

2015

The Impact of Nutrition Education on Fruit and Vegetable Consumption of Elementary School Students

Constance Evans Herriott

Eastern Illinois University

This research is a product of the graduate program in [Nutrition and Dietetics](#) at Eastern Illinois University. [Find out more](#) about the program.

Recommended Citation

Herriott, Constance Evans, "The Impact of Nutrition Education on Fruit and Vegetable Consumption of Elementary School Students" (2015). *Masters Theses*. 1869.
<https://thekeep.eiu.edu/theses/1869>

This is brought to you for free and open access by the Student Theses & Publications at The Keep. It has been accepted for inclusion in Masters Theses by an authorized administrator of The Keep. For more information, please contact tabruns@eiu.edu.

The Graduate School

EASTERN ILLINOIS UNIVERSITY



Thesis Maintenance and Reproduction Certificate

FOR: Graduate Candidates Completing Theses in Partial Fulfillment of the Degree
Graduate Faculty Advisors Directing the Theses

RE: Preservation, Reproduction, and Distribution of Thesis Research

Preserving, reproducing, and distributing thesis research is an important part of Booth Library's responsibility to provide access to scholarship. In order to further this goal, Booth Library makes all graduate theses completed as part of a degree program at Eastern Illinois University available for personal study, research, and other not-for-profit educational purposes. Under 17 U.S.C. § 108, the library may reproduce and distribute a copy without infringing on copyright; however, professional courtesy dictates that permission be requested from the author before doing so.

Your signatures affirm the following:

- The graduate candidate is the author of this thesis.
- The graduate candidate retains the copyright and intellectual property rights associated with the original research, creative activity, and intellectual or artistic content of the thesis.
- The graduate candidate certifies her/his compliance with federal copyright law (Title 17 of the U. S. Code) and her/his right to authorize reproduction and distribution of all copyrighted materials included in this thesis.
- The graduate candidate in consultation with the faculty advisor grants Booth Library the non-exclusive, perpetual right to make copies of the thesis freely and publicly available without restriction, by means of any current or successive technology, including by not limited to photocopying, microfilm, digitization, or internet.
- The graduate candidate acknowledges that by depositing her/his thesis with Booth Library, her/his work is available for viewing by the public and may be borrowed through the library's circulation and interlibrary loan departments, or accessed electronically.
- The graduate candidate waives the confidentiality provisions of the Family Educational Rights and Privacy Act (FERPA) (20 U. S. C. § 1232g; 34 CFR Part 99) with respect to the contents of the thesis and with respect to information concerning authorship of the thesis, including name and status as a student at Eastern Illinois University.

I have conferred with my graduate faculty advisor. My signature below indicates that I have read and agree with the above statements, and hereby give my permission to allow Booth Library to reproduce and distribute my thesis. My adviser's signature indicates concurrence to reproduce and distribute the thesis.

Graduate Candidate

Printed Name

Graduate Degree Program

Printed Name

Date

Please submit in duplicate.

The Impact of Nutrition Education on Fruit and Vegetable

Consumption of Elementary School Students

(TITLE)

BY

Constance Evans Herriott

THESIS

SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF

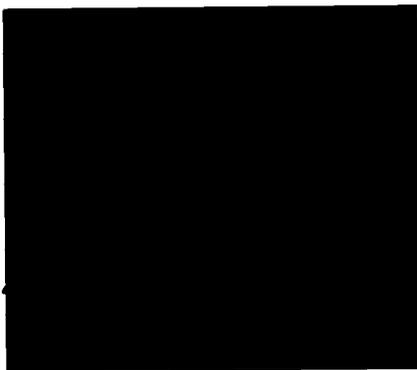
Master of Science in Nutrition and Dietetics

IN THE GRADUATE SCHOOL, EASTERN ILLINOIS UNIVERSITY
CHARLESTON, ILLINOIS

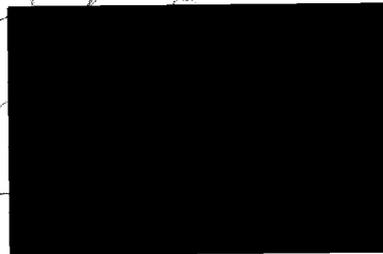
2015

YEAR

I HEREBY RECOMMEND THAT THIS THESIS BE ACCEPTED AS FULFILLING
THIS PART OF THE GRADUATE DEGREE CITED ABOVE



5/6/2015
DATE



5/6/15
DATE

May 6, 2015
DATE

THESIS COMMITTEE MEMBER

DATE

THESIS COMMITTEE MEMBER

DATE

THESIS COMMITTEE MEMBER

DATE

Abstract

The purpose of this study was to determine the effect of nutrition education on the fruit and vegetable consumption of third grade students. This was in an effort to determine whether nutrition education played a role in the consumption of fruits and vegetables because current intakes are very low. This quasi-experimental study consisted of a relatively small convenience sample at a rural elementary school. For this study, thirty-minute nutrition education lessons were delivered for four consecutive weeks to the experimental group. In order to assess the impact of the lessons, fruit and vegetable plate waste were gauged prior to and following said lessons. The mean waste from each measurement was compared by means of descriptive statistics and the results from the control and experimental groups were compared to determine the significance of the changes made in the fruit and vegetable intake by the students. Results revealed the children in the experimental group increased their fruit and vegetable consumption after receiving the nutrition education while participants in the control group decreased their intake. The increase in fruit and vegetable consumption after exposure to nutrition education supports the importance of the role of such education within elementary school classrooms.

Dedication

First and foremost, I would like to dedicate this thesis to my husband, Daniel. Your understanding and encouragement throughout this process have been more helpful than you can imagine. I would also like to dedicate this work to those who are considering a thesis or are already committed to writing one in the near future. While overwhelming, trying and exhausting, writing this thesis has been a one-of-a-kind experience from which I have learned a great deal and would not trade if given the chance.

Acknowledgements

I would like to thank Dr. Carla Honselman for serving as my initial thesis advisor and providing guidance throughout the planning and research portions of this process. I would also like to thank Dr. Richard Wilkinson and Dr. Lisa Brooks for serving on my committee; I appreciate your patience, encouragement and invaluable input. I also owe Dr. Melanie Burns a great deal of gratitude for stepping in as my graduate advisor in the final steps of this process to help me complete it in a timely manner.

Additionally, I would like to acknowledge Unity East and Unity West Elementary Schools for allowing me to conduct my research within their classrooms and the parents of the students for allowing their children to participate in the study.

Special thanks go to Julia MacKenzie for taking the time to make the drive to assist with gathering data for the study, even when she was not feeling well and had other previous engagements. I would not have been able to gather all of the data without your help!

Table of Contents

	<u>Page</u>
Abstract.....	i
Dedication.....	ii
Acknowledgements.....	iii
Table of Contents.....	iv
 <u>Chapter</u>	
1. Introduction.....	1
Significance of the Study.....	1
Purpose.....	3
Hypotheses.....	4
Definition of Terms.....	4
2. Review of Literature.....	5
Fruit and Vegetable Intake Versus Need.....	5
Local, State and National Initiatives.....	9
Obesity.....	12
Nutrition Education.....	14
CATCH Curriculum.....	17
Summary.....	20
Theoretical Base.....	20
3. Methodology.....	21
Research Design.....	21
Sample.....	22

Instrumentation.....	24
Validity.....	25
Procedure for Data Collection.....	26
Data Analysis.....	27
Summary.....	28
4. Results and Discussion.....	29
Hypothesis 1.....	29
Hypothesis 2.....	31
Summary.....	33
5. Conclusion.....	34
Summary.....	34
Limitations.....	34
Implications and Recommendations.....	36
References.....	38
Appendix A.....	46
Appendix B.....	48
Appendix C.....	49

Chapter 1

Introduction

Obesity is a chronic condition that has become a major concern for children today, with nearly one in five children ages 6-11 considered obese (CDC, 2012a). According to Ludwig (2007), the rise of childhood obesity has the potential to decrease the lifespan of this population by three to five years by the year 2035. A healthful diet, in which informed nutritious decisions are made, has been shown to significantly delay the onset of many chronic diseases and possibly deter the onset of obesity (Boeing, et al., 2012). Many of these chronic diseases that could be delayed with good nutrition are becoming increasingly prevalent in children. Beyond the benefits of a healthy intake, studies evaluated in a recent review article have shown that specifically the consumption of fruits and vegetables is key in the prevention of chronic diseases (Boeing, et al., 2012). The results of studies like this one suggest that delivering nutrition education to children could increase their knowledge of nutrition, which could positively impact their eating patterns and decrease their risk for chronic disease.

Significance of the Study

According to the Child Nutrition and WIC Reauthorization Act of 2004, school districts throughout the nation are required to write and implement wellness policies that contain goals for nutrition standards and nutrition education (CDC, 2011). These policies were to be put into action by 2006. There are minimum requirements of the wellness policies (CDC, 2015). One such requirement is goals for promotion of student wellness. Another requirement reported by CDC (2015) is

permission of parents, students, teachers and the public to participate in the development, implementation and update of the policy. Also required are to inform and update the public on the content and implementation of the policy and to periodically measure progress (CDC, 2015).

The nationwide School Health Policies and Practices Study of 2012 assessed several aspects of school health policies (CDC, 2012b). Of the responding school districts, 82% reported delivering some form of nutrition education within their elementary schools. The proportion of students reportedly receiving nutrition education is higher than the 24.9% of those who are required to incorporate nutrition education (CDC, 2012b). While all school districts reported having the required wellness policies in place, 72.5% reported evaluating the effectiveness of their policies with 64.5% having a person with the known responsibility of evaluating the school wellness policy (CDC, 2012b).

The school hosting this study has a wellness policy in place but, according to C. Gaither (personal communication, March 2014), the nutrition education aspect of the policy has been on hold since 2011 due to increased emphasis on other areas of learning. Action for Healthy Kids 2008 reports one difficulty of providing nutrition education in schools to be that most schools surveyed did not view student wellness or nutrition education as a part of the school's mission. This is alarming because childhood eating patterns seem to carry on into adulthood (Mikkila, Rasanen, Raitakari, Pietinen, & Viikari, 2005). In 2009, approximately 95% of those ages 5-17 were enrolled in schools in which they spend six or more hours of the day five days a week for approximately nine months of the year for 13 years (US Dept of

Education, 2010). With so much time being spent in schools, the Institute of Medicine, Academy of Nutrition and Dietetics and the American Academy of Pediatrics recommend schools provide nutrition education in the classroom to support efforts to increase fruit and vegetable intake of this population. Ensuring that nutrition education is incorporated into the classroom could decrease the chance of chronic diseases for schoolchildren as they grow into adults (Boeing, et al., 2012).

Many professional publications not only support the positive effect of nutrition education on fruit and vegetable and consumption, but also the importance of increased fruit and vegetable consumption (AAP, 2014; CATCH, 2015; Mahan, Raymond & Escott-Stump, 2011). However, there is still a need for additional research on the effects of nutrition education on fruit and vegetable intake and on the optimal amount of nutrition education needed to make a change in the dietary intake of children (USDA, 2012).

Determining the impact of nutrition education on the eating habits of elementary school students to be shared with stakeholders and for use in policy making could be meaningful in future decisions relating to this subject. Any effect observed from this study could aid educators in future decisions regarding nutrition education and whether teaching about nutrition and healthy eating would be worth the resources that would need to be allocated for it.

Purpose

The purpose of this study was to determine the effect of a 4-week nutrition education program on the fruit and vegetable consumption of third grade students.

Hypotheses

1. There will be an increase in fruit and vegetable consumption post-intervention in the experimental group.
2. There will be no change in fruit and vegetable consumption post-intervention in the control group.

Definition of Terms

Third grade students: For this study, mostly 8 and 9 year old children who are enrolled in the third grade of a small public elementary school in a rural community

Fruit: Fresh, canned (in 100% fruit juice or light syrup), cooked, frozen or dried fruit or 100% fruit juice (USDA, 2013)

Vegetable: 100% vegetable juice or non-fried cooked, fresh, canned or dried vegetables that meet fat and sodium guidelines set by the school district; cooked beans or peas may be considered a meat or vegetable, but not both in the same meal (USDA, 2013)

Nutrition education: "...any combination of educational strategies, accompanied by environmental supports, designed to facilitate the voluntary adoption of food choices and other food- and nutrition-related behaviors conducive to health and well being." (Contento, 2011)

Chapter 2

Review of Literature

This review of literature provides insight on the severity of low fruit and vegetable consumption in children and nutrition education concerning this topic. The review focuses specifically on the following: the prevalence of low fruit and vegetable intake in elementary school students and the importance of consuming enough fruits and vegetables daily, the current obesity epidemic as it relates to children, and the success of several nutrition education programs that have been evaluated previously.

Fruit and Vegetable Intake Versus Need

As evidenced by Centers for Disease Control and Prevention (CDC) data from recent years, fruits and vegetables have been nearly omitted from the diets of adolescents. The 2013 CDC report for the state of Illinois revealed a mere one fruit serving on average per day by adolescents and 1.1 servings of vegetables. Nationally, adolescent consumption is about the same with one serving of fruit per day and 1.3 servings of vegetables. Of the Illinois adolescents surveyed, 38.7% reported consuming less than one serving per day of fruit and 42.3% reported less than one serving of vegetables daily (CDC, 2013). Nine out of ten children surveyed nationally consumed less than the recommended amount of vegetables daily and six out of ten children consumed less than the recommended amount of fruit daily (CDC, 2010). The amount of fruit consumed decreased as age increased and the CDC attributes to the decrease in 100% fruit juice drank by the older children and adolescents.

According to the 2010 National Health and Nutrition Examination Survey (NHANES), vegetable intake of children did not increase from 2003-2010 despite efforts toward raising awareness of the importance of adequate fruit and vegetable intake. Additionally, one third of the vegetables eaten by children in the 2009-2010 year were white potatoes, 63% of which were potato chips or french fries (CDC, 2010). This is very unfortunate because research findings reveal the importance of consuming adequate servings of fruits and vegetables daily because poor intake has been linked to an increased risk for developing chronic disease (Boeing, et al., 2012). The data revealing low fruit and vegetable intake for this population indicate a high risk of compromised health.

Fruits and Veggies-More Matters (FVMM) is a national initiative that aims to increase the fruit and vegetable intake of Americans in line with the 2010 Dietary Guidelines for Americans, or 2010 DGA (FVMM, 2014). The 2010 DGA recommend increasing consumption of all plant foods, filling half your plate with fruits and vegetables and choosing nutrient dense foods, such as fruits and vegetables, whole grains, lean proteins and low-fat or fat-free milk most often (FVMM, 2014). FVMM highlights many benefits to increasing consumption of fruits and vegetables. One such benefit is that eating fruits and vegetables can displace higher calorie snacks, and thus promote weight loss (FVMM, 2014). Also, FVMM states that Vitamin A, Vitamin C, Vitamin K, potassium, magnesium and fiber are widely under consumed in the United States, but all of which are present in a variety of fruits and vegetables. The National School Lunch Program (NSLP) includes foods that are considered excellent sources (20% of the daily value per serving) of each of the aforementioned

micronutrients (FVMM, 2014). The benefits of each micronutrient are also described by Fruits and Veggies-More Matters and they are reported as the following: fiber to decrease risk of cardiovascular disease, potassium to maintain normal blood pressure, Vitamin A to protect against infections and keep eyes healthy, Vitamin C for immune health, tooth and gum health, Vitamin K for blood coagulation and magnesium for enzyme production and bone health. The advantages of consuming adequate fruits and vegetables are abundant.

Several researchers have discovered links between inadequate fruit and vegetable consumption and the risk of several chronic diseases, including cardiovascular disease and certain types of cancer (Boeing, et al., 2012; Larsson, Virtamo, & Wolk, 2013; Lock, Pomerleau, Causer, Altmann, & McKee, 2005). The Dietary Guidelines Advisory Committee (2010) states that by following the 2010 Dietary Guidelines for Americans, which includes increasing fruit and vegetable intake, one promotes optimal health and reduces their risk of high cholesterol, high blood pressure, cardiovascular disease, type II diabetes mellitus, obesity and osteoporosis.

The Dietary Guideline Advisory Committee (2010) states that increased fruit and vegetable consumption reduces many health risks, including obesity. Due to their fiber content making them filling and most being low in fat and calories, State of Obesity (2014) states that increased fruit and vegetable consumption may reduce total energy intake and therefore inhibit weight gain. A review of eleven experimental studies conducted by Ledoux, Hingle and Baranowski (2011) examined the effect of increased fruit and vegetable consumption on weight of

children. Findings from eight of the studies included in the review related higher fruit and vegetable intake to decreased incidence of obesity while three revealed no significant difference. This is evidence that fruit and vegetable consumption likely has a positive effect on the weight of elementary school students.

Findings from a meta-analysis by Boeing and colleagues (2012) emphasize the role of fruits and vegetables in preventing chronic diseases based on evidence of a reduction in risk of hypertension, coronary heart disease and stroke associated with increased fruit and vegetable consumption. A considerable number of controlled observational studies revealed consistent results showing an inverse relationship regarding fruit and vegetable intake with many chronic diseases. The meta-analysis by Boeing and colleagues (2012) compiled current research studying the relationship between fruit and vegetable intake and chronic disease that was ranked by probability of actual relationship. The analysis revealed evidence relating consumption of fruit and vegetables to decreased risk of obesity, type II diabetes and cancer at a level rated by the authors as probable (Boeing, et al., 2012). In the article, a rating of “probable” is correlated with several previous studies having the same findings, but with some weaknesses or inconsistencies among the research.

Additionally, the findings from this publication did support a possible link between fruit and vegetable intake and decreased occurrence of obesity, rheumatoid arthritis, chronic obstructive pulmonary disease, asthma, osteoporosis, macular degeneration, cataracts and dementia. A relationship rating of “possible” is associated with somewhat limited findings and several weaknesses or inconsistencies. From the relationships established between fruit and vegetable

intake and chronic disease, Boeing and colleagues (2012) concluded that the promotion of fruits and vegetables is an effective way to decrease the prevalence of many chronic diseases.

Local, State and National Initiatives

With a need cited above for more healthful diets of American children, the initiatives being made across the country to do so are well received. On the CDC Chronic Disease State Policy System Database are several bills that have been introduced, and sometimes either killed or enacted, that aim to increase nutritional standards for Illinois citizens. One such bill was enacted in 2010 and the aim of the bill was to facilitate and encourage the purchase of fresh produce by schools in Illinois (CDC, 2015).

In 2005, the Young Men's Christian Association (YMCA) began testing a health education curriculum that focused on nutrition and physical activity (CDC, 2012). After testing and updating of the curriculum, the revised curriculum was put to use at YMCA facilities across the country in 2011. In addition to teaching the curriculum, the YMCA began providing low-cost fruit and vegetable options at their before and after school program that were to be completely in place by 2015. The new healthy snack options coincide with the National School Lunch Program (NSLP) standards (CDC, 2012). The YMCA reports an important role for themselves in the health of children across the country because efforts made outside of school, such as in their facilities, increase the likelihood of success when combined with health education efforts being made within schools (CDC, 2012).

The Women, Infants and Children (WIC) program has made recent efforts to increase the fruit and vegetable consumption of women who are pregnant or nursing and their young children (Whaley, et al., 2012). WIC has revised their package and included vouchers for fruits and vegetables (Whaley, et al., 2012). This update enhances the availability of fruits and vegetables for those who may not have otherwise obtained them. The 2012 updated meal standards for the NSLP made by the Food and Drug Administration (FDA) also increased the availability of fruits and vegetables to American children (Let's Move, 2014). These updates were the first changes made to the nutritional standards of the NSLP in over 15 years (Let's Move, 2014).

Prior to the updated standards, schools were required to provide $\frac{1}{2}$ - $\frac{3}{4}$ cups of fruits and vegetables combined per day and there were no specifications on the types or categories of the vegetables (State of Obesity, 2014). As of 2012, schools are required to provide $\frac{3}{4}$ -1 cup vegetables per day and there are weekly subcategory amounts that must be met. These include leafy greens or red and orange vegetables, among others. With the updated standards, schools are also required to provide $\frac{1}{2}$ -1 cup of fruit per day. Schools must provide $\frac{1}{4}$ of the students' daily energy needs for breakfast and $\frac{1}{3}$ of their daily energy needs for lunch (State of Obesity, 2014). These updated standards contribute specifically to two of the Healthy People 2020 objectives: increase the proportion of school districts who require schools to make fruits and vegetables available wherever food is sold and to increase fruit and vegetable consumption.

The above recommendations for fruit and vegetable consumption are consistent with those made by the 2010 DGA. MyPlate recommendations, which are based on 2010 DGA, include making half your plate fruits and vegetables. The actual amount of fruits and vegetables recommended varies by gender and age. For third grade males, 2 ½ cups of vegetables per day are recommended and 1 ½ cups of fruit. For third grade females, 2 cups of vegetables are recommended per day while 1 ½ cups of fruit are suggested (USDA, 2014). MyPlate recommendations also include choosing whole fruit over fruit juice and increasing fruit and vegetable needs if the child is very physically active more than 30 minutes per day (USDA, 2014).

The Let's Move initiative that was started by First Lady Michelle Obama in 2010 includes, not only the updated NSLP nutrition standards, but also many other objective-specific initiatives (Let's Move, 2014). One such initiative is the Healthier US School Challenge (HUSSC), which establishes high standards for the areas surrounding the health of American children. These standards are set for food quality, nutrition education, physical activity and participation in meal programs (Let's Move, 2014). Other sections of the Let's Move initiative include Chefs Move to Schools and Salad Bars Move to Schools, in which children are exposed to a variety of nutritious foods and learn how to prepare them (Let's Move, 2014). For schools, the USDA Food and Nutrition Service provides The School Day Just Got Healthier toolkits. The toolkits provide tips for nutrition-related policy making and educational materials (USDA, 2012). Initiatives such as these appear to play an important role in child health.

Obesity

Illinois is ranked 9th in the nation for most obese children with 19.3% of children being obese. Nationally, 16.9% of children ages 6-11 are obese and 31.8% are either overweight or obese (CDC, 2012). This is up from 15.1% of children in 2000 (CDC, 2010). This is an alarming increase within a short period of time because obesity has been linked to early onset of chronic diseases, increased healthcare costs, premature mortality, increased incidence of school absence, decreased academic performance, and social and mental complications (Au, 2012; Geier, et al., 2007; Janssen, Craig, Boyce, & Pickett, 2004; Long, Mareno, Shabo, & Wilson, 2012; Masters, et al., 2013; Taras & Datema, 2005). Consequences of *overweight* in childhood are reported to include negative self-image, depression, high blood pressure, high cholesterol and hyperinsulinemia (Daniels, et al., 2009). Such consequences of being overweight as a child may lead to those mentioned above for obesity in children. Furthermore, children who are overweight or obese in early childhood are five times as likely to be overweight or obese as adults (CDC, 2010).

Au (2012) observed non-hospital medical costs for children during their first five years of school and those who were overweight or obese at ages four and five incurred a 10% higher medical bill than those of normal weight. The research of Au provides evidence that the effects of obesity begin to reveal themselves at an early age and with a high cost. According to Trasande and Chatterjee (2009), the annual total *direct* cost of childhood obesity is \$14.1 billion. Their article recommends future research on the *indirect* costs associated with the childhood obesity epidemic,

such as absenteeism from school and decreased academic achievement (Trasande, & Chatterjee, 2009).

A separate study evaluates the annual cost per child who has been diagnosed with obesity by their physician (Marder, & Chang, 2006). The results revealed a significant difference in the annual medical costs between the average child and the obese child. These measurements were taken using the emergency room visits, outpatient visits and prescription drug costs of the children included in the study. An obese child on Medicaid was shown to incur an average of \$6,730 in medical costs annually while the average child on Medicaid was shown to incur an average of \$2,446 annually (Marder, & Chang, 2006). The results were similar for children on private insurance with the average annual medical cost for obese child was \$3,743 and the total for the average child was \$1,108 (Marder, & Chang, 2006).

In addition to physical complications, research by Janssen, Craig, Boyce and Pickett (2004) revealed several social implications of overweight and obesity in school-aged children. Daniels and colleagues (2009) also report difficulties with negative self-image and depression in overweight children. The activities of bullying and being left out were identified as having a negative impact on a child's quality of life (Williams, Wake, Hesketh, Maher, & Waters, 2005).

Increasing intake of fruits and vegetables has received support from studies that examined multiple causes of obesity. Blom-Hoffman (2008) stated that some causes of the sharp increase in childhood obesity involve the following: large portion sizes, consumption of high fat and high sugar foods, increase in television viewing, increase in internet use, and school budget cuts to physical education

programs. As effective approaches to combat obesity, Stevens-Edouard and Cavallaro (2005) suggested incorporating at least 60 minutes of activity daily with less than two hours of screen time in addition to consumption of at least five servings of fruits and vegetables per day. These recommendations for physical activity are in line with those of the World Health Organization (WHO) and 2008 Physical Activity Guidelines for Americans (PAG), which both recommend a minimum of 60 minutes of physical activity per day for children with the majority of exercise being aerobic (USDHHS, 2008; WHO, 2011). Strength-building exercise should be practiced at least three times per week (USDHHS, 2008; WHO, 2011).

Based on research findings that support fruit and vegetable intake as a preventive measure against obesity and chronic disease, increasing fruit and vegetable intake among children appears to be an effective approach to addressing the problem of childhood obesity. Up-to-date research shows that nutrition education is one way to increase fruit and vegetable consumption within this population.

Nutrition Education

Research has shown that a lack of nutrition education is a common barrier to a healthy lifestyle (Ying-Ying, et al., 2009). The position of the Academy of Nutrition and Dietetics (AND) regarding nutrition education in schools is that, “...comprehensive, integrated nutrition services are an essential component of school health programs and will improve nutritional status, health and academic performance of students.” (AND, 2010). The AND also states that schools play an important role in the health promotion of the nation’s children (2010).

Wardle, Herrera, Cooke, and Gibson (2003) report a need for increasing children's familiarity through repeated exposure of commonly averted foods such as vegetables in order to increase preference for them. Others suggest that fruit and vegetable consumption of children is influenced by their taste preferences, repeated exposure, positive social experiences and their availability (Blanchette, & Brug, 2005). One meta-analysis of literature exploring the promotion of fruit and vegetables to children included fifteen studies that incorporated behavior change as an outcome variable and had a follow-up period of at least three months. Eleven of these studies were conducted on elementary school children (Knai, Pomerleau, Lock, & McKee, 2006). Of the studies including school children, nine (82%) had significant effects on children's fruit and vegetable intake with increases in consumption that ranged from 0.3 to 0.99 servings per day. Knai and colleagues (2006) concluded that seven general principles greatly increased success of increasing fruit and vegetable consumption in children, including nutrition education, active student engagement, and active parental involvement. According to the USDA (2012), there is sufficient evidence to show a positive effect on the dietary intake of children ages nine and older when parents are involved in nutrition education efforts. The evidence showing a positive effect on dietary intake of students age nine or younger is lacking (USDA, 2012).

Some research shows a lack of success with obesity prevention programs that have approached nutrition education in a variety of ways. Stice, Shaw, and Marti (2006) studied 13 programs aimed to prevent obesity and 80% were discovered to have no statistically significant effect on weight gain. Also reported in

the article, almost all of the programs were unable to produce long-term effects to prevent weight gain in these children and adolescents. Specific information regarding the types of prevention programs was not disclosed. A study conducted by Blom-Hoffman and DuPaul in 2003 explored knowledge and behavioral change following nutrition education in an urban elementary school. A significant increase in nutrition knowledge was discovered, but the students did not show any behavior change. This was evidenced by no significant change in the amount and type of plate waste left by the students following the nutrition lessons.

Mahan, Raymond and Escott-Stump (2011) recommended the focus of nutrition education for those ages 10-17 be on tangible and short-term benefits such as healthier skin, increased hair growth, increased energy and improved academic performance. While most of the participants in this study are eight or nine years old, this area of focus may also be effective with this age group. Also recommended by Mahan and colleagues (2011) is for families to provide nutritious snacks at home for their children and to support the nutritional education efforts being made in the school. The recommendations of the American Academy of Pediatrics are similar; AAP recommends that parents get involved with their child's health education they are receiving at school in order to increase the effectiveness of said education through reinforcement (AAP, 2014). The organization also recommends parents get involved with wellness policy making at their child's school (AAP, 2014).

An important focus of nutrition education are the people and places effecting the nutrition environment of children, which may include schools, community

leader, parents, state officials, local officials and other stakeholders (USDHHS, 2010). The USDA (2012) reports there is little evidence to show an effect on the dietary intake of children dependent upon who is teaching the nutrition lessons or the type of teaching. Additionally, consistent evidence suggests combining nutrition education with increased nutrition standards is more effective than solely increasing nutritional quality of foods offered (USDA, 2012). This indicates that *who* delivers the nutrition education is not as important as ensuring that *someone* is providing these lessons within the schools.

The CDC provide several approaches to influence the health eating habits of children. The CDC (2015) recommends children get the opportunity to eat nutritious meals with their teachers, prepare healthy snacks as a class, have fruits and vegetables available at class parties and have teachers send home healthy eating handouts. The CDC School Health Guidelines to Promote Healthy Eating and Physical Activity (2011) recommended schools aim to establish an environment that supports healthy eating, is encouraging, provides access to nutritious foods and partners with families and the community to influence the healthy eating behaviors of children. These guidelines are based on the 2010 DGA and Healthy People 2020 objectives. The guidelines are used to develop, implement, and evaluate healthy eating policies and practices (CDC, 2011).

CATCH Curriculum

The Coordinated Approach to Child Health (CATCH) is a nationwide program aimed toward promoting healthy choices in children. The study to be conducted will use selected lessons from the CATCH program. CATCH has been supported by over

25 years of research and has been cited in over 120 peer-reviewed scientific publications supporting its effect on healthy eating for children and adolescents (Luepker, et al., 1996; Nader, et al., 1999). The program began at The University of Texas School of Public Health over 25 years ago. The curriculum is constantly expanding and being updated as the needs of today's children change. Research for the program is also conducted regularly to test for effectiveness of the program (CATCH, 2015).

The effectiveness of the CATCH program was evaluated by Sharma, Chuang and Hedberg (2011) in 3-5 year old preschool students. Fruit and vegetable intake, 100% fruit juice intake and physical activity at school were measured before and after six weeks of nutrition education lessons were given from the CATCH curriculum. All factors were determined to have increased post-intervention, but none of the increases were significant (Sharma, Chuang, & Hedberg, 2011). Results from a study published in 2010 revealed a 9% lower incidence of overweight and obesity in students enrolled in schools using CATCH versus those who were not within a single county in Texas (Hoelscher, et al., 2010). Long-term sustainability of the benefits gained from CATCH was examined in one study; the results revealed a continued reduction in fat consumption three years post-education (Nader, et al., 1999).

CATCH currently partners with several organizations throughout the country, including the following: CDC Whole School, Whole Community, Whole Child (WSCC), National Head Start Association and The Coordinated Health Institute. Two years of using the CATCH intervention with 629 children in the Gulf Coast Head

Start centers, a 30% decrease in incidence of overweight and obesity was seen (CATCH, 2015). From 2008-2011, CATCH was used by the Oklahoma Department of Health and the intervention was spread across 74 schools. Over the three years, a significant decrease in BMI was seen in addition to an increase in fruit and vegetable consumption and vigorous physical activity (CATCH, 2015). When used in Dallas Independent School District, 201 elementary and middle schools were included with a total of more than 122,000 students. During the 2009-2010 year, a significant increase in fruit and vegetable consumption and vigorous physical activity were seen (CATCH, 2015).

Additionally, when compared to other nationwide health education programs, CATCH ranked as the most cost-effective program that is proven to influence healthy behavior in children (Cawley, 2010). From the analysis conducted for this study, the researchers estimated a \$68,125 decrease in the amount spent on future medical bills per person exposed to CATCH when compared to not being exposed to the program (Cawley, 2010).

The Health Education Curriculum Analysis Tool (HECAT) that is sponsored by the CDC is used to measure the effectiveness of health education curricula using an expansive list of characteristics (CDC, 2015). According to HECAT, one characteristic of an effective curriculum is one that focuses on clear health goals and related outcomes. Such outcomes may include increased fruit and vegetable intake, decreased sugar intake or other outcomes recommended by 2010 DGA (CDC, 2015). Also important in assessing the effectiveness of the curriculum is whether or not it is research-based. Other important characteristics include the use of strategies to

personalize the information and engage the students and that the curriculum builds personal competence (CDC, 2015).

Theoretical Base

The theoretical basis for this study was the Health Belief Model, which focuses on a condition (or disease) and the factors that may influence behavior related to said condition (Mahan, Raymond, & Escott-Stump, 2011). For example, this study aimed to examine the effectiveness of using nutrition education as a means to influence dietary intake behavior in the form of fruit and vegetable intake. As referenced previously, evidence shows adequate fruit and vegetable intake to reduce the risk of several chronic diseases, including cardiovascular disease and certain types of cancer (Boeing, et al., 2012; Larsson, Virtamo, & Wolk, 2013; Lock, Pomerleau, Causer, Altmann, & McKee, 2005).

Summary

Many previous studies have evaluated programs intended to decrease the prevalence of obesity and to increase the fruit and vegetable consumption of school-aged children. Many of these studies indicate a discrepancy in results, revealing a need for more research in the area. Current research appears to provide adequate support for continuing to study the impact of nutrition education on fruit and vegetable intake. Including nutrition education in schools could be an effective way to increase fruit and vegetable consumption.

Chapter 3

Methodology

Research Design

According to Harris and colleagues (2006), “Quasi-experiments are studies that aim to evaluate interventions, but do not use randomization.” The study conducted was of quasi-experimental design due to lack of randomly assigned groups within the experiment. In a meta-analysis by Harris and his fellow researchers (2006), a hierarchy of the types of quasi-experimental studies is outlined. In the hierarchy of eleven types of such studies, the single pre/post-intervention design to be used for this study was ranked as third most accurate. The most accurate quasi-experimental design was one in which several pre-intervention and post-intervention measurements were taken, spaced at regular intervals (Harris, et al., 2006). Such a design was not feasible for this study.

A nutrition education intervention was implemented, using a program already in place for use. The Champaign-Urbana Public Health District had previously prepared and distributed a nutrition education curriculum that utilizes components of CATCH to many elementary schools throughout the county and this curriculum is the one to be used for this study. The program had been used in previous years by the schools hosting the study, but had been recently cut from the third grade curriculum due to increased emphasis on other areas of study.

This study utilized the measurement of fruit and vegetable consumption preceding and following the intervention. A concern for the data collection of the study was the varying weights of the different fruits and vegetables to be served to

the students and how to compare the intake of the students from two different fruits of varied weights. The matter was resolved by using measured plate waste, rather than weighed food measures. Fruit and vegetable waste were measured by volume in cups (to the nearest $\frac{1}{4}$ cup) using measuring cups created for commercial use. The amount of waste was considered to be inversely proportional to consumption; as the amount of food waste decreased, the amount consumed increased and vice versa.

A study conducted by Jacko, Dellava, Engle and Hoffman in 2007 compared means of measuring food intake of children. The researchers compared visual estimation, weighed food measurements, aggregate plate waste and dietary recall. The results revealed weighed food measurements and aggregate plate waste to be the most accurate means of collecting dietary intake data. Further, plate waste was determined to provide comparable measures to weighed food measures and be an accurate measure (Jacko, et al., 2007). The researchers also suggest plate waste is simpler to implement than weighed measurements. Jacko and colleagues (2007) report the following benefits of a plate waste study: ethical concerns are less with plate waste because student contact is not required, there is little contact with the kitchen staff so the measurements are less intrusive, and the amount of time needed to obtain the data is less. Overall, this study supports the use of aggregate plate waste over other methods of food intake data.

Sample

Participants were chosen using a convenience sample. There were two classes comprised of approximately 60 students in the experimental group and

three classes comprised of approximately 65 in the control group. Measurements were only taken from 32 students (50% male, 50% female) in the experimental group because those students returned the consent form, were present for both measurements and ate school lunch on both days. Measurements were taken from 27 students (44% male, 56% female) in the control group for the same reasons. All were third grade students at one of two rural midwestern elementary schools. The two schools are a part of the same school system; therefore had very similar cafeterias, menus and curricula. Consent for participation (Appendix A) was obtained from either a parent or guardian through a parental consent form distributed prior to the study. Consent to conduct the study within the elementary school was granted by the superintendent (see Appendix B).

There was no randomization of the groups because the school who functioned as the control group were unwilling to participate in the intervention due to the class time required to deliver the nutrition education lessons. Because the school who functioned as the experimental group was willing to offer half an hour of their class time once a week for four consecutive week, the intervention was implemented in their facility. There was no randomization of the students within the schools due to the children being organized by their predetermined classroom assignments.

The teachers of the students participating in this study reported the nutrition education their students have received prior to this study to be minimal (C. Gaither, & K. Beasley, personal communication, March 2014). The school wellness policy includes use of the CATCH nutrition education curriculum. However, the curriculum

has not been used since 2011 due to increased emphasis on other areas of study. There are currently posters provided by CATCH hung in the school cafeteria, but the students have not received any explanation of the nutrition education behind the posters (C. Gaither, personal communication, March 2014).

Instrumentation

Data was collected using measuring cups to quantify the amount of fruits and vegetables left on the students' trays, which was used to assess whether or not this amount changed with the addition of a nutrition education intervention in the classroom. Four commercial grade quart-sized glass measuring cups were placed on a table; two for fruit waste and two for vegetable waste. The use of two containers for each allowed for faster measuring as the students came through. The same cups were used for the entirety of the study to ensure consistent and reliable results. This method was used both prior to and following the nutrition education intervention.

The Champaign-Urbana Public Health District provided the nutrition education curriculum Coordinated Approach to Child Health (CATCH). This curriculum has been supported by over 25 years of ongoing research by University of Texas School of Public Health. The curriculum is recognized and utilized by the CDC. The original study for CATCH "...was the largest school-based health promotion study in the United States (CATCH, 2015)." Examples of activities from this curriculum are shown in Appendix C. The researcher of the study delivered the curriculum in order to control for a difference in teaching style by different teachers involved in the study. The Eastern Illinois University Institutional Review Board

(IRB) received the required documentation prior to the study and granted approval for the research to be conducted under approval number 14-065.

Validity

Measuring fruit and vegetable consumption by collecting plate waste for measurement after lunchtime uses the direct measure of food waste, creating a more valid measure than one in which fruit and vegetable consumption is self-reported (Jacko, et al., 2007). Consumption was determined by subtracting waste from the total amount served. The cafeteria workers used standard scoops and ladles to portion $\frac{1}{2}$ cup servings each of fruits and vegetables for each student. Also, the same measuring cups were used in all measurements with the same researcher and assistant taking all measurements.

In addition, previous research reveals fruit and vegetable consumption to be a credible measure of overall eating patterns, which validates the measures used for this study (Stevens-Edouard, & Cavallaro, 2005). The use of two schools within the same school system provided more valid results because variables such as varied menus, curricula, daily schedules, and socioeconomic status (Onboard Informatics, 2015) are controlled for. In addition to having similar menus to one another, both schools rotate their menus, allowing the researcher to measure the fruit and vegetable intake of the students at each school pre- and post-education on days that the same food was being served. Doing so decreases the likelihood of a difference in the likability of the fruits and vegetables served on one day versus the other.

Procedure for Data Collection

Plate waste was measured pre- and post-intervention in both the control and experimental groups. The procedure for obtaining the data was the same for both groups. First, students who had returned a consent form and were eating school lunch were given a sticker to place on their shirt by their teacher as they entered the cafeteria. These stickers were a sign to the researcher and assistant that the plate waste of those children was to be measured.

All students picked up their trays per their usual routine and sat in their designated areas. Meanwhile, the researcher and assistant prepared for data collection near the window at which the students drop off their trays after their meal. As the students finished their meals and brought them to the window to be discarded, the researcher and assistant asked the students with stickers on their shirts to place their trays on a table next to the window. While the remainder of the students finished eating, the researcher began scooping the fruit and vegetable waste into their respective container and the assistant continued to obtain the trays of students participating in the study. As the measuring cups became full of the students' combined fruit or vegetable waste, the measured amounts were recorded and the cups were emptied into a wastebasket so the measuring cups could be reused for additional measurements. After the plate waste data was collected from all participating students, the recorded measurements were totaled for later comparison to post-intervention measurements. To facilitate the process, measurements were not taken from individual students and the number of students

included in the study was recorded and used to determine mean fruit or vegetable waste.

For the next four weeks, the nutrition education intervention was implemented weekly with a thirty-minute lesson using the CATCH curriculum. The lessons in the curriculum provide step-by-step instructions for the instructor. As instructed as a part of the lesson, the students were given a handout relating to the what had been taught that day to take home to their parents that included activities to be completed at home as a family after the completion of each classroom lesson. A sample lesson from the CATCH curriculum may be viewed in Appendix C. The researcher delivered the lesson to two of the five third grade classes involved in the study, also known as the experimental group. Meanwhile, the other three classes (the control group) continued to receive no nutrition education. The week following the conclusion of the four-week intervention, the researcher and assistant repeated the process described above to measure the post-intervention waste of fruits and vegetables for all five classes involved in the study.

Data Analysis

The results were analyzed using descriptive statistics. The total fruit and vegetable waste, expressed as percentages, were compared for both groups pre- and post-intervention. The analyses were conducted to determine whether nutrition education affected the fruit and vegetable consumption as measured by a plate waste evaluation within the experimental group using the data obtained prior to and following the nutrition education intervention. This data was compared to the

fruit and vegetable consumption of the students in the control group that was also gathered before and after the lessons were delivered to the experimental group.

Summary

Fruit and vegetable plate waste data was obtained from students in both control and experimental groups pre- and post-intervention. The intervention was composed of half-hour lessons provided by CATCH that were delivered weekly for four consecutive weeks, providing a total of four thirty minute lessons in total. After plate waste data was obtained from each school before and after the intervention, the recorded data was compiled for analysis. Through use of descriptive statistics, the researcher analyzed the information and determined whether either the control or experimental group made any substantial changes in fruit and vegetable consumption.

Chapter 4

Results and Discussion

The purpose of this study was to determine the effect of a 4-week nutrition education program on the fruit and vegetable consumption of third grade students. As described in the previous chapter, plate waste data was collected from two groups of elementary students before and after the nutrition education intervention. The two groups were labeled as the experimental group and the control group. The recorded data are reported, analyzed and discussed in this chapter.

Hypothesis 1

The first hypothesis of the study was that participants in the experimental group would increase their fruit and vegetable consumption after receiving four consecutive weeks of nutrition education. This hypothesis was confirmed.

Results. For the experimental group measurements, 32 students were included. The fruit served on measurement days was orange slices and 51% of the 16 cups served were measured as waste. The vegetable served those days was celery pieces and 13 of the 16 cups served were wasted, or 81%. Post-intervention, of the 16 cups each of fruits and vegetables served, $7\frac{3}{4}$ cups of the orange slices were wasted (48%) and $12\frac{1}{4}$ cups of the celery pieces were wasted (77%).

When the percentages of mean waste were compared, there was a meaningful decrease in fruit waste discovered in the experimental group from before to after nutrition education. The decrease of the vegetable waste measured prior to and following the education was less substantial. The evaluation using

descriptive statistics revealed a substantial increase in the amount of fruits and vegetables consumed by the experimental group after receiving nutrition education. These results are depicted in Table 1 below.

Table 1

Experimental Group Plate Waste Pre- and Post-Intervention

Food Type	N	Total waste pre-intervention	Total waste post-intervention	Mean difference
Fruits	32	51%	48%	-6%
Vegetables	32	81%	77%	-5%
Fruits & Vegetables	32	66%	63%	-5%

Discussion. Within the experimental group, the increase in fruit consumption was more substantial than that of the vegetables. When combined, the increase in fruit and vegetable consumption remained meaningful. The difference of change in consumption between fruits and vegetables could be associated with the amount of Illinois children who do not eat vegetables at all. The CDC (2013) report that of the Illinois adolescents surveyed, 38.7% reported consuming less than one serving per day of fruit and 42.3% reported less than one serving of vegetables daily. Additionally, average fruit consumption increased from 2003 to 2010 while vegetable consumption did not change (NHANES, 2010). Given the results of this study and the fact that fewer children in Illinois eat vegetables per day than fruit, there is a possibility that vegetable intake may be more difficult to influence than those toward fruit.

The results described and shown above are consistent with the meta-analysis evaluating the effect of nutrition education on the consumption of fruits and vegetables by Knai and colleagues (2006), who reported nine of the eleven studies reviewed to be successful in increasing fruit and vegetable consumption in elementary school students. The results of this study also supports the previous 25 years of research showing the efficacy of the CATCH curriculum with making changes in the nutritional intake of children, including an increase in fruit and vegetable consumption.

The impact shown in this study of nutrition education on fruit and vegetable consumption has specifically been seen in two recent CATCH study. One of these studies was that conducted through Oklahoma Department of Public Health from 2008-2011, from which results revealed a statistically significant increase in fruit and vegetable consumption as a result of use of the CATCH program (CATCH, 2015). Similar results were seen in Dallas Independent School District from 2009-2010; during the school year, fruit and vegetable intake increased significantly with initiation of the CATCH program in the schools (CATCH, 2015). One major difference between the reported CATCH program studies and this study is the length of the intervention; four weeks for this study as opposed to 1-3 years for those cited above.

Hypothesis 2

The second hypothesis of the study was that participants in the control group would make no change in their fruit and vegetable consumption. This hypothesis was rejected, as the data analysis showed a very substantial difference in the

quantities of fruits, vegetables and combined fruits and vegetables consumed within the control group before and after nutrition education.

Results. A total of 27 students were included in the control group. Pre-intervention, 13 ½ cups of pineapple chunks were served as the fruit of the day (½ cup for each student). Of the pineapple served, 47% was wasted. The same day, students in the control group were also served ½-cup servings of salad as their vegetable. Of the salad served to the students, 83% was measured as waste. Four weeks later, after the completion of the nutrition education lessons with the experimental group, post-intervention measurements were taken from the control group. Of the 13 ½ cups of pineapple served, eight cups were wasted (59%). Of 13 ½ cups of salad served, 13 of those were wasted (96%).

A substantial difference in the amount of fruit waste before and after nutrition education was revealed by the data analysis. While the difference between the amounts of fruit waste before and after was significant, the amount of waste significantly *increased*. This indicates the consumption of fruit among the control group decreased from the first measurement to the second. Very substantial results were also discovered from comparing vegetable waste pre- and post-intervention, which likewise displayed a meaningful decrease in consumption. When the means of the combined amounts of fruit and vegetable waste were compared additionally pre- and post-intervention, the difference remained substantial. A depiction of these analyses are shown below in Table 2.

Table 2

Control Group Plate Waste Pre- and Post-Intervention

Food Type	N	Total waste pre-intervention	Total waste post-intervention	Mean difference
Fruits	27	47%	59%	26%
Vegetables	27	83%	96%	16%
Fruits & Vegetables	27	65%	78%	20%

Discussion. While the research question is aimed toward the overall fruit and vegetable consumption of the students in this study, fruits and vegetables were also each examined individually. Consumption of both fruits and vegetables in the control group were discovered to decrease substantially from the first measurement to the second. This difference continued to be substantial once fruits and vegetables were combined and the means of the two measurements were compared. One possibility for the sharp decrease in consumption of both fruits and vegetables within the control group was a class party held during the morning of the second measurement that provided snacks for the students, including popcorn and candy.

Summary

While both hypotheses from this study could not be confirmed, a great deal of information was obtained. A positive effect on the fruit and vegetable consumption of students who received nutrition education was shown, which could effect future decisions of policy-makers, teachers and parents in regard to nutrition education. The decrease in the consumption by the control group could be attributable to the class party the morning of the measurement.

Chapter 5

Conclusion

Summary

The purpose of this study was to determine the effect of nutrition education on the fruit and vegetable consumption of third grade students. Although the results from this study cannot be generalized due to the small convenience sample used in the research, valuable information was gained. The results indicate that delivering four consecutive weeks of half-hour nutrition education lessons can have a positive impact on the amount of fruits and vegetables consumed by young children. The increase in fruit and vegetable consumption within the experimental group compared to the decrease in the fruit and vegetable consumption within the control group provide evidence for this hypothesis.

In spite of the positive effects of the nutrition education lessons delivered to the students in this study, nutrition education alone is unlikely to completely resolve the low fruit and vegetable intakes shown in these children. Further research should be conducted in order to explore the various theories related to the fruit and vegetable consumption of elementary school students.

Limitations

While the researcher of this study was able to control for many variables, there are always limitations. A few of these were the relatively small sample size, the use of a convenience sample and the lack of variation in demographic qualities. Another limitation was the use of only one measurement pre and post-intervention because human error or other extraneous variables could skew results. However,

precautions were taken to lessen the risk of human error and other variables. The researcher and assistant carefully planned each of their roles prior to the measurements to ensure accuracy and precision. The roles were the same for each person during each measurement. Also, the same equipment was used for each measurement; this includes table, measuring cups and scoops. Because the fruit and vegetable served for each group was different, this could be a limiting factor. There is a possibility that the results would have been different if both the control and experimental group had been served the same fruit and vegetable. In addition, solely measuring fruit and vegetable waste to evaluate the effectiveness of the program could have limited the results.

Another, possible severe, limitation of the study was a party held for the students of the control group in the hours prior to their post-intervention measurement. At the party, the children were served snacks such as popcorn and candy. These students do not normally have any snack in the morning. A decrease in consumption of both fruits and vegetables was shown on this day, which may have been the result of the fullness of the children carried over from the snacks provided at the party that morning.

Additionally, the students reported a lack of interest by many of their parents in the nutrition education and the handouts that were sent home. One student asked if she had to participate in the nutrition education program anymore because her parents were getting annoyed with the handouts being sent home each week. This reported lack of parental support could have been an added limitation of the study. Also related to parents was the rate of signed consent forms returned. Of those sent

home, approximately 48% were returned. This alone was a limitation of the study, but a further limitation is the difference of parent attitudes of the parents who signed the consent forms from those who did not and how those attitudes may affect those of their children.

Implications and Recommendations

Implications. The results of this study provide valuable information that could be used in the formulation of elementary school study plans. Because nutrition education was shown to increase the fruit and vegetable consumption of the students in this study, the schools involved may recognize the importance of nutrition education and make it a higher priority by reintroducing the CATCH program in the classroom. The food service director was interested in viewing the results of this study for use in future meal and wellness policy planning. Other schools may also use this information in the planning and implementation of their wellness policies. The results of this study could also influence the attitudes of the parents toward nutrition education as many of the parents and guardians of the students in this study did not see the value in the research during this study, as evidenced by the reports of the students.

Recommendations. Because of the small sample size used in this study, repeating it on a larger scale would be a beneficial way to determine whether or not these results can be generalized. Other research should be conducted that includes active parental involvement since past research has shown parental involvement to be advantageous in increasing the fruit and vegetable consumption of children. This coincides with the lack of parental interest shown in this study; if the parents were

more actively involved, they may have a greater appreciation for the purpose of the research. Examining the effect of the teacher attitude toward good nutrition and healthful foods would also be valuable information in the quest to increase fruit and vegetable consumption in elementary school students.

Finally, finding the most likeable fruits and vegetables would facilitate the process of creating effective school menus. Studying the differences in children's attitudes toward fruits and vegetables may also assist with the creation of menus. The types of fruits and vegetables served have been shown to effect intake as well. In one study of plate waste in elementary school students, canned fruit was wasted less than fresh fruit for most varieties of fruit (Riegel, 2014). More research concerning the types of fruits and vegetables preferred by children could be beneficial in the effort to increase fruit and vegetable consumption by this population. Conducting research studies such as these is crucial because the results of these studies have the potential to drastically improve the nutrition habits of today's youth.

References

- AAP. (2014). Nutrition. Retrieved March 13, 2015, from <http://www.healthychildren.org/English/Pages/default.aspx>.
- Action for Healthy Kids. (2008). *Progress or promises? What's working for and against healthy schools-executive summary*. Retrieved from <http://www.actionforhealthykids.org/media-center/reports/881-action-for-healthy-kids-progress-or-promises-2008>.
- AND. (2010). Comprehensive School Nutrition Services. Retrieved April 3, 2015, from <http://www.eatrightpro.org/resource/practice/position-and-practice-papers/position-papers/comprehensive-school-nutrition-services>.
- Au, N. (2012). The health care cost implications of overweight and obesity during childhood. *Health Services Research, 47*(2), 655-676. doi:10.1111/j.1475-6773.2011.01326.x
- Blanchette L, & Brug J. (2005). Determinants of fruit and vegetable consumption among 6–12-year-old children and effective interventions to increase consumption. *Journal of Human Nutrition and Diet, 18*:431–43.
- Blom-Hoffman, J. (2008). School-based promotion of fruit and vegetable consumption in multiculturally diverse, urban schools. *Psychology in the Schools, 45*(1), 16-27. doi:10.1002/pits.2027
- Blom-Hoffman, J., & DuPaul, G. J. (2003). School-based health promotion: The effects of a nutrition education program. *School Psychology Review, 32*, 263–271.
- Boeing, H., Bechthold, A., Bub, A., Ellinger, S., Haller, D., Kroke, A., & ... Watzl, B. (2012). Critical review: Vegetables and fruit in the prevention of chronic

diseases. *European Journal of Nutrition*, 51(6), 637-663. doi:10.1007/s00394-012-0380-y.

CATCH. (2015). About us. Retrieved February 18, 2015, from

<http://catchinfo.org/about/>.

Cawley J. (2010). The economics of childhood obesity. *Health Affairs*. 29(3): 364-371.

CDC. (2010). Continuous NHANES Dietary Data. Retrieved April 3, 2015, from

<http://wwwn.cdc.gov/nchs/nhanes/search/datapage.aspx?Component=Dietary&CycleBeginYear=2009>.

CDC. (2011). Data and Statistics. *Adolescent and School Health*. Retrieved April 3,

2015, from <http://www.cdc.gov/healthyyouth/data/index.htm>

CDC. (2012a). NCHS data brief. *Centers for Disease Control and Prevention*. Retrieved

from <http://www.cdc.gov/nchs/data/databriefs/db82.htm>.

CDC. (2012b). School health policies and practices survey. *Adolescent and School*

Health. Retrieved March 13, 2015, from

<http://www.cdc.gov/HealthyYouth/shpps/>.

CDC. (2013). State indicator reports. *Centers for Disease Control and Prevention*.

Retrieved from <http://www.cdc.gov/obesity/resources/reports.html>.

CDC. (2015). Fruits and vegetables. Retrieved April 3, 2015, from

<http://www.cdc.gov/nutrition/everyone/fruitsvegetables/>.

Contento, I. (2011). *Nutrition education: Linking research, theory, and practice*.

Sudbury, Mass.: Jones and Bartlett.

- Daniels, S. (2009). Overweight in children and adolescents: Pathophysiology, consequences, prevention and treatment. *Circulation*. 111:1999.
- Dietary Guidelines Advisory Committee (2010). Report of the Dietary Guidelines Advisory Committee on the Dietary Guidelines for Americans, 2010, to the Secretary of Agriculture and the Secretary of Health and Human Services. Washington, DC: U.S. Department of Agriculture.
- Fruits & Veggies More Matters. (2014). Fruit & Veggie Info. Retrieved March 13, 2015, from <http://www.fruitsandveggiesmorematters.org/why-fruits-veggies>.
- Geier, A., Foster, G., Womble, L., McLaughlin, J., Borradaile, K., Nachmani, J., ...Shults, J. (2007). The relationship between relative weight and school attendance among elementary schoolchildren. *Obesity*, 2157-2161. Retrieved February 18, 2015, from <http://onlinelibrary.wiley.com/doi/10.1038/oby.2007.256/abstract>.
- Harris, A., McGregor, J., Perencevich, E., Furuno, J., Zhu, J., Peterson, D., & Finkelstein, J. (2006). The use and interpretation of quasi-experimental studies in medical informatics. *Journal of the American Medical Informatics Association: JAMIA*, 13(1), 16-23. doi:10.1197/jamia.M1749.
- Hoelscher, D., Springer, A., Ranjit, N., Perry, C., Evans, A., Stigler, M., & Kelder, S. (2010). Reductions in child obesity among disadvantaged school children with community involvement: The Travis County CATCH Trial. *Obesity*, S36-S44. Retrieved February 5, 2015.

- Jacko, C., Dellava, J., Ensle, K., & Hoffman, D. (2007). Use of the plate-waste method to measure food intake in children. *Journal of Extension, 45*(6). Retrieved April 3, 2015, from <http://www.joe.org/joe/2007december/rb7.php>
- Janssen, I., Craig, W., Boyce, W., & Pickett, W. (2004). Associations between overweight and obesity with bullying behaviors in school-aged children. *Pediatrics, 113*, 1187–1194.
- Knai, C., Pomerleau, J., Lock, K., & McKee, M. (2006). Getting children to eat more fruit and vegetables: A systematic review. *Preventive Medicine, 42*, 85–95.
- Larsson, S., Virtamo, J., & Wolk, A. (2013). Total and specific fruit and vegetable consumption and risk of stroke: A prospective study. *Atherosclerosis, 227*(1), 147-152.
- Ledoux, T., Hingle, M., & Baranowski, T. (2011). Relationship of fruit and vegetable intake with adiposity: A systematic review. *Obesity Reviews, 12*, e143-e150. doi:10.1111/j.1467-789X.2010.00786.x
- Let's Move. (2014). About us. Retrieved March 13, 2015, from <http://www.letsmove.gov>.
- Lock, K., Pomerleau, J., Causser, L., Altmann, D., & McKee, M. (2005). The global burden of disease attributable to low consumption of fruit and vegetables: Implications for the global strategy on diet. *Bulletin of the World Health Organization, 83*(2), 100-108.
- Long, J., Mareno, N., Shabo, R., & Wilson, A. (2012). Overweight and obesity among White, Black, and Mexican American children: Implications for when to

intervene. *Journal for Specialists In Pediatric Nursing*, 17(1), 41-50.

doi:10.1111/j.1744-6155.2011.00309.x

Ludwig, D. (2007). Childhood obesity-the shape of things to come. *New England Journal of Medicine*, 357(23), 2325-2327. Retrieved from

<http://www.nejm.org/doi/full/10.1056/NEJMp0706538>

Luepker, R., Perry, C., & McKinlay, S. (1996). Outcomes of a field trial to improve children's dietary patterns and physical activity: The Child and Adolescent Trial for Cardiovascular Health (CATCH). *Journal of the American Medical Association*, (278), 768-776.

Mahan, L., Raymond, J., & Escott-Stump, S. (2011). *Krause's Food and the Nutrition Care Process*. (13th ed, pp. 400-429). St. Louis, MO.: Elsevier/Saunders.

Marder, W., & Chang, S. (2006). Childhood obesity: Costs, treatment patterns, disparities in care, and prevalent medical conditions. *Thomson Medstat Research Brief*.

Masters, R., Reither, E., Powers, D., Claire Yang, Y., Burger, A., & Link, B. (2013). The impact of obesity on US mortality levels: The importance of age and cohort factors in population estimates. *American Journal of Public Health*, 103(10), 1895-1901. doi:10.2105/AJPH.2013.301379

Mikkila, V., Rasanen, L., Raitakari, O., Pietinen, P., & Viikari, J. (2005). Consistent dietary patterns identified from childhood to adulthood: The cardiovascular risk in young Finns study. *British Journal of Nutrition*, 93(6), 923-931.

- Nader, P., Stone, E., Lytle, L., Perry, C., Osganian, S., Kelder, S., ... Luepker, R. (1999). Three-year maintenance of improved diet and physical activity. *Archives of Pediatrics & Adolescent Medicine*, 695-695. Retrieved February 5, 2015.
- NIH. (2012). How are overweight and obesity diagnosed? *National Institute of Health*. Retrieved from <http://www.nhlbi.nih.gov/health/health-topics/topics/obe/diagnosis.html>.
- Onboard Informatics. (2014). Community data. Retrieved March 15, 2015 from <http://www.onboardinformatics.com/local-content/community/>.
- Riegel, H. R. (2014). Fruit and Vegetable Consumption Patterns among Children during School Lunch (Master's thesis). Wright State University. <http://corescholar.libraries.wright.edu/mph/136>.
- Sharma, S., Chuang, R-J., & Hedberg, A. (2011). Pilot-testing CATCH early childhood: A preschool based healthy nutrition and physical activity program. *American Journal of Health Education*, 42(1), 12-23.
- State of Obesity (2014). Obesity data trends and policy analysis. Retrieved on April 3, 2015 from <http://stateofobesity.org/rates/>.
- Stevens-Edouard, S., & Cavallaro, V. (2005). Jump up and go! Healthy choices: Statewide program implementation to improve nutrition and physical activity in Massachusetts public middle schools. Paper presented at the American Public Health Association annual meeting, Philadelphia.
- Stice, E., Shaw, H., & Marti, C. (2006). A meta-analytic review of obesity prevention programs for children and adolescents: The skinny on interventions that work. *Psychological Bulletin*, 132, 667 – 691.

- Taras, H., & Potts-Datema, W. (2005). Obesity and student performance at school. *Journal of School Health*, 291-295. Retrieved February 18, 2015, from [http://faculty.ksu.edu.sa/almuzaini/Important Resources/School/school performance.pdf](http://faculty.ksu.edu.sa/almuzaini/Important%20Resources/School/school%20performance.pdf).
- Trasande, L., & Chatterjee, S. (2009). The impact of obesity on health service utilization and costs in childhood. *Obesity*, 17(9),1749-54.
- US Department of Education, Institute of Education Sciences. (2010). *Educational Indicators*. Washington, DC: US Department of Education.
- USDA. (2012). A series of systematic reviews on the effects of nutrition education on children's and adolescents' dietary intake. *Evidence Analysis Library*.
- USDA. (2013). Program Regulations (CFR). *School Meals Regulations*. Retrieved from <http://www.fns.usda.gov/cnd/governance/regulations>.
- USDA. (2014). Welcome to the Five Food Groups. Retrieved March 13, 2015, from <http://www.choosemyplate.gov/food-groups/>.
- USDHHS. (2008). Physical Activity Guidelines for Americans. Retrieved April 3, 2015, from <http://www.health.gov/paguidelines/guidelines/>.
- USDHHS. (2010). The Surgeon General's vision for a healthy and fit nation. Washington, DC: US Department of Health and Human Services.
- Wardle, J., Herrera, M., Cooke, L., & Gibson, E. (2003). Modifying children's food preferences: The effects of exposure and reward on acceptance of an unfamiliar vegetable. *European Journal of Clinical Nutrition*, 57, 341 – 348.

- Whaley, S., Ritchie, L., & Spector, P. (2012). Revised WIC food package improves diets of WIC families. *Journal of Nutrition Education and Behavior, 44*, 204–209.
- WHO. (2011). Physical Activity and Young People. Retrieved March 13, 2015, from http://www.who.int/dietphysicalactivity/factsheet_young_people/en/.
- Williams, J., Wake, M., Hesketh, K., Maher, E., & Waters, E. (2005). Health-related quality of life of overweight and obese children. *Journal of the American Medical Association, 293*, 70 – 76.
- Ying-Ying, G., Bogart, L., Sipple-Asher, B., Uyeda, K., Hawes-Dawson, J., Olarita-Dhungana, J., & Schuster, M. (2009). Using community-based participatory research to identify potential interventions to overcome barriers to adolescents' healthy eating and physical activity. *Journal of Behavioral Medicine, 32*(5), 491-502.

Appendix A
Parental Consent Form

Control Group

I, _____, give permission for my child, _____ to participate in a research study investigating the effect of nutrition education on the fruit and vegetable consumption of elementary school students. The data gathered from this study will be used in the compilation of a Master's thesis at Eastern Illinois University. Your child's participation in the study is completely voluntary and involves the measurement of the fruits and vegetables on their tray following the lunch meal if they are eating 'hot' lunch twice during their fourth quarter of this school year. This measurement will be completed by simply scooping their leftover fruits and vegetables into large containers after the meal. There are no risks or direct benefits to be gained from this study and participation is not required. Your child may withdraw from the study at any time during the study for any reason. The data collected will be anonymous and your child will be asked if they would like to participate before they are included in the study. If you have any questions regarding this study, please contact Constance Herriott at 217-766-7364 or clevans@eiu.edu

"If you have any questions or concerns about the treatment of human participants in this study, you may call or write: Institutional Review Board, Eastern Illinois University, 600 Lincoln Ave., Charleston, IL 61920, Telephone: (217) 581-8576, E-mail: eiuirb@www.eiu.edu

Experimental Group

I, _____, give permission for my child, _____ to participate in a research study investigating the effect of nutrition education on the fruit and vegetable consumption of elementary school students. The data gathered from this study will be used in the compilation of a Master's thesis at Eastern Illinois University. Your child's participation in the study is completely voluntary and involves the measurement of the fruits and vegetables on their tray following the lunch meal if they are eating 'hot' lunch twice during their fourth quarter of this school year. This measurement will be completed by simply scooping their leftover fruits and vegetables into large containers after the meal. Participation also involves a total of two hours of nutrition education, to be delivered by their regular homeroom teacher. These nutrition education lessons will be delivered weekly for half an hour for three consecutive weeks. There are no risks or direct benefits to be gained from this study and participation is not required. Your child may withdraw from the study at any time during the study for any reason. The data collected will be anonymous and your child will be asked if they would like to participate before they are included in the study. If you have any questions regarding this study, please contact Constance Herriott at 217-766-7364 or clevans@eiu.edu

"If you have any questions or concerns about the treatment of human participants in this study, you may call or write: Institutional Review Board, Eastern Illinois University, 600 Lincoln Ave., Charleston, IL 61920, Telephone: (217) 581-8576, E-mail: eiuirb@www.eiu.edu

Appendix B
School Consent Form

Community Unit School District #7

Superintendent:
Andrew J. Larson

Administration Center
P.O. Box 720
Tolono, IL 61880
217-485-6510 Fax 217-485-3091
www.unit7schools.com

April 23, 2014

Dear Eastern Illinois University Institutional Review Board:

On behalf of Unit 7 Schools, I grant permission for the research study entitled *The Impact of Nutrition Education on the Fruit and Vegetable Consumption of Elementary School Students* by Constance Herriott to be conducted within Unity East and Unity West Elementary Schools. I have an understanding of the nature of the study to be conducted and the research is to be carried out from April 28th, 2014-May 30th, 2014.

Sincerely,



Andrew Larson
Superintendent, Unit 7 Schools

UNIT 7 SCHOOLS

Better Schools



Better Citizens

Appendix C

CATCH Sample Lesson

Lesson 2

Hearty Goes on a Mission

In this lesson, students will:

1. Review the basic function and maintenance of the circulatory system.
2. Watch the first episode of an animated story that promotes healthful behaviors.
3. Identify healthful eating, exercise, and food label reading as behaviors that promote heart health.
4. Identify specific healthful foods that are good for your heart (vegetables, fruits, 100% fruit juices, whole-grain breads and cereals, beans, low-fat dairy products, and lean meats).
5. Illustrate their own message of healthful eating and exercise.

* The circulatory system poster is not provided. This may be found in a teacher supplies store or through the American Heart Association.

Activity 1: Review – Circulatory System

Purpose: To briefly review the body's circulatory system and the important effects that healthful eating and exercise have on that system.

A. Introduce this lesson by using a poster that diagrams the body's circulatory system to review what students may have previously learned about this system.

EMPHASIZE:

- Your heart is an amazing muscle. It continuously pumps blood and oxygen throughout your body in miles and miles of tiny blood vessels called "arteries" and "veins."
- Your heart asks little from you. If you exercise by doing regular physical activity and eat foods that are good for you, you will be helping to keep your heart healthy for many beats to come.
 - As your heart beats, it is pumping blood around your body.
 - When you exercise regularly, your heart becomes very good at pumping blood around your body.
 - When you play hard in PE class, during recess, or at home, your heart is being exercised.
 - Regular exercise makes your heart muscle strong and healthy.
 - The foods you eat are also very important to your heart.
 - Eating foods high in fat is not good for your heart.
 - High-fat foods can cause blood vessels to clog. When the heart has to work much harder to pump blood through those clogged blood vessels.
 - It is important to choose foods that are low in fat.
 - Eating too many foods that are high in fat and sugar is also not good for your heart. Such foods usually have many calories, and too many calories can make you gain too much weight. When you gain

too much weight, your heart has to work harder to pump blood.

- So, it is very important for you to take good care of your heart all of your life. This good care should begin now when you are young and your heart is very healthy.

B. Ask students to name two things they can do to take good care of their heart. (Eat healthy and be active) Explain that the Hearty Heart and Friends program will include adventure stories and activities that will help them find ways to eat healthy and be active. By eating healthy and being active, they will feel good and have lots of energy to do all the fun things they like to do.

Activity 2: Hearty Heart Adventure Story

Purpose: To view the first Hearty Heart episode and then identify and discuss some of the important points in the adventure.

A. Announce to the class that during the Hearty Heart program they will see adventure stories about Hearty Heart and his friends, all of whom they read about during the first lesson.

B. Instruct students to prepare to watch Episode 1: Hearty Goes on a Mission by putting aside everything on their desks and being good listeners. Explain that since the word “episode” means “part,” they will be watching “Part One” today.

C. Show Episode 1. (There is a script of the episode at the end of this lesson.)

Synopsis: Hearty Heart accepts a mission to go to Planet Earth to find the children who wrote Principal Goodheart asking for information about what they need to know to prepare to visit Planet Strongheart. Hearty invites his friends Dynamite Diet, Sally Sleuth, and Flash Fitness to help him with this mission. As Hearty and his friends prepare to “blast off” for Earth, they explain that healthful eating and exercise are both important to heart health.

D. Discuss the adventure story, as time permits.

ASK:

- Where was Hearty Heart from? (Planet Strongheart)
- Why was he being sent on a mission? (Some children on Earth wrote to Mr. Goodheart, the principal of his school, asking for information on heart health so they could prepare to visit Planet Strongheart.)

- Why did Hearty Heart invite Dynamite Diet, Sally Sleuth, and Flash Fitness to go on the mission? (Dynamite Diet is an expert in healthy eating; Sally Sleuth is an expert in looking for information on food labels; Flash Fitness is an expert in exercise and play.)

♥ What did the characters take with them on their journey to Earth? (Dynamite Diet – vegetables, fruits, 100% fruit juices, whole-grain breads and cereals, beans, low-fat dairy products, poultry, fish, lean meats; Sally Sleuth – a magnifying glass to help her find information on food labels; Flash Fitness – soccer ball, bicycle, tennis shoes, swimming suit)

♥ Who were the sneaky characters that Principal Goodheart told Hearty to watch out for on his trip to Earth? (Sittin’ Sam and

Food Fat)

E. Ask students for additional comments and reactions to this first episode and discuss, as time permits.

Activity 3: Drawing and Labeling Pictures

Purpose: To draw and label pictures that depict their own message of healthful eating and exercise.

A. Ask students to think about and name things they can do now to take good care of their heart. Encourage them to address both exercise and healthful eating.

B. Distribute paper and ask students to draw and label a picture that illustrates their own message of heart healthy living. So that students produce pictures illustrating

both exercise and healthful eating, either make assignments of the type of message they should illustrate, or (if time permits) ask students to draw and label two pictures—one of each type of message.

C. Collect students' drawings and, if possible, display them in the cafeteria, hall, or classroom.

Activity 4: Lesson Summary

Purpose: To review the main points of Lesson 2.

A. Remind students that the heart is an amazing muscle that needs regular exercise and good foods, like vegetables, fruits, 100% fruit juices, whole-grain breads and cereals, beans, low-fat milk and dairy products, poultry, fish, and lean meats.

B. Emphasize that it is very important for them to learn how to take good care of their heart, and that this good care should begin now when they are young and their heart is still very healthy.

C. Review that the first adventure story found Hearty and his friends on their way to Earth to find some children who wanted to learn more about heart health and how they could prepare to visit Planet Strongheart.

D. Explain that the adventures will continue, but that their next Hearty Heart class will include a very special activity.

If you have not already done so:

♥ Check with your cafeteria manager or parent volunteer(s) on food items/supplies ordered for the snack preparation activity in the next lesson.

♥ Arrange for a parent volunteer to assist you with this activity.

Episode 1: Hearty Goes on a Mission

DVD script

Sound: trumpet fanfare

Narrator: The Adventures of . . . Hearty Heart and His Friends!

Episode One: Hearty Goes on a Mission. On Planet Strongheart, in a galaxy far away. It was the last day of school at the Intergalactic School of Heart Health. Hearty Heart and his friends had just completed their training in how to live a healthy life. Suddenly, Hearty Heart got an urgent call from the principal.

Intercom: Hearty Heart, report to the principal's office! Hearty Heart to the principal's office!

Sound: door opening/closing

Hearty Heart: Gee! I'm sorry, Mr. Goodheart, but it was just one little paper spaceship.

Principal: That's all right, Hearty, my boy. That's not why I called you in. Since you've done so well in school, I've chosen you for a very important mission. It's time to put your training to good use, to help others learn about heart health.

Hearty Heart: Yes, sir! I'll do my best! What's the mission?

Principal: Well, Hearty, as you know, one of my duties as leader of this school is to keep an eye on the heart health of everyone in the universe.

Hearty Heart: That's a big place, sir!

Principal: Yes, it is, Hearty! The other day I received a letter from some children on a planet called "Earth" in the Milky Way Galaxy. Hearty, they need your help. They'd like to visit us on Planet Strongheart, but they need to be prepared for the journey. Your job will be to find them and teach them about heart health. Then they'll be able to make the most of their visit here and also live healthier lives on Planet Earth.

Hearty Heart: Yes, sir!

Principal: Unfortunately, I don't know where to find the children who wrote me. All I can tell you is that they live on Earth. Will you accept the assignment? It's not going to be easy.

Hearty Heart: I know that, sir. But I accept the mission.

Principal: Good. I'll watch your progress on my laservision screen. First you'll need to put together a team of the best heart health advisors you can find here at the school. They'll go along and help you with your mission. And, Hearty, watch out for some very sneaky characters who might get in the way of your mission: Food Fat and Sittin' Sam.

Hearty Heart: Don't worry, sir. I'll do my best.

Narrator: Yes! Hearty Heart accepted the mission: to find the Earth children and prepare them for their visit to Planet Strongheart.

Hearty Heart: Let's see. I wonder who I need on my team to make the mission a success. First, I need somebody who knows about eating the right things. Hmm . . . I've got it! My old friend Dynamite Diet! Hey, Dynamite! I need your help!

Dynamite Diet: What can I do for you, Hearty?

Hearty Heart: I've just accepted a mission to find some children on Planet Earth who want to learn about healthy living. I need someone to come with me who knows all about eating the right things—and that's you, Dynamite! Will you come along?

Dynamite Diet: Of course, Hearty! I'd love to! But, have you thought about also bringing someone who understands the information on food labels? Reading food labels helps you find the right foods to eat.

Hearty Heart: You're right! Do you have anyone in mind?

Dynamite Diet: Yes, my old friend Sally Sleuth. She's just down the hall. Let's stop in and see her. Sally? I'd like you to meet my friend, Hearty Heart. We're going on a mission together and we need your help.

Sally Sleuth: What's the mission, Hearty?

Hearty Heart: Principal Goodheart wants us to find some Earth children who want to learn about heart health.

Dynamite Diet: Will you come along?

Sally Sleuth: Positively, dear Dynamite! I wouldn't miss it for the world. I assume you want me to show them how to look for information on food labels.

Dynamite Diet: You've got it, Sally!

Sally Sleuth: Of course, you'll also need someone who knows about exercise and play. That's absolutely, positively important to healthy living!

Hearty Heart: You're right! Who do you have in mind?

Sally Sleuth: Why, none other than Flash Fitness! She knows more about the right ways to exercise and play than anyone I know. I suggest we three meet at her home in the morning. We'll have breakfast with her, invite her on the mission, and then get ready to leave. What do you say?

Dynamite/Hearty: Good idea! Let's do it!

Sally Sleuth: Flash Fitness! I'm delighted to present Dynamite Diet and Hearty Heart. We want you to come along on an important mission. We're going to teach the children of Earth about living healthy lives. Will you do it?

Flash Fitness: All right! I'd love to show the Earthlings the get-fit way to exercise and play! When do we leave?

Hearty Heart: Our spaceship is parked just outside. We can leave right after breakfast.

Dynamite Diet: Here's one of my favorite healthy breakfasts: plenty of fresh fruits, and whole-grain cereal with low-fat milk.

All: Ahhh! Sounds great! Delicious! Yum-yum!

Hearty Heart: Okay, everybody! Do we have what we need for the mission?

Dynamite Diet: Let's check the list: vegetables, fruits, 100% fruit juices, whole-grain breads and cereals, beans, low-fat dairy products, lean meats . . . Right! Everything I need is here!

Flash Fitness: Let's see: soccer ball, bicycle, tennis shoes, swimming suit . . . Yes! All here!

Sally Sleuth: I've got all I need: my magnifying glass for reading food labels.

Dynamite Diet: Then, let's get going. We've got a long ride through the galaxies. Fasten your seatbelts, everyone!

Sounds: humming and then blast-off

Narrator: And so our fearless foursome set off for Earth on the greatest mission of their lives: to find the children who wrote to the principal and then teach them about heart health. But little did they know that their mission would be more difficult than they expected. There were sinister forces sneaking about that might keep the children of Earth from living healthy lives. . . . Don't miss the next episode of "Hearty Heart and His Friends!"