ride 10,000 miles and burn over 1,500,000 calories each year [32].

In 1996, Neighborhood Bike Works (NBW) was founded in Philadelphia, Pennsylvania. Its vision is to be a program that produces positive activities for urban youth (ages 8-17) by offering educational, recreational and career-building opportunities through bicycling [33]. The program also helps promote bicycling as a healthy, affordable and environment-friendly form of transportation. NBW offers classes on bicycle repair and safety in the afternoons, weekends, and summertime. Youth can earn their own bike by completing 15 of these classes. NBW also offers group rides with an average of one ride a month. These rides, with good behavior, can be counted towards credit towards earning a bicycle [33].

Cascade Education Foundation, founded in 1970, has created a bicycle club that offers different services across the country. The bicycle club is based out of Seattle, Washington. Their mission is to create a better community through bicycling [34]. Their website provides ideas related to bicycle rodeos. They offer materials as well as their personal services. The bicycle club has set rates for different events including bicycle rodeos, school assemblies, summer camps, bicycle classes, and even special pricing for

helmets. The classes include urban cycling skills as well as bicycle maintenance. The school assemblies are geared mostly to safety as well as promoting bicycling as a mode of transportation [34].

Blackstone Bicycle Works was founded in Chicago, Illinois in 1994. Youth aged 9-16 years of age are able to participate in volunteer hours on fixing bicycles in order to earn their own [35]. Participants first learn how to fix a flat tire and work up to disassembling and reassembling an entire bicycle. As well as learning these useful skills, participants are able to learn how to conduct themselves in a bicycle shop/business setting. Volunteering for 25 hours afterschool will allow children to earn their own bicycle, helmet, and lock. Further, some of the more advanced volunteers can become paid employees to help work on customer's bike repairs and orders, as well as helping the younger Earn-A-Bike participants [35].

Kids on Bikes is a non-profit organization, serving the Colorado Springs area, whose aim is to provide brand new bikes and equipment such as helmets to underserved children. By giving away bicycles, this group provides opportunities to youth and serves as a motivating force for these children. They also hope that by participating, children will become inspired and are able to grow in confidence. While there is no safety course that is provided along with the bicycle, Kids on Bikes does partner with the community to deliver presentations on bicycles safety, nutrition, physical activity and bicycle as a means for transportation. Events such as the "Kids on Bikes Festival" provide opportunities for children in the community to learn and bicycle safety. With the main goal of this program being to give away bicycles to underserved youth, there are many other outcomes that may

result from this opportunity including gained confidence, increased motivation for success, and a healthier lifestyle [36].

Trips For Kids is a non-profit organization that provides mountain biking experiences for children throughout the U.S., Canada, and Israel. With more than 60 chapters, over 90,000 at-risk youth have been given the experience of mountain biking in a group setting. The Trips for Kids group provides all materials, so children just show up and get to ride. Their goal is to "combine lessons in confidence building, achievement, and environmental awareness through the development of practical skills and the simple act of having fun." This program might have the ability to inspire children to be a part of their mountain biking community through participation in this program [37].

A competitive cycling group in Kentucky, Red Zone Cycling, also provides bicycle-learning experiences for youth. There missions is to "Be Safe…Have Fun… and Ride Fast..really, really FAST." They aim to teach safety and have fun, but also produce competitive youth riders. While some of the advanced riders on the team compete, the beginners are welcomed into the team to learn the basics of riding bicycles as a sport. This competitive environment can help children grow and strive towards a goal [38].

In conclusion, today more than ever, children are in need of proper guidance on a healthy lifestyle. Sedentary activity should be limited and proper amounts of physical activity should be achieved in order to attain health benefits. Children should accumulate 60 minutes of physical activity per day and have no more than two hours per day of sedentary screen time. After school settings have been identified as an appropriate setting for physical activity gain using many different approaches. Bicycling is an age appropriate activity for elementary aged children that can, with adequate sources, be integrated into

the after school setting in order to provide physical activity to children. Bicycling, as part of an afterschool program, should be studied to determine the positive impacts it can provide.

Chapter 3

Manuscript

Introduction

Obesity rates in U.S children have increased over the past 30 years [1]. In 2010, 31.8% of U.S. children (ages 6-19) were either overweight or obese, defined as at or above the 85th percentile for body mass index (BMI) on the CDC growth charts [2, 3]. In addition, 16.9% of children were obese, defined as at or above the 95th percentile [4].

Childhood obesity can have detrimental health implications such as diabetes, hypertension, joint problems, and asthma [15, 16]. Obese children have an increased risk for cardiovascular complications such as high blood pressure, high cholesterol levels and abnormal glucose tolerance [16, 18, 19]. In addition to these physical health problems, obese children may suffer psychological problems [16]. Obese children are often subjected to teasing and bullying, which has detrimental psychological effects on a child. Children who are obese tend to be more likely to have poor body image and higher rates of loneliness, sadness and nervousness. A study assessing depressive symptoms in third grade students found that overweight concerns [22] were significantly associated with depressive symptoms. Self-image and social acceptance are important children, and being overweight or obese can negatively affect both[16].

To counteract childhood obesity and its comorbidities, proper physical activity and nutrition must be obtained [5]. The 2008 National Guidelines for Physical Activity for children and adolescents (ages 6-18 years) include aerobic, bone strengthening, and muscle strengthening recommendations [6, 7]. Children aged 6-17 should engage in 60 minute or more of moderate-to-vigorous aerobic activity. Muscle strengthening and bone

strengthening activities should be incorporated at least three days per week, and can make up part of the 60 minutes of aerobic activity. Currently, it is estimated that only 41.4% of U.S children meet these recommendations [8].

Although there are no recognized guidelines regarding sedentary time, the American Academy of Pediatrics recommends that children should not exceed more than two hours of screen time per day [8, 11]. However, 47.3% of children are exceeding the recommendations for sedentary time [8]. The temporal trend towards increases in sedentary time can be tied to the declines in active transportation (e.g.- walking or biking to school) and the increased use of modern technology [9]. Technological advances that have impact children's activity levels include televisions, computers, gaming systems, telephones, washing machines and even automobiles. Changes in active transport and electronic entertainment have made it easy for children to become inactive. Active transport to and from school was a common mode of travel in the 1960's [9]. Nearly 41% of all trips to and from school were made by active transport in 1969 compared to 12.9% in 2001[9]. More specifically, elementary-aged students had the biggest decrease (34.2%) in active transport from 1969-200l; 49.3% and 15.1% respectively [9].

Bicycling is a useful skill to maintain throughout life. Bicycling, especially on roads shared with motor vehicles, requires similar cognitive and motor skills to driving a car [39]. Children must learn the rules of the road such which side of the street to ride, turn signals, and bicycle laws is not something that every child has the opportunity to learn. In 2007, bicycling collisions were among the top five reasons that children (ages 5-14) were admitted into emergency rooms in the U.S [40]. Learning traffic rules at a younger age may

help reduce the amount of collisions that occur. Also, having the knowledge to maintain a bicycle is useful information that a child can carry into adulthood.

Bicycling can be used in the afterschool setting to further the healthy development of children. The cycling skills learned can be used as a mode of active transportation, or as a recreational activity. The physical activity gained from incorporating this age appropriate activity can help children receive their recommended daily physical activity, and in turn, help combat the childhood obesity epidemic.

The purposes of this study are to evaluate a youth bicycle-sharing pilot program designed to determine the program's impact on: 1) attitudes towards the program as whole, and 2) changes in bicycle safety and skill knowledge.

Methods

Program Description

East Tennessee Children's Hospital and the Knoxville Area Coalition on Childhood Obesity (KACCO) launched 'Kids Can Bike!' in March of 2012. The purposes of this program were to acquire physical activity, explore the Knoxville Greenways and Park system, teach safe cycling skills and have fun. The local Ronald McDonald House Charities awarded a grant of nearly $27,000 for purposes of creating and maintaining the program for five years. A sub-committee of KACCO met once a month for nearly two years to develop the program's curriculum and work out the logistics of the program

Several organizations were represented on the Kids Can Bike! sub-committee. These included the East Tennessee Children's Hospital, the Knoxville Transportation Planning Organization (TPO), the City of Knoxville's Park and Recreation Department, and

the University of Tennessee Department of Kinesiology, Recreation, & Sport Studies. Representatives of these organizations provided the necessary expertise needed to create of the program (Appendix E)

The equipment needed to start Kids Can Bike! was identified in the planning stages. Forty Giant ™ bicycles were purchased (along with 5-year maintenance agreements) in four different sizes in order to accommodate the children, volunteers, and ride leaders. A 24-foot enclosed trailer was purchased and retrofitted in order to store and transport the bicycles being used. Helmets were purchased in children and adult sizes as well as donated from the local Epilepsy Foundation. Water bottles were purchased so that the children could remain hydrated during the rides. Each child was given a helmet and water bottle at the start of the program. Bicycle combination locks were purchased, and these were given to the children at the completion of the program. Bicycle repair equipment (pumps, wrenches, tire levers, inner tubes, etc.) were purchased for the adult leaders to use. First aid equipment and battery-powered portable radios were supplied by the Department of Parks and Recreation.

Planning meetings, headed by the KACCO director, were held to discuss program specifics. Over a 2-year period, the committee produced plans for the first year of the program, including a curriculum that is described below. The committee decided to include fourth through sixth graders attending afterschool or summer programs in the Knoxville area.

The 7-week program consisted of weekly bicycling events with the children. Bicycles were transported each week to the site in the trailer, using a truck owned by the

City of Knoxville Department of Parks and Recreation. The ride leaders were Parks and Recreation employees, and a UT graduate student assisted with the program.

Week 1 was a bike rodeo, conducted for the purpose of fitting children with bikes and determining which children had the basic skills needed to safely participate in the program. Four stations were established to test the existing bicycle skills of the children, using plastic cones and sidewalk chalk. These included riding a straight line, a figure eight drill, a turning drill, and a zig-zag course.

Week 2 consisted of a session held at the afterschool or summer program facility in order to teach the participants' bicycle and helmet fitting as well as basic bicycle maintenance. This session was used to teach the participants how to fit a bicycle and helmet to themselves. Basic bicycle maintenance was taught including checking the air in tires with a pressure gauge, pumping Air in tires, Brake checks, and Chain checks (ABC).

Week 3 was held at "Safety City" a facility owned and operated by the City of Knoxville Police Department. A Safety City instructor taught the children how to be a safe pedestrian by using crosswalks, sidewalks, and traffic lights. During their time at Safety City, the children practiced riding their bicycles around the city and obeying the traffic laws. This served as basic training for the children to learn the rules of the roads.

Weeks 4 through 7 were spent riding on different greenways with the ride leaders and a student volunteer accompanying the children. After a brief instructional lesson, the goal was to accumulate at least 35 minutes of constant riding.

A formative program evaluation was conducted, as required by the grant. The children were asked to fill out an entrance survey designed to assess their cycling knowledge and skills, and at the end of the program they filled out an exit survey designed

to re-assess their knowledge and perceptions of the quality of the bicycling program. The surveys are attached as Appendix A.

Data Analysis

The survey data, stripped of identifiers, were provided to the researchers by the KACCO for the purposes of secondary data analysis. Data were analyzed using IBM SPSS Statistics Version 19. Chi Square and paired sample t-tests were used to compute differences in the outcome variables (bicycling knowledge and satisfaction with the program). Pre- and post-test measures for knowledge were combined and analyzed using paired sample t-test to determine if there were changes in total bicycling knowledge.

Results

Program Participant Characteristics

Paired survey data were obtained for 13 of 16 pilot program participants in the first two sessions of the Kids Can Bike! program; three of the children dropped out. These participants belonged to the first two sessions of the Kids Can Bike! program. One group met on Tuesdays for seven weeks, while the other met on Thursdays throughout the same seven weeks. This program format is designed to continue for five years. The participant surveys were grouped together due to limited number of paired surveys.

Table 1 describes the characteristics of the program participants. It indicates that the participants averaged 10 years of age, and the majority of them classified themselves as female, in the fifth grade, and Caucasian.

Table 1. Descriptive Characteristics of Program Participants (N=13)

Demographic Characteristic	n	
Age (yr.)		10.2 ± 0.9 yrs
Sex		
Male	5	38.50%
Female	8	61.50%
Grade		
3rd	1	7.70%
4th	4	30.80%
5th	8	61.50%
Race		
African American	2	15.40%
Caucasian	7	53.80%
Other	4	30.80%

Abbreviations: SD=standard deviation

The previous bicycle experiences of participants are displayed in Table 2. These results indicate that all respondents owned a bike, but none owned a bicycle lock and over a third did not own a helmet.

Table 2. Previous Bicycle Experiences of Program Participants

	n	**Yes**
Do you own a bike?	13	100%
Do you own a helmet?	8	61.50%
Do you own a bike lock?	0	0.00%
Have you ever ridden your bike on a greenway?	5	15.40%

Program Evaluation

Attitudes towards the program were assessed by nine questions using a Likert scale ranging from 1 to 5, with lower scores indicating greater enjoyment. Results indicate all of the participants (100%) agreed that the program was fun and the leaders were helpful (Table 3). In all of the other categories, a majority of the children gave positive responses, indicating high levels of satisfaction with the bicycle program.

Table 3. Participants Attitudes Towards Program Elements and Self- Efficacy

Program Elements and Self Efficacy	**Agree**	**Neutral**	**Disagree**
The program was fun.	100%	--	--
The leaders were helpful.	100%	--	--
The bike rodeo was fun.	84.6%	7.7%	7.7%
The visit to Safety City was fun.	92.3%	--	7.7%
The greenway bike rides were fun.	92.3%	7.7%	--
The rides were a good distance.	84.6%	--	--
I learned a lot from the program.	84.6%	15.4%	--
I am better at biking now.	84.6%	7.7%	7.7%
I like biking.	84.6%	7.7%	7.7%

Assessment of Bicycling Knowledge

Table 4 shows the change in individual bicycling knowledge scores. There were no significant changes from pre- to post-test, when looking at individual questions. However, when all pretest scores were combined and compared to the combined posttest scores, a significant increase in knowledge was detected (pre: 3.31±0.63 correct responses vs. post: 3.77±0.44 correct responses; $p=0.008$).

Table 4. Percentages of Correct Responses in Pre- and Post Survey Questions

	% Correct		
Subject of Question	**Pre**	**Post**	**Sig.**
Stop Sign	92.3	100	--
Side of Road	53.8	92.3	0.261
Hand Signaling	92.3	100	--
Crossing Road	92.3	84.6	0.657
TOTAL SCORE	82.7%(15.8%)	94.2%(10.9%)	.008*

*Significant difference, as determined from paired samples t-test (P<0.05)

The survey also found similarities in participant's favorite and least favorite portion of the program. Specifically, the children reported that their favorite part of the entire program was the visit to Safety City (n=5), followed by the bicycle rodeo (n=3). The part of the program that participants reported disliking the most was bicycling uphill (n=7).

Discussion

The results of these surveys show no significant change in individual question knowledge, but there was a significant change in the total bicycling knowledge gained from the beginning to the end of the program (P=0.008). The lack of change in individual test items could be due to the high level of knowledge that the participants demonstrated on the pre-test. As the sessions continue, the Kids Can Bike! committee may elect to alter the bicycle knowledge questions. Since only thirteen participants in the pilot program were evaluated, this decision cannot be made yet.

The program evaluation part of the survey indicated overwhelming positive responses to the program. The surveys also contained two open-ended questions

regarding most favorite and least favorite aspects of the program. The children were able to write-in their answers according to what they found to be most and least enjoyable. These responses from children will be taken into account at KAACO's meeting and used to guide the curriculum design and locations of program. After evaluating the CATCH Kids Club Pilot program, Kelder et al.,[29] concluded that taking children's opinions into account is important when designing or updating a program. Since the committee that makes the decisions regarding the program consists only of adults, the children's responses to these questions should be considered.

In contrast to the article by Kelder et al., [37] none of the participants reported not liking the educational parts of the curriculum. The explanation given by Kelder et al., was that their participants' responses could have been due to coming straight from school and having to sit down and pay attention again. This program integrated education into the physical activity portion of the program. The children were minimally aware that they were gaining knowledge in the course of their involvement in the exciting bicycle rides.

Coleman et al., [27] evaluated the Healthy Opportunity for Physical Activity and Nutrition program (HOP'N) and reported that leaders' actions and enthusiasm can affect the degree to which children like and participate in afterschool programs. It seems that encouragement is key to the success of a program. In Kids Can Bike!, the participants overwhelming responded that they enjoyed the program, which could be a result of the program leaders and adult volunteers taking part in the entire program. Leadership provided by the adult mentors may have given children the necessary encouragement needed to make a program successful.

Kelder et al., [29] reported that staff turnover can affect children's participation rates in afterschool programs. Kids Can Bike! participants encountered the same three adults leaders and volunteers every session for the program's duration. Consistency in leadership may be a key quality of a successful afterschool program. Thus, the adult leaders should be someone who the children already know, or who they can learn to rely on.

In the HOP'N intervention, Howe et al., [25] showed that the participant group that had the highest rates of attendance showed the most improvements. While attendance was not directly reported on the surveys, the participants who completed both surveys complete almost all of the seven sessions of the program. As the program continues, attendance should be reported in order for these correlations to be run.

The Kids Can Bike! pilot program achieved its goals and the program fidelity was high. Participating children got on average 30-40 minutes each session and traveled 3-4 miles by bike. They had an increase in bicycle knowledge as related to safe cycling. The children explored a different greenway each week of the program. They learned safe cycling skills in the bike rodeo and safety city week, and their bicycling knowledge increased over the course of the program. Participant's satisfaction was high, although the program will be altered according to what was learned after the first year of programming. In the future, the goal is to provide the program to children in Knoxville for at least five years. Resources and staffing provided by the Knoxville Parks and Recreation department, as well as recruitment of student volunteers from the University of Tennessee, should help to ensure the sustainability of the program.

Future Implications

As the Kids Can Bike! program continues, more evaluations should be done to strengthen the current findings. The participants undoubtedly liked the program and the leaders. In terms of the educational component as well as the skill level, the curriculum design seems to be age-appropriate and enjoyable. Consistent adult leadership also seems to be a key to the success of the program. Evaluating the leaders with a tool such as SOFIT may be of benefit to determine what aspects of leadership are of greatest impact. Also, in order to quantify the amount of physical activity received, a bicycle computer could be added to the children's or leader's bicycles. These would help track time and mileage ridden during each session. A case study could be done in order to help determine the continued riding habits of participants after the program. As sessions continue, we will be able to draw more conclusions regarding the Kids Can Bike! program and its effects on elementary school-age children.

References

1. Ogden, C.L., et al., *The epidemiology of obesity.* Gastroenterology, 2007. **132**(6): p. 2087-102.
2. Ogden, C., et al., *Prevalence of High Body Mass Index in US Children and Adolescents, 2007-2008.* JAMA, 2010. **303**(3): p. 242-249.
3. Kuczmarski, R.J., C.L. Ogden, and Grummer-StrawnLM, *CDC Growth Charts: United States.* Adv Data, 2000. **314**: p. 1-27.
4. Ogden, C.L., et al., *Prevalence of obesity and trends in body mass index among US children and adolescents, 1999-2010.* JAMA, 2012. **307**(5): p. 483-90.
5. Hill, J.O., et al., *Obesity and the Environment: Where Do We Go from Here?* Science, 2003. **299**: p. 853-855.
6. Strong, W.B., et al., *Evidence Based Physical Activity for School-age Youth.* The Journal of Pediatrics, 2005. **146**(6): p. 732-737.
7. Services, U.S.D.o.H.a.H., *2008 Physical Activity Guidelines for Americans. In: Office of Diease Prevention and Health Promotion, ed. .* 2008. **Washington HHS**.
8. Troiano, R.P., et al., *Physical Activity in the United States Measured by Accelerometer.* Medicine & Science in Sports & Exercise, 2007. **PAP**.
9. McDonald, N., *Active Transportation to SchoolTrends Among U.S. Schoolchildren, 1969–2001.* American Journal of Preventive Medicine, 2007. **32**(6): p. 509-516.
10. Sisson, S.B., et al., *Profiles of sedentary behavior in children and adolescents: the US National Health and Nutrition Examination Survey, 2001-2006.* Int J Pediatr Obes, 2009. **4**(4): p. 353-9.
11. Education, C.o.P., *Children, Adolescents, and Television.* Pediatrics, 2001. **107**(2): p. 423-426.
12. Sarampote, N., H. Bassett, and A. Winsler, *After-School Care: Child Outcomes and Recommendations for Research and Policy.* Child & Youth Care Forum, 2004. **33**(5): p. 339-348.
13. Mahoney, J.L., H. Lord, and E. Carryl, *Afterschool Program Participation and the Development of Child Obesity and Peer Acceptance.* Applied Developmental Science, 2005. **9**(4): p. 202-215.
14. Trost, S.G., R.R. Rosenkranz, and D. Dzewaltowski, *Physical activity levels among children attending after-school programs.* Med Sci Sports Exerc, 2008. **40**(4): p. 622-9.
15. Dietz, W.H., *Health consequences of obesity in youth: childhood predictors of adult disease.* Pediatrics, 1998. **101**(3 Pt 2): p. 518-25.
16. Deckelbaum, R.J. and C.L. Williams, *Childhood obesity: the health issue.* Obes Res, 2001. **9 Suppl 4**: p. 239S-243S.
17. Pi-Sunyer, F.X., *Medical Hazards of Obesity.* Annals of Internal Medicine, 1993. **119**(2): p. 655-660.
18. Boyd, G.S., et al., *Effect of obesity and high blood pressure on plasma lipid levels in children and adolescents.* Pediatrics, 2005. **116**(2): p. 442-6.
19. Freedman, D.S., et al., *Relationship of Childhood Obesity to Coronary Heart Disease Risk Factors in Adulthood: The Bogalusa Heart Study.* Pediatrics, 2001. **108**(3): p. 712-718.

20. Gilliland, F.D., *Obesity and the Risk of Newly Diagnosed Asthma in School-age Children.* American Journal of Epidemiology, 2003. **158**(5): p. 406-415.
21. Vajro, P., et al., *Persistent hyperaminotransferasemia resolving after weight reduction in obese children.* Journal of Pediatrics, 1994. **125**(2): p. 239-241.
22. Erickson, S., et al., *Are Overweight Children Unhappy? Body Mass Index, Depressive Symptoms, and Overweight Concerns in Elementary School Children.* Arch Pediatr Adolesc Med, 2000. **154**(9): p. 931-935.
23. Welk, G.J., C. Corbin, and D. Dale, *Measurement issues in the assessment of physical activity in children.* Res Q Exerc Sport, 2000. **71**(2): p. 59-73.
24. Alliance, N.A.S. and N.A.o.E.S. Teachers, *Leading a New Day for Learning.* 2007: p. 1-3.
25. Howe, C.A., R.A. Harris, and B. Gutin, *A 10-month physical activity intervention improves body composition in young black boys.* J Obes, 2011. **2011**: p. 358581.
26. Barbeau, P., et al., *Ten months of exercise improves general and visceral adiposity, bone, and fitness in black girls.* Obesity (Silver Spring), 2007. **15**(8): p. 2077-85.
27. Coleman, K.J., et al., *Physical activity and healthy eating in the after-school environment.* J Sch Health, 2008. **78**(12): p. 633-40.
28. Dzewaltowski, D.A., et al., *HOP'N after-school project: an obesity prevention randomized controlled trial.* International Journal of Behavioral Nutrition and Physical Activity, 2010. **7**(1): p. 90.
29. Kelder, S., et al., *The CATCH Kids Club: a pilot after-school study for improving elementary students' nutrition and physical activity.* Public Health Nutr, 2005. **8**(2): p. 133-40.
30. Weintraub, D.L., et al., *Team sports for overweight children: the Stanford Sports to Prevent Obesity Randomized Trial (SPORT).* Arch Pediatr Adolesc Med, 2008. **162**(3): p. 232-7.
31. Greenfield, J., *On Bicycles*. Earn-A-Bike Programs, ed. A. Walker2011, Novato, California: New World Library.
32. *Youth Programs*. 2010 [cited 2012 June 8, 2012]; Available from: http://www.recycleabicycle.org/youth-programs.
33. *Earn-A-Bike*. 2012 [cited 2012 June 8, 2012]; Available from: http://neighborhoodbikeworks.org.
34. *Cascade Bicycle Club*. 2007 [cited 2012 June 8, 2012]; Available from: http://www.cbcef.org.
35. *Blackstone Bicycle Works*. 2012 [cited 2012 June 8, 2012]; Available from: http://www.experimentalstation.org/blackstone-bikes.
36. Bikes, K.o. *Our Story*. 2012 [cited 2012 June 12]; Available from: http://www.kidsonbikes.net/about.
37. Kids, T.f. *Trips for Kids*. 2012 [cited 2012 June 12]; Available from: http://tripsforkids.org/.
38. Cycling, R.Z. *Red Zone Cycling*. 2009 [cited 2012 June 12]; Available from: http://www.redzonecycling.com/AboutUs.aspx.
39. Agran, P.F. and D.G. Winn, *The Bicycle: A Developmental Toy Versus a Vehicle.* Pediatrics, 1993. **91**(752-757).
40. Control, N.C.f.I.P.a., *National Estimates of the 10 Leading Causes of Nonfatal Injuries Treated in Hospital Emergency Departments, United States, 2007*, C.f.D.C.a. Prevention, Editor 2007.

Appendices

Appendix A

Entrance Survey

NAME_____



"KIDS CAN BIKE!" Survey

1 What is your age?_____
2. Circle the ethnic group to which you belong:

African American Caucasian Hispanic Asian Native American Other

3. What grade are you in? _____

BICYCLE OWNERSHIP

5. Do you own a bike? YES NO
6. Do you own a helmet? YES NO
7. Do you own a bike lock? YES NO
8. If you answered YES to owning a bike, where do you normally ride?

_____

9. Have you ever ridden your bike on a greenway? YES NO

BICYCLING KNOWLEDGE

13. When you ride a bike, are you required to stop at stop signs? YES NO
14. What side of the road should you ride your bike on?

LEFT MIDDLE RIGHT

15. How do you signal that you are going to turn right?







16. What should you do before crossing a road?
A. Come to a complete stop
B. Look Both Ways
C. Stop and Look Both Ways

17. What is the most important thing to have when riding your bike?

Appendix B

Post-Survey

NAME_____

"KIDS CAN BIKE!" Survey



RATE THE PROGRAM	**Agree**				**Disagree**
1. The program was fun.	1	2	3	4	5
2. The leaders were helpful.	1	2	3	4	5
3. The bike rodeo was fun.	1	2	3	4	5
4. The visit to Safety City was fun.	1	2	3	4	5
5. The greenway bike rides were fun.	1	2	3	4	5
6. The rides were a good distance	1	2	3	4	5

7. My favorite part of this program was

_____

8. My least favorite part of this program was

_____

RATE YOURSELF					
9. I learned a lot from the program.	1	2	3	4	5
10. I am better at biking now.	1	2	3	4	5
11. I like biking.	1	2	3	4	5

BICYCLING KNOWLEDGE

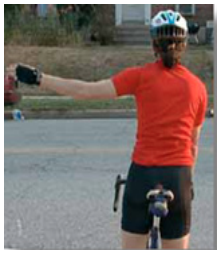
13. When you ride a bike, are you required to stop at stop signs? YES NO

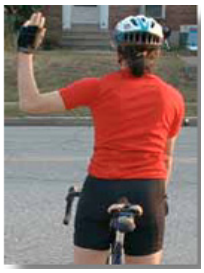
14. What side of the road should you ride your bike on?

LEFT MIDDLE RIGHT

15. How do you signal that you are going to turn right?







16. What should you do before crossing a road?

A. Come to a complete stop

B. Look Both Ways

C. Stop and Look Both Ways

Appendix C

Letter from Director of Knoxville Area Coalition on Childhood Obesity Granting Access to De-Identified Data



May 30, 2012

To Whom It May Concern:

As the Coordinator of The Knoxville Area Coalition on Childhood Obesity, I am writing to allow access of the Kids Can Bike! Program entrance and exit surveys. The Kids Can Bike! leaders will remove the names from each survey and place numbers at the top in order to pair the surveys later. Jessica Chandler and Dr. David Bassett will then have full access to the surveys for data analysis. The surveys will be used until the completion of Jessica Chandler's thesis and then returned to the coalition.

If you have any questions or concerns, please feel free to contact me:

Eleanor Stevens, Coordinator
Knoxville Area Coalition on Childhood Obesity
East Tennessee Children's Hospital
P.O. Box 15010
Knoxville, TN 37901
(865) 541-8218

Appendix D

Table 5. Central Tendencies for Attitudes Towards Program

Table 5 shows the central tendencies for attitudes towards the program. The median and mode for every question was 1, indicating that the majority of the responses for each question were a positive reflection of the program.

Table 5. Central Tendencies for Program Elements and Self-Efficacy Scores

Program Elements and Self Efficacy	**Mean ± SD**	**Mode**	**Median**	**IQR**
The program was fun.	1.23± 0.44	1.0	1.0	1.0-1.5
The leaders were helpful.	1.08± 0.27	1.0	1.0	1.0-1.0
The bike rodeo was fun.	1.46± 1.26	1.0	1.0	1.0-1.0
The visit to Safety City was fun.	1.23± 0.83	1.0	1.0	1.0-1.0
The greenway bike rides were fun.	1.38± 0.65	1.0	1.0	1.0-2.0
The rides were a good distance.	1.27± 0.47	1.0	1.0	1.0-2.0
I learned a lot from the program.	1.38± 0.77	1.0	1.0	1.0-1.5
I am better at biking now.	1.77± 1.19	1.0	1.0	1.0-2.0
I like biking.	1.62± 1.19	1.0	1.0	1.0-2.0

Abbreviations: SD;standard deviation, IQR;interquartile range

Appendix E
Committee Members and Affiliations

Kids Can BIKE! Committee

David Bassett, Jr., University of Tennessee, Knoxville
Ellen Blassius, Knoxville Parks and Recreation Department
Ben Epperson, Knox County Healthy Kids, Healthy Community
Roger Fernandez, Knoxville Parks and Recreation Department
Kathleen Gibi, Knoxville Parks and Recreation Department
Marty Hinch, Knoxville Parks and Recreation Department
Kristin Manuel, Knoxville Parks and Recreation Department
Kelly Segars, Knoxville Transportation Planning Organization
Eleanor Stevens, East Tennessee Children's Hospital
Steve Waller, University of Tennessee, Knoxville
Joe Walsh, Knoxville Parks and Recreation Department

Vita

Jessica Lynn Chandler was born on July 19, 1988 in Atlanta, George, and raised in Franklin, TN. She graduated from Battle Ground Academy in the Spring of 2006. She attended the University of Tennessee, Knoxville in the Fall of 2006 and where she earned her Bachelor of Science in Education degree in Exercise Science. She then went on to complete her Master of Science degree in Exercise Physiology from the Department of Kinesiology, Recreation and Sports Studies at the University of Tennessee, Knoxville. In August of 2012, she plans to begin her doctoral studies at the University of South Carolina, Columbia in Exercise Science with a focus on Health Aspects of Physical Activity.