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A QUANTITATIVE EVALUATION OF NUTRITION EDUCATION INTERVENTION WITH LOW-INCOME YOUTH

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by

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ABSTRACT

The purpose of this study was to evaluate whether selected nutrition education lessons from the *Up for the Challenge: Health, Fitness, and Nutrition* curriculum could contribute to change in knowledge, attitudes and behaviors about nutrition with low-income youth in afterschool programs. *Up for the Challenge* is a curriculum for the promotion of healthful nutrition knowledge, attitudes and behaviors with youth. The curriculum is based on experiential learning model that is structured around direct participation: experiencing, thinking, discussing, and applying what the youth have learned to their daily lives. Five research question/hypotheses guided this investigation.

A quasi-experimental design consisting of pretest-posttest comparison control group was used. The intervention in this study consisted of six nutrition lessons from the curriculum. To evaluate the nutrition education lessons, three measurements were taken at pretest (time 1), posttest (time 2), and delayed posttest (time 3). Participants included youth in two afterschool programs receiving nutrition education lessons through the Expanded Food and Nutrition Education Program of Penn State Nutrition Links. A total of 86 students both in the treatment and control groups participated in the study.

A four-part evaluation tool was developed to collect data. Part one contained questions pertaining to general nutrition knowledge and physical activity. Part two contained statements about attitude towards nutrition, fruits and vegetable consumption, and eating healthy and making healthful food choices. Part three contained statements on nutrition and physical activity behaviors. Part four contained demographic questions such as gender, age, grade level and ethnicity.

Hands-on nutrition education lessons were taught to youth in the treatment group each week over a four-week period. Pretest data was collected before intervention, posttest data collected after the four weeks of intervention, and delayed posttest data collected after two weeks of posttest data collection. The control group did not receive any lessons.

General linear model (GLM) procedures were performed. Results from repeated measures ANCOVA posttest and delayed posttest with pretest as a covariate showed that youth who received nutrition education lessons significantly improved their nutrition knowledge, attitudes, and nutrition behaviors compared to those who did not participate in the lessons. Physical activity knowledge and physical activity behaviors also improved from pretest to posttest and delayed posttest. However, factorial ANOVA with repeated measures pretest, posttest, and delayed posttest indicated no significant differences between nutrition knowledge, attitudes, and nutrition behaviors when participants were examined by gender, grade level, and age.

The significant improvement for nutrition knowledge and physical activity knowledge, attitudes, and nutrition behaviors and physical activity behaviors indicated program effectiveness regardless of the demographic characteristics examined in the study. These results suggest that the selected nutrition education lessons form *Up for the Challenge* curriculum are ready for dissemination within the studied groups. It is recommended that the nutrition education lessons be tested in multiple settings with a diverse group for generalization of results. Nutrition educators, youth and parents should work closely together to implement nutrition education programs.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

ACKNOWLEDGEMENTS

Most importantly, I thank God Almighty for his guidance and direction throughout my life. “He is my light, my fortress and my shield; whom shall I fear?”

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Chapter 1

INTRODUCTION

Over the past three decades, the prevalence of overweight in the United States has tripled for children ages 6–11 years and adolescents' ages 12–19 years (Hedley, Ogden, Johnson, Carroll, Curtin, & Flegal, 2004). An estimated 9.18 million U.S. children and adolescents ages 6–19 years are considered overweight. If obesity levels continue at the current rate, the lifetime risk of being diagnosed with type 2 diabetes at some point in their lives is 30% for boys and 40% for girls (McGinnis, Gootman, & Kraak, 2006). Moreover, overweight puts children at greater risk for cardiovascular disease, hypertension and cancer.

The effects of childhood overweight are devastating to the health and well-being of children now and throughout adulthood. A recent special report (Olshansky et al., 2005) suggests that the United States could be facing its first sustained drop in life expectancy in the modern era due to obesity. The authors suggest that unless steps are taken to curb excessive weight gain, younger Americans will likely face a greater risk of mortality throughout life than previous generations.

In recent years, there have been many calls for methods and programs to help address the childhood "obesity" epidemic (Serrano & Cox, 2005; Story, 1999). To date, prevention is recognized as one of the best methods for controlling the rapid increase in childhood overweight (American Academy of Pediatrics, 2003; Fowler-Brown & Kahwati, 2004; Moran, 1999).

Nutrition education as a means of prevention, may offer some hope for combating obesity, and thus lessening the onset of many cancers and diabetes. Reviews of nutrition education projects have identified a need for increased fruit and vegetable consumption, healthy lifestyles to change life, and making healthy food choices as a means to accomplishing an early introduction (Contento, Balch, Bronner, Lytle, Maloney, Olsen, & Swadener, 1995; Hertzler & DeBord, 1994; Reynolds, Baranowski, Bishop, Gregson, & Nicklas, 2001). In addition, physical activity can have an enormous impact on improving a child's physical and emotional well-being. Research has shown that increased exercise and sports participation can simultaneously help children maintain a healthy body weight, enhance their self-confidence, and offer "opportunities for social contact, nurturing, and maturational guidance" (Centers for Disease Control and Prevention, 2003).

A study conducted by Strong et al. (2005), on evidence based physical activity for school-age youth found that intervention programs of moderate to vigorous physical activity of 30 to 45 minutes duration 3 to 5 days per week would be necessary to achieve beneficial effects on health and behavioral outcomes. The study concluded that school-age youth need to participate daily in 60 minutes or more of moderate to vigorous physical activity that is developmentally appropriate, enjoyable, and involving a variety of activities.

Childhood and adolescent obesity is related to socioeconomic status (SES) (Raman, 2002; Wang, 2001). Low SES populations tend to have elevated rates of illness due to their low socioeconomic situations (Williams & Collins, 1995). A study conducted by Wang (2001) of children ages 6 to 18 found that 32.7% of the low income population

was classified as being overweight or obese compared to 19% of the high income population. The prevalence of overweight and obesity in low income populations may be a result of the consumption of low cost foods that are high in fat and calorically dense, which often happens when families lack the money to buy nutritious foods (Brown, 2002). Oftentimes, parents feel that fresh produce or fruits and vegetables are expensive, hard to select, and difficult to store, and as a result, children have lower levels of fruit and vegetable consumption (Treiman et al., 1996; Kirby et al., 1995; Baranowski et al., 2000; Cullen et al., 2003; Morton & Guthrie, 1999).

In a study conducted of mothers in the Special Supplemental Nutrition Program for Women, Infant, and Children (WIC), Treiman et al. (1996) found that although the mothers had positive perceptions of fruits, they said they were too expensive, hard to select, and difficult to store; and because of these reasons, they often did not purchase fresh fruits for their families. They also considered vegetables to be healthy, but felt that vegetables were difficult to prepare and they were not well liked by their families (Treiman et al., 1996). Research by Morton and Guthrie (1999) found similar results, "Low income respondents were more concerned with price, convenience and how well food keeps than were high income participants" (Morton & Guthrie, 1999, p. 26). Children in low income households are not being taught the importance of fresh fruits and vegetables or being given the opportunity to taste them at home. They are less aware of relationships between nutrition, diet and disease, less likely to utilize the nutrition panel on food labels, and less likely to have low fat and low cholesterol diets and are less likely to know how many servings of fruits and vegetables are recommend (Morton and Guthrie, 1999).

Nutrition education, and more importantly the consumption of fruits and vegetables is vital to the health of children (Domel et al., 1993; Kirby et al., 1995; Ness and Powles, 1997; Liu et al., 2000; Bazzano et al., 2002; Cullen et al., 2002; Djoussé et al., 2004). Fruit and vegetable consumption decreases the risk for cardiovascular disease, (Liu et al., 2000) decreases concentrations of LDL cholesterol, (Djoussé et al., 2004) and lowers stroke incidence (Bazzano et al., 2002). Including fruits and vegetables consistently in a diet can also assist with weight control (Lin & Morrison, 2002).

Statement of Problem

Food preferences and dietary habits are established during childhood (Kirby et al., 1995; Carter, 2002). This means that nutrition interventions need to be targeted to young children while they are forming their lifelong habits. Research has indicated that establishing healthy habits, which include eating fruits and vegetables (F&V) early in childhood will decrease the likelihood of becoming overweight or obese in adulthood (Veugelers & Fitzgerald, 2005). It is critical to begin teaching children the importance of healthy food choices, at an early age. A healthy lifestyle, which includes good nutrition and an adequate intake of F&V has been shown to improve weight status, decrease disease risk, and improve overall health (Veugelers & Fitzgerald, 2005).

Schools are a resourceful place to begin nutrition education intervention programs and are an important social environment that shapes children's eating habits (Pilant, 2006). Several studies have been conducted to determine the effectiveness of classroom-based nutrition education programs and targeted a variety of school-age children using a

number of social-psychological theories explaining nutrition behavior, knowledge, and attitude, and their relationship. Among the theories and theoretical models that have been used by nutrition education researchers are the Health Belief Model (Maiman & Becker, 1974), Theory of Reasoned Action (Fishbein & Ajzen, 1975), Social Cognitive Theory (Bandura, 1977), and Theory of Diffusion of Innovation (Rogers, 1995). Work done by researchers using each of these models has added to the understanding of the mental processes influencing eating behavior and habits.

Although many nutrition education interventions have been designed and evaluated, relatively few have emphasized the use of the experiential learning as a framework for implementing curriculum-based nutrition education intervention in afterschool settings. Initial studies have illustrated the positive effect that afterschool nutrition intervention with urban youth can have using some of the models previously identified in the above paragraph in increasing nutritional knowledge and causing behavior change towards healthy eating (Rinderknecht & Smith, 2004 & Kelder et al. 2005). Other studies have also used experiential learning model as a framework for developing and implementing garden-based nutrition learning programs (Desmond, Grieshop, & Subramaniam, 2004), some of which have been shown to be effective at improving the nutrition knowledge and behaviors of school students (Morris,et al., 2002). However, there remains insufficient/inadequate information on implementing curriculum-based nutrition education lessons using experiential learning model with low-income youth in afterschool settings. Overweight and obesity is greatest among the low-income groups than other groups (Morton and Guthrie, 1999; Wang, 2001). There is a need for additional research to: (a) assess effectiveness and demonstrate positive impact of

nutrition education intervention with low-income youth in afterschool programs, (b) improve programs and develop better nutrition intervention, and (c) replicate research in other settings.

Attempting to reach low-income youth in afterschool programs is important because school districts are increasingly reluctant to release class time for such non-academic activities as health promotion due to lack of recognition of nutrition education as a priority, and competition for classroom time, (Kelder, Mitchell, & McKenzie, et al. (2003); Parcel, Perry, Kelder, & Elder, et al. (2003); Kolbe, Kann, & Brener, (2001). Afterschool programs provide opportunity for health programs that may be difficult to incorporate into an already-full school day. Furthermore, according to a study conducted by Mahoney, Lord, & and Carryl, (2005a), afterschool programs for children from low-income families can significantly improve these children's performances in school. They found that over time, students in these programs were reading at a higher level than their peers in any other type of educational setting.

Therefore, the current study was designed to evaluate whether selected nutrition education lessons from the *Up for the Challenge: Health, Fitness, and Nutrition* curriculum based upon an experiential learning framework could contribute to change in knowledge, attitudes and behaviors about nutrition with low-income youth in afterschool programs. The *Up for the Challenge* curriculum was designed for the promotion of healthful nutrition knowledge, attitudes and behaviors with low-income youth. The curriculum is based on an experiential learning model that is structured around direct participation: experiencing, thinking, discussing, and applying what the youth have learned to their daily lives. The intervention components of *Up for the Challenge*

curriculum include lessons on good nutrition, eating fruits and vegetables, physical activity, and healthy lifestyle choices for elementary school, middle school and teen youth.

Model/Framework Underlying the Intervention Design and Implementation

Experiential learning was the underlying framework guiding the design and implementation of nutrition education lessons tested in this study. The experiential learning model uses a five-step learning cycle (Figure 1) based on the work of Dewey (1938), Kolb (1984) and Pfeiffer and Jones (1985), and is the most common one currently used in youth development programs. Experiential learning offers a viable framework for nutrition education for children using hands-on, active learning. This model allows children to learn and construct meaning through experiencing real-life situations (Dewey, 1938; Kolb 1984). Experiential learning offers children a more learner-centered approach which often produces deeper and more enduring learning than other approaches to learning. The three major components and foundation of experiential model that makes active hands-on learning more effective are "*do*" the activity, "*reflect*", and think about what they have learned has "*application*" in other areas of their lives. The experiential learning approach helps children to *experience* the activity, *share* what they learned, *reflect*/*process* on what they learned, *generalize* the life skill to their own lives, and *apply* the life skill to a new situation (see figure 1).

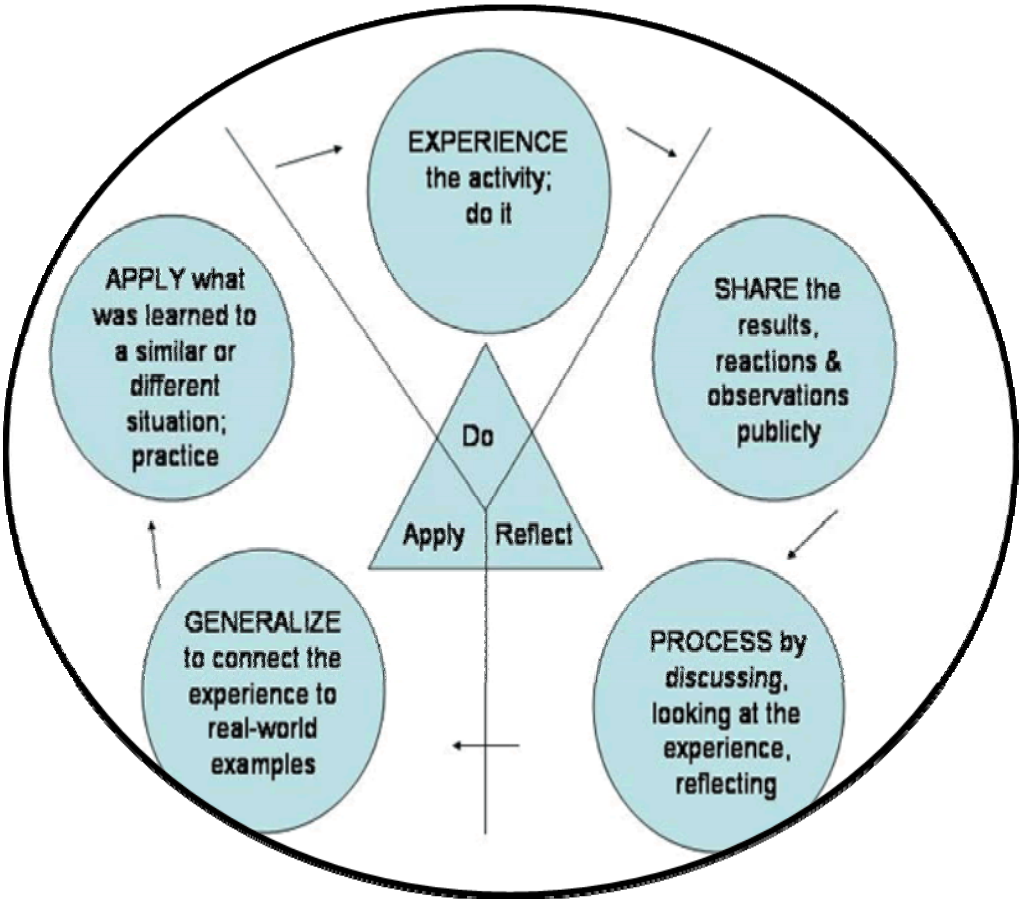


Figure 1: Experiential Learning Model/Framework used in Youth Development Programs
Source: Cooperative State Research, Education and Extension Services (CSREES-USDA)

Significance of the Study

This study is important for one major reason: the majority of prior studies focusing on youth have assessed their nutrition education intervention primarily through classroom-based observations and self-reported checklists from the teachers in the classrooms, and garden based experiential learning approach. This study utilized an afterschool setting using an experiential learning approach to implement and evaluate

curriculum-based nutrition education intervention to change nutrition knowledge, attitudes and behaviors. Data collected from this study not only will add to the body of knowledge on nutrition education intervention effect, but also will be made available to county nutrition educators in order use the *Up for the Challenge* curriculum to improve the health and well-being of low-income youth.

Purpose of the Study

The purpose of this study was to evaluate whether selected nutrition education lessons from the *Up for the Challenge: Health, Fitness, and Nutrition* curriculum based upon an experiential learning model contribute to change in knowledge, attitudes and behaviors about nutrition with low-income youth in afterschool programs.

Research Questions/Hypotheses

The following research questions (R_Q)/hypotheses (H_O/H_A) guided the study: First, the demographic characteristics of youth participating in the study were described.

R_{Q1}: What is the effect of nutrition education intervention (selected lessons from the *Up for the Challenge* curriculum) on general nutrition and physical activity knowledge?

H_{A1}: Youth receiving nutrition education intervention will score significantly higher on general nutrition knowledge compared to youth who do not receive intervention (control group).

R_{Q2}: What is the effect of nutrition education intervention on the attitudes about nutrition, eating fruits and vegetables, eating healthy, and making healthy food choice?

H_{A2}: Youth receiving nutrition education intervention will score significantly higher on attitudes compared to youth who do not receive intervention (control group).

R_{Q3}: What is the effect of nutrition education intervention on nutrition and physical activity behaviors?

H_{A3}: Youth receiving nutrition education intervention will score significantly higher on nutrition behaviors compared to youth who do not receive intervention (control group).

R_{Q4}: Is there a difference in nutrition knowledge, nutrition attitudes, and nutrition behaviors when examined by participants' demographic characteristics such as gender, age, grade level, and ethnicity?

H_{O4}: There will be no difference in nutrition knowledge, nutrition attitudes and nutrition behaviors when examined by demographic characteristics of youth.

$R_{Q5:}$ Are there relationships between nutrition knowledge, attitudes and nutrition behaviors?

H_{O5}: There will be no relationships between nutrition knowledge, nutrition attitudes, and nutrition behaviors of youth.

Assumptions of the Study

The following assumptions were made in the implementation and evaluation of this study: 1) All youth taking the survey will understand and truthfully answer the questions, 2) Nutrition education lessons from *Up for the Challenge* curriculum will be administered accurately and appropriately in the experiential learning framework, 3) No prior formal nutrition education intervention has occurred in the treatment group of participants.

Limitations of the Study

The study is limited to youth receiving nutrition education lessons with Expanded Food and Nutrition Education Program (EFNEP) in Clearfield and Glendale afterschool programs. Results cannot be generalized to youth in other afterschool programs.

Operational Definitions

Dependent Variables

Behavior: The action an individual makes towards something.

Nutrition attitude: Feelings of an individual towards or about a specific nutritionally related item.

Nutrition knowledge: The ability of an individual to respond correctly to questions on specific facts about nutrition. Or the acquisition and comprehension of facts and processes related to nutrition.

Independent Variable

Nutrition education intervention: Learning activities designed to facilitate or intervene with the intent of modifying the outcome. For this study, nutrition lessons from *Up for the Challenge* Curriculum were used as an intervention.

Others Definitions

Low-income youth: An individual, who is determined by a State educational agency or local educational agency to be a child, aged 5 through 14, from a low-income family, on the basis of data used to determine children eligible for free or reduced-price lunches under the National School Lunch Act.

Experiential learning: Educational method/process of learning by making meaning from direct experience commonly used in youth development programs.

After-school programs: Afterschool programs are safe, extracurricular structured activities that convene regularly in the hours after school and offer activities to help children learn new skills, and develop into responsible adults.

Organization of the Dissertation

Chapter I includes the introduction, problem statement, significance of the study, purpose of the study, research questions/hypotheses, a definition of operational terms, and assumptions of the study. Chapter II contains a literature review relevant to the study. Chapter III describes the research methods/procedures used to collect data. Chapter IV presents findings of the study. Chapter V includes a summary, discussion of the findings, conclusions, and recommendations of the study.

Chapter 2

REVIEW OF LITERATURE

The purpose of this study was to evaluate whether selected nutrition education lessons from the *Up for the Challenge: Health, Fitness, and Nutrition* curriculum based upon experiential learning model contribute to change knowledge, attitudes and behaviors about nutrition with low-income youth in afterschool programs.

This chapter present a review of literature related to the study and is organized into four sections. First section presents literature related to overweight issues and youth, followed by knowledge, attitudes and behavior of youth towards nutrition (section 2). Section three presents literature pertaining to nutrition education of youth, while section four discusses literature related to afterschool programming. The final section discusses literature on experiential learning theory as related to this study. Finally, a summary of literature review is presented.

Overweight in Youth

The increase in the number of overweight children has become a major public health concern in industrialized nations (Veugelers & Fitzgerald, 2005). In the United States, the Centers for Disease Control and Prevention (2007) reported that the prevalence of overweight status among children aged 6 to 11 has more than doubled since 1985, and the rate among adolescents ages 12 to 19 has more than tripled during the same

time period. In addition, overweight children have a greater chance of becoming overweight or obese adults (Center for Disease Control, 2007; Veugelers & Fitzgerald, 2005; Ritchie et al., 2006). Educating children on the health benefits of maintaining a healthy weight is the first step in reducing the incidence of childhood overweight and preventing future health problems.

Poor nutrition, including the lack of Fruits and Vegetable (F&V) consumption, is widely recognized as one of the primary causes for excess body fat (Veugelers & Fitzgerald, 2005). Research has shown a positive relationship between F&V consumption and weight loss. In a study conducted by Fitzwater et al., (1991) obese adults were asked to restrict their diets to low-fat, high complex carbohydrate food emphasizing unlimited F&V. After 25 months, 69% of the participants lost an average of 13.9 pounds. Follow-ups were conducted at a range of 4 to 76 months and showed that 53% of the participants continued to lose or maintain their weight while staying on the high F&V diet. The mean weight loss from pretreatment to end of follow-up was 17.6 +/- 2.2 lb. Epstein et al. (2001) conducted a study that compared increased F&V consumption and weight loss to decreased fat and sugar consumption and weight loss. The study design randomized families into two groups. Both of the groups were given a comprehensive weight control program, but one group was encouraged to increase F&V consumption while the other group was encouraged to decrease fat and sugar consumption. After one year, the parents from the families that increased F&V consumption had greater weight loss ($p<.03$) compared to the parents from the families that decreased fat and sugar consumption.

Even though the benefit of a diet that incorporates F&V is well established, children today are not consuming adequate levels of F&V. Only 26% of children between

the ages of 6 and 11 eat two or more servings of fruit each day (United States Department of Health and Human Services (USDHHS), 2000). In addition, only 27% of boys and 24% of girls between the ages of 6 and 11 eat three servings of vegetables each day (USDHHS, 2000). Childhood food consumption is a strong predictor of adulthood food consumption (Edwards & Hartwell, 2002). Therefore, teaching children about nutrition, increasing consumption of healthy foods, which includes F&V, are important objectives in maintaining overall good health later in life.

Overweight children are at risk for the same health complications as overweight adults including: heart disease, high cholesterol, high blood pressure, and type 2 diabetes (Center for Disease Control and Prevention, 2007). The incidence of type 2 diabetes, which was once considered an adult disease, has increased among children (USDHHS, 2001). This could be related to an advanced maturation process in overweight children. Precocious puberty has been associated with insulin resistance (Ritchie et al., 2006). In addition to the physical health threats caused by obesity, there are also psychological and social threats (Ritchie et al., 2006). The Surgeon General (USDHHS, 2001) reported that the most immediate consequence of being overweight, as perceived by the children themselves, is social discrimination. Overweight children associated being teased and shunned by their peers with their weight. Overweight children also tend to have a poor self-image and have fewer academic and employment opportunities (Backman et al., 2002).

The Centers for Disease Control (2007) recommends both a diet that follows the USDA's Dietary Guidelines and daily physical activity to manage one's weight. A weight loss of 5 to 15% of the total body weight of an overweight person reduces their

risk of some diseases, particularly heart disease. Weight loss can also lower blood pressure, blood sugar, and improve cholesterol levels (USDHHS, 2001). Weight maintenance and healthy diet choices, therefore, should be considered a lifelong effort which begins in childhood.

Nutrition Knowledge, Attitudes and Behaviors

Food preferences, dietary habits, behaviors, and lifestyle choices are all developed and established during childhood (Kirby et al., 1995; Carter, 2002). Therefore, any unhealthy eating practices that are established at an early age contribute to chronic disease because "young persons having unhealthy eating habits tend to maintain these habits as they age" (Mobility and Mortality Weekly Report (MMWR), 1996, p.5). Since many behaviors and lifestyle choices are developed while a child is in school, a student's food intake and physical activity at school are important determinants of body weight (Carter, 2002).

Many children and adults do not meet the goal set by the USDA to consume at least five servings of fruits and vegetables daily (Domel et al., 1993; Subar et al., 1995; CDC, 1996; Krebs-Smith et al., 1996; Cullen et al., 2001). According to the Five a Day Baseline Survey (Subar et al., 1995), the total population had a median weekly intake of 3.4 servings of fruits and vegetables per day and only 23% of the total population reports consumed five or more servings of fruits and vegetables on a daily basis (Domel et al., 1993; Subar et al., 1995). A sample of children, aged 2-18, that participated in a three day diet record consumed, on average, 3.6 servings of fruit and vegetables daily, and a large

portion of those vegetables reported were fried potatoes (Krebs-Smith et al., 1996). Of the children surveyed, only 20.4% did consume the recommended five or more servings of fruits and vegetables a day, 50.8% ate less than one serving of fruit per day, and 29.3% ate less than one non-fried vegetable daily (Krebs-Smith et al., 1996). A study conducted by Cullen et al. (2001) reported that the average daily fruit and vegetable intake was 2.13 servings and another study indicated that only 5% of 7to 14 year olds met the "five a day" fruits and vegetables recommendation, (St-Onge et al., 2003) both of which are a decrease from the previous study. A 24 hour diet recall of high school students indicated that 41% of the students surveyed did not consume any vegetables and 42% ate no fruit the day before they participated in the survey (MMWR, 1996). The percentages of fruits and vegetables consumed also decreased as the children got older.

The amount of fat, saturated fat, and calories consumed has increased while physical activity has declined, which contributes to the rising number of overweight children (CDC, 1996; Blumenthal et al., 2002). Between 1994 and 1997 there was more than a 15% increase in the average daily calorie intake per person in the United States (Blumenthal et al., 2002). Part of this may be due to the increase in the prevalence of snacking between meals and the increase in fast food consumption, because fast food consumption is connected with lower intakes of fruits and vegetables (St-Onge et al., 2003). In 1996, it was reported that of children aged 6 to 17, 84% ate too much fat, and 91% ate too much saturated fat (CDC, 1996). The amount of physical activity among Americans had declined in 2002, with 74% of adults stating that they did not engage in the amount of physical activity recommended by the U.S. Department of Health and Human Services (Blumenthal et al., 2002). During the time between 1991 and 2001, the

percentage of students attending daily physical education classes declined from 42% to 32% respectively (Blumenthal et al., 2002).

There are many different attitudes that children and their parents have about food, especially fruits and vegetables (Contento, 1981; Kirby et al., 1995). According to a study conducted by Kirby et al. (1995), many adults believe that children eat what their parents eat or they eat what their peers eat. Many children believe that "if it's good for you, then it must be bad" (Kirby et al., 1995). The translation is that if something is healthy, then it must taste bad, because the children interviewed said that "veggies taste bad" (Kirby et al., 1995). Both parents and children view eating out as a treat and would not normally order fruits and vegetables (Kirby et al., 1995).

A qualitative study conducted by Contento (1981) about food knowledge and attitudes revealed that children thought that "good for you" foods were fruits, vegetables, and meat, "food" was non-sweet foods, and "other foods" consisted of desserts and candy. There was a difference between "food" and "snacks" and they were aware that "food" makes one "strong" and "healthy" and "made you grow." However, they did not know how or why food did those things.

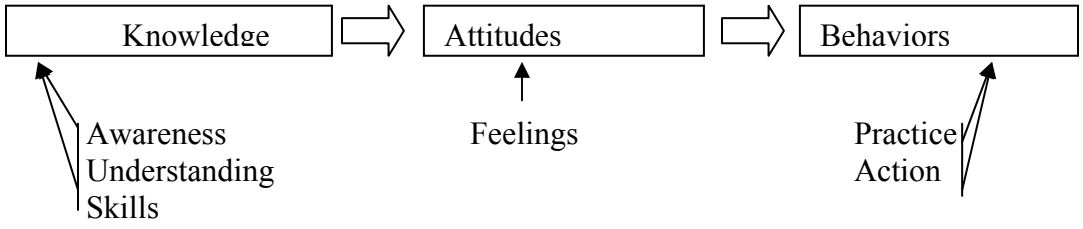
A study by Cullen et al. (2000) found that students did report that peers affect the choices they make in regards to fruits and vegetables; however negative comments about eating vegetables were not likely to cause them to stop eating a vegetable they liked. The children and parents interviewed said that "all kids like candy more than fruit" and parents said that "most of the children eat the same thing, a lot of junk food" (Cullen et al., 2000). Most of the children preferred starches over vegetables and most reported that they ate out for dinner at least twice a week (Cullen et al., 2000).

Preference for and positive attitudes about health food choice and fruits and vegetables have been major predictors of fruit and vegetable consumption (Domel et al., 1993; Resnicow et al., 1997; Cullen et al., 2000). Since many chronic disease processes begin in childhood and carry over into adulthood and dietary preferences are learned while children are young, strategies should be aimed at younger children to increase their preferences and positive attitudes towards health foods and fruits and vegetables (Baranowski et al., 1997). Strategies aimed at younger children tend to have better long-term results than strategies focused on adolescents (Carter, 2002).

The literature on eating behavior and its relationship to nutrition knowledge is contradictory. Some researchers have shown that nutrition knowledge was highly and positively related to the behavior towards nutrition (Read et al., 1988, Saegert and Young, 1983). Other researchers have found little or no correlation between nutrition knowledge and actual choices of healthy foods (Story and Resnick, 1986). Furthermore, other researchers have found that knowledge is not the only factor that could influence eating behavior. Other factors and variables that could influence children eating behavior are: food preferences, parental practices, peer pressure, media, fast foods, social norms (Farthering, 1991; Shannon and Chen, 1988; Schwartz, 1985). Additional, findings from this study will either support or not support findings previously found by other researchers.

Conceptual Framework of the Study Variables

This study uses a traditional learning framework in which knowledge precedes attitude, which in turn influences behavior. This approach urges that individuals first learn about an innovation, then develop a positive attitude towards it, and after passing through these stages, engage in the behavior (Rogers, 1995).



Nutrition Education for Youth

One method of exposure of a variety of nutritious foods to children is through nutrition education efforts. The goal of nutrition education is to provide educational programs to increase the likelihood that people will make healthy food choices consistent with the most recent dietary advice as reflected in the Dietary Guidelines for Americans (U.S. Department of Agriculture and U.S. Department of Health and Human Services, 2005) and the MyPyramid (U.S. Department of Agriculture, 2005). It is the position of the American Dietetic Association (Shafer, Gillespie, Wilkins, & Borra, 1996) that nutrition education is essential for the public to achieve and maintain optimal nutritional health. The Association further notes that "nutrition education should be an integral component of all health promotion, disease prevention, and health maintenance programs, through incorporation into all appropriate nutrition communication, promotion, and education systems" (p.1183-1187).

Lifelong beliefs and habits about food and health are established in early childhood. A child's day-to-day experiences with food and eating mold the way he/she thinks and feels about nutrition for the rest of his/her life. Although young children are not developmentally or cognitively ready to take over responsibility for their diets and health behaviors, they are capable of understanding basic nutrition and health concepts; they are interested in their growing bodies and staying healthy; and they are forming beliefs and attitudes about nutrition and health based on their daily experiences with food and eating (Singleton, Achterberg, & Shannon, 1992).

The impact of nutritional habits formed in childhood on current and future health has underscored the importance of nutrition education for young children. Although nutrition education is important throughout life, nutrition education tailored to the young child may have the greatest potential for change not only because of the impact of early nutrition on health, but also because of the tremendous learning readiness of young children. Children's natural interest and curiosity about food and their bodies provides an excellent opportunity to provide learning experiences for children about nutrition and health. Nutrition education for children illustrates the relationship between food and health, helps children understand their growing bodies and how to take care of themselves through positive eating, exercise, and health behaviors, and exposes them to a variety of learning experiences about where food comes from and how it can be prepared.

Numerous studies have indicated the important role that a nutrition educator plays in helping children to obtain and to develop healthy eating knowledge and behaviors (American School Health Association, 1997; Celbuski & Farris, 2000; Escobar, 1999). Nutrition educators work to effectively teach children about food and nutrition and apply

that knowledge to promote optimal health and growth. A recent review of research on overweight in young children found that early intervention can be effective in reducing the incidence of childhood overweight and that afterschool programs as well as schools can be influential partners in childhood healthy weight initiatives (National Institute for Health Care Management, 2004).

Nutrition education for children is implemented in numerous ways. Additionally, nutrition education resources written and developed for young children deal with a variety of topics concerning good eating habits and creating a healthy lifestyle. Effective educational strategies with young children are the ones which provide ample opportunities for experimentation, discovery, and self-learning. According to the National Association for the Education of Young Children (1997), children should be involved with actual food in order to learn about nutrition. Hands-on nutrition activities help children develop healthy eating habits and can complement other learning, for example math, science, language, social development, cooperation, and respect for culture. Achterberg (1988, p. 3) notes that "meaningful learning is more likely to occur in an interactive context that fosters positive feelings" and that "learning in one context can affect learning in another context, especially if these contexts generate the same kind of feelings."

Lytle (1995) examined studies of current nutrition education efforts directed toward school-aged children. Her findings indicated two major approaches for nutrition education programs. The first approach termed knowledge-based nutrition education has the goal to enhance the knowledge, skills, and attitudes needed by children to understand broad, contemporary food and nutrition issues and to select a diet that is good for their

general health using a food group approach. The second approach focuses on disease prevention and enhancement of overall health through diet. Both approaches have been found to have merit with a school-aged audience.

Hertzler and DeBord (1994) designed and tested four lessons for developmentally appropriate food and nutrition skills for young children in an effort to determine their effectiveness. The authors promoted the importance of tailoring nutrition education materials to the developmental skills of children, including muscular development as well as math and language readiness levels. Their findings yielded several recommendations for implementing nutrition curricula for young children: (a) a nutrition plan such as the Food Guide Pyramid should be central to planning nutrition concepts and activities, (b) actual teaching methods need to be appropriate to the child's learning level and "telling" should only be used in emergencies, (c) parental involvement and family processes are vital to reinforce nutrition activities, and (d) nutrition education materials should complement children's developmental levels and be easily adapted for generating activities.

Ciliska, Miles, O'Brien, Turl, Hale Tomasik, and Donovan (1999) conducted a systematic review to identify nutrition education that was effective in specifically increasing fruit and vegetable consumption in children and adults. The review concluded that the most effective interventions: (a) gave clear messages about increasing fruit and vegetable consumption, (b) incorporated behavioral theories and goals, providing a consistent framework for implementation and evaluation, (c) provided longer, more intensive interventions rather than one or two contacts, (d) actively involved influential people such as family members and teachers, and (e) had a greater impact on those whose

knowledge or intake were lower at the beginning. The implications of this review led the authors to conclude that there is a current shortage of effective nutrition education and there must be an investment in human resources to plan, implement and evaluate public health nutrition interventions.

A similar review examined the effectiveness of nutrition education intervention research funded under the National Cancer Institute's 5-A-Day for Better Health Program (Reynolds, Baranowski, Bishop, Gregson, & Nicklas, 2001). These interventions were specifically targeted at increasing fruit and vegetable consumption. Findings from the review indicated that the nutrition interventions reviewed were successful in increasing fruit and vegetable consumption among children and adolescents. However, the authors recognized a need for further development of programs for children. Specifically, a call was issued for increased "environmentally friendly settings" to interventions to increase fruit and vegetable consumption for these audiences. Although "environmental settings" were not defined, it can be assumed that a logical venue to provide children nutrition education, such as afterschool setting, would qualify.

Afterschool Programs and Expectation

Approximately seven million children in the United States are regular attendees of an afterschool program (ASPs) between the hours of 3 p.m. and 6 p.m. (Capizzano, Tout, & Adams, 2000). The goals of ASPs vary, but most aim to provide a safe and structured environment during the hours following school dismissal, while parents are working, and opportunities for academic, social, and health promotion.

Afterschool programs are viewed as one of many places that can tackle the growing problem of overweight among children and youth. Several evaluation research studies have demonstrated that afterschool programs can contribute to improvement in healthy lifestyles and increased knowledge about nutrition and exercise. For example:

First, an experimental study of the *Girlfriends for KEEPS* program, which includes fun skill-building activities and physical activity, conducted by Story, Sherwood, Himes, Davis, Jacobs, Cartwright, et al., (2003), showed benefits to girls' intentions to maintain healthy behaviors, knowledge about proper diet practices, and preferences for physical activity.

Second, the experimental study of the *Cooke Middle School Afterschool Recreation Program* found increases in participants' time spent on strength-training activities (Lauver, 2002).

Third, the experimental study of the *FitKid program*, which combines academic enrichment, healthy snacks, and physical activity, conducted by Yin, Gutin, Johnson, Hanes, Moore, Cavnar, et al., (2005) found that participants benefited from the program in terms of their percentage of body fat and cardiovascular fitness.

Fourth, a longitudinal study of children's afterschool program conducted by Mahoney, Lord, & Carryl, (2005 a & b) of over 650 youth at 25 after-school programs found that youth who participated in after school programs were more likely than nonparticipants to experience reductions in obesity, after accounting for a variety of differences between participants and nonparticipants. This was true even after controlling for youth's initial Body Mass Index (BMI) status at the beginning of the study, as well as demographic factors like poverty, race, and ethnicity. Likewise, a study of adolescent

time use and health behavior showed that afterschool activity participants spent less time eating and watching television and more time engaged in sports compared to nonparticipants (Vandell, Shernoff, Pierce, Bolt, & Fu, 2003). Together, these studies point to afterschool programs' potential power to promote the general health, fitness, and wellness of young people by keeping them active, there by promoting the importance of healthy behaviors, and providing healthy snacks.

Afterschool programs represent a relatively healthy developmental context when compared to alternative arrangements. Afterschool programs typically provide a structured, adult-supervised environment where physical recreation is a normal part of the curriculum and eating is restricted to snack time. Therefore, over time, children who regularly participate in this context are expected to have a lower BMI and show lower rates of obesity than children who do not participate.

Reviews of nutrition education programs by (Contento, Balch, Bronner, Lytle, Maloney, Olsen, & Swadener, 1995; Reynolds, Baranowski, Bishop, Gregson, & Nicklas, 2001) found that nutrition education programs based on practices and sound learning theory produced more desirable results that are more readily evaluated. A learning theory that provides guidelines for conducting the educational activities in the afterschool program setting, and allows the educator to recognize success through targeted evaluation is more appropriate.

Experiential Learning Model

One means of providing appropriate nutrition education experiences is through the experiential learning model/theory. Experiential learning theory suggests that learning is cyclical. A person has an experience, reflects on that experience, draws some conclusions about the lessons that can be learned from that experience, and then uses those lessons as part of his or her basis for reactions to future experiences. The foundations of experiential learning were articulated by Dewey (1938) as he attempted to outline his "progressive" approach to education.

Philosophical traditions and the pedagogical theories and practices of 18th and 19th century philosophers and educators can be noted in Dewey's writing (Dewey, 1910, 1916, 1938) which included concepts regarding the relationship between experience and learning. Among the many concepts that Dewey espoused were: the interaction and continuity of experience; the creation of new knowledge, awareness, and ability; the integration and expansion of perception; and the development and understanding of self-direction (Wilson & Burket, 1989).

Dewey provided his model of experiential learning in *Experience and Education* (1938). Dewey believed that learning transforms the impulses, feelings, and desires of concrete experience into purposeful action. Dewey's model integrated experience, concepts, observations, and actions. He developed several principles that created an "intimate and necessary relation between actual experiences and education," free expression and cultivation of the individuality, free activity, learning through experience, acquisition of skills and techniques as means of attaining ends. These principles allowed

participants to make the most of their present opportunities and acquaintance with a changing world (Dewey, 1938, pp. 19-20).

Dewey's emphasis on the primacy of experience was first described in the 18th century by Rousseau in his classic book, *Emile*, in which he introduced the concepts of experiential learning into the field of education. "Put the problem before him [the learner] let him not be taught science, let him discover it" (Rousseau, 1762, pp. 130-131). Rousseau believed that teachers should provide participants with opportunities to observe nature, experience nature, and learn on their own. He contended that "God makes all things good," (Rousseau, 1762, p. 5) and educators served children best when they recognized their innate goodness and encouraged children to follow their individual interests and experiences of their choice. The inception of the child-centered educational concepts of today can be found in Rousseau's early writings on children's innate wisdom (Day, 1994).

The experiential learning model, in which experience is central to the learning process, may offer potential for developing a learning atmosphere in which human experiences can be shared and interpreted through dialogue (Kolb, 1984). According to the experiential learning theory, "a holistic integrative perspective on learning" can be developed which combines experience, perception, cognition, and behavior (Kolb, 1984). Thus, the most influential proponent of the experiential approach is Dewey.

Another proponent of the experiential learning approach is Jean Piaget, a developmental psychobiologist. He suggested that ideas were not fixed elements of thought, but were formed and reformed through experience. The experiential learning

model builds on his notion that learners are co-creators of learning as they construct knowledge in context.

Piaget created a developmental theory which concluded that intellectual development is the result of the interaction of hereditary and environmental factors. A central component of Piaget's developmental theory of learning and thinking is that both involve the participation of the learner. Knowledge is not merely transmitted verbally but must be constructed and reconstructed by the learner. Piaget asserted that for a child to know and construct knowledge of the world, the child must act on objects and it is this action which provides knowledge of those objects (Sigel & Cocking, 1977), organizes reality and acts upon it. The learner must be active; he is not an empty vessel to be filled with facts.

According to Piaget, intellectual growth involves three fundamental processes: assimilation, accommodation, and equilibration. Assimilation involves the incorporation of new events into preexisting cognitive structures. Accommodation means existing structures change to accommodate to the new information. This dual process, assimilation-accommodation, enables the child to form schemata. Equilibration involves the person striking a balance between himself and the environment, between assimilation and accomodation. When a child experiences a new event, disequilibrium sets in until he is able to assimilate and accommodate the new information and thus attain equilibrium. There are many types of equilibrium between assimilation and accomodation that vary with the levels of development and the problems to be solved. For Piaget, equilibration is the major factor in explaining why some children advance more quickly in the development of logical intelligence than do others (Lavatelli, 1973).

A Piagetian-inspired curriculum emphasizes a learner-centered educational philosophy. The teaching methods which most American school children are familiar with, teacher lectures, demonstrations, audio-visual presentations and programmed instruction, do not fit in with Piaget's ideas on the acquisition of knowledge. Piaget espoused active discovery learning environments in our schools. Intelligence grows through the twin processes of assimilation and accomodation; therefore, experiences should be planned to allow opportunities for assimilation and accomodation. Children need to explore, to manipulate, to experiment, to question, and to search out answers for themselves.

In a Piagetian teaching model, children are allowed to make mistakes and learn from them. Learning is much more meaningful if the child is allowed to experiment on his own rather than listening to the teacher lecture. The teacher should present students with materials and situations and occasions that allow them to discover new learning. In his book, *To Understand Is to Invent,* Piaget (1972) stated the basic principle of active methods can be expressed as follows: "to understand is to discover, or reconstruct by rediscovery, and such conditions must be complied with if in the future individuals are to be formed who are capable of production and creativity and not simply repetition" (p. 20). In active learning, the teacher must have confidence in the child's ability to learn on his own.

Kolb's book, *Experiential Learning* (1984) provides more recent information on the experiential learning model. Derived from Dewey's earlier cyclical model, Kolb's cycle consists of four stages: concrete experience, reflective observation, abstract conceptualization, and active experimentation.

Two quite different bodies of literature have grown out of the works of Kolb and Dewey. A number of edited volumes by Boud et al (Boud, Cohen & Walker, 1993; Boud, Keogh, & Walker, 1985; Boud & Miller, 1996) also an early text by Schon (1983), provide numerous studies and examples of learning from experience. In these volumes, it is clear that the reflective stage in Kolb's model (and other such models) is taken very seriously, as illustrated by the title of the oldest of these volumes: *Reflection: Turning Experience into Learning* (Boud et al, 1985). Indeed, similar with Kolb's theory, learning is assumed not to occur at all unless there is active and intentional reflection. Throughout nearly all these books, the role of the teacher is seen as critical in helping students turn their experience into learning.

The other body of literature, which is on experiential education, exemplified in the edited volume by Warren, Sakofs, Hunt, and Jasper (1995), similarly focuses upon the importance of the teacher for helping typically young students interpret various experiential opportunities that are engineered or developed as part of their formal training. In these writings, Kolb is never cited, but much theoretical significance is given to Dewey (e.g., 1910, 1929, 1938), in terms of his cyclical model as well as his emphasis upon the importance of creating learning opportunities around the interests and relevant experiences of students. Again, as with Kolb and Boud, the creation of learning depends not on "experience" per se, but upon the intervention of a teacher who helps students understand that experience.

Not all writings on experiential learning stress the importance of a mediator or guide. Many books have been written to simply emphasize the other Deweyan message, that experiential learning, or learning first hand by doing, produces deeper and more

enduring knowledge than isolated classroom or second-hand learning. Eisner (1994), Hopkins (1994), and Reed (1996) all argue that formal education, which is inordinately dependent upon book-learning is really quite shallow and relatively ineffective. The theoretical importance of these writings is that they call into question the use of formal learning as a benchmark against which to assess experiential learning. It could well be that Dewey and Kolb's view of experience as somehow "raw" and undigested needing the civilizing force of intentional reflection to make it meaningful is wrong. Certainly, this conception of experience seems directly contradicted by some of these writings, as well as by several writers who describe how first-hand experiences on the job provide learning opportunities that are otherwise simply unavailable (Burnard, 1991, on nursing; Scannelli & Simpson, 1996, on the value of student internships; Calder & McCollum, 1998, on vocational learning). Eisner (1994) illustrates these ideas by having the reader examine a picture of two people interacting in a restaurant and then asking them to read a well-written description of the picture. He then asks which experience is richer, and it is patently obvious that infinitely more information is conveyed by the picture than the prose piece. In other words, these writers clearly see educational value in experience itself and are not prepared to state that such experiences constitute learning only if they are subjected to additional thought.

Young people desire and deserve opportunity to learn in an engaging, active, participatory environment where they can connect hands and minds (Seidel, Aryeh, & Steinberg, 2002).

Summary of Literature Review

This chapter reviewed overweight status in youth, nutrition knowledge, attitudes and behaviors, previous nutrition education studies, after-schools settings, and the experiential learning model/theory. The literature review summarized research that has clearly shown establishing good nutrition habits at an early age is important to healthy child outcomes. The prevalence of overweight status among children in the United States has tremendously increased. Concomitant with overweight and obesity are greater risks for diseases such as cardiovascular disease, hypertension, diabetes, and cancer. The lack of nutrition knowledge, negative attitudes, and poor dietary behavior are among the many causes of overweight which leads to obesity in youth. Prevention of obesity is recognized as the best method for controlling it's rise. Good nutrition, healthy food choices, increasing fruit and vegetable consumption, and physical activity may offer one approach to combating obesity as well as lessening the onset of many cancers and reducing diabetes. These foods need to be introduced early in life in order to develop positive dietary habits (Traahms & Pipes, 2000).

One method to accomplish this introduction is through nutrition education intervention in after-school programs. In order to be effective, nutrition education needs to meet certain criteria including being theoretically based, of a sufficient duration to affect change, and containing appropriate activities that incorporate meaningful learning for the child (Contento, Balch, Bronner, Lytle, Maloney, Olsen, & Swadener, 1995; Hertzler & DeBord, 1994). Reviews of nutrition education projects aimed at good nutrition, increasing fruit and vegetable consumption have identified a need for increased

numbers of interventions meeting these criteria, as well as interventions containing environmental settings to improve learning opportunities (Reynolds, Baranowski, Bishop, Gregson, & Nicklas, 2001). Experiential learning offers a viable framework for nutrition education to school-aged children. This model allows children to learn and construct meaning through real life situation.

Chapter 3

METHODOLOGY

The purpose of this study was to evaluate whether selected nutrition education lessons from the *Up for the Challenge: Health, Fitness, and Nutrition* curriculum based upon an experiential learning model contribute to change in knowledge, attitudes and behaviors about nutrition with low-income youth in afterschool programs. The following five research questions (R_Q)/hypotheses (H_A/H_O) guided this investigation. First, the demographic characteristics of youth participating in the study were described.

R_{Q1}: What is the effect of nutrition education intervention (selected lessons from the *Up for the Challenge* curriculum) on general nutrition and physical activity knowledge?

H_{A1}: Youth receiving nutrition education intervention will score significantly higher on general nutrition knowledge compared to youth who do not receive intervention (control group).

R_{Q2}: What is the effect of nutrition education intervention on the attitudes about nutrition, eating fruits and vegetables, eating healthy, and making healthy food choice?

H_{A2}: Youth receiving nutrition education intervention will score significantly higher on attitudes compared to youth who do not receive intervention (control group).

R_{Q3}: What is the effect of nutrition education intervention on nutrition and physical activity behaviors?

H_{A3}: Youth receiving nutrition education intervention will score significantly higher on nutrition behaviors compared to youth who do not receive intervention (control group).

R_{Q4}: Is there a difference in nutrition knowledge, nutrition attitudes, and nutrition behaviors when examined by participants' demographic characteristics such as gender, age, grade level, and ethnicity?

H_{O4}: There will be no difference in nutrition knowledge, nutrition attitudes and nutrition behaviors when examined by demographic characteristics of youth.

$R_{Q5:}$ Are there relationships between nutrition knowledge, attitudes and nutrition behaviors?

H_{O5}: There will be no relationships between nutrition knowledge, nutrition attitudes, and nutrition behaviors of youth.

Evaluation Research Design

This study was conducted from September, 2008 to December, 2008 using two afterschool programs. Afterschool programs were categorized into treatment (TG) and control group (CG). Group designations were based on requests from Penn State Nutritional Links program. The study used a *quasi-experimental design consisting of pretest-posttest comparison control group* (see figure 2). The evaluation of nutrition education intervention on nutrition knowledge, attitudes and behaviors were measured at pretest (time 1) posttest (time 2) and delayed post-posttest (time 3).

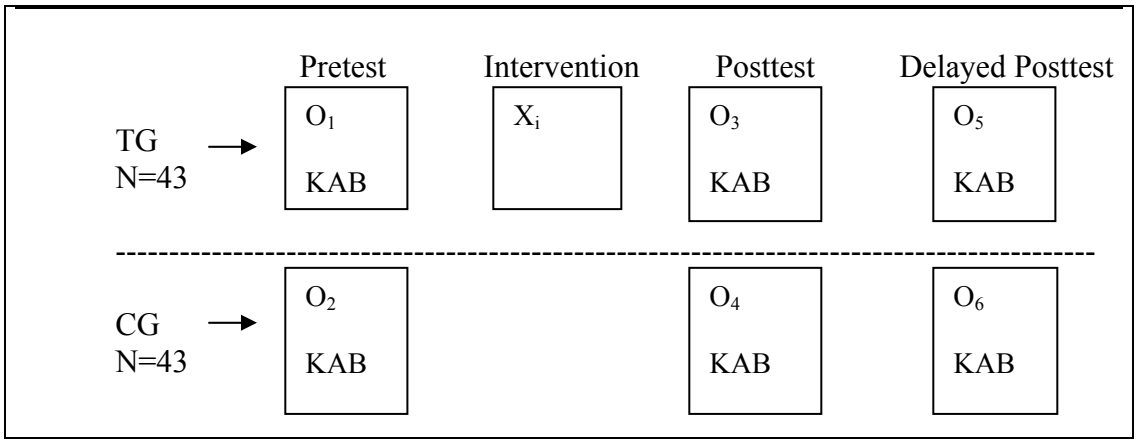


Figure 2: Illustration of Quasi-Experimental Design with Pretest-Posttest Comparison Control Group

TG= Treatment/Intervention group
CG= Control group
X_i = Nutrition Education Lessons/Intervention
$O_{1\,2\,3\,4\,5\,6}$ = Observations at pretest, posttest, and delayed posttest
KAB= Knowledge, Attitudes, Behaviors

Selection of Participants

Youth in the two afterschool programs receiving nutrition education lessons through the Expanded Food and Nutrition Education Program (EFNEP) under Penn State Nutrition Links were identified to participate in this study. Clearfield afterschool program served as the treatment group, while Glendale afterschool program served as the control group. Initially, there were 84 youth in the treatment group and 73 in control group. However, due to a very high drop-out, regular monitoring and maintenance of attendance list and participation requirement were necessary to obtain a sample size that would yield reliable data for a quasi-experimental study. The minimum sample size needed in quantitative research depends on how large the effects being studied are, so there is no rule, but a general guideline for a minimum sample size is usually between 30-50

participants (Schaefer, (2001). The larger the sample size, the smaller the differences needed between groups to attain statistical significance. Overall, a total of 86 youth participated in the study with (treatment=43, and control=43). All youth in both groups completed a pretest, posttest assessments, and delayed posttest/follow-up after two weeks.

Evaluation Tools/Instrumentation

A four-part evaluation tool (see Appendix G) was developed to collect data. The tools were developed to reflect the content of nutrition lessons based on lesson objectives/outcome (see Table 2) described in the *Up for the Challenge* curriculum. Each part contained questions that addressed the research questions/hypotheses of the study.

Part one contained 14 questions pertaining to general nutrition knowledge and physical activity. Questions were measured using multiple choices and yes or no format. Part two contained 14 statements about attitudes towards nutrition, fruits and vegetable consumption, and eating healthy and making healthful food choices. Statements were measured on a five-point, Likert-type scale that ranged from 1 = disagree very much to 5 = agree very much. Part three contained 10 questions on nutrition and physical activity behavior. Statements were measured using a four-point scale that ranged from 1 = never to 4= several times a day. Part four contained demographic questions such as gender, age, grade level, and race/ethnicity.

Ethical Considerations

Review and Validity of Instruments

Instruments used for data collection were reviewed by a panel of experts consisting of Penn State Nutrition Links specialists and advisers, and faculty members in the department of Agriculture & Extension Education, and the department of Nutritional Sciences at The Pennsylvania State University. Based on the review of the expert panel, modifications were made to the instrument. The instrument, cover letter, parent consent and child assent forms were reviewed and approved by the Institutional Review Board (IRB) at the Pennsylvania State University (see Appendix A, C, D, E, F, IRB # 28899 dated 7/24/2008). In addition, a written permission was also obtained to conduct the study in the two afterschool programs from the school district board research review committee under the Cen- Clear Child Services Inc. in Philipsburg, Pennsylvania (see Appendix B)

Pilot-testing/Reliability

A pilot test was conducted in mid-September of 2008 with 18 youth not included in the study for appropriateness of content, readability, understandability and clarity of questions, and to provide ideas that helped increase the chances of obtaining valid and reliable data. Data from the pilot test was analyzed to estimate the reliability for each of the sections of the instrument. Cronbach's alpha coefficient, α was used to estimate reliability of knowledge, attitudes, behaviors, and physical activity questions. An acceptable Cronbach's alpha value may be defined as a coefficient greater than .50

(marginally reliable), but ideally values should range from .70-.90 (Portney and Watkins 2000; Sapp and Jensen 1997). To determine consistency of question response over-time, reliability estimates from the pilot test, pretest, posttest, and delayed posttest were analyzed. Table 1 presents reliability estimates for the four administrations.

As shown in Table 1, reliability estimates for the pilot test were in acceptable range; nutrition knowledge questions (α= .68), physical activity knowledge (α= .28), attitude statements (α=.92), nutrition behavior statements (α=.49), and physical activity behavior (α=.55). The low reliability for physical activity knowledge is due to fewer numbers of questions analyzed.

Table 1: Reliability Analyses (Cronbach's Alpha, α) of Questionnaire

Sections		**Pilot test**	**Pretest**	**Posttest**	**Delayed posttest**
		N=18	**N=43**	**N=43**	**N=43**
Knowledge*	11 Nutrition knowledge questions	.68	.69	.69	.69
	3 Physical activity knowledge Questions	.28	.28	.29	.29
Attitude**	14 Attitudes questions	.92	.92	.92	.92
Behavior**	7 Nutrition Behavior questions	.49	.51	.51	.51
	3 Physical activity behavior questions	.55	.55	.55	.55

*Multiple choice, **Likert scale

Intervention Description

Six nutrition education lessons from the *Up for the Challenge* curriculum were identified for use in the treatment group. This curriculum encompasses lessons to enhance knowledge, skills, and food choices via experiential learning activities that include food tasting, food art, food puzzles, games, identification of fruit and vegetables and preparation of healthy snack, and physical activity. Each lesson targeted specific objectives/outcome (see Table 2 for a brief description of each of the six lessons).

Lesson one focused on the importance and benefits of physical activity types. Lesson two focused on the use of MyPyramid guide for healthy eating and making healthy food choices; and significance of portion/serving size in making food choices.

Lesson three focused on the description of healthier beverages such as milk, water, juice; reading nutrition labels to compare drink choices; comparing taste and fat content of different types of milk and selection of low fat- dairy; and preparation of quick and simple nutritious drinks.

Lesson four emphasized identification and the necessity of eating a variety of fruits and vegetables, importance of color in vegetable and fruit choices, and preparation of healthful snack.

Lesson five was on importance of starting each day with breakfast, selection of healthy breakfast, and preparation of quick and easy breakfast.

Lesson six examined differences between high and low energy foods, understanding of how certain foods are related to weight gain/loss, and participate in energy burning.

Table 2: Lesson Plan Title and Objective/Outcome from the *Up for the Challenge* Curriculum

Lesson	**Lesson title**	**Objectives/Outcome**
Lesson 1	Get in the movement groove	Physical activity types, importance and benefits
Lesson 2	MyPyramid: The beginning challenge	Use MyPyramid guide for healthy eating and making healthy food choices; and significance of portion/serving size in making food choices
Lesson 3	Think your drink	Description of healthier beverages such as milk, water, juice; reading nutrition labels to compare drink choices; comparing taste and fat content of different types of milk and selection of low fat- dairy; and preparation of quick and simple nutritious drinks
Lesson 4	Emphasis on fruits and vegetables	Identification and the necessity of eating a variety of fruits and vegetables, importance of color in vegetable and fruit choices, and preparation of healthful snack
Lesson 5	Break it up-breakfast first & Snack attack	Discover importance of starting each day with breakfast, selection of healthy breakfast, and preparation of quick and easy breakfast
Lesson 6	Calories In – calories Out	Examined differences between high and low calorie foods, understand how certain foods are related to weight gain/loss, and participate in calorie burning

Note: Lesson 3 and 4 were taught in same week, and lesson 5 and 6 in the same week

Training

One nutrition educator working with Penn State Nutrition Links program was selected to implement the nutrition education lessons. She was trained by nutrition specialists prior to implementation of the lessons for about one-week. The training sessions were dynamic, interactive workshop designed to provide the knowledge and skills necessary for successful implementation of the nutrition education lessons. Training included background information about the program, physical activity demonstrations, basic group management techniques and tips on using the *Up for the Challenge* curriculum. In addition, the researcher made weekly visits to the schools to check on implementation progress, ensure quality control and to provide assistance, make observations, providing guidance for the evaluation process, implementation, and data collection.

Intervention Implementation Period

The time schedule for the intervention implementation period of the study is shown in Table 3. One nutrition educator attended a workshop/training in August of 2008 to become familiarized with the nutrition intervention lessons. The nutrition lessons were implemented in four weeks between September 30- October 28, 2008.

Table 3: Time Schedule of the Study for Intervention Group and Control Group

	Intervention	**Control**
Date	Event/Activity	
August 14-21, 2008	Training/workshop on use of the nutrition lesson from curriculum[1] for the treatment group	
September 23, 2008 Pilot testing		
September 30, 2008	Pretest data collection Demographic data	Pretest data collection Demographic data
October 7, 2008	Nutrition intervention period for treatment group Lesson one	
October 14, 2008	Lesson two	
October 21, 2008	Lesson three Lesson four	
October 28, 2008	Lesson five Lesson six	
October 29, 2008	Posttest data collection	Posttest data collection
November 13, 2008	Delayed posttest/follow-up after two weeks of posttest	Delayed Posttest

[1]Up for the Challenge

Data Collection

Data collection was completed in three stages (see Table 4). Pretest data on knowledge, attitudes and behaviors for both the treatment and control groups was collected first at the same time. Demographic data was also collected at the time of collecting pretest data. Two-three hours hand-on nutrition education lessons were taught to youth in the treatment group every week over a 4-week period, after which posttest data was collected, followed by delayed posttest data for both groups after two weeks of administering the survey. The control group did not receive any nutrition lessons. Questionnaires were administered by the researcher following the appropriate protocol. The researcher/evaluator provided assistance to children who did not understand or needed help completing the questionnaire. The time frame and order was carefully followed in the data collection process in order to ensure consistency of the research conditions to minimize extraneous variations. Each questionnaire was labeled and given an identification letter for easy data entry, management and analysis. Data from the treatment and control groups were examined for equivalence.

Table 4: Data Collection Process

	Stage 1		**Lesson (4 weeks)**	**Stage 2**	**Stage 3 (after 2 weeks)**
	Demographic	Pretest	L1 L2 L3 L4 L5 L6	Posttest	Delayed posttest
Treatment	X	X (KAB)	x x x x x x x	X (KAB)	X (KAB)
Control	X	X (KAB)	- - - - - -	X (KAB)	X (KAB)

X=data collection
Wk 1=L1, wk 2= L2, wk 3= L3 and L4, wk 4= L5 and 6
x=lesson plan implementation
---- =no lessons
KAB=knowledge, attitude, behavior

Data Analysis

Weekly sign –up sheets completed by of students were examined and only those students/youth that participated in the intervention/treatment group for the four-weeks and completed all the three tests were included in the data analysis. To analyze the nutrition knowledge questions, each correct answer received "one" point. An incorrect answer received "zero" points. Data were entered and analyzed using a Statistical Package for Social Sciences (SPSS) version 17.0 for windows vista 2007; Chicago, IL. The nutrition knowledge scores were summated so that each participant received a score ranging from zero to 11 points. The higher the score, the more knowledge the student had about general nutrition. Fourteen attitude scores with responses ranging from (1= disagree very much to 5= agree very much) were summed to create an attitude score. The attitude scores could range from a low of 14 to a high of 70. Seven nutrition behavior statements/questions with responses ranging from (1=never to 4= several times a day) were summated to create a nutrition behavior score. This score could range from a low of 7 to a high of 28. The 3 physical activity knowledge and 3 physical activity behavior questions were analyzed using percentages. Descriptive and inferential statistics were used to summarize data. Descriptive statistics included frequency distribution, percentages, means and standard deviations. Inferential statistics included general linear model (GLM) repeated measure ANCOVA, factorial repeated measure ANOVA, and Pearson correlation coefficient (see Table 5).

General linear model repeated measure ANCOVA were used to measure the effect of intervention on general nutrition knowledge, attitudes and nutrition behaviors.

Factorial ANOVA with repeated measures pretest, posttest and delayed posttest were used to determine the difference in nutrition knowledge, attitude, behavior, and demographic characteristics. Pearson correlation, r, was used to determine the degree of relationship between nutrition knowledge, attitudes and nutrition behavior.

Table 5: Summary of Research Questions, Related Variables, Scale of Measurement, and Analysis Techniques

***$R_Q/H_A/H_O$**	**Variables**		**Scale of measurement**	**Analysis Technique**
	IV	**DV**		
Demographics				Freq. & Percentages
	Gender		Nominal	
	Age		Interval	
	Grade level		Nominal	
	Ethnicity		Nominal	
R_{Q1}/H_{A1}	Nutrition Lessons	Knowledge	Interval	GLM Repeated measure ANCOVA
		Physical activity		Percentages
R_{Q2}/H_{A2}	Nutrition Lessons	Attitudes	Interval	GLM Repeated measure ANCOVA
R_{Q3}/H_{A3}	Nutrition Lessons	Behaviors	Interval	GLM Repeated measure ANCOVA
		Physical activity		Percentages
R_{Q4}/H_{O4}	Demographic & Group	Knowledge, Attitudes, Behaviors		Factorial repeated measure ANOVA
R_{Q5}/H_{O5}		Knowledge, Attitudes, Behaviors	Interval	Pearson Correlation, r

*$R_{Q\ 1,\ 2,\ 3,\ 4,\ 5}$=Research Questions; $H_A/H_{0\ \ 1,\ 2,\ 3,\ 4,\ 5}$=Hypotheses

Internal and External Validity

Considering the research design used in this study, the potential threats to internal and external validity as defined by Gall, Borg & Gall (1996); Fraenkel & Wallen (2003); Campbell & Stanley (1966); Ary, Jacobs & Razavieh (2002) were examined. Table 6 provides a definition of each of the threat present and how it was controlled by the researcher.

Internal validity is the extent to which the changes observed in a dependent variable are, in fact, caused by the independent variables. *Threat to internal validity* is caused by extraneous variables on other possibility, and unless these variables are controlled, they may very well produce an effect that could be mistaken for the effect of the experiment. External validity refers to the extent to which the findings of a study can be generalized (applied) beyond the sample. *Threat to external validity* help explain how one might be wrong in making a generalization of findings.

Table 6: Threats to Internal and External Validity

Threats	**Presence**		
Internal	**Yes/No**	**Definition**	**Control of threat**
Experimental Mortality	Yes	Occur when participants in both groups leave the study or miss part of it	-Kept a log of dropouts in both treatment and control groups -Started the experiment with large enough samples (TG, N=86; CG, N=73) -Used only those who provided data for pre, post, delayed post) - Go after them/or use approval procedures for handling missing data

A ceiling effect	Yes	A threat to research when the participants have knowledge of the subject prior to the research. They may score high on pretests, thus limiting room for improvement in posttest scores	-Did not control or expect this threat
Testing	No	Scores can improve merely from being exposed to the test more than one time	-Used ANCOVA to adjust pretest scores
Experimenter effect	No	Occur when the research administers the treatment and unintentionally influences the scores	-Carefully developed protocol material to be followed in the study -Used trained individual to work with the participants
Resentful demoralization	No	Happens when the control group realizes that they are not receiving the treatment and thus performs below normal	-Participants in the control group actually received treatment at a later date when the study was over
Differential selection	Yes	Threat when a difference can be seen between the treatment and control groups prior to considering effect from treatment	-Did not have much control to this threat -Did not compare unequal groups and all participants in both groups were of same age, grade level
Instrumentation	No	Changes occurring in the measurement procedures while the experiment is being conducted	-Used multiple choices, -Used equivalent/ similar measurements -Used valid and reliable instruments
External			
Interaction effect of selection biases and treatment	Yes	Sample not representative of the population i.e not selected randomly	-No much control -Random assignment
Reactive experimental arrangements	No	Subjects' knowledge of participating in expt. may affect their responses	-Subjects were not aware of experiment

Chapter 4

FINDINGS

The purpose of this study was to evaluate whether selected nutrition education lessons from the *Up for the Challenge: Health, Fitness, and Nutrition* curriculum based upon an experiential learning model contribute to change in knowledge, attitudes and behaviors about nutrition with low-income youth in afterschool programs. The following five research questions (R_Q)/hypotheses (H_A/H_O) guided this investigation.

R_{Q1}: What is the effect of nutrition education intervention (selected lessons from the *Up for the Challenge* curriculum) on general nutrition and physical activity knowledge?

H_{A1}: Youth receiving nutrition education intervention will score significantly higher on general nutrition knowledge compared to youth who do not receive intervention (control group).

R_{Q2}: What is the effect of nutrition education intervention on the attitudes about nutrition, eating fruits and vegetables, eating healthy, and making healthy food choice?

H_{A2}: Youth receiving nutrition education intervention will score significantly higher on attitudes compared to youth who do not receive intervention (control group).

R_{Q3}: What is the effect of nutrition education intervention on nutrition and physical activity behaviors?

H_{A3}: Youth receiving nutrition education intervention will score significantly higher on nutrition behaviors compared to youth who do not receive intervention (control group).

R_{Q4}: Is there a difference in nutrition knowledge, nutrition attitudes, and nutrition behaviors when examined by participants' demographic characteristics such as gender, age, grade level, and ethnicity?

H_{O4}: There will be no difference in nutrition knowledge, nutrition attitudes and nutrition behaviors when examined by demographic characteristics of youth.

$R_{Q5:}$ Are there relationships between nutrition knowledge, attitudes and nutrition behaviors?

H_{O5}: There will be no relationships between nutrition knowledge, nutrition attitudes, and nutrition behaviors of youth.

The findings of this study are reported sequentially based on research questions/hypotheses. First, the demographic characteristics such as gender, grade level, age, and ethnicity of youth participating in the study are described.

Demographic Characteristics

The demographic characteristics of youth participating in the study are presented in Table 7. A total of 86 youth participated and responded to the questionnaires in both groups. Majority of youth in the treatment group were male (55.8%), while a majority in the control group were female (58.1%). The age of youth ranged from 10-14 years, with almost less than 40% between ages 10 and 11 in the treatment group, and 11 and 12 in control group. Approximately 48.8% of youth were in fifth grade, followed by sixth grade (23.3%) for the treatment group, while in the control group approximately 37.2% of youth were in sixth grade followed by seventh grade (34.9%). All youth, both in treatment and control groups, were white.

Table 7: Demographic Characteristics of Youth Participating in the Study

Group	**Treatment (N=43)**		**Control (N=43)**	
Characteristics	*f*	*Percent*	*f*	*Percent*
Gender				
Male	24	55.8	18	41.9
Female	19	44.2	25	58.1
Age				
10	16	37.2	4	9.3
11	14	32.5	16	37.2
12	7	16.3	14	32.6
13	3	7.0	7	16.3
14	3	7.0	2	4.6
Grade level				
Grade 5	21	48.8	5	11.6
Grade 6	10	23.3	16	37.2
Grade 7	7	16.3	15	34.9
Grade 8	5	11.6	7	16.3
Ethnicity				
White/Caucasian	43	100.0	43	100.0

Research Question/Hypothesis One:

Nutrition Knowledge Assessment

Nutrition knowledge of youth was assessed at pretest, posttest and delayed posttest using 11 knowledge questions. The 11 knowledge questions focused on: identification and importance of eating different kinds of fruits and vegetables, eating breakfast as part of a healthy lifestyle, eating high-fiber cereal, whole grain bread, reading nutrition labels, MyPyramid food group, sources of calcium with the lowest amount fat, and snack choice that is lower in fat and sugar.

General linear model (GLM) repeated measures analysis of covariance (ANCOVA) was performed with posttest and delayed posttest nutrition knowledge scores as factors and pretest nutrition knowledge scores as a covariate. Sphericity assumption (of covariance matrix) using Mauchly's test were not met; significant value was <.05. Therefore, F-value of Greenhouse-Geisser was used to determine level of significance.

Results indicated a significant increase in nutrition knowledge [F (1.000, 83.00) =10.12, $p<.001$] from posttest to delayed posttest when controlling for pretest knowledge scores, and nutrition knowledge increased regardless of the group [F (1.000, 83.00) =19.37, $p<.001$]. However, increase in nutrition knowledge co-varies with pretest nutrition knowledge of youth [F (1.000, 83.00) =4.819, $p<.05$], but, the covariate (pretest nutrition knowledge) has no significant effect [F 1, 83) =.57.056, $p>.05$) on the increase in nutrition knowledge scores (Table 8). Thus, the hypothesis that youth receiving nutrition education intervention would score significantly higher on general nutrition

knowledge compared to youth who do not receive intervention (control group) was supported.

Table 8: Repeated Measure ANCOVA Comparing Posttest and Delayed Posttest Scores of Nutrition Knowledge[a] with Pretest Scores as a Covariate

	Group	**Adjusted Means**	**Std Error**
Post-test	Treatment	8.747	.223
	Control	5.741	.223
Delayed posttest	Treatment	9.968	.238
	Control	5.544	.238

Source of variation	**df**	**SS**	**MS**	**F**	**p(sig)**
Posttest, delayed (factor 1)	1.000	7.767	7.767	10.12	<.001
Factor 1 by covariate (pretest knowledge)	1.000	3.703	3.703	4.819	.031
Factor 1 by group (treatment & control)	1.000	14.88	14.88	19.37	<.001
Error (factor 1)	83.00	63.78	.768		
Covariate (pretest knowledge)	1	168.62	168.62	57.056	.101
Group	1	408.46	408.46	138.22	<.001
Error	83	245.29	2.955		

[a]scores range from 0 to 11
Knowledge measured by multiple choice, yes/no format

Physical Activity Knowledge Assessment

Three questions assessed youth's knowledge on physical activity. Results indicated there was an increase in knowledge scores on physical activity for youth who participated in the intervention/treatment group compared to the control group (Table 9). More than 50% of youth reported a correct response on the activity that kept them healthy at pretest, posttest and delayed posttest (79%, 83.7%, 100%) respectively. Similarly, results were found for importance of physical activity (44.2% 69.8%, 83.7%), and the amount of time needed to be physically active (55.8%, 88.4%, 88.4%) for pretest, posttest, and delayed posttest respectively.

However, in the control group, less than 35% of the youth answered correct on physical activity knowledge questions. There was no increase in scores for physical activity knowledge at pretest, posttest and delayed posttest.

Table 9: Pretest, Posttest and Delayed Posttest Scores for Physical Activity Knowledge[b]

	Treatment			**Control**		
	Pretest	*Posttest*	*Delayed*	*Pretest*	*Posttest*	*Delayed*
Physical activity items	*%*	*%*	*%*	*%*	*%*	*%*
Activity that keeps me healthy and active	79.1	83.7	100.0	32.6	32.5	34.9
Importance of physical activity	44.2	69.8	83.7	32.6	30.2	32.0
Amount of time needed to be physically active	55.8	88.4	88.4	32.6	30.2	30.2

[b] percent scores of correct responses for 3 items

Research Question/Hypothesis Two:

Nutrition Attitude Assessment

Attitude towards nutrition was assessed at pretest, posttest and delayed posttest using 14 statements. The 14 attitude statements focused on how youth feel about nutrition and eating fruits and vegetables, and making healthy related foods choices. The 14 statements were measured on a five-point, Likert-type scale that ranged from 1 = disagree very much to 5 = agree very much. The physical activity statements were removed from the analysis since they were measured on a different scale.

General linear model (GLM) repeated measures analysis of covariance (ANCOVA) was performed with posttest and delayed posttest attitude scores as factors and pretest attitude scores as a covariate. Sphericity assumption (of covariance matrix) using Mauchly's test were not met; significant value was <.05. Therefore, F-value of Greenhouse-Geisser was used to determine level of significance.

Results indicated a significant change in attitude scores [F (1.000, 83.00) =16.57, $p<.001$] from posttest to delayed posttest when controlling for pretest attitude scores, and nutrition attitude changed regardless of the group [F (1.000, 83.00) =81.34, $p<.001$]. However, change in attitudes co-varies with pretest attitudes of youth [F (1.000, 83.00) =4.288, $p<.05$], but, the covariate (pretest attitude) has no significant effect [F (1, 83.00) =21.60, $p>.05$) on the change in attitude scores (Table 10). Thus, the hypothesis that youth receiving nutrition education intervention would score significantly higher on attitudes compared to youth who do not receive intervention (control group) was supported.

Table 10: Repeated Measure ANCOVA Comparing Posttest and Delayed Posttest Scores of Attitudes[c] with Pretest Attitudes Scores as a Covariate

	Group	Adjusted Means	Std Error			
Post-test	Treatment	59.24	.734			
	Control	32.57	.704			
Delayed posttest	Treatment	64.35	.734			
	Control	31.88	.704			
Source of variation		**df**	**SS**	**MS**	**F**	**p(sig)**
Pretest, posttest, delayed (factor 1)		1.000	66.866	66.866	16.57	<.001
Factor 1 by covariate (pretest attitudes)		1.000	17.301	17.301	4.288	.041
Factor 1 by group (treatment & control)		1.000	328.20	328.203	81.34	<.001
Error (factor 1)		83.00	334.88	4.035		
Covariate (pretest attitudes)		1	827.32	827.32	21.60	.201
Group		1	34123.12	34123.12	891.02	<.001
Error		83	3178.64	38.297		

[c]scores could range from 14 to 70

Attitude measured on five- point scale (1) disagree very much to (5) agree very much.

Research Question/Hypothesis Three:

Nutrition Behavior Assessment

For nutrition behavior assessment, seven items that focused on time/period youth ate fruits, vegetables, ate low-fat and sugar free foods, drank milk or consumed milk products were analyzed at pretest, posttest and delayed posttest.

General linear model (GLM) repeated measures analysis of covariance (ANCOVA) was performed with posttest and delayed posttest nutrition behavior scores as factors and pretest nutrition behavior scores as a covariate. Sphericity assumption (of covariance matrix) using Mauchly's test were met; significant value was >.05. Therefore, F-value for Sphericity Assumed was used to determine level of significance.

Results indicated a significant increase in nutrition behavior scores [F (1, 83) =3.290, $p<.001$] from posttest to delayed posttest, and nutrition behaviors increased [F (1, 83) =55.34, $p<.001$] regardless of the group. However, the increase in nutrition behavior co-varies with pretest nutrition behaviors of youth [F (1, .83) =.921, $p<.05$], but the covariate (pretest nutrition behavior) has no significant effect [F 1, 83) =.54.76, $p>.05$) on the increase in nutrition behaviors (Table 11). Thus, the hypothesis that youth receiving nutrition education intervention would score significantly higher on nutrition behavior compared to youth who do not receive intervention (control group) was supported.

Table 11: Repeated Measure ANCOVA Comparing Posttest and Delayed Posttest Scores for Nutrition Behavior[d] with Pretest Behavior Scores as a Covariate

	Group	Adjusted Means	Std Error
Post-test	Treatment	16.93	.226
	Control	12.51	.226
Delayed posttest	Treatment	19.11	.224
	Control	12.47	.224

Source of variation	df	SS	MS	F	p(sig)
Pretest, posttest, delayed (factor 1)	1	4.300	4.300	3.290	<.001
Factor 1 by covariate (pretest behaviors)	1	1.204	1.204	.921	.034
Factor 1 by group (treatment & control)	1	46.19	46.19	35.34	<.001
Error (factor 1)	83	108.49	1.307		
Covariate (pretest behaviors)	1	151.02	151.02	54.76	.113
Group	1	1144.75	1144.75	415.07	<.001
Error	83	228.91	2.758		

[d]scores could range from 7 to 28

Behavior measured on scale (1) Never, (2) 2-3 times/week, (3) once/day, (4) several times a day

Physical activity Behavior Assessment

For physical activity behavior assessment, three questions relative to time/period youth engaged in physical activity, involved in physical activity outside of school, and watched television (TV) were analyzed at pretest, posttest and delayed posttest (Table 12 and figure 3).

Results indicated changes/improvement in physical activity behavior for the intervention/treatment group from not being physically active (pretest, 23.3%) to being physically active at least 30 minutes per day (posttest, 48.8%), and for 4-6 days per week (delayed posttest, 51.2%). There was change in behavior from not being involved in physical activity outside of school (pretest, 30.2%), to being involved everyday (posttest, 51.2%), and to being involved 4-6 days per week (delayed posttest, 46.5%). Watching television (TV) did not change from pretest (69.8%), posttest (44.2%) and delayed posttest (51.2%).

For the control group, there was no change in physical activity behavior. About 50% of youth were not physically active (53.5%, 46.5%, 46.5%) at pretest, posttest, and delayed posttest respectively. Closer to one-half of youth were not involved in physical activity outside of school (48.8%, 46.5%, 46.5%) for the pretest, posttest, and delayed posttest respectively. About one-half of youth watched TV (51.2%, 48.8%, 48.8%) for 4-6 days per week for the pretest, posttest and delayed posttest respectively. Overall, compared to the treatment group, control group watched less TV.

Table 12: Pretest, Posttest and Delayed Posttest Scores for Physical Activity Behavior[d]

	Treatment			**Control**		
	Pretest	*Posttest*	*Delayed*	*Pretest*	*Posttest*	*Delayed*
Physical activity items	*%*	*%*	*%*	*%*	*%*	*%*
Period of being physically active						
30 min/day	14.0	*48.8*	*23.3*	2.3	2.3	2.4
4-6 days/wk	34.9	37.2	51.2	20.9	20.9	20.9
1-3 days/wk	27.8	11.6	25.6	23.3	30.3	30.2
Not physically active	*23.3*	2.3	-	*53.5*	*46.5*	*46.5*
Involvement in physical activity outside of school						
Everyday	4.7	*51.2*	*32.6*	-	-	-
4-6 days/week	11.6	30.2	46.5	-	-	-
2-3 days/week	23.3	16.3	18.6	7.0	7.0	7.0
1 day/week	30.2	2.3	2.3	44.2	46.5	46.5
Not Involved	*30.2*	-	-	*48.8*	*46.5*	*46.5*
Period of watching TV						
Everyday	*69.8*	*44.2*	*41.8*	30.2	32.6	32.6
4-6 days/week	9.2	30.2	51.2	*51.2*	*48.8*	*48.8*
2-3 days/week	7.0	*25.6*	7.0	16.3	16.3	16.3
1 day/week	14.0	-	-	2.3	2.3	2.3

[d] percent physical activity behavior scores for 3 questions

___ underlined scores which indicate changes in physical activity behavior over time from pretest to posttest to delayed posttest are illustrated in figure 3.

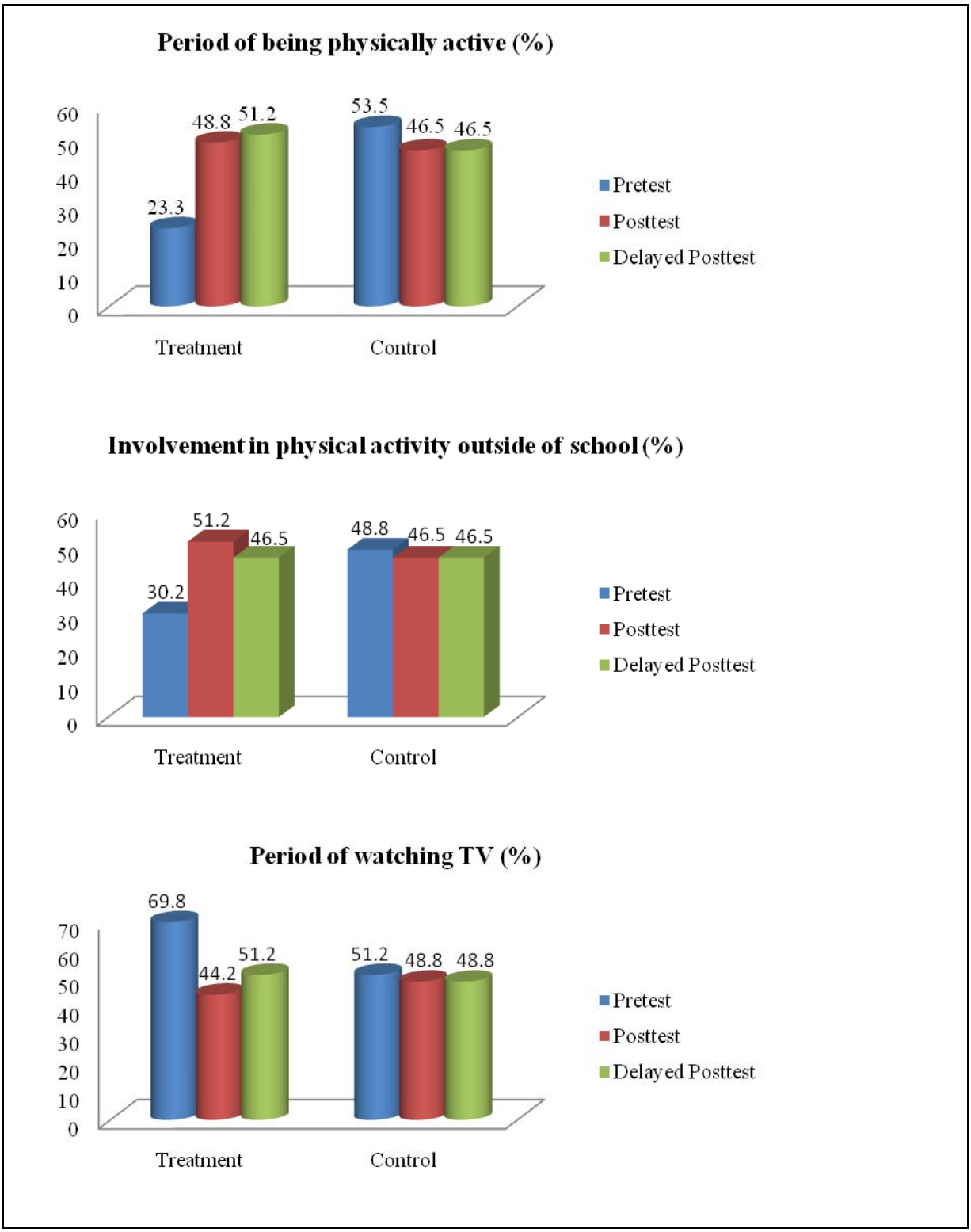


Figure 3: Pretest, Posttest and Delayed Posttest Scores for Physical Activity Behaviors

Research Question/Hypothesis Four:

Nutrition Knowledge by Demographic Characteristics

Additional comparisons were performed for nutrition knowledge using factorial ANOVA with repeated measures pretest, posttest and delayed posttest to determine if there were significant differences between scores when youth were categorized by gender, grade level and age.

Gender: For the treatment group, males started with slightly higher scores compared to female students/youth at pretest, posttest and delayed posttest, while females in the control group started with high scores than males (Table 13).

Factorial ANOVA with repeated measure showed that both male and females in the treatment group significantly increased their knowledge scores from pretest to posttest to delayed posttest. However, there was no significant differences ($p>.05$) between scores of male and female youth on nutrition knowledge both in the treatment and control groups. Youth scored significantly different ($p<.001$) in nutrition knowledge between the treatment and control group (Table 14).

Table 13: Descriptive Statistics of Nutrition Knowledge Scores Pretest, Posttest and Delayed Posttest by Group by Gender

	Group	**Gender**	**Mean***	**SD**	**N**
Pretest	Treatment	Male	7.50	1.61	24
		Female	7.21	1.78	19
	Control	Male	4.67	1.94	18
		Female	5.16	1.97	25
Posttest	Treatment	Male	9.79	1.25	24
		Female	9.16	1.34	19
	Control	Male	4.78	2.13	18
		Female	5.12	2.09	25
Delayed posttest	Treatment	Male	10.6	0.72	24
		Female	10.5	0.84	19
	Control	Male	4.56	2.31	18
		Female	5.28	2.09	25

* Mean score could theoretically range from 0 to 11

Table 14: Factorial ANOVA with Repeated Measures Pretest, Posttest and Delayed Posttest of the Nutrition Knowledge by Group by Gender

Source of variation	**Df**	**SS**	**MS**	**F**	**p(sig)**
Pretest, posttest, delayed (factor 1)	2	110.88	55.44	49.31	<.001
Factor 1 by group (treatment & control)	2	109.28	54.64	48.60	<.001
Factor 1 by gender	2	2.170	1.085	0.965	0.383
Factor 1 by group by gender	2	0.105	0.053	0.047	0.954
Error (factor 1)	164	184.371	1.124		
Group	1	1111.17	1111.17	162.58	<.001
Gender	1	0.488	0.488	0.071	0.790
Group by gender	1	11.80	11.80	1.727	0.192
Error	82	560.44	6.835		

Grade level: The descriptive statistics for the pretest, posttest and delayed posttest scores for nutrition knowledge by grade level in the treatment group indicated that fifth graders had the highest increase in knowledge scores with an increase of 2.15 points (pre vs post), 0.85 points (post vs delayed) and, 3.0 points (delayed vs pre). Sixth graders started with slightly higher scores but had almost the same scores as seventh through eighth graders at posttest and delayed posttest (Table 15). For the control group, nutrition knowledge scores remained the same for all grade levels.

Factorial ANOVA with repeated measures for pretest, posttest and delayed in the treatment group showed that all three grade levels significantly increased knowledge scores from pretest to posttest and delayed posttest. However, no significant differences ($p>.05$) were found between nutrition knowledge scores of grade 5, grade 6 and grade 7-8 in both treatment and control groups (Table 16). Results also showed that youth scored significantly different in nutrition knowledge between the treatment and control group ($p<.05$).

Table 15: Descriptive Statistics of Nutrition Knowledge Scores Pretest, Posttest and Delayed Posttest by Group and by Grade Level

	Group	**Grade**	**Mean***	**SD**	**N**
Pretest	Treatment	5	7.71	1.98	21
		6	7.50	1.58	10
		7-8	6.67	0.89	12
	Control	5	2.60	1.67	5
		6	5.12	1.99	16
		7-8	5.36	1.65	22
Posttest	Treatment	5	9.86	1.24	21
		6	9.20	1.23	10
		7-8	9.17	1.47	12
	Control	5	4.60	2.30	5
		6	5.13	2.16	16
		7-8	4.95	2.08	22
Delayed posttest	Treatment	5	10.71	0.46	21
		6	10.30	1.06	10
		7-8	10.42	0.90	12
	Control	5	4.60	2.70	5
		6	5.13	2.16	16
		7-8	4.95	2.19	22

* Mean score could theoretically range from 0 to 11

Table 16: Factorial ANOVA with Repeated Measures Pretest, Posttest and Delayed Posttest of the Nutrition Knowledge by Group by Grade Level

Source of variation	**Df**	**SS**	**MS**	**F**	**p(sig)**
Pretest, posttest, delayed (factor 1)	2	122.07	61.03	58.57	<.001
Factor 1 by group (treatment & control)	2	59.51	29.76	28.46	<.001
Grade by factor 1	4	9.571	2.393	2.288	0.062
Factor 1 by group by grade	4	15.95	3.987	2.919	0.057
Error (factor 1)	160	167.29	1.046		
Group	1	945.04	945.04	139.19	<.001
Grade	2	4.264	2.132	0.314	0.731
Group by grade	2	28.93	14.47	2.131	0.125
Error	82	543.15	6.789		

Age: For the treatment group, the descriptive statistics indicated that all youth increased nutrition knowledge scores from pretest to posttest and delayed posttest. However, 10 year olds had the highest increase in knowledge scores of all ages, followed by 11 year old and 12-14 year old (Table 17). The 11 year and 12-14 year olds had almost the same scores at delayed posttest with a score difference of 0.02 points. The control group did not show increase in scores from pretest to posttest to delayed posttest.

Results from factorial ANOVA with repeated measures pretest, posttest and delayed posttest by age indicated that nutrition knowledge scores increased from pretest to posttest to delayed posttests for the treatment group. However, there was no significant differences ($p>.05$) between scores of 10 year old, 11 year old, and 12-14 year old youth on nutrition knowledge in both the treatment and control groups (Table 18). There was a significant difference in nutrition knowledge between the treatment and control group ($p<.05$).

Table 17: Descriptive Statistics of Nutrition Knowledge Scores Pretest, Posttest and Delayed Posttest by Group by Age

	Group	Age	Mean*	SD	N
Pretest	Treatment	10	7.69	2.056	16
		11	7.57	1.697	14
		12-14	6.77	0.927	13
	Control	10	3.00	1.633	4
		11	5.19	2.040	16
		12-14	5.13	1.817	23
Posttest	Treatment	10	9.81	1.223	16
		11	9.43	1.342	14
		12-14	9.23	1.423	13
	Control	10	5.50	1.291	4
		11	5.19	2.198	16
		12-14	4.74	2.158	23
Delayed posttest	Treatment	10	10.81	0.403	16
		11	10.36	0.842	14
		12-14	10.38	0.961	13
	Control	10	5.50	2.082	4
		11	5.19	2.198	16
		12-14	4.74	2.261	23

* Mean score could theoretically range from 0 to 11

Table 18: Factorial ANOVA with Repeated Measures Pretest, Posttest and Delayed Posttest of the Nutrition Knowledge by Group by Age

Source of variation	Df	SS	MS	F	p(sig)
Pretest, posttest, delayed (factor 1)	2	128.21	64.10	62.10	<.001
Factor 1 by group (Treatment & Control)	2	48.99	24.49	23.73	<.001
Age by factor 1	4	12.667	3.167	3.068	0.058
Factor 1 by group by age	4	17.03	4.257	4.125	0.060
Error (factor 1)	160	165.15	1.032		
Group	1	843.94	843.94	120.63	<.001
Age	2	5.011	2.505	0.358	0.700
Group by age	2	5.666	2.833	0.405	0.668
Error	80	559.71	6.996		

Nutrition Attitudes by Demographic Characteristics

Additional comparisons were performed for nutrition attitude using factorial ANOVA with repeated measures pretest, posttest, and delayed posttest to determine if there was a significant difference between scores when youth were categorize by gender, grade level and age.

Gender: Male students started with higher scores compared to females at pretest, while females had higher scores at posttest and delayed posttest in the treatment group compared to the control group (Table 19). While both male and females significantly increased their attitude scores from pretest to posttest and to delayed posttest, there was no significant differences ($p>.05$) between male and female youth relative to nutrition attitude scores in both treatment and control group (Table 20).

Table 19: Descriptive Statistics of Attitude Scores Pretest, Posttest and Delayed Posttest by Group by Gender

	Group	**Gender**	**Mean***	**SD**	**N**
Pretest	Treatment	Male	39.25	13.867	24
		Female	37.84	14.404	19
	Control	Male	32.33	6.417	18
		Female	31.44	6.063	25
Posttest	Treatment	Male	59.96	4.438	24
		Female	60.16	4.113	19
	Control	Male	32.28	6.351	18
		Female	31.40	6.191	25
Delayed posttest	Treatment	Male	64.83	3.908	24
		Female	65.11	3.365	19
	Control	Male	31.39	5.782	18
		Female	31.20	5.993	25

*Mean computes on a scale of 1=disagree very much to 5=agree very much
Mean score could theoretically range from a low of 14 to a high of 70

Table 20: Factorial ANOVA with Repeated Measures Pretest, to Posttest and Delayed Posttest of Attitude Scores by Group by Gender

Source of variation	**SS**	**Df**	**MS**	**F**	**p(Sig)**
Pretest, posttest, delayed (factor1)	8055.50	2	4027.75	120.16	<.001
Factor1 by group (treatment & Control)	8599.08	2	4299.54	128.27	<.001
Factor1 by gender	15.623	2	7.812	.233	.792
Factor1 by group by gender	6.787	2	3.393	.101	.904
Error(factor1)	5497.11	164	33.519		
Group	33004.88	1	33004.88	315.04	<.001
Gender	14.729	1	14.729	.141	.709
Group by gender	1.840	1	1.840	.018	.895
Error	8590.57	82	104.763		

Grade level: The descriptive statistics for the pretest, posttest and delayed posttest scores for attitude by grade level indicated that sixth graders had the highest increase in attitude scores with an increase of 1.25 points (pre vs post). Fifth graders started with low scores but scored high at posttest and delayed posttest in the treatment group (Table 21).

Factorial ANOVA with repeated measures for attitude pretest, posttest and delayed posttest by grade level indicated that all three grade levels in the treatment group significantly increased their attitude scores from pretest to posttest and delayed posttest. However, there was no significant difference between attitude scores of grade 5, grade 6 and grade 7-8 youth in both the treatment and control group (Table 22).

Table 21: Descriptive Statistics of Attitude Scores Pretest, Posttest and Delayed Posttest by Group by Grade Level

	Group	Grade	Mean*	SD	N
Pretest	Treatment	5	36.62	13.891	21
		6	43.10	12.991	10
		7-8	38.42	15.120	12
	Control	5	33.80	7.497	5
		6	30.44	7.127	16
		7-8	32.36	5.104	22
Posttest	Treatment	5	60.29	3.621	21
		6	60.60	4.142	10
		7-8	59.17	5.458	12
	Control	5	33.40	7.057	5
		6	30.62	7.580	16
		7-8	32.23	4.947	22
Delayed posttest	Treatment	5	65.90	3.129	21
		6	63.90	4.701	10
		7-8	64.17	3.353	12
	Control	5	33.20	6.979	5
		6	30.44	7.127	16
		7-8	31.45	4.595	22

*Mean computed on a scale of 1=disagree very much to 5=agree very much
Mean score could theoretically range from a low of 14 to a high of 70

Table 22: Factorial ANOVA with Repeated Measures Pretest, to Posttest and Delayed Posttest of Attitude Scores by Grade Level

Source of variation	SS	Df	MS	F	p(Sig)
Pretest, posttest, delayed (factor1)	5862.38	2	2931.19	89.326	<.001
Factor1 by group (treatment & control)	6238.93	2	3119.46	95.064	<.001
Factor1 by grade	82.210	4	20.553	.626	.644
Factor1 by group by Grade	119.99	4	29.999	.914	.457
Error(factor1)	5250.32	160	32.814		
Group	25795.03	1	25795.05	245.26	<.001
Grade	26.363	2	13.181	.125	.882
Group by grade	188.64	2	94.319	.897	.412
Error	8414.01	80	105.18		

Age: The descriptive statistics for pretest, posttest and delayed posttest for age indicated that all youth increased their attitude scores from pretest to posttest and delayed posttest. However, the 10 year olds started with lower scores but scored high at posttest and delayed posttest in the treatment group (Table 23).

Results from factorial ANOVA with repeated measures for pretest, posttest and delayed posttest by age indicated that all age groups significantly increased their attitude scores from pretest to posttest to delayed posttest. However, there was no significant difference ($p>.05$) between attitude scores of 10 year old, 11 year old and 12-14 year old youth in both the treatment and control groups (Table 24).

Table 23: Descriptive Statistics of Attitude Scores Pretest, Posttest and Delayed Posttest by Group by Age

	Group	Age	Mean*	SD	N
Pretest	Treatment	10	36.44	14.052	16
		11	38.36	13.540	14
		12-14	41.62	14.830	13
	Control	10	32.25	7.676	4
		11	29.81	6.462	16
		12-14	33.13	5.570	23
Posttest	Treatment	10	60.31	3.807	16
		11	60.71	3.791	14
		12-14	59.00	5.260	13
	Control	10	31.75	6.946	4
		11	30.00	6.976	16
		12-14	33.00	5.452	23
Delayed posttest	Treatment	10	65.81	3.487	16
		11	65.21	3.984	14
		12-14	63.62	3.305	13
	Control	10	32.25	7.676	4
		11	29.38	6.163	16
		12-14	32.43	5.186	23

*Mean computes on a scale of 1=disagree very much to 5=agree very much
Mean score could theoretically range from a low of 14 to a high of 70

Table 24: Factorial ANOVA with Repeated Measures Pretest, to Posttest and Delayed Posttest of Attitude Scores by Age

Source of variation	SS	df	MS	F	p(Sig)
Pretest, posttest, delayed (factor1)	5956.58	2	2978.29	90.335	<.001
Factor1 by group (treatment & control)	6255.11	2	3127.56	94.862	<.001
Factor1 by age	114.58	4	28.644	.869	.484
Factor1 by group by age	93.342	4	23.336	.708	.588
Error(factor1)	5275.11	160	32.969		
Group	25216.61	1	25216.61	242.53	<.001
Age	114.08	2	57.038	.549	.580
Group by age	129.54	2	64.772	.623	.539
Error	8317.98	80	103.975		

Nutrition Behavior by Demographic Characteristics

Additional comparisons were performed for nutrition behavior using factorial ANOVA with repeated measures to determine if there were significant differences between scores when youth were categorized by gender, grade level, and age.

Gender: For the treatment group, female youth started with higher scores compared to males at pretest and posttest but had almost similar scores at delayed posttest (Table 25). While both male and female youth increased their nutrition behavior scores from pretest to posttest and to delayed posttest, there was no significant difference ($p>.05$) between nutrition behavior scores of male and females in both the treatment and control groups (Table 26).

Table 25: Descriptive Statistics of Nutrition Behavior Scores Pretest, Posttest and Delayed Posttest by Group by Gender

	Group	**Gender**	**Mean***	**SD**	**N**
Pretest	Treatment	Male	13.12	1.918	24
		Female	13.74	1.881	19
	Control	Male	11.72	1.638	18
		Female	12.20	1.826	25
Posttest	Treatment	Male	17.08	1.530	24
		Female	17.63	2.033	19
	Control	Male	11.83	1.505	18
		Female	12.32	1.909	25
Delayed posttest	Treatment	Male	19.54	1.641	24
		Female	19.32	1.529	19
	Control	Male	11.89	1.451	18
		Female	12.32	1.909	25

*Mean computes on a scale of 1=never to 4=several times a day
Mean score could theoretically range from a low of 7 to a high of 28

Table 26: Factorial ANOVA with Repeated Measures Pretest, to Posttest and Delayed Posttest of Nutrition Behaviors by Group by Gender

Source of variation	**SS**	**Df**	**MS**	**F**	**p(Sig)**
Pretest, posttest, delayed (factor1)	410.55	2	205.27	149.89	<.001
Factor1 by group (treatment & control)	372.04	2	186.02	135.83	<.001
Factor1 by gender	2.587	2	1.294	.945	.391
Factor1 by group by Gender	2.014	2	1.007	.735	.481
Error(factor1)	224.59	164	1.369		
Group	1391.26	1	1391.26	214.93	<.001
Gender	9.530	1	9.530	1.472	.228
Group by gender	.374	1	.374	.058	.811
Error	530.80	82	6.473		

Grade level: The descriptive statistics for the pretest, posttest and delayed posttest scores for nutrition behavior by grade level indicated all grades increased their scores in nutrition behavior in the treatment group (Table 27). Factorial ANOVA with repeated measures pretest, posttest and delayed posttest indicated no significant differences between nutrition behavior scores of grade 5, grade 6 and grade 7-8 students in both the treatment and control groups (Table 28).

Table 27: Descriptive Statistics of Nutrition Behavior Scores Pretest, Posttest and Delayed Posttest by Group by Grade Level

	Group	Grade	Mean*	SD	N
Pretest	Treatment	5	13.38	1.687	21
		6	13.30	2.111	10
		7-8	13.50	2.236	12
	Control	5	11.80	1.789	5
		6	12.00	2.221	16
		7-8	12.05	1.397	22
Posttest	Treatment	5	17.19	1.861	21
		6	18.00	1.633	10
		7-8	17.00	1.706	12
	Control	5	12.00	1.581	5
		6	12.13	2.094	16
		7-8	12.14	1.583	22
Delayed posttest	Treatment	5	19.43	1.777	21
		6	19.10	.876	10
		7-8	19.75	1.712	12
	Control	5	12.00	1.581	5
		6	12.13	2.094	16
		7-8	12.18	1.532	22

*Mean computes on a scale of 1=never to 4=several times a day
Mean score could theoretically range from a low of 7 to a high of 28

Table 28: Factorial ANOVA with Repeated Measures Pretest, to Posttest and Delayed Posttest Nutrition Behavior by Group by Grade Level

Source of variation	SS	Df	MS	F	p(Sig)
Pretest, posttest, delayed (factor1)	331.81	2	165.91	120.19	<.001
Factor1 by group (treatment & control)	298.11	2	149.06	107.99	<.001
Factor1 by grade	5.336	4	1.334	.966	.428
Factor1 by group by Grade	4.893	4	1.223	.886	.474
Error(factor1)	220.86	160	1.380		
Group	1103.41	1	1103.41	163.52	<.001
Grade	.720	2	.360	.053	.948
Group by grade	.120	2	.060	.009	.991
Error	539.85	80	6.748		

Age: The descriptive statistics for pretest, posttest and delayed posttest scores for age indicated that all youth increased from pretest to posttest and delayed posttest in the treatment group. However, the 10 years old in the treatment group had the highest increase in behavior scores of all ages, followed by 11 year olds (Table 29). Factorial ANOVA with repeated measures indicated no significant differences ($p>.05$) between nutrition behavior scores of 10 year old, 11 year old and 12-14 year old youth in both the treatment and control group (Table 30).

Table 29: Descriptive Statistics of Nutrition Behavior Scores Pretest, Posttest and Delayed Posttest by Group by Age

	Group	**Age**	**Mean**	**SD**	**N**
Pretest	Treatment	10	13.50	1.414	16
		11	13.50	2.594	14
		12-14	13.15	1.676	13
	Control	10	11.25	1.500	4
		11	11.94	2.175	16
		12-14	12.17	1.466	23
Posttest	Treatment	10	17.13	1.996	16
		11	17.79	1.718	14
		12-14	17.08	1.553	13
	Control	10	11.50	1.291	4
		11	12.06	2.048	16
		12-14	12.26	1.630	23
Delayed posttest	Treatment	10	19.69	1.778	16
		11	19.07	1.207	14
		12-14	19.54	1.713	13
	Control	10	11.50	1.291	4
		11	12.06	2.048	16
		12-14	12.30	1.579	23

*Mean computes on a scale of 1=never to 4=several times a day
Mean score could theoretically range from a low of 7 to a high of 28

Table 30: Factorial ANOVA with Repeated Measures Pretest, to Posttest and Delayed Posttest of Nutrition Behavior by Age

Source of variation	**SS**	**Df**	**MS**	**F**	**p(Sig)**
Pretest, posttest, delayed (factor1)	317.16	2	158.58	114.48	<.001
Factor1 by group (treatment & control)	282.09	2	141.04	101.82	<.001
Factor1 by age	3.573	4	.893	.645	.631
Factor1 by group by age	3.423	4	.856	.618	.650
Error(factor1)	221.63	160	1.385		
Group	1107.01	1	1107.01	166.35	<.001
Age	3.225	2	1.612	.242	.785
group by age	7.348	2	3.674	.552	.578
Error	532.36	80	6.655		

Overall, the above findings support the hypothesis that there was no significant difference in nutrition knowledge, nutrition attitudes, and nutrition behaviors by demographic characteristics (gender, grade level and age) of youth in both the treatment and control groups. Significant difference was only found between the treatment and control groups**.**

Research Question/Hypothesis Five:

Relationship between Nutrition Knowledge, Attitudes and Behaviors

Correlation analysis was used to examine the relationship between nutrition knowledge at pretest, posttest, delayed posttest, and nutrition attitudes at pretest, posttest and delayed posttest, and nutrition behaviors at pretest, posttest, and delayed posttest respectively.

Results indicated a non-significant correlation for knowledge and attitude pretests, and attitude and behavior pretest scores; non- significant correlation for knowledge, attitude, and behavior posttest scores; a negative correlation for knowledge, attitude, and behavior delayed posttest scores (Table 31). Thus, the hypothesis that there would be no relationship between nutrition knowledge, nutrition attitudes, and nutrition behavior of youth who participated in the intervention was supported. However, there was correlation ($r=.253$, $p<.05$) between knowledge and behavior pretests scores, and correlation ($r=.302$, $p<.05$) between attitude posttest and behavior posttest scores.

Table 31: Correlation between Nutrition Knowledge, and Attitude and Behavior for Pretest, Posttest and Delayed Posttest Respectively

	Attitude Pretest	Behavior Pretest	Attitude posttest	Behavior posttest	Delayed attitude	Delayed behavior
Knowledge pretest	.063	.253*				
Attitude pretest		.145				
Knowledge posttest			.026	.152		
Attitude posttest				.302*		
Knowledge delayed					-.179	.075
Attitude delayed						-.021

*correlation significant at 0.05

Chapter 5

SUMMARY, DISCUSSION, CONCLUSIONS, AND RECOMMENDATIONS

This chapter presents a summary of the study's procedures, discussion of the findings, conclusions, and recommendations for future research, practice and suggestions for program improvement.

Summary

The purpose of this study was to evaluate whether selected nutrition education lessons from the *Up for the Challenge: Health, Fitness, and Nutrition* curriculum based upon an experiential learning model contribute to change in knowledge, attitudes and behaviors about nutrition with low-income youth in afterschool programs. The following five research questions (R_Q)/hypotheses (H_A/H_O) guided this investigation.

R_{Q1}: What is the effect of nutrition education intervention (selected lessons from the *Up for the Challenge* curriculum) on general nutrition and physical activity knowledge?

H_{A1}: Youth receiving nutrition education intervention will score significantly higher on general nutrition knowledge compared to youth who do not receive intervention (control group).

R_{Q2}: What is the effect of nutrition education intervention on the attitudes about nutrition, eating fruits and vegetables, eating healthy, and making healthy food choice?

H_{A2}: Youth receiving nutrition education intervention will score significantly higher on attitudes compared to youth who do not receive intervention (control group).

R_{Q3}: What is the effect of nutrition education intervention on nutrition and physical activity behaviors?

H_{A3}: Youth receiving nutrition education intervention will score significantly higher on nutrition behaviors compared to youth who do not receive intervention (control group).

R_{Q4}: Is there a difference in nutrition knowledge, nutrition attitudes, and nutrition behaviors when examined by participants' demographic characteristics such as gender, age, grade level, and ethnicity?

H_{O4}: There will be no difference in nutrition knowledge, nutrition attitudes and nutrition behaviors when examined by demographic characteristics of youth.

$R_{Q5:}$ Are there relationships between nutrition knowledge, attitudes and nutrition behaviors?

H_{O5}: There will be no relationships between nutrition knowledge, nutrition attitudes, and nutrition behaviors of youth.

A quasi-experimental design consisting of pretest-posttest comparison control group was used. To evaluate the selected nutrition lessons from the *Up for the Challenge: Health, Fitness, and Nutrition* curriculum, three measurements were taken at pretest (time 1), posttest (time 2), and delayed posttest (time 3). Participants included youth in two afterschool programs registered with Expanded Food Nutrition Education program

(EFNEP) of Penn State Nutrition Links. A total of 86 youth participated in the study (treatment=43, and control=43).

A four-part questionnaire was developed to collect data. Part one contained 14 questions pertaining to general nutrition knowledge and physical activity. Questions were measured on multiple choice and yes or no format. Part two contained 14 statements about attitudes towards nutrition and fruits and vegetable consumption, and eating healthy and making healthful food choices. Statements were measured on a five-point Likert-type scale that ranged from 1 = disagree very much to 5 = agree very much. Part three contained 11 statements on nutrition and physical activity behavior measured on a four-point scale that ranged from 1 = never to 4= several times a day. Part four contained demographic questions such as gender, age, grade level, and ethnicity.

The questionnaire was reviewed by a panel of experts consisting of nutrition specialists and advisers, and faculty members in the department of Agricultural and Extension Education at The Pennsylvania State University. The instrument was pilot tested with students not included in the study. The reliability estimates were in acceptable range; nutrition knowledge questions (pilot test, α= .68; posttest, α=.69), physical activity knowledge questions (pilot test, α= .28; posttest, α=.29), attitude statements (pilot test, α=.92; posttest, α=.92), nutrition behavior (pilot test, α=.49; posttest, α=.51), and physical activity behavior (pilot test, α=.55; posttest, α=.55).

Data collection was completed in three stages. Pretest data on knowledge, attitudes and behaviors was collected first for both the treatment and control groups at the same time. Two-three hours hands-on nutrition education lessons were taught to youth in the treatment group every week over a 4-week period, after which posttest data was

collected, followed by delayed posttest/follow-up for both groups after two weeks of posttest data collection. The control group did not receive any nutrition lessons.

Data were entered and analyzed using a Statistical Package for Social Sciences (SPSS). Descriptive and inferential statistics were used to analyze data. Descriptive statistics included frequency distribution, percentages, means and standard deviations. Inferential statistics included repeated measures ANCOVA, factorial ANOVA with repeated measures for pretest, posttest, and delayed posttest, and Pearson correlation, r.

Discussion

Overall, youth who received nutrition education lessons from the *Up for the Challenge Healthy Fitness, and Nutrition* curriculum significantly improved their nutrition and physical activity knowledge, attitudes, and nutrition and physical activity behaviors compared to the youth who did not receive the intervention (control group).

It is important to *note* that physical activity knowledge and physical activity behavior scores for the treatment group at pretest were higher than the pretest scores for the control group. This finding indicates that youth in the treatment group were 1) either already knowledgeable about physical activity from their families, 2) previously exposed to other physical activity related activities, and/or 3) the questions were too easy and not challenging enough for the students. The research study did not consider other factors in afterschool programs or family settings known to influence the high scores given the fact that the two afterschool program sites were a little bit different geographically, and the researcher had no control of selecting study sites.

Nutrition and Physical Activity Knowledge

The nutrition knowledge scores for youth participating in nutrition education lessons from the *Up for the Challenge* curriculum significantly ($p<.001$) increased from pretest to posttest and delayed posttest compared to youth in the control group. Previous research has shown an increase in knowledge after nutrition intervention among children in afterschool programs (Kelder, Hoelscher, Barrosa, Walker, Cribbs, & Hu, 2005; Kelder, Michell, McKenzie, Derby, Strikmiller, Luepker, et al. 2003). Also, in a meta-analysis of nutrition education studies, Lytle (1995) found that 71% of studies reporting on knowledge outcomes showed significant gains in knowledge for the treatment group as compared to the control group.

Physical activity knowledge scores also increased from pretest to posttest and delayed posttest for youth participating in the nutrition education lessons.

Additional comparisons revealed that both male and female youth participating in the nutrition education lessons from the *Up for the Challenge* curriculum (treatment group) increased their nutrition knowledge scores. However, no significant difference between male and female youth on nutrition knowledge was found regardless of the group (treatment or control).

All youth in three grade levels (fifth, sixth, seventh-eighth) increased their nutrition knowledge scores from pretest to posttest and delayed posttest. However, no significant difference between grade levels on nutrition knowledge was found regardless of the group (treatment or control). However, fifth graders had the highest increase in nutrition knowledge scores compared to sixth, and seventh -eighth graders in the

treatment group. This suggests that just being in a higher grade does not necessarily translate into scoring better or higher on nutrition knowledge.

All age groups (10 year, 11 year, and 12-14 year olds) increased nutrition knowledge scores from pretest to posttest to delayed posttest. However, no significant difference between age groups on nutrition knowledge was found regardless of the group (treatment or control). The 10 year olds had the highest increase in scores compared to other age groups.

It is important to note that *fifth graders* and *10 year olds* had the highest increase in nutrition knowledge scores (see Table 32 for a brief summary). This suggests that the nutrition education lessons from the *Up for the Challenge* curriculum had more of an effect on the younger youth, meaning the nutrition activities may be better geared toward younger children in lower grade levels for knowledge acquisition. These findings concur with previous research conducted by Carter (2002) and Baranowski et al. (1997) stating that nutrition strategies should be aimed more at younger children and not youth entering adolescence.

Nutrition Attitudes

The attitude towards nutrition and eating fruits and vegetables, eating healthy, and making healthy food choices for youth participating in nutrition education lessons from the *Up for the Challenge* curriculum significantly ($p<.001$) increased from pretest to posttest and to delayed posttest when compared to the control group.

A closer examination of gender, grade level, and age revealed that there was no significant differences between scores of male and female, grade levels (5, 6, 7-8

graders), and age groups (10, 11, 12-14), on attitudes towards nutrition, fruits and vegetables, eating healthy and making healthy food choices.

Nutrition and Physical Activity Behaviors

Nutrition behavior scores of youth participating in nutrition education lessons from the *Up for the Challenge* curriculum increased significantly ($p < .001$) from pretest to posttest and delayed posttest compared to the control group. The findings achieved in this study concur with findings of Powers, Struempler, Guarino, & Parmer (2005), who found that children participating in nutrition intervention curriculum (dairy consumption, fruits and vegetable consumption, food guide pyramid knowledge) exhibited significantly greater improvements in overall nutrition behavior than the children in the control group.

The findings from physical activity behavior assessment also showed that youth participating in nutrition education lessons from the *Up for the Challenge* curriculum increased scores from pretest to posttest and delayed posttest.

Additional comparison of nutrition behavior scores by gender, grade levels, and age group increased pretest to posttest and delayed posttest. However, no significant difference were found between scores of male and female, grade levels (5, 6, 7-8) and age (10, 11, 12-14) on nutrition behavior in both treatment and control groups.

However, *10 year olds* had the greatest increase in nutrition behavior scores compared to 11 year old and 12-14 year old. Also, *fifth graders* had the greatest increase in behavior compared to sixth, and seventh-eighth graders (see Table 32 for a brief summary). This suggests that just being older and in a higher grade does not necessarily translate into better eating behavior. The possible reason for these results could be

because the majority of children in grades six and seven-eight are entering puberty/adolescents and as children get older negative behaviors about certain foods develop (Santrock, 1993).

Table 32: Summary of Increases in Nutrition Knowledge, Attitude, Nutrition behavior by Demographics for the Treatment (T) and Control (C) Groups

Demographics	**Nutrition Knowledge**		**Attitude**		**Nutrition Behavior**	
	T	C	T	C	T	C
Gender						
Male	-	-	-	-	-	-
Female	-	-	-	-	-	-
Age						
10	+	-	-	-	+	-
11	-	-	-	-	-	-
12-14	-	-	-	-	-	
Grade level						
5	+	-	-	-	+	-
6	-	-	-	-	-	-
7-8	-	-	-	-	-	-

\+ = highest increase in knowledge, attitude, behavior scores
\- = lowest increase in scores

Relationships

Pearson correlation coefficient showed no significant relationship between nutrition knowledge, attitudes, and behavior scores of youth participating in the selected nutrition education lessons from the *Up for the Challenge* curriculum. The correlations were weak. Other studies have found a weak or non-significant correlation between nutrition knowledge and behavior (Powers, Struempler, Guarino, & Parmer, 2005; and Pirounznia, 2001). Worsley (2002) points out several reasons that might contribute to low or weak correlation: 1) the small number of subjects which do not have the statistical power to detect any relationship, 2) different age groups respond differently to different

types of questions, hence questions/responses cannot be correlated, 3) type of statistical tests performed, and 4) other factors that the researchers have no control may affect the relationship.

Conclusions

The findings from this study should be viewed with caution because of threats to the validity of the study and confounding/extraneous variables as previously discussed. Despite all the limitations described, overall, there was a program effect on the treatment group. The significant improvement for nutrition and physical activity scores, attitude scores, and nutrition and physical activity behavior scores indicated that the nutrition education lessons from the *Up for the Challenge Healthy Fitness, and Nutrition* curriculum can be used to change/improve youths' knowledge, attitudes and behaviors regarding nutrition and physical activity. Youth who were in the control group did not receive any lessons, and therefore, did not improve or change knowledge, attitudes or behaviors.

These findings also imply that irrespective of time taken to implement the nutrition education lessons, youth were able to retain nutrition and physical activity information. This evidence is indicated by the significant increases in scores from pretest to posttest (four weeks) and a slight increase of scores from posttest to delayed posttest after two weeks of posttest data collection.

However, the curriculum did not have the same effect on all age groups and grade levels. The insignificant results of nutrition knowledge, attitude and nutrition behavior scores when compared to demographic variables may be due to the small sample size.

The non-significant relationship between nutrition knowledge, attitudes and behaviors suggest that, for young children, nutritional knowledge alone does not necessarily influence their nutrition behavior, but does provide them with the ability to know how to make healthy food choices at times when they are or not given an opportunity to make decisions on what to eat (Ruzita et al. 2000).

The results from this study cannot be generalized as a result of data collection for a relatively small sample in two afterschool programs. Also the students' demographic characteristics are not diverse but relatively homogenous within each group, for example ethnicity.

The findings from this study demonstrates that implementing curriculum-based nutrition education lessons using hands-on, experiential learning approach for youth in afterschool program can have positive effects on their nutrition knowledge, attitudes, and nutrition behaviors. These findings are consistent with Heneman, Junge, Zidenberg-Cherr, (2008) who found improvement of nutrition knowledge and behaviors of elementary students using nutrition lessons from the "Reading Across My Pyramid (RAMP)" curriculum that was based on experiential learning model.

Recommendations for Future Research

The following recommendations for future research are suggested.

Further testing of the nutrition education lessons from the *Up for the Challenge* curriculum with a diverse group of youth, representing greater diversity is very important given the fact that ethnicity was ruled out of the analysis as all youth were white. It is not known how the effect of ethnicity would have altered the results.

Collection of data from multiple afterschool programs would yield a large sample for analysis which would be easier for generalization of results, but also detect the relationships, and differences in nutrition knowledge scores, attitudes scores, and nutrition behaviors scores across demographic characteristics.

Differential selection was a major threat in this study. Selection of study sites (control and treatment groups) that are similar at the beginning of the experiment should be considered given the fact that the scores for both groups were significantly different at the beginning of the study.

The high scores at pretest for the treatment group (physical activity) is an indication that the evaluation questions were not challenging enough for youth and needs to be revised. Revisions in terms of length and difficulty are suggested.

Finally, further research should include open-ended or qualitative evaluation questions in addition to closed-ended/quantitative questions to provide opportunity for participants to express themselves fully on particular nutrition and physical activity issues.

Recommendations for Practice and Suggestions for Program Improvement

Given the fact that fifth graders and 10 year olds had the highest increase in knowledge and behavior scores compared to sixth, and seventh through eighth graders, it is recommended that youth should be taught nutrition lessons separately according to their grade levels and/or age. This would help nutrition educators reinforce more lessons early on to young students.

Another recommendation when implementing and evaluating nutrition education programs is to involve youths' parents. Parents should be involved to provide information on the eating habits of their children. This would help nutrition educators find out what information from lessons children are sharing with their parents. Perhaps, further study involving parents should be undertaken.

Parents should be given fliers that include information on nutrition lessons which would inform them what their child is learning and reinforce the information at home for good nutrition practices. Such efforts and sharing of information will ensure communication among parents and youth.

Additional attention should be placed on increasing the number of nutrition educators to deliver lessons given the large number of youth turnout in afterschool programs. One nutrition educator faces a challenge of teaching the nutrition lessons and engaging all youth to participate in each and every scheduled activity during the implementation process.

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Appendix A

Penn State University Human Subjects Approval Letter

PENNSTATE

Senior Vice President for Research
Office for Research Protections

The Pennsylvania State University
201 Kern Graduate Building
University Park, PA 16802-3301

(814) 865-1775
Fax: (814) 863-8699
www.research.psu.edu/orp/

Date: July 24, 2008

From: Andrea R. Seisler, IRB Administrator

To: Olive Monalisa K. Kemirembe

Subject: Results of Review of Proposal - Expedited **(IRB #28899)**
Approval Expiration Date: July 10, 2009
"**A Quantitative Evaluation of Nutrition Education Intervention with Low-Income Youth**"

The Social Science Institutional Review Board (IRB) has reviewed and approved your proposal for use of human participants in your research. By accepting this decision, you agree to obtain prior approval from the IRB for any changes to your study. Unanticipated participant events that are encountered during the conduct of this research must be reported in a timely fashion.

Enclosed is/are the dated, IRB-approved informed consent(s) to be used when recruiting participants for this research. Participants must receive a copy of the approved informed consent form to keep for their records.

If signed consent is obtained, the principal investigator is expected to maintain the original signed consent forms along with the IRB research records for this research at least three (3) years after termination of IRB approval. For projects that involve protected health information (PHI) and are regulated by HIPAA, records are to be maintained for six (6) years. The principal investigator must determine and adhere to additional requirements established by the FDA and any outside sponsors.

If this study will extend beyond the above noted approval expiration date, the principal investigator must submit a completed Continuing Progress Report to the Office for Research Protections (ORP) to request renewed approval for this research.

On behalf of the IRB and the University, thank you for your efforts to conduct your research in compliance with the federal regulations that have been established for the protection of human participants.

Please Note: The ORP encourages you to subscribe to the ORP listserv for protocol and research-related information. Send a blank email to: L-ORP-Research-L-subscribe-request@lists.psu.edu

ARS/ars
Enclosure
cc: Rama B. Radhakrishna

Appendix B

The Cen-Clear Child Services, Inc., Board of Directors Approval Letter

Cen-Clear Child Services Inc.

1633 Philipsburg Bigler Highway, Philipsburg, PA, 16866

September 12, 2008

Olive Monalisa Karekezi Kemirembe
Graduate Research Assistant, Agricultural & Extension Education
12 Ferguson Building
Penn State University
University Park, PA 16802

Dear Ms. Kemirembe,

I am pleased to inform you that your request to complete your research project entitled "**A Quantitative Evaluation of Nutrition Education Intervention with Low-Income Youth**" has been presented and approved by the Cen-Clear Child Services, Inc. Board of Directors. This approval also requires that the results of the research are provided to Cen-Clear Child Services, Inc.

The research will be conducted in collaboration with the Project SUCCESS Program. Your contact will be Cinde Schuckers. She can be reached at 814-342-5678 or cschuckers@cenclear.org.

I want to take this opportunity to wish you success with your research.

Sincerely,

Pauline Raab
Assistant to the Executive Director
Cen-Clear Child Services, Inc.

CC: Cinde Schuckers

Appendix C

Recruitment Letter/ Parent Letter

PENNSTATE

Department of Agricultural and Extension Education

College of Agricultural Sciences
The Pennsylvania State University
012 Ferguson Building
University Park, PA 16802-4300

Olive Monalisa K. Kemirembe
Phone: 814-404-8987
Fax: 814-863-4753
E-mail: ozk102@psu.edu

Dear Parent:

I am writing to request for your consent to include your child in my research study. I am a graduate student at The Pennsylvania State University. I am conducting a study on**: A Quantitative Evaluation of Nutrition Education Intervention with Low-income Youth.**

Children in afterschool programs in Clearfield County, Pennsylvania will participate in this research study. The purpose of the study is to help children learn the importance of eating fruits and vegetables, the USDA dietary guidelines for children, and how to make healthy food choices. It is important to know and understand whether the nutrition information taught in after-school programs is having effect in changing children's knowledge, attitude and behavior about their eating habits.

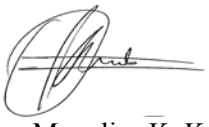
During the study, I, the researcher and nutrition education advisers will assist in teaching your child the basic information about nutrition. Your child will complete three questionnaires: one before the study begins, the second, immediately after the completion of the nutrition education program, and a follow up, two weeks later.

Attached to this letter is a consent form which gives your permission as a parent for your child to participate in this study. If you allow your child to participate in this study, please read and sign the attached consent form, a copy of which you will retain for your records.

If your child is under age 13, a verbal assent will be read to him or her before the study begins by the researchers, and no need of signing the form. However, if he or she is age 13 and older, we request you to indicate your child agreement by letting him or her sign and date on the consent form.

Thank you for consenting your child's participation in the study. If you have any questions or concerns about the study, please contact Olive Monalisa K. Kemirembe at 814-404-8987, email: ozk102@psu.edu, or Rama Radhakrishna at 814-863-7069, email: brr100@psu.edu, and Elise Gurgevich at 814-863-3447, email: EAG107@psu.edu.

Sincerely,



Olive Monalisa K. Kemirembe
Graduate Research Assistant

Appendix D

Parent Consent Form

ORP USE ONLY: IRB# 28899 Doc.# 1
The Pennsylvania State University
Office for Research Protections
Approval Date: 07/24/2008 ARS
Expiration Date: 07/10/2009 ARS
Social Science Institutional Review Board

PARENTAL CONSENT FORM

Project title: A Quantitative Evaluation of Nutrition Education Intervention with Low-income Youth.

Investigators: The following investigators are available for questions and concerns about this project from, Monday through Friday, 8:00am-5:00pm.

Principal Investigator
Olive Monalisa Kemirembe
Graduate Research Assistant
Ag & Extension Education
12 Ferguson Building
Penn State University
University Park, PA 16802
Phone: 814-404-8987
Email: ozk102@psu.edu

Project Advisor
Dr. Rama Radhakrishna
Associate Professor
Ag & Extension Education
212 Ferguson Building
Penn State University
University Park, PA 16802
Phone: 814-863-7069
Email: brr100@psu.edu

Project Collaborator
Elise Gurgevich, MPH, PhD
State Coordinator
PSU Nutrition Links
208 Special Service Building
Penn State University
University Park, PA 16802
Phone: 814-863-3447
Email: EAG107@psu.edu

Purpose of the study: The purpose of this research is to determine the effect of nutrition education interventions on nutrition knowledge and attitudes of youth. It is believed that, improved nutrition knowledge and attitudes should lead to improved behavior.

Project procedures: The project will take place in afterschool programs in Clearfield County, Pennsylvania. Before the project starts each child will fill out a pretest questionnaire to determine their knowledge, attitude and behavior about eating fruits and vegetables, making health food choice and physical activity. During the next 2-4 weeks, children will use the nutrition education curriculum to learn about the benefits of eating Fruits and Vegetables, making food choice, and physical activity after which a posttest questionnaire will be administered, and a follow up, two weeks later.

Duration: It will take about 30 minutes to complete each questionnaire.

Discomforts and Risks: There are no risks involved in participating in this research beyond those experienced in everyday life.

Benefits: Your child will learn about the importance and benefit of eating fruits and vegetables, the USDA dietary guidelines for children, how to make healthy food choices and being physically active. At the end of the program, your child will have more information to make decisions about fruits and vegetables and physical activity.

Statement of Confidentiality: Participation in this research is confidential**.** Participant's information in this study may be reviewed by the investigators. Results of the study may be published, but no names or identifying information will be included for publication. Participant identity will remain confidential. Penn State's Office for Research Protection, the social Science Institutional Review Board, and the Office for Human Research Protections in the Department for Health and Human Services may review records related to this project.

Right to Ask Questions: Please contact Olive Monalisa Kemirembe at (814) 404-8987 with questions, complaints or concerns about this research. You can also call this number it you feel this study has harmed you. Questions about your right as a research participant may be directed to Penn State University Office for Research Protections at (814) 865-1775.

Voluntary Participation: Participation is strictly voluntarily, and a child will become part of the study only if both the child and the parent/guardian agree to the child's participation. Your child can choose not to answer certain questions. Even if you choose not to participate in the study your child will still receive the nutrition education programming. Refusing to participate or withdrawing early from the study will involve no penalty or loss of benefits your child would be entitled to otherwise.

You must be 18 years of age or older to take part in this research study. If you agree to take part in this research study and the information outlined above, please sign your name and indicate the date below.

You will be given a copy of this consent form for your records.

I give permission for my child, _____, to participate in this research.

_____ _____

Parent Signature Date

_____ _____

Assent: Age 13 and Older Child's Signature Date

_____ _____

Person Obtaining Consent Date

Appendix E

Child Assent Form

ORP USE ONLY: IRB# 28899 Doc.# 2
The Pennsylvania State University
Office for Research Protections
Approval Date: 07/24/2008 ARS
Expiration Date: 07/10/2009 ARS
Social Science Institutional Review Board

CHILD ASSENT FORM TO BE READ ALOUD TO 7TH GRADERS (under age of 13)

Title of Project: A Quantitative Evaluation of Nutrition Education Intervention with Low-Income Youth.

Principal Investigator:
Olive Monalisa K. Kemirembe,
Graduate Research Assistant, Agricultural & Extension Education
12 Ferguson Building
Penn State University, University Park, PA 16802
Phone: 814-404-8987
Email: ozk102@psu.edu

Project Advisor:
Dr. Rama Radhakrishna,
Associate Professor, Agricultural & Extension Education
212 Ferguson Building
Penn State University, University Park, PA 16802
Phone: 814-863-7069
Email: brr100@psu.edu

Project Collaborator:
Elise Gurgevich, CHES, MPH, PhD
State Coordinator- Penn State Nutrition Links program
208 Special Service Building
Penn State University, University Park, PA 16802
Phone: 814-863-3447
Email: EAG107@psu.edu

1. **What is project about?** You are being asked to participate in a research study. Studies like this one help researchers determine the effect of nutrition education intervention on nutrition knowledge, attitudes and eating behavior of youth. This form will tell you about the study to help you decide whether or not you want to participate. You can ask any questions you have before making up your mind. You can think about it and discuss it with your family or friends before you decide. It is okay to say "No" if you don't want to be in the study. If you say "Yes" you can change your mind and quit being in the study at any time without getting in trouble. Your parent and/or guardian has already given permission for you to be in the study.

2. **What is the research about?** The research will help researchers understand the relationship between of nutrition education intervention and knowledge, attitude and eating behavior of youth.

4. **How long will it take me?** The research lasts about 30 minutes long filling out a survey (but could be shorter). If you feel uncomfortable answering any of the questions, you can stop at any time.

5. **Voluntary Participation:** Your participation in the regular nutrition education programming will not be affected if you decide that you do not want to participate and no penalty will be involved. When we get the results back from the study, we will be happy to share them with you. It feels good to be involved in a project to help make your health better.

6. **Confidentiality of Answers:** All of the answers you write on the questionnaire will remain confidential, meaning that it will be kept a secret between you and the researcher only. I, the researcher, will analyze the data, but never match your answers with your name or other information about you when I summarize, present, or publish the results of the research.

7. If you do not want to participate in the research, please tell your teacher so that she/he makes sure to remove your answers from the worksheets that the researcher will use for her project.

Thank you for considering your involvement in this research.

***Verbal assent: _____ has verbally indicated **THAT HE OR SHE IS NOT INTERESTED in participating**.

1.
2.
3.
4.
5.
6.
7.
8.

Witnessed by:_____ Date _____

Research Investigator Date

Appendix F

Penn State Nutrition Links Program- Letter of Support

PENNSTATE

Nutrition Links
Cooperative Extension

The Pennsylvania State University
Special Services Building
University Park, PA 16802

Office: 814-863-3447
Fax: 814-863-6426

July 15, 2008

Rama Radhakrishna
212 Ferguson Building
University Park, PA 16802

Dear Dr. Radhakrishna,

Penn State Nutrition Links is willing to assist your graduate student, Olive Monalisa K. Kemirembe, in conducting her research project to pilot a youth evaluation tool. I will agree to review the survey instrument, coordinate her interactions with the Nutrition Links staff, and provide access to a sample of our youth participants. As the State Coordinator for EFNEP and Extension's FSNE, I am interested in the results of the study and the possible use of this tool in the future to evaluate our youth programming.

I look forward to working with you and Olive on this research project as it is implemented and the results are summarized.

Sincerely,

Elise A. Gurgevich, Ph.D., MPH, CHES
State Coordinator

c: M. Corbin

Appendix G

Evaluation Tools

PART ONE

Nutrition and Physical Activity Knowledge

Pretest/Posttest/Delayed-post

For question 1-14, please CIRCLE the ONE CORRECT ANSWER for each question.

1. Fruits and Vegetables are part of a healthy diet.
   (a) Yes (b) No

2. It is important to eat different kinds of vegetables every day.
   (a) Yes (b) No

3. It is important to eat different kinds of fruit every day.
   (a) Yes (b) No

4. Eating breakfast is an important part of a healthy lifestyle.

   (a) Yes (b) No

5. Reading nutrition labels is important for making health food choice.
   (a) Yes (b) No

6. Eating high-fiber cereal is very important for my health.
   (a) Yes (b) No

7. Eating whole grain bread is good for my health.
   (a) Yes (b) No

8. From which MyPyramid food group **SHOULD YOU** eat most of your foods?
   a. Milk
   b. Meat & Beans
   c. Fruits
   d. Vegetables
   e. Grains
   f. All groups

9. Which of the following is good source of calcium with the lowest amount fat?
   a. Whole milk
   b. 2% milk
   c. Skim milk

10. Which of the following is the healthiest snack choice that is lower in fat and added sugar?
    a. Soda pop and chips
    b. Milkshake and fries
    c. Fruit juice and pretzels

11. Which of the following are some ways of eating more fruits and vegetables?
    a. Eat an apple for dessert
    b. Making a Banana smoothie
    c. Using carrot and celery sticks for dipping in your bean dip
    d. All of the above

12. Which of the following activity can help keep me healthy by being more active?
    a. Playing computer games
    b. Watching TV
    c. Walking
    d. I do not know

13. Being physically active is important because……
    a. It keeps you healthy
    b. It gives you energy
    c. It makes you happy
    d. All of the above

14. The amount of time I need to be physically active is……..
    a. 60 minutes everyday
    b. 4-6 days/week
    c. 1-3 days/week
    d. I do not need to be physically active

PART TWO

Attitudes

Pretest/Posttest/Delayed-post

Please place an X in the box that best answers the question.	**1 I Disagree very much**	**2 I Disagree a little**	**3 I am not sure**	**4 I Agree a little**	**5 I Agree very much**
Healthy food choice/eating					
1. I think healthy food taste good					
2. I think eating healthy is very important					
3. I believe my health in future may be affected by what I eat today					
4. I believe I eat a balanced healthy diet at home					
5. I believe I eat a balanced healthy diet at school					
6. I think eating breakfast every day is good for my health					
7. Drinking a glass of fat-free milk everyday is good for my health					
8. I think drinking a glass of water every day is good for my health					
Fruits and vegetables I feel that if I eat fruits and vegetables every day…..					
9. It will help me have a healthy weight					
10. I will be healthier.					
11. I will have more energy.					
12. I will be stronger.					
13. I will think better in class.					
14. My family will be proud of me.					

PART THREE

Nutrition Behavior and Physical Activity Behavior

Pretest/Posttest/Delayed-post

For questions 1-13, please CIRCLE the ONE ANSWER that best describes what you have done over the past week.

1. How often did you eat vegetables?

Several times a day Once a day 2-3 times/week Never

2. How often did you eat fruits?

Several times a day Once a day 2-3 times/week Never

3. How often did you skip meals?

Several times a day Once a day 2-3 times/week Never

4. How often did you eat a variety of foods?

Several times a day Once a day 2-3 times/week Never

5. How often did you ask a parent or adult to buy fruit or vegetables that you like?

Several times a day Once a day 2-3 times/week Never

6. How often did you change what you eat because of how much fat or sugar it has?

Several times a day Once a day 2-3 times/week Never

7. How often did you drink milk or eat milk products like cheese or yogurt?

Several times a day Once a day 2-3 times/week Never

8. How often were you physically active?
    a. 30 minutes everyday
    b. 4-6 days/week
    c. 1-3 days/week
    d. I am not physically active

9. I am involved in organized physical activity outside of school (ex. Team sports, dance, gymnastics, etc)
    a. Everyday
    b. 4-6 days/week
    c. 2-3 days/week
    d. 1 day/week
    e. I am not involved in organized physical activity outside of school

10. Over the past month, how often do you watch TV at home?
    a. Everyday
    b. 4-6 days/week
    c. 2-3 days/week
    d. 1 day/week

PART FOUR

Demographics

Today's Date: _____

Name Initials: _____

Tell us about you……

For Question 1-4, CIRCLE the ONE ANSWER that best describes who you are.

1. Circle if you are a:

Girl Boy

2. Circle the number that shows how old you are today

9 10 11 12 13 14 15

3. Circle the number that shows what grade you are in

5th Grade 6th Grade 7th Grade 8th Grade 9th Grade

4. Circle if you are:

White
African American
Asian
American Indian/Alaskan
Hawaiian/Pacific islander
Hispanic:

Other_____

Curriculum Vita

OLIVE MONALISA-KAREKEZI KEMIREMBE

Education

Aug, 2009	Doctor of Philosophy **(Ph.D.)**, Agricultural & Extension Education Emphasis***: Evaluation and Research Methods*** The Pennsylvania State University
May, 2004	Masters of Science **(M.S),** Agricultural & Extension Education Emphasis: ***International Agriculture and Education Development*** Michigan State University
Dec, 2001	Bachelor of Science **(B.S),** Agriculture National University of Rwanda

Professional Experience

Jan, 2006-May, 2009	***Graduate Research Assistant,*** Pennsylvania State University
Jan, 2004-Dec, 2005	***Lecturer,*** National University of Rwanda
Aug, 2001-Dec, 2003	***Graduate Research Assistant,*** Michigan State University
May, 2001-Jul, 2001	***Teaching Assistant,*** National University of Rwanda

Publications and Presentations

Kemirembe, O.M.K., Radhakrishna, R.B., & Gurgevich, E.A. (2009). A quantitative evaluation of nutrition education program with low-income youth. *Paper accepted for presentation at the American Evaluation Association (AEA) conference,* November 11-14, Orlando, Florida.

Kemirembe, O.M.K., Hall, M.H., & Radhakrishna, R.B. (2008). Evaluation of Interactive, Computer-Based Teaching (CBT) Modules for Forage Courses. *NACTA Journal.*

Radhakrishna, R.B., Hall, M.H., & Kemirembe, O.M.K. (2008). Evaluation of computer-based interactive (CBI) modules in six universities: Lessons learned. *Abstract presented at the American evaluation association* (AEA*) conference.* November 5-8, Denver, Colorado.

Radhakrishna, R.B., Hall, M.H., & Kemirembe, O.M.K. (2007). Developing, Implementing, and Evaluating Interactive, Computer-based Teaching Modules for Agricultural Courses. *Paper presented, Proceedings of International Conference on 21st Century: Challenges to sustainable Agri-food systems,* Bangalore, India.

Professional Affiliations

American Evaluation Association (AEA)
Gamma Sigma Delta Honor Society
Association for International Agricultural and Extension Education (AIAEE)
American Educational Research Association (AERA)
Washington Evaluators