EVALUATION OF CATCH KIDS CLUB AFTER SCHOOL PROGRAM: A NUTRITION AND PHYSICAL FITNESS INTERVENTION FOR THRID, FOURTH, AND FIFTH GRADE STUDENTS

By

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CHAPTER I

INTRODUCTION

Poor nutrition and physical activity behaviors are contributing to an increased prevalence of obesity in the United States. Between the years 1976 to 2008 the childhood obesity rate among children age six to eleven increased from 6.5% to 19.6% (Ogden & Carroll, 2010). This is largely due to the poor dietary habits of children including inadequate consumption of fruits and vegetables, consuming insufficient amounts of low fat or fat free dairy products, consuming foods higher in fat, especially saturated fat, and consuming inadequate amounts of high fiber foods along with a sedentary lifestyle (BRFSS, 2009; USDA, 2010; Molnar, 2008; USDA/CNPP, 2007; YRBSS, 2010). Schools are an ideal location for intervention because it allows for a great number of children to be reached (Bailey, 2006). Almost all elementary schools have facilities such as inside gymnasiums and outside playgrounds to teach and encourage physical activity among children. Also, classrooms or cafeterias can easily be utilized as learning laboratories where children can be exposed to and practice making healthful food choices. However, because schools feel the need to meet academic student outcomes, nutrition education and physical activity are often the first to be eliminated from school curriculum in order to focus on primary topics of math, reading, and writing (Pate et al., 2006). This is a great disservice to students as literature suggests when students engage in activities requiring motor skills various portions of the brain are being utilized, including portions associated with cognition (Ratey &

Hagerman, 2008). As such, schools are eliminating subjects that can have a positive impact on learning. A possible way to address this issue is the implementation of after-school programs that focus on nutrition education and physical activity, thus creating learning opportunities in a school setting without interfering with core school subjects.

Coordinated Approach to Childhood Health (CATCH) Kids Club is an after-school program that focuses on educating elementary school students on physical activity and nutrition (Nader et al, 2005). The curriculum is primarily designed for third through fifth grade students. Thirteen public elementary schools in Lawton, Oklahoma implemented the *CATCH Kids Club* after-school program in an effort to improve nutrition knowledge, attitude, intent, self-efficacy, behavioral capabilities and behaviors and physical activity levels among students. These schools served as the intervention sites for this particular study.

CATCH Kids Club is based on Social Cognitive Theory (SCT) with the curriculum aiming to increase knowledge, self-efficacy, and outcome expectancies among students participating in the program. The curriculum is comprised of thirty-two nutrition lessons revolving around the story of Hearty Heart Adventure to Earth. Of these, there were five lessons focusing on fruit and vegetable consumption, four lessons on selecting low fat foods, four lessons on choosing low-fat or fat free dairy products, six lessons on selecting foods high in fiber, and three lessons focusing on MyPyramid (Nadar et al., 2005). During eight of the nutrition lessons children have the opportunity to prepare and taste different snacks that are nutrient dense, allowing children to be interactive with the food and exposing them to healthy options (Nadar et al., 2005). Two lessons are taught each week over a sixteen week period and physical activity sessions are administered on the days without nutrition lessons. *CATCH Kids Club* utilizes slightly competitive non-elimination activities to keep all students engaged throughout the activity, and *CATCH Kids Club* offers 300 different physical activities to maintain student interest

(Nader et al., 2005). The program was administered by teachers or volunteers who supervised the after-school programs.

Purpose

The purpose of this study is to evaluate the impact of the *CATCH Kids Club* after-school program being implemented in 13 elementary school sites in Lawton Public Schools on students' nutritional knowledge, self-efficacy, intent, attitude, behavioral capabilities and behaviors; four measures of physical fitness including strength, flexibility, and cardiovascular endurance; and academic performance.

Specific Aims and Hypotheses

Specific Aim 1: Evaluate the impact of *CATCH Kids Club* after-school programs on students' nutritional knowledge, attitude, intent, self-efficacy, behavioral capability and behaviors compared to students not participating in after-school programs.

Nutrition Knowledge

H_1: At pre-intervention there will be no difference in nutrition knowledge between students participating in *CATCH Kids Club* and students not participating in after-school programs.

$H_{0\text{-}1}$: At pre-intervention there will be differences in the nutrition knowledge between students participating in *CATCH Kids Club* and students not participating in after-school programs.

H_2: At post-intervention students participating in the *CATCH Kids Club* after-school program will have improved nutrition knowledge compared to students not participating in after-school programs.

$H_{0\text{-}2}$: At post-intervention there will be no difference in nutrition knowledge between students participating in *CATCH Kids Club* and students not participating in after-school programs.

H_3: From pre to post-intervention students participating in the *CATCH Kids Club* after-school program will have improved nutrition knowledge.

$H_{0\text{-}3}$: From pre to post-intervention there will be no difference in nutrition knowledge among students participating in *CATCH Kids Club*.

Nutrition Attitudes

H_4: At pre-intervention there will be no difference in nutrition attitudes between students participating in *CATCH Kids Club* and students not participating in after-school programs.

$H_{0\text{-}4}$: At pre-intervention there will be differences in the nutrition attitudes between students participating in *CATCH Kids Club* and students not participating in after-school programs.

H_5: At post-intervention students participating in the *CATCH Kids Club* after-school program will have improved nutrition attitudes compared to students not participating in after-school programs.

$H_{0\text{-}5}$: At post-intervention there will be no difference in nutrition attitudes between students participating in *CATCH Kids Club* and students not participating in after-school programs.

H_6: From pre to post-intervention students participating in the *CATCH Kids Club* after-school program will have improved nutrition attitudes.

$H_{0\text{-}6}$: From pre to post-intervention there will be no difference in nutrition attitudes among students participating in *CATCH Kids Club* after-school program.

Nutrition Intent

H_7: At pre-intervention there will be no difference in intent to choose healthful foods between students participating in *CATCH Kids Club* and students not participating in after-school programs.

$H_{0\text{-}7}$: At pre-intervention there will be differences in the intent to choose healthful foods between students participating in *CATCH Kids Club* and students not participating in after-school programs.

H_8: At post-intervention students participating in the *CATCH Kids Club* after-school program will have improved intent to choose healthful foods compared to students not participating in after-school programs.

$H_{0\text{-}8}$: At post-intervention there will be no difference in intent to choose healthful foods between students participating in *CATCH Kids Club* and students not participating in after-school programs.

H_9: From pre to post-intervention students participating in the *CATCH Kids Club* after-school program will have improved intent to choose healthful foods.

$H_{0\text{-}9}$: From pre to post-intervention there will be no difference in intent to choose healthful foods among students participating in *CATCH Kids Club*.

Nutrition Self-Efficacy

H_{10}: At pre-intervention there will be no difference in nutrition self-efficacy between students participating in *CATCH Kids Club* and students not participating in after-school programs.

$H_{0\text{-}10}$: At pre-intervention there will be differences in the nutrition self-efficacy between students participating in *CATCH Kids Club* and students not participating in after-school programs.

H_{11}: At post-intervention students participating in the *CATCH Kids Club* after-school program will have improved nutrition self-efficacy compared to students not participating in after-school programs.

$H_{0\text{-}11}$: At post-intervention there will be no difference in nutrition self-efficacy between students participating in *CATCH Kids Club* and students not participating in after-school programs.

H_{12}: From pre to post-intervention students participating in the *CATCH Kids Club* after-school program will have improved nutrition self-efficacy.

$H_{0\text{-}12}$: From pre to post-intervention there will be no difference in nutrition self-efficacy among students participating in *CATCH Kids Club*.

Nutrition Behavioral Capability

H_{13}: At pre-intervention there will be no difference in nutrition behavioral capability between students participating in *CATCH Kids Club* and students not participating in after-school programs.

$H_{0\text{-}13}$: At pre-intervention there will be differences in the nutrition behavioral capability between students participating in *CATCH Kids Club* and students not participating in after-school programs.

H_{14}: At post-intervention students participating in the *CATCH Kids Club* after-school program will have improved nutrition behavioral capability compared to students not participating in after-school programs.

$H_{0\text{-}14}$: At post-intervention there will be no difference in nutrition behavioral capability between students participating in *CATCH Kids Club* and students not participating in after-school programs.

H_{15}: From pre to post-intervention students participating in the *CATCH Kids Club* after-school program will have improved nutrition behavioral capability.

$H_{0\text{-}15}$: From pre to post-intervention there will be no difference in nutrition behavioral capability among students participating in *CATCH Kids Club* after-school program.

Nutrition Behaviors

H_{16}: At pre-intervention there will be no difference in nutrition behaviors between students participating in *CATCH Kids Club* and students not participating in after-school programs.

$H_{0\text{-}16}$: At pre-intervention there will be differences in the nutrition behaviors between students participating in *CATCH Kids Club* and students not participating in after-school programs.

H_{17}: At post-intervention students participating in the *CATCH Kids Club* after-school program will have improved nutrition behaviors compared to students not participating in after-school programs.

$H_{0\text{-}17}$: At post intervention there will be no difference in nutrition behaviors between students participating in *CATCH Kids Club* and students not participating in after-school programs.

H_{18}: From pre to post-intervention students participating in *CATCH Kids Club* after-school program will have improved nutrition behaviors.

$H_{0\text{-}18}$: From pre to post-intervention there will be no difference in nutrition behaviors among students participating in *CATCH Kids Club* after-school program.

Specific Aim 2: Evaluate the impact of *CATCH Kids Club* after-school programs on the students' overall level of physical fitness as measured by tests for trunk strength, upper-body strength, flexibility, and cardiovascular endurance compared to students not participating in after-school programs**.**

Physical Fitness: Trunk Strength

H_{19}: At pre-intervention there will be no difference in trunk strength between students participating in *CATCH Kids Club* and students not participating in after-school programs.

$H_{0\text{-}19}$: At pre-intervention there will be differences in trunk strength between students participating in *CATCH Kids Club* and those not participating in after-school programs.

H_{20}: At post-intervention students participating in the *CATCH Kids Club* after-school program will have improved trunk strength compared to students not participating in after-school programs.

$H_{0\text{-}20}$: At post-intervention there will be no difference in trunk strength among students participating in *CATCH Kids Club* and students not participating in after-school programs.

H_{21}: From pre to post-intervention students participating in *CATCH Kids Club* will have improved trunk strength.

$H_{0\text{-}21}$: From pre to post-intervention there will be no difference in trunk strength among students participating in *CATCH Kids Club*.

Physical Fitness: Upper-body Strength

H_{22}: At pre-intervention there will be no difference in upper-body strength between students participating in *CATCH Kids Club* and students not participating in after-school programs.

$H_{0\text{-}22}$: At pre-intervention there will be differences in upper-body strength between students participating in *CATCH Kids Club* and those not participating in after-school programs.

H_{23}: At post-intervention students participating in the *CATCH Kids Club* after-school program will have improved upper-body strength compared to students not participating in after-school programs.

$H_{0\text{-}23}$: At post-intervention there will be no difference in upper-body strength among students participating in *CATCH Kids Club* and students not participating in after-school programs.

H_{24}: From pre to post-intervention students participating in *CATCH Kids Club* between will have improved upper-body strength.

$H_{0\text{-}24}$: From pre to post-intervention there will be no difference in upper-body strength among students participating in *CATCH Kids Club*.

Physical Fitness: Flexibility

H_{25}: At pre-intervention there will be no difference in flexibility between students participating in *CATCH Kids Club* and students not participating in after-school programs.

$H_{0\text{-}25}$: At pre-intervention there will be differences in flexibility between students participating in *CATCH Kids Club* and those not participating in after-school programs.

H_{26}: At post-intervention students participating in the *CATCH Kids Club* after-school program will have improved flexibility compared to students not participating in after-school programs.

$H_{0\text{-}26}$: At post-intervention there will be no difference in flexibility among students participating in *CATCH Kids Club* and students not participating in after-school programs.

H_{27}: From pre to post-intervention students participating in *CATCH Kids Club* will have improved flexibility.

$H_{0\text{-}27}$: From pre to post-intervention there will be no difference in flexibility among students participating in *CATCH Kids Club*.

Physical Fitness: Cardio Endurance

H_{28}: At pre-intervention there will be no difference in cardio endurance between students participating in *CATCH Kids Club* and students not participating in after-school programs.

$H_{0\text{-}28}$: At pre-intervention there will be differences in cardio endurance between students participating in *CATCH Kids Club* and those not participating in after-school programs.

H_{29}: At post-intervention students participating in the *CATCH Kids Club* after-school program will have improved cardio endurance compared to students not participating in after-school programs.

$H_{0\text{-}29}$: At post-intervention there will be no difference in cardio endurance among students participating in *CATCH Kids Club* and students not participating in after-school programs.

H_{30}: From pre to post-intervention students participating in *CATCH Kids Club* there will have improved cardio endurance among students.

$H_{0\text{-}30}$: From pre to post-intervention there will be no difference in cardio endurance among students participating in *CATCH Kids Club*.

Specific Aim 3: Evaluate the academic scores of students participating in *CATCH Kids Club* after-school program in comparison to students not participating in after-school programs.

H_{31}: Students participating in *CATCH Kids Club* after-school program will have higher reading and math standardized test scores compared to students not participating in *CATCH Kids Club*.

$H_{0\text{-}31}$: There will be no difference in standardized test scores between students participating in *CATCH Kids Club* after-school programs and students not participating in *CATC Kids Club.*

Definitions

Behavioral Factor Risk Surveillance Survey (BFRSS) – The largest on-going telephone health survey system tracking risk behaviors among United States citizens. The BFRSS has been conducted yearly since 1984 (CDC, BFRSS, 2011).

Body Mass Index (BMI) – A measurement number reflecting the ratio of height and weight, it is an indirect measure of body fat. For children and adolescents, ages two to nineteen years, BMI is plotted on a BMI-for-age growth chart to obtain percentile ranking (CDC, 2011).

Community Nutrition Education Program (CNEP) – A program offering classroom based lessons to third and fourth grade students on selecting healthy foods and food safety practices associated with the Oklahoma Cooperative Extension (CNEP, 2010).

Coordinated Approach to Childhood Health (CATCH) Kids Club – An after-school program based on the Social Cognitive Theory targeting third, fourth, and fifth grade students offering nutrition lessons and physical activity sessions (Nadar *et al*., 2005).

Fitnessgram – A "comprehensive fitness assessment battery for youth…includes a variety of health-related physical fitness tests designed to assess cardiovascular fitness, muscular strength, muscular endurance, flexibility" developed by the Cooper Institute (Meredith & Welk, 2007, pg. 3).

Healthy Fitness Zone – A set of "values reflect the range of scores (by age and sex) that would provide health benefits if the same level of fitness were maintained into adulthood" based on fitnessgram assessments (Meredith & Welk, 2007, pg. 60).

Obesity – A term used to describe children and adolescents ages two to nineteen years having a BMI equal to or greater than the 95th percentile compared to children of the same age and gender (CDC, 2011).

Overweight – A term used to describe children and adolescents ages two to nineteen years having a BMI equal to or greater than the 85th percentile but less than the 95th percentile compared to children of the same age and gender (CDC, 2011).

Social Cognitive Theory (SCT) – Albert Bandura's theory of learning that theorizes human functioning is a result of triadic reciprocity between the interaction of behavioral, cognitive factors, and environmental events (Bandura, 1986).

USDA MyPyramid – An interactive tool developed by the USDA to help individuals understand the adequate amount calories and nutrients and exercise as is recommended for one's specific age, gender, and BMI (USDA MyPyramid, 2011).

Youth Risk Behavior Surveillance Survey (YRBSS) – A surveillance system that monitors priority health-risk behaviors among 9th and 12th grade youth. The YRBSS is based on national school-based data collected by the Centers for Disease Control and Prevention (CDC) along with state, territorial, tribal, and district surveys collected by local education and health agencies and tribal governments (CDC, YRBSS, 2011).

CHAPTER II

LITERATURE REVIEW

An urgent health concern of our nation is the increasing prevalence of poor nutrition and sedentary lifestyles, both of which contribute to the increased incidence of obesity in both adult and youth populations. Obesity is defined as having a Body Mass Index (BMI) greater than 30 in adults and for youth, obesity is defined as a BMI equal to or greater than the 95th percentile compared to children of the same age and gender (Centers for Disease Control and Prevention [CDC], BMI for Children and Teens, 2011). BMI is an indirect measure of body fat based on the ratio of weight to height. It is calculated by dividing weight in kilograms by height in meters squared (CDC, 2011). Between the years 1976 to 2008, the childhood obesity rate among children age six to eleven years increased from 6.5% to 19.6% (Ogden & Carroll, 2010). In addition to 19.6% of youth being classified as obese, 17.1% of children ages six to nineteen were classified as overweight (Surgeon General, 2010). Overweight is defined as having a BMI of 25.0-29.9 for adults (CDC, 2011). For youth, overweight is defined as having a BMI equal to or greater than the 85th percentile but less than the 95th percentile compared to children of the same age and gender (CDC, 2011). This is alarming in that analyses of epidemiological data indicates overweight adolescents are 70% more likely to be overweight or obese as adults (Surgeon General, 2010), which is reflected in the fact that in 2009 almost 1 in 3 Americans were either

overweight or obese (BRFSS, 2009). The concern is that obese individuals have a greater likelihood of developing health problems including coronary heart disease, type 2 diabetes, various cancers, hypertension, dyslipidemia, stroke, and respiratory problems such as sleep apnea (CDC, Health Consequences, 2011). Oklahoma is not an exception to the current trend of increasing obesity. According to national survey data, approximately 67% of adult Oklahomans are overweight or obese (BRFSS, 2009) and the Youth Risk Behavior Surveillance Survey (YRBSS) indicates approximately 31% of Oklahoma's high school students were classified as overweight or obese (YRBSS OK, 2009).

Along with serious health consequences obesity is associated with major economic consequences. Between the years 1998 and 2000 it is estimated that nationally Medicare and Medicaid spent 75 billion dollars on medical expenses attributed to obesity (CDC, Economic Consequences, 2011). In Oklahoma alone 854 million dollars were spent on medical expenses attributed to obesity (CDC, Economic Consequences, 2011).

While the role of genetics must be acknowledged, a primary cause of obesity is an imbalance between energy consumed through diet and energy expended in the form of physical activity. There are multiple factors that contribute to the imbalance including limited consumption of low-calorie, nutrient-dense foods; over consumption of calorie-dense, low-nutrient foods; large portion sizes; and sedentary lifestyles. For example, 85% of Oklahomans participating the Behavioral Risk Factor Surveillance Survey (BRFSS) reported consuming fewer than five recommended servings of fruits and vegetables in the week prior to the survey (BRFSS, 2009), ranking 50th in the nation. Further, 53% of Oklahomans reported not meeting the minimum physical activity recommendations, ranking as the 12th least active state nationwide (YRBSS OK, 2009). Oklahoma children fall short of the 60 minutes of daily exercise as recommended by the U.S. Department of Health and Human Services (USDHHS) (YRBSS, 2010). The health behaviors of adult Oklahomans are reflected in the youth of the state and will

be discussed further in the following section. As such, to reverse the poor health status of the state there is need for immediate efforts to be made in order to address the current trends in poor diet and sedentary lifestyle. These factors can be modified through educational and behavior change programs based on Bandura's Social Cognitive Theory (Kelder et al., 2004) and are the focus of this literature review.

Nutrition

Dietary Recommendations, Benefits, and Trends

The 2010 Dietary Guidelines developed by the USDHHS recommends increasing consumption of fruits and vegetables, whole grain products, and low-fat or fat-free milk and milk products as a part of a balanced diet (USDHHS, 2010). Adequate consumption of these foods has many health benefits including decreased risk of developing coronary artery disease, type 2 diabetes, hypertension, osteoporosis, and cancers (Harvard School of Public Health, 2011).

Fruits and Vegetables

Fruits and vegetables are excellent sources of fiber, antioxidants, vitamins, and minerals which are protective agents against various diseases. Antioxidants are chemical agents that inhibit or prevent oxidation (Venes, 2001). Antioxidants have an active role in preventing cancer and other diseases in that they hunt for and bind to free radicals throughout the body, thus protecting cells from oxidative damage (Gropper, Smith, & Groff, 2005). A variety of fruits and vegetables offer a bountiful assortment of vitamins and minerals that help maintain healthy skin, eyes, teeth, gums, and blood pressure (CDC, Fruits and Veggies Matter More, 2011). Red fruits and vegetables are rich in vitamin C which protects against cancer and boosts immunity (Joseph, Nadeau, & Underwood, 2007). Fruits and vegetables that are orange are a great source of vitamin A which helps maintain healthy eyes and skin (Joseph et al., 2007). The green group of fruits and vegetables contain the phytochemical leutin which maintains eye health (Joseph et al., 2007).

Also, greens contain folate which helps prevent heart disease, and potassium which is instrumental in maintaining healthy blood pressure (Joseph et al., 2007). Finally, the purple group is a source of the anthocyanin antioxidants which maintain healthy skin, maintain brain health, aid in lowering LDL cholesterol and maintain artery elasticity (Joseph et al., 2007). As demonstrated, nutrient contribution of fruits and vegetables varies greatly and helps to explain the recommendations to eat a variety of fruits and vegetables on a daily basis.

Currently the 2010 Dietary Guidelines recommend children between the ages of eight through twelve years consume between three and five cups of fruits and vegetables a day based on gender, age, and activity level (USDHHS, 2010). However, as previously stated, Oklahoma ranks 50th in the nation in fruit in vegetable consumption with 85% of individuals participating in the BRFSS consuming less than the recommended five serving of fruits and vegetables a day (BRFSS, 2009). Therefore, there is great need to identify effective strategies to encourage Oklahomans to consume the recommended amount of fruits and vegetables each day.

Low-Fat and Fat Free Diary

Milk and milk products have many properties that promote health and development of school-age children. First, they are rich in calcium and vitamin D which are essential nutrients needed to build and maintain healthy bones. The American Academy of Pediatrics (AAP) strongly emphasizes the importance of low-fat and fat-free dairy for children as aids in building strong bones and reducing the risk of fracture (Greer & Krebs, 2006). Calcium is a vital component to mineralization and bone formation. Osteoblasts are the cells responsible for mineralization of the bone in that they "secrete substances onto the bone surface, which enhance the precipitation or deposition of calcium and other minerals" onto the bone (Gropper et al., 2005, pg. 436). A major dietary source of calcium is milk and milk products and is essential during

peak growth years for development of bone mass. Maximum calcium accretion is reached at an average age of 12.5 years for girls and 14.0 years for boys (Greer & Krebs, 2006).

Along with promoting and maintaining bone health, low-fat and fat free dairy products also protect against hypertension and aid in weight management (Dairy Council Digest, 2007). Two minerals, potassium and calcium, found in milk directly affect blood pressure, and therefore heart health. Potassium is associated with increased urinary excretion of sodium and decreased urinary excretion of calcium and magnesium, and "potassium may induce vascular smooth muscle relaxation and thus reduce peripheral resistance" resulting in blood pressure regulation (Gropper et al., 2005). Calcium also demonstrates vaso-relaxing properties on smooth muscle. Calcium reacts with parathyroid hormone (PTH), suppressing PTH induced calcium concentration and in turn vascular tone, helping to regulate blood pressure (Gropper et al, 2005). There are two potential mechanisms through which calcium may aid in weight management. First, calcium suppresses calcitropic hormones 1,25-dihydroxyvitamin D3 and PTH which can inhibit lypolysis resulting in increased adiposity (Parikh & Yanovski, 2003). Second, calcium may inhibit the body's ability to absorb triacyglycerol within the gastrointestinal track resulting in greater excretion of saturated fat (Parikh & Yanovski, 2003).

Three servings of low-fat or fat free milk and milk products is recommended by 2010 Dietary Guidelines for children ages nine through twelve (USDHHS, 2010). A dairy serving is classified as one cup of milk or yogurt, one and a half ounces of natural cheese, or two ounces of processed cheese (Dairy Research Institute, 2011). As with fruits and vegetables, most children are not consuming the recommended amounts of low-fat and fat-free milk and milk products. According to the Dairy Research Institute, children ages two to eight years consume on average 1.2 servings of white milk, 0.3 servings of flavored milk, 0.1 servings of yogurt, 0.2 serving of cheese, and 0.5 milk or cheese in food mixtures, a total of 2.3 servings per day (Dairy Research Institute, 2011). Children ages nine to eighteen years consume 0.9 servings of white milk, 0.2

servings of flavored milk, 0.3 servings of cheeses, 0.03 servings of yogurt, and 0.8 servings of milk and cheese in food mixtures, a total of 2.2 servings a day (Dairy Research Institute, 2011). Based on this information children ages two to three years are meeting the 2010 Dietary Guidelines recommendations of two serving of milk each day (Dairy Research Institute, 2011); however, older children are falling short of the recommendations. Children between four and eight years of age are slightly short of the recommended 2.5 servings of dairy a day while children ages nine to eighteen are falling almost one serving short of the 2010 Dietary Guideline recommendation of 3 servings a day (Dairy Research Institute, 2011).

Whole Grain Products

Whole grain products, especially those high in fiber, should be included in a balanced diet. Fiber has many vital roles in health maintenance. Fiber is protective against cardiovascular disease, diabetes, and certain cancers, aids in weight maintenance, and also aids in maintaining the integrity of the gastrointestinal tract (ADA, 2008). There are two types of fiber, soluble and insoluble. Soluble fiber is instrumental in the preventing cardiovascular disease. It binds to bile inhibiting enterohepatic recirculation, causing the liver to produce more bile from cholesterol, and thus decreasing circulating cholesterol (Panel on the Definition of Dietary Fiber, 2005). Decreased cholesterol results in decreased risk of developing atherosclerosis which can contribute to other cardiovascular complications such as heart attack and stroke. Viscous, soluble fiber expands and delays gastric emptying, and in turn glucose absorption is delayed, resulting in protective effect against diabetes (Panel on Definition of Dietary Fiber, 2005). The same property of delayed gastric emptying contributes to weight maintenance as it keeps individuals feeling satiated for prolonged periods of time (Panel of Dietary Fiber, 2005). Insoluble fiber has two main functions, increasing stool bulk and increasing laxation. It is hypothesized that these properties protect against colon cancer through diluting carcinogens, procarcinogens, and tumor promoters in bulky stools and rapid transit (Panel on the Definition of Dietary Fiber, 2005). Both

types of fiber, soluble and insoluble, aid in maintaining the integrity of the gastrointestinal tract. The functions of insoluble fiber keep the colon motile, preventing diseases such as diverticulitis (Panel on the Definition of Dietary Fiber, 2005). Delayed gastric emptying, resulting from soluble fiber, reduces the risk of duodenal ulcers (Panel on the Definition of Dietary Fiber, 2005).

The 2010 Dietary Guidelines recommend children ages eight to twelve years consume three ounces of whole grains (USDHHS, 2010). Adequate intake of dietary fiber for children two to eleven years of age is between twenty-five and thirty-one grams of fiber per day (ADA, 2008). According to a report by the American Dietetic Association, only 13% of children ages two to eleven are consuming at least two servings of whole grains per day, meaning the majority of children are not consuming the recommended three ounces of whole grains per day (ADA, 2008). Given that most all individuals do not meet dietary recommendations for fruits and vegetables, low-fat and fat free milk and milk products, and whole grains measures need to be taken to encourage individuals to increase consumption of all three as a part of a balanced diet.

Etiology of Poor Nutrition

Marketing of food to children, food selection, portion sizes, and food availability all contribute to the poor nutrition of today's youth. Children are the major target of numerous food and restaurant advertisements with mascots representing restaurants, cereals, chips, and beverages. Along with mascots, marketers are targeting children through giving prizes away with their product or through Internet giveaways. The primary avenue through which marketers target children is television advertisements. In a study conducted by Batada and Wootan (2007) researchers examined the frequency of food and restaurant advertisements during Saturday morning cartoon programming, and then assessed the nutritional content of the foods advertised. Half of the advertisements shown during the Saturday morning cartoon block were for food, and 91% of the advertisements were for foods high in fat, sugar, or sodium (Batada, 2007). From an

early age children are subjected to messages that influence them to eat unhealthful foods. Children want their parents to buy the foods they see advertised on television because the marketers make them seem appealing. However, most children are unaware of the fact that these foods are unhealthy, and they want their parents to purchase foods based off the image the marketers have portrayed to them.

Along with children being the target of food advertisements during Saturday morning cartoons, children are also bombarded with corporate advertisements at school (Molnar, Garcia, Boninger, & Merrill, 2008). Molnar et al. (2008) surveyed 391 school administrators using phone interviews about marketing programs within schools and found that 59.4% of primary schools participate in some kind of advertising or incentive program. As mentioned previously, children do not fully understand how the foods marketed toward them are not as healthy as other foods. In order to counteract this current trend of excessive advertising to students, schools should actively educate students on nutrition and help them understand how to select healthful foods.

Given the number of food advertisements targeted to children promoting foods high in fat, sugar, or sodium there is a great challenge in teaching students how to select healthful foods and making healthful foods appealing to children. This is evidenced in a study conducted by Martin et al. (2010) who evaluated school lunches to see if they met the Institute of Medicine's (IOM) recommendations and the School Meals Initiative standards. The results of the study showed that 74% of children exceeded the upper limit of total energy intake recommended by the IOM, and over 70% of children exceeded the upper limit for percent of energy coming from saturated fat recommended by the IOM (Martin et al., 2010). Targeting children during elementary school ages is imperative because their knowledge will be shaping their future habits. Fox, Gordon, Nogales, and Wilson (2009) analyzed foods purchased and consumed by students, and found that 40% of students consume one or more competitive foods. Competitive foods are those that are available to purchase, but are not included with the school reimbursable lunch such

as soft drinks, chips, and ice cream. Consumption was lowest among elementary school students (29%) compared to middle school students (44%), and high school students (55%) (Fox et al., 2009). Students consuming competitive foods consumed 150 more calories from foods that were high-energy, low-nutrient (Fox et al., 2009). Both of these studies indicate that children were prone to select foods that were higher in unnecessary fat and calories, and lacking in important vitamins and minerals essential for growth and development. In order to counter this trend, providing more nutrition education in school could help children understand the importance of selecting healthful foods, and help them develop healthful eating habits.

Another source of excessive calories is large portion sizes. In recent years portion sizes have increased, and children are as susceptible to these increasing sizes as adults. In a study conducted by the Children's Research Nutrition Center (CNRC), researchers observed consumption patterns of five and six year old children when presented with a large portion entrée, an energy dense entrée, and a large portion of an energy-dense entrée (Flores, 2007). Results indicated that children ate one-third more entrée calories when given a large portion or energy-dense entrée (Flores, 2007). However, when children were presented with the large portion of an energy-dense entrée the children consumed 75% more entrée calories (Flores, 2007). This is concerning in that as restaurants have increased their adult portions, they have also increased their child-size portions. In fact, "fast food chains are now targeting children age 7-12 with supersized versions of their popular kids meal" (North Carolina Department of Health and Human Services [NCDHHS], 2007). For example, McDonalds offers a mighty kids meal, which is a supersized happy meal. The supersizing was achieved by changing the hamburger to a double hamburger, thus increasing the meal by 100 to 180 calories (NDHHS, 2007). As Fisher, Liu, Birch, and Rolls (2007) discovered, children's energy consumption increases by 33% when meal size is doubled. Studies examining the overconsumption of energy-dense side dishes and snack foods have had similar findings as those looking at entrées. Colapinto, Fitzgerald, Taper, and Veugelers

(2007) found that children tend to select larger portions of low nutrient foods such as French fries and potato chips and smaller portions of vegetables. Also, children that eat fast food frequently or watch television while eating commonly eat larger portions of low-nutrient foods (Colpainto et al., 2007).

While incremental increases in calorie consumption may seem insignificant, they contribute to the disruption of a child's energy balance when consumed on a regular basis. Eating away from home was once considered an indulgence (North Carolina Cooperative Extension [NCCE], 2008). However, as women have become more active in the work force, dual-income households have become more common. At the same time, restaurant food has become more reasonably priced, resulting in families eating out more often (NCCE, 2011). About half of the meals families eat outside the home are fast food meals (NCCE, 2008). As children are subjected to more fast food meals and low-nutrient foods their consumption of energy increases. These statistics only worsen as children get older in that less than 20% of preschoolers consume meals away from home compared to 30% of adolescents (NCCE, 2008). It seems logical that as more children are exposed to fast food meals and larger portion sizes, this becomes normal, and calorie consumption exceeds needs. As such, there is need to help children develop skills in recognizing appropriate portion sizes in order to build efficacy for avoiding excessive calorie consumption.

Another factor that influences children's food selection is the availability of food. Children are dependent on adults to provide food for them, and therefore, they are usually restricted in their ability to select food. However, schools offer a variety of options with school lunches, a la carte items, and vending machine items (Fox et al., 2007). As mentioned previously, children tend to select foods that are higher in fat and energy when given the option. In addition to parents and school, socioeconomic level impacts the availability of foods to children. Lower socioeconomic areas, typically urban areas, have more fast food restaurants and convenience

stores and lack grocery stores (Galvez et al., 2009). Galvez et al. (2009) found an association between convenience stores within the same block as residence and the BMI percentile of children. Foods offered at convenience stores are typically highly processed with low nutrient value. Children of lower socioeconomic status generally consume greater amounts of fat and sodium in comparison to children of higher socioeconomic status (Keita, Casazza, Thomas, & Fernandez, 2009). However, children of lower and higher socioeconomic statuses consumed equivalent caloric loads, and both were susceptible to consuming more calories than recommended (Keita et al., 2009). While children of lower socioeconomic status may be at greater risk of developing poor health outcomes and diseases, due to their poor nutrient foods, children of all socioeconomic statuses are at risk of overweight and obesity due to the overall overconsumption of excessive calories (Keita et al., 2009). Obesity is a serious risk for all children and should be addressed within schools and within communities.

Physical Activity

Recommendations, Benefits, and Trends

Along with poor nutrition, an overall decrease in physical activity contributes to an energy imbalance and an increased prevalence of poor health among children. The Centers for Disease Control and Prevention (CDC) currently recommends children engage in 60 minutes of physical activity each day, and the AAP recommends limiting total screen time to two hours each day (CDC, Physical Activity 2011; AAP, 2001). Physical and psychological benefits can be gained from regular physical activity. Physical benefits include the development and maintenance of healthy bones and muscles, reduced risk of chronic disease, such as diabetes, and maintenance of healthful weight (CDC, Physical Activity, 2011). Psychological benefits consist of protection against stress, protection against depression, decreased drug use among adolescents, and development of social skills (Bailey, 2006 & Tassitano et al., 2010).

Despite these benefits the YRBSS indicates only 18.4% of children age 14 to 18 years engage in the recommended amounts of physical activity and 23.1% of children did not exercise any day of the week (YRBSS, 2010). As such the majority of children are engaging in some physical activity each week, but not enough for meaningful health benefits. Therefore, there is a great need to get children more active and moving.

Determinants of Decreased Physical Activity

Engaging in physical activity is as vital in school as it is at home. However, in recent years physical activity both at school and at home has shown a decreasing trend. There are numerous factors contributing to the decline in children's physical activity including the increasing trend of technology with television, video games, and computer games. Results of the National Survey of Children's Health (NSCH) indicate that children with greater amounts of daily screen time, watching television, playing video games, or computer time, had lower levels of physical activity (Sisson, Broyles, Baker, Katzmarzyk, 2010). This was true for both boys and girls (Sisson et al., 2010). According to the 2003, 2005, and 2007 National Health and Nutrition Examination Survey (NHANES) data, boys reported longer lengths of screen time than girls (Sisson et al., 2009). Approximately 37% of boys ages six to eleven spend two or more hours in front of the screen versus 34% of girls ages six to eleven (Sisson et al., 2009). While boys tend to have greater amounts of screen time both boys and girls categorized as obese based on their BMI age-for-gender percentile were more likely to exceed two hours of screen time in comparison to children that had overweight or normal BMIs (Sisson et al., 2009). As previously mentioned this exceeds the amount recommended by the AAP (Committee of Public Education, 2001).

Other researchers have found a relationship between social demographic characteristics and physical activity. These factors include socio-economic level, race and parental involvement. Sisson's analysis of the NHANES data revealed that African-American children are more likely

to have a screen time of greater than two hours versus European-American and Mexican-American children (Sisson et al., 2009). In addition, children with a lower socio-economic status were more likely to exceed two hours of screen time in comparison to children with a higher socio-economic status (Sisson et al., 2009). Results from the NSCH also indicate children in lower socio-economic neighborhoods are 66% more likely to be physically inactive in comparison to children in higher socio-economic neighborhoods (Singh, 2008). Also, the results indicated children living in unsafe neighborhoods had a 12% lower odds of regular physical activity in contrast to children residing in safe neighborhoods (Singh, 2008). A longitudinal study conducted by Bauer, Nelson, Boutelle, and Neumark-Sztainer (2008) in which adolescents were surveyed in middle school or high school, and then five years later, demonstrated that parental encouragement was influential in the physical activity of children, especially if it was from the same-sex parent.

As physical activity has decreased in the home environment, opportunities at school have decreased as well. Children are at school approximately forty hours a week, therefore, school is a valuable setting in which to encourage physical activity. School is an ideal environment to implement physical activity because more children are given access to physical education, there are few external pressures on the activities, and socialization opportunities are integrated into the activities (Bailey, 2006). Also, programs implemented in the school setting are more effective and efficient (Tassitano et al., 2010). However, while creating more opportunities for physical education within schools is ideal, the pressure to succeed academically on standardized tests is interfering with physical education (Pate et al., 2006). In fact, since the implementation of the No Child Left Behind Act in 2002, physical education has decreased by an average of forty minutes per week within schools (McMurrer, 2008). Also, schools reported decreasing recess by an average of fifty minutes per week (McMurrer, 2008). Students are being deprived of approximately twenty minutes of physical activity a day at school, which is one-third of the

recommended 60 minutes of exercise per day for children. These decreased times for physical activity are reflected in YRBSS data that reports 41.6% of students reported attending physical activity classes in 1991 compared to 33.5% in 2009 (CDC, YBRSS, 2010). Schools reported decreasing time allotment for physical education and recess to focus on English-language arts and/or math (McMurrer, 2008). The task of increasing physical activity within school is almost a battle, given that schools prioritize efforts to meet government mandates and succeed academically.

Measures of Physical Fitness

As with nutrition, low levels of physical activity and sedentary behavior in children is a complex problem resulting in children having low levels of physical fitness; which is comprised of aerobic capacity, muscle strength, and flexibility. Meredith and Welk (2007) suggests that aerobic capacity is the most important indicator of fitness because it is positively associated with reduced risk for cardiovascular disease, obesity and diabetes. Upper-body and trunk strength are indicators for functional health of the musculoskeletal system. It is important to have muscles that are strong enough to work over a period of time as well as flexible enough to have full range of motion. In other words, strong and flexible muscles are essential for carrying out the activities of daily living.

Because physical activity and therefore physical fitness tends to decrease with age (Nader et al., 2008), it is essential that schools find strategies for including physical activity in the overall programming offered to students in order to establish physical activity habits early.

Health and Cognitive Learning

While school administrators are shifting time away from physical education to aim their focus on English-language arts and/or math, students are being deprived of the subject that might enhance their performance in English or math, that is physical education. Literature suggests that

physical activity can increase blood flow to the brain, increase mental alertness, enhance mood, and enhance self-esteem (Bailey, 2006). Therefore, physical activity seems to influence cognition. Ratey and Hagerman explain that learning is influenced by exercise particularly at the cellular level (Ratey & Hagerman, 2008). They explain when students engage in activities requiring motor skills various portions of the brain are being utilized, including portions associated with cognition (Ratey & Hagerman, 2008). It is during these activities that students improve their ability to intake and process new information (Ratey & Hagerman, 2008). This could be especially beneficial for students in that allowing them to be physically active could positively influence their academic performance. In a meta-analysis conducted by Sibley and colleagues, ten of the fifteen studies examined indicated there were positive effects associated with physical activity on cognition (Sibley & Etnier, 2003). These results indicate decreasing time allotted to physical education in school might be preventing children from obtaining all the benefits of physical activity, especially those improving cognition. Overall, limiting time for physical education and physical activity during the school day may not be the best solution to improve academic success with regards to English and/or math.

As mentioned previously, physical activity has been positively correlated with overall cognition, and consequently has been positively associated with academic outcomes for students. In a study conducted by Fox, Barr-Anderson, Neumark-Sztainer, and Wall (2010) the findings indicated there was 0.20 increase in GPA reported by male students that were physically active more than seven hours a week. Researchers administered questionnaires to middle school and high school students in order to examine whether physical activity alone or team sports had an impact on academic outcomes. Chomitz and colleagues (2009) evaluated fourth, sixth, seventh, and tenth grade students' fitness achievement in an endurance cardiovascular, abdominal strength, flexibility, upper-body strength, and agility tests adjusted from the Amateur Athletic Union and Fitnessgram in comparison to academic achievement in standardized testing for

English and math. The results indicated that each fitness test that was passed, a student was 38% more likely to pass the mathematics standardized test and 24% more likely to pass the English standardized tests (Chomitz et al., 2009). Given the results of these studies, elimination of physical education to allot more time to standardize testing preparation does not appear to be the best solution.

Social Cognitive Theory

Social Cognitive Theory (SCT) is a broad theory developed by Albert Bandura hypothesizing the reasoning behind human behavior. Bandura theorizes that human functioning is a result of triadic reciprocity between cognitive and personal factors, environmental events, and behavior (Bandura, 1986). According to the theory if an individual participates in a nutrition class their knowledge on the subject would increase, and if they were also exposed to healthful foods on a regular basis, their behavior in turn could be impacted.

The first part of the triad is cognitive and personal factors, which can be explained as the way an individual perceives his/her environment or his/her abilities. Bandura indicates there are two major components of cognitive factors, self-efficacy and outcome expectancies (Bandura, 1986). Self-efficacy is the judgment one makes of his/her abilities to perform a certain skill, for instance selecting a piece of fruit instead of a cookie for dessert (Bandura, 1986). If an individual is confident in his/her ability to perform a certain skill, meaning he/she has high self-efficacy, the individual will be likely to practice that skill. Outcome expectancies are the judgment of what would likely be the consequence a certain behavior (Bandura, 1986). The results of the decision an individual would make impact his/her behavior. Expectancies can be measured quantitatively and can either be positive or negative (Contento, 2007). For instance an individual may increase consumption of fruits and vegetables on the expectancy that it will aid in weight management. An individual's cognition increases as he/she gains knowledge from classes and experiences, and

also through observation of others (Blackman & Kvaska, 2011). For instance if a child observes his/her parents consuming fruits and vegetables at every meal, he/she will be inclined to consume fruits and vegetables as well.

The second factor that influences human functioning are behavioral factors. SCT postulated that an individual's behavioral capabilities were determined by an individual's knowledge and skills (Contento, 2007). In order for an individual to act a particular way, he/she must first possess factual knowledge; like knowing the number of servings of fruit and vegetables to eat each day (Contento, 2007). Also, an individual must possess procedural knowledge, for example, an understanding of how to utilize the USDA MyPyramid website, and apply the recommendations to action (Contento, 2007). Without proper knowledge a person does not possess the necessary skills to change behavior. Along with knowledge, SCT indicates individuals need self-regulation and goal setting to impact behavior (Contento, 2007). In order to change behavior one must "observe the behavior [one seeks] to change" which helps one "identify the determinants of [one's] behavior and provides the information necessary for setting realistic goals" (Contento, 2007, pg. 120). Self-regulation involves problem solving, and goal setting increases motivation for behavior change, which in turn can positively influence self-efficacy (Contento, 2007).

Along with cognitive factors and behavioral factors, Bandura states that environmental factors influence an individual's functioning (Bandura, 1986). An environmental factor "represents the objective factors affecting our behavior that are external" (Contento, 2007, pg. 120). According to social cognitive theory, there are three types of environments (Contento, 2007). An imposed environment is one in which an individual has no control over, such as foods offered at the school cafeteria, but the individual must react or act within (Contento, 2007). A selected environment is one that is not a fixed entity, but develops based on an individual's behavior (Contento, 2007). Finally, a created environment which is strictly as the name indicates,

an environment an individual creates, such as the foods purchased for the home environment (Contento, 2007). Each of these environments is important because they are key constructs through which individuals observe and model behaviors, and practice guided mastery experience to gain new skills (Contento, 2007).

The SCT is helpful in aiding the understanding of how one can elicit change in his/her dietary habits. In fact, one school intervention, *CATCH Kids Club*, based on the social cognitive theory has been monitored and found to be successful in prompting healthy changes among children. *CATCH Kids Club* was developed by researchers from four universities; the University of California San Diego, University of Minnesota, Tulane University, and University of Texas Health Science Center in Houston, and was specifically formatted for the after-school setting (CATCH Texas, 2011). The *CATCH Kids Club* curriculum is comprised of a manual including 32 nutrition lessons and an activity box with 300 activity cards that provide instruction for administering the activity (Nader et al., 2005). The nutrition lessons are based on the story of Hearty Heart's adventure to Earth with five lessons focusing of fruit and vegetable consumption, four lessons focusing on selecting low-fat and fat free milk and milk products, six lessons focusing on increasing fiber intake, and three lessons focusing on MyPyramid (Nader et al., 2005). The *CATCH Kids Club* activities are slightly competitive, and the majority are non-elimination activities to keep all students engaged through the entire activity, and with 300 different activities students are less likely to become bored with the activities (Nader et al., 2005).

Researchers from the University of Texas Health Science Center conducted a pilot study to assess the effectiveness of *CATCH Kids Club.* The entire curriculum, nutrition education and physical activity, was implemented in eight elementary schools in El Paso, Texas with four serving as the intervention sites and four serving as reference sites (Kelder et al., 2004). The physical activity curriculum was also implemented in eight public elementary schools in Austin, Texas, four serving as the intervention sites and four serving as the reference sites (Kelder et al.,

2004). A questionnaire assessing self-reported nutrition measures and physical activity measures was administered to students in both the intervention and reference sites. To assure students were reaching moderate to vigorous levels of activity for at least 30 minutes, the physical activities were assessed through System for Observing Fitness Instruction Time (SOFIT) (Kelder et al., 2004). The findings of the study indicated that the physical activity portion of the program was highly effective in increasing moderate to vigorous physical activity ($p=0.001$). This was observed through increased amounts of walking ($p=0.001$) and decreased amounts of standing ($p=0.027$) among intervention participants (Kelder et al., 2004). Also, intervention students free play was reduced ($p=0.002$) which was replaced by more structured activity, such as *CATCH Kids Club* activities (Kelder et al., 2004). There were fewer significant improvements observed regarding nutrition assessments. A significant difference was observed between intervention students and reference students regarding the understanding of the correct servings of fruits and vegetables that should be consumed each day ($p=0.0398$) (Kelder et al., 2004). Intervention students also reported consuming vegetables more frequently ($p=0.0003$) in comparison to reference students (Kelder et al., 2004). Overall, the intervention students demonstrated improved nutrition knowledge ($p=0.0364$) in comparison to reference students (Kelder et al., 2004). *CATCH Kids Club* provided nutrition and physical activity education, which influenced cognitive factors related to health behaviors. In addition, it provided an environment for regular physical activity and to try new foods which in turn influenced children's behavior as theorized by SCT. The findings of the pilot study suggest that *CATCH Kids Club* was a successful program in providing a positive environment after-school and improving nutrition knowledge, nutrition behavior, and physical activity habits.

Summary

Childhood obesity is a critical issue impacting a substantial proportion of the nation's youth, resulting in adverse health outcomes such as type 2 diabetes, hypertension, cardiovascular

disease, and certain cancers. In Oklahoma, children do not meet the 2010 Dietary Recommendations for fruit and vegetables, milk and milk products, and whole grains. Therefore, there is great need to identify effective strategies to encourage Oklahomans to consume the recommended amount of fruits and vegetables, low-fat and fat-free milk and milk products, and whole grains high in fiber each day. In addition to not meeting 2010 Dietary Recommendations in three categories, only a small percentage of children are meeting the recommended 60 minutes of physical activity daily. In order to counter this trend, providing more nutrition education and physical activity in school could help children understand the importance of selecting healthful foods, and help them develop healthful eating and physical activity habits. Schools provide an optimal environment to address these concerning issues and educate students on nutrition and physical activity. Theory based interventions; such as *CATCH Kids Club*, have been successful in school environments in addressing barriers related to nutrition and physical activity.

CHAPTER III

METHODOLGY

The primary purpose of this study was to evaluate the impact of the *CATCH Kids Club* after-school program being implemented in 13 elementary school sites in Lawton Public Schools during the 2009-2010 school year. According to the Oklahoma State Department of Education all participating schools met low-income criteria: that being 50% of students or more were eligible for free and reduced meals during the 2009-2010 school year (Oklahoma Department of Education, 2010). Specifically the study looked at 1) six measures related to nutrition including the students' nutritional knowledge, behavioral capabilities, self-efficacy, intent, attitude and behaviors; 2) four measures of physical fitness including trunk strength, upper body strength flexibility, and cardiovascular endurance; and 3) academic achievement. The study also compared students who participated in the *CATCH Kids Club* after-school program to similar students enrolled in Lawton Public elementary school sites who did not participate in the program. This study was approved by the Oklahoma State University (OSU) Institutional Review Board (IRB) (Appendix A).

Participants

The study consisted of two groups of third, fourth, and fifth grade students from the elementary schools in Lawton, Oklahoma. Students in the intervention group (n = 160) consisted of all students participating in *CATCH Kids Club* after-school program. Students in the control group were first randomly selected as potential participants by the physical education teachers and principals of school sites not implementing the *CATCH Kids Club* after-school program. From this sample the Health, Physical Education, and Wellness Coordinator of the Lawton Public

School District randomly selected students for the control group by selecting every third student until the sample numbers of both control and intervention were nearly even (n = 163).

Study Design

The quasi-experimental study utilized data from two convenience samples of students. Data was collected using repeated nutrition and physical fitness assessments of each group.

Intervention Design and Procedure

The *CATCH Kids Club* program was administered by teachers or volunteers who conducted after-school programming. *CATCH Kids Club* was implemented over a sixteen week period at the intervention schools during the 2009-2010 school year. *CATCH Kids Club* facilitators taught nutrition lessons on two days each week from the *CATCH Kids Club* Nutrition Manual (Nadar et al., 2005). On alternating days, facilitators conducted physical activity sessions from the *CATCH Kids Club* Activity Box (Nadar et al., 2005) with the intervention students. Program facilitators, Comanche County Health Educators and physical education (PE) teachers at both control and intervention sites were trained on how to collect the nutrition and physical fitness data by the Health, Physical Education, and Wellness Coordinator of the Lawton Public School District. All data was collected prior to implementation of the *CATCH Kids Club* after-school program and again at the end of the implementation period.

Nutrition data was collected using a 58 item questionnaire developed by the University of Texas, Health Science Center of Houston (Appendix B). It was designed to assess nutrition knowledge, behavior, behavioral capability, attitude, intent and self-efficacy as well as physical activity behavior and self-efficacy. For the purpose of this study, only the nutrition related sections of the questionnaire will be reported. (Changes related to physical fitness were evaluated and reported using the Cooper Fitnessgram that is described below.) In Kelder et al.'s (2004) pilot study of *CATCH Kids Club* the questionnaire was determined to have acceptable internal

consistency greater than r=0.6. Questionnaire items were presented to students using a PowerPoint presentation. Students responded to each item using a separate answer sheet that coordinated with the questionnaire. Questionnaires and physical fitness data were collected by the Health, Physical Education, and Wellness Coordinator of the Lawton Public School District, data was de-identified, and submitted to OSU for analyses. The same measures and protocol were conducted with the selected students in the control sites.

Physical fitness was assessed by measuring four variables known to be indicators of overall fitness, including trunk strength, upper-body strength, flexibility and cardio-endurance using Fitnessgram protocols (Meredith & Welk, 2007). *Curl-ups* were used to measure trunk strength. The protocol was for a student (student A) to lie in a supine position on a gym mat with feet flat on the floor and knees bent at approximately a 140 degree angle; arms are parallel to trunk with palms resting on the mat, and head resting on the mat. When in position a measuring strip was placed underneath students' legs with fingertips resting near the edge. A 3 inch strip was used for students 5 to 9 years of age and a 4.5 inch strip was used for students 10 years and older. A sheet of paper was placed underneath the student's head, prior to starting the test to serve as a guide to determine if the student's head had made contact with the mat between curl-ups. The student curled up slowly until fingers reached the opposite side of the measuring strip. A second student (student B) counted the number of curl-ups until the second form correction was made or the student could no longer continue. The students switched positions allowing student B to perform curl-ups while student A observed form and counted. The number of curl-ups each student completed was recorded on a standardized form. The *flexed arm hang* measured upper body strength. PE teachers helped students place themselves on a horizontal bar. Students grasped the bar with an overhand grip, had the chin over the bar, and chest up close to the bar with elbows flexed. Once the student was in position, the PE teachers started a stopwatch and timed students as long as they could hold the position, and then recorded time in seconds. The *sit*

and reach test measured flexibility. Students were instructed to remove shoes and sit facing a measuring apparatus. One leg was fully extended with foot flat against the face of the box, the other knee bent and the sole of the foot flat on the floor, and arms extended towards the measuring scale with one hand on top of the other and palms down. The student reached forward toward the scale divided into ½ inch increments four times holding fourth reach for a minimum of one second. The PE teacher recorded the number of inches to the nearest ½ inch reached by the student. The *Progressive Aerobic Cardiovascular Endurance Run* (*PACER)*, assessed cardio endurance. PE teachers delineated a 20 meter course and familiarized students with PACER timing compact disc (CD). Students lined up on one side of the course and began running to the next line when the CD alerted. Students had to reach to other line by the time the beep sounded. If they did not reach the next line, they had to go back to the starting line. If students reached the line before the beep they waited at that line until the beep sounded. Then students would run back to the starting line. The test continued in this fashion until students failed to reach the line before the beep twice. A triple beep sounded every minute informing students how long they had run and that the pace would get faster. The number of laps a student was able to run was recorded.

Oklahoma State Core Curriculum standardized tests was administered by Lawton Public Schools in April 2010. The standardized reading and math test scores for third, fourth, and fifth grade students from the Oklahoma State Core Curriculum test were obtained from the school district by the Health, Physical Education and Wellness coordinator for the Lawton Public School District. The coordinator matched scores for students in both intervention and control study groups, de-identified the scores, and then submitted the scores to OSU for analysis.

Statistical Analysis

Data collected from the study was analyzed using the Statistical Program for Social Science (SPSS) version 19 for Microsoft Windows (IBM, 2011). Frequencies were performed to provide descriptive statistics for demographic characteristics for participants in both study groups. Responses to each section of the nutrition questionnaire were evaluated and coded for data entry. If students responded more than once to a question, the question was counted as a non-response.

For responses regarding nutrition behaviors (items 5-10) were assigned a 4-point Likert scale, with the largest number assigned to the most healthful response and the smallest number assigned to the least healthful response. An exception was the behavior item regarding sweets, a 4-point Likert scale, with the smallest number assigned to the most healthful response and the largest number assigned to the least healthful response was utilized. One-way ANOVA analyses were used to assess differences between intervention and control groups at pre and post regarding behavior. A paired t-test was used to assess responses within the intervention group from pre to post.

In the knowledge section (items 18-20) each response was assigned a numerical code, and then chi-square goodness-of-fit was used to assess the proportion of students that had selected each response. This was done for the assessments between control and intervention groups at pre and post and to assess changes in the distribution of responses within intervention group from pre to post.

Response options for items assessing *nutrition attitudes* (items 21-23) were coded using a 3-point Likert scale with 3=the most positive attitude, 2=somewhat positive attitude, and 1=negative attitude. Chi-square goodness-of-fit analyses were utilized to assess differences in the proportion of students with positive, neutral and negative attitudes between control and intervention students at pre and post and differences in the distribution of responses within the

intervention group between pre and post. Response options for items related to *intent* (items 29-36), *behavioral capabilities* (items 37-46) and *self-efficacy* (items 47-54) were coded and summed into scales for each of the variables.

Response codes for intent and behavioral capability items were 0=incorrect answer and 1=correct answer. Codes for self-efficacy items were 0=not sure, 1 = a little sure, and 2 = very sure. One-way ANOVA, analyses were utilized to assess differences between students in the control and intervention groups at pre and post regarding intent, behavioral capabilities, and self-efficacy.

Physical fitness data for each of the four variables was transformed into one of three Healthy Fitness Zone categories using gender and age specific criteria established by the Cooper Institute (Meredith and Welk, 2007). Codes were 1 = below the HFZ, 2 = within the HFZ, and 3 = above the HFZ. Chi-square goodness-of-fit analyses were then conducted to analyze differences in the proportion of students in each HFZ category between control and intervention groups from pre to post and to analyze changes in the proportion of students in each category within the intervention group from pre to post.

One-way ANOVA was used to evaluate differences in standardized reading and math test scores between students in the intervention and control groups. The level of significance was set at $p<0.05$ for all analyses.

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CHAPTER IV

FINDINGS

Demographics

The demographic characteristics of the study are represented in Table 1. Of the 160 students in the intervention group a total of 119 pre and post surveys were matched resulting in an attrition rate of 25%. In the control group for the intervention group and a total 128 post surveys were matched from 163 pre surveys (attrition of 21%) for the control group for analysis. Overall, the intervention group and the control group were similar in gender, grade, and racial makeup. Females accounted for 57% of the intervention group while males accounted for 43% of the group. The intervention group was comprised of 36% third graders, 34% fourth graders, and 30% fifth graders. The intervention group consisted of primarily White/Other (50%), followed by African American/Black (24%), Hispanic (12%), American/Alaskan Indian (11%), and Asian Pacific Islander (3%). In the control group, 49% of the students were females while males accounted for 51% of the group. Third graders represented 36%, fourth graders represented 34%, and fifth graders represented 30% of the control group. Similar to the intervention group approximately half (47%) of the students in the control group were White/Other, followed by African American/Black (25%), Hispanic (16%), American/Alaskan Indian (8%), and Asian Pacific Islander (4%).

Table 1. Demographic Characteristics

Demographic	Control		Intervention	
	n	%	n	%
Gender				
Boys	65	51	51	43
Girls	63	49	68	57
Total	128	100	119	100
Grade				
Third	46	36	43	36
Fourth	44	34	41	34
Fifth	38	30	35	30
Total	128	100	119	100
Race				
White/Other	60	47	60	50
African American/Black	32	25	28	24
Hispanic	21	16	14	12
American/ Alaskan Indian	10	8	13	11
Asian Pacific Islander	5	4	4	3
Total	128	100	119	100

Nutrition Knowledge

Students' nutrition knowledge is represented in Tables 2, 3, and 4. Table 2 shows the chi-square goodness-of-fit results of intervention and control responses at pre intervention regarding knowledge related to the number of servings to eat from different food groups. There were significant differences in the distribution of responses for two of the three questions, "which food group to have the least servings" ($p<0.001$) and "how many servings of fruits and vegetables should be consumed each day" ($p<0.001$). While the distribution of responses was significantly different for the items asking which food group should you eat the least of, the majority of students in both the control and intervention reported fats, oils, and sweets as the correct answer (66.3% and 65.8%, respectively). A dissimilar observation was made for the item asking the total number of servings of fruits and vegetables to eat each day. Approximately 25% of both groups identified "at least 5" as the correct answer. In contrast larger proportions of each group (41.7% of control and 35.7% of intervention) incorrectly answered "at least 2" as the correct answer. There was no significant difference in the distribution of responses between groups for the foods you should eat the most of everyday. Within

this item, the largest proportion of students in each group incorrectly reported fruit as the correct answer (21% of control and 23.4% of intervention).

Table 2. Comparison of Control and Intervention Groups' Nutrition Knowledge at Pre Intervention

Questionnaire Item	Control %	Intervention %	P-value
Which foods should you eat the most servings of everyday?			
	N=162	N=158	
Breads, cereals, rice, pasta	15.4	12.0	
Dairy products (milk, cheese)	5.6	6.3	
Fats, oils, sweets	6.8	7.6	P=0.787
Fruits	21.0	23.4	
Meats, fish, poultry, beans, eggs, nuts	15.4	12.7	
Vegetables	16.7	19.0	
Don't Know	19.1	19.0	
Which food group should you eat the least servings everyday?			
	N=163	N=158	
Breads, cereals, rice, pasta	5.5	5.1	
Dairy products (milk, cheese)	1.8	3.2	
Fats, oils, sweets	66.3	65.8	P=0.000*
Fruits	6.1	2.5	
Meats, fish, poultry, beans, eggs, nuts	3.7	7.0	
Vegetables	3.1	8.2	
Don't Know	13.5	8.2	
How many total servings of fruit and vegetables should you eat everyday?			
	N=163	N=157	
At least 2	41.7	35.7	
At least 5	25.8	25.5	P=0.000*
At least 8	9.8	5.7	
At least 10	12.9	12.7	
I don't know	9.8	20.4	

* Chi-square goodness-of-fit indicates significant difference between intervention and control group, $p<0.05$

Table 3 reports the results of a chi-square goodness-of-fit test comparing distribution of responses for the intervention group from pre to post. The distribution of responses were statistically significant for two questions, "which foods should you eat the most servings of everyday" ($p=0.006$) and "how many total servings of fruits and vegetables should be eaten everyday" ($p<0.001$). For the first question (foods to eat the most of everyday) there was no change in percentage (12%) correctly

answering breads, cereals, rice, and pasta. Fewer students answered fruits, but appear to have shifted answers to (meats, fish, poultry, beans, eggs, and nuts), vegetables, and don't know. For the question assessing knowledge of the servings of fruits and vegetables to eat each day the percentage of students answering correctly increased two-fold from 25.5% at pre intervention to 52.6% at post intervention. While there was no significant difference in distribution of responses for "which food group should you eat the least servings everyday" the percentage of students answering correctly increased from 65.8% to 73.3%.

Table 3. Comparison of Intervention Group's Nutrition Knowledge From Pre to Post Intervention

Questionnaire Item	Pre %	Post %	P-value
Which foods should you eat the most servings of everyday?			
	N=158	N=116	
Breads, cereals, rice, pasta	12.0	12.1	
Dairy products (milk, cheese)	6.3	9.5	
Fats, oils, sweets	7.6	3.4	P=0.006*
Fruits	23.4	18.1	
Meats, fish, poultry, beans, eggs, nuts	12.7	22.4	
Vegetables	19.0	22.4	
Don't Know	19.0	12.1	
Which food group should you eat the least servings everyday?			
	N=158	N=116	
Breads, cereals, rice, pasta	5.1	6.0	
Dairy products (milk, cheese)	3.2	2.6	
Fats, oils, sweets	65.8	73.3	P=0.203
Fruits	2.5	3.5	
Meats, fish, poultry, beans, eggs, nuts	7.0	1.7	
Vegetables	8.2	4.3	
Don't Know	8.2	8.6	
How many total servings of fruit and vegetables should you eat everyday?			
	N=157	N=116	
At least 2	35.7	23.3	
At least 5	25.5	52.6	P=0.000*
At least 8	5.7	6.0	
At least 10	12.7	6.0	
I don't know	20.4	12.1	

* Chi-square goodness-of-fit indicates significant difference between intervention and control group, $p<0.05$

A chi-square goodness-of-fit test compared the intervention and control groups' post intervention responses related to nutrition knowledge. The results are shown in Table 4. At post, two items had statistical significance, "food groups that you should eat the most of everyday" ($p<0.001$) and "how many total servings of fruit and vegetable servings one should consume everyday" ($p<0.001$). While there was a significant difference in the distribution of responses for "foods to eat the most of", the results reflect both groups continued to have inaccurate knowledge as demonstrated by only 12.1% of the intervention group and 15% of the control group correctly answering breads, cereals, rice and pasta. In contrast, the proportion of students in the in the intervention group reporting 5 servings as the number of servings of fruits and vegetables that should be eaten each day was 64% higher than the proportion of students in the control group who demonstrated accurate knowledge (52.6% and 33.6%, respectively).

Table 4. Comparison of Control and Intervention Groups' Nutrition Knowledge at Post Intervention

Questionnaire Item	Control %	Intervention %	P-value
Which foods should you eat the most servings of everyday?			
	N=127	N=116	
Breads, cereals, rice, pasta	15.0	12.1	
Dairy products (milk, cheese)	3.9	9.5	
Fats, oils, sweets	3.1	3.4	P=0.000*
Fruits	22.0	18.1	
Meats, fish, poultry, beans, eggs, nuts	15.7	22.4	
Vegetables	15.7	22.4	
Don't Know	24.4	12.1	
Which food group should you eat the least servings everyday?			
	N=128	N=116	
Breads, cereals, rice, pasta	3.9	6.0	
Dairy products (milk, cheese)	1.6	2.6	
Fats, oils, sweets	78.1	73.3	P=0.813
Fruits	3.9	3.5	
Meats, fish, poultry, beans, eggs, nuts	1.6	1.7	
Vegetables	3.9	4.3	
Don't Know	7.0	8.6	
How many total servings of fruit and vegetables should you eat everyday?			
	N=128	N=116	
At least 2	38.3	23.3	
At least 5	33.6	52.6	P=0.000*
At least 8	8.6	6.0	
At least 10	8.6	6.0	
I don't know	10.9	12.1	

* Chi-square goodness-of-fit indicates significant difference between intervention and control group, $p<0.05$

Nutrition Attitudes

In the survey section evaluating attitudes, students reported whether they felt their diet could impact their health, if they thought the foods they currently consumed were healthy, and if they liked to try new foods. The response distributions are illustrated in Tables 5, 6 and 7. At pre-intervention the chi-square goodness-of-fit analysis revealed only one response was statistically significant, with more intervention students reflecting the foods they were currently consuming were sometimes or all the time healthy ($p=0.001$) in comparison to the control students.

Table 5. Comparison of Control and Intervention Groups' Nutrition Attitudes at Pre Intervention

Questionnaire Item	Control %	Intervention %	P-Value
What you eat can make a difference in getting heart disease or cancer?			
	N=161	N=158	
Yes	54.0	55.7	0.774
No	18.0	15.8	
I don't know	28.0	28.5	
The foods I eat and drink now are healthy.			
	N=162	N=158	
Yes, all of the time	4.3	7.6	0.001*
Yes, sometimes	66.0	75.3	
No	29.6	17.1	
I like to try new foods.			
	N=163	N=157	
Almost never or never	13.5	15.9	0.091
Sometimes	59.5	51.0	
Almost always or always	27.0	33.1	

* Chi-square goodness-of-fit indicates significant difference between intervention and control group, $p<0.05$

However, intervention students' attitude about the foods they consumed changed from pre to post intervention as presented in Table 6. There was a significant difference in the proportion of students at post reporting the foods they were eating were not healthy compared to pre intervention (25.2% versus 17.1% respectively) ($p=0.015$).

Table 6. Comparison of Intervention Group's Nutrition Attitudes at Pre and Post Intervention

Questionnaire Item	Pre %	Post %	P-Value
What you eat can make a difference in getting heart disease or cancer?			
	N=158	N=116	
Yes	55.7	56.0	0.868
No	15.8	17.3	
I don't know	28.5	26.7	
The foods I eat and drink now are healthy.			
	N=158	N=115	
Yes, all of the time	7.6	2.6	0.015*
Yes, sometimes	75.3	72.2	
No	17.1	25.2	
I like to try new foods.			
	N=157	N=116	
Almost never or never	15.9	15.5	0.951
Sometimes	51.0	50.0	
Almost always or always	33.1	34.5	

* Chi-square goodness-of-fit indicates significant difference between intervention and control group, $p<0.05$

A chi-square goodness-of-fit analysis of post attitude data between intervention and control groups is shown in Table 7. At post, more control students (75.3%) felt the foods they were currently consuming were healthier in comparison to intervention students (72.2%) ($p=0.035$). This data also reflects an increase from pre to post in the proportion of students in the control group reporting the foods they eat are healthy (see tables 5 and 7).

Table 7. Comparison of Control and Intervention Groups' Nutrition Attitudes at Post Intervention

Questionnaire Item	Control %	Intervention %	P-Value
What you eat can make a difference in getting heart disease or cancer?			
	N=125	N=116	
Yes	52.3	56.0	0.092
No	12.5	17.3	
I don't know	35.2	26.7	
The foods I eat and drink now are healthy.			
	N=128	N=115	
Yes, all of the time	2.3	2.6	0.035*
Yes, sometimes	81.3	72.2	
No	16.4	25.2	
I like to try new foods.			
	N=127	N=116	
Almost never or never	10.2	15.5	0.162
Sometimes	54.3	50.0	
Almost always or always	35.4	34.5	

* Chi-square goodness-of-fit indicates significant difference between intervention and control group, $p<0.05$

Intent

Students' intent to select healthy foods was analyzed between study groups using a one-way ANOVA. There was no significant difference between the control group and intervention group at pre. Results are shown in Table 8. A table presenting findings comparing students in the control and intervention group for individual items within the scale is presented in Appendix C.

Table 8. Comparison of Control and Intervention Groups' Intent to Choose Healthy Food Items at Pre Intervention

Item	Control (N=122) Mean ± SD[a]	Intervention (N=108) Mean ± SD[a]	*P*- Value[b]
Intent	3.97 ± 2.03	3.78 ± 1.95	0.477

[a] Scale score range was 0 to 8 with 0 = low intent and 8 = high intent as analyzed by one-way ANOVA.
[b] Mean difference significant at $p < 0.05$

A paired t-test analysis revealed that intervention students had a greater mean score related to their intent to choose a healthy food item at post (mean = 4.2621) compared to pre (mean = 3.6699). This increase in the intervention group's mean between pre and post was statistically significant (p=0.002). Table 9 illustrates these results. A table comparing pre and post responses for individual items within the scale for the intervention group between pre and post are presented in Appendix D.

Table 9. Comparison of Intervention Group's Intent to Choose Healthy Food Items from Pre to Post Intervention

Item	Pre (N=103) Mean ± SD[a]	Post (N=103) Mean ± SD[a]	*P*- Value[b]
Intent	3.66 ± 1.89	4.26 ± 1.97	0.002[b]

[a] Scale score range was 0 to 8 with 0 = low intent and 8 = high intent as analyzed by paired t-test.
[b] Mean difference significant at $p < 0.05$

Finally, a one-way ANOVA was used to compare the responses of control and intervention students at post, results are shown in Table 10. While the intervention group had a significant increase in intent to select healthy food items, there was no statistically significant difference between control and intervention students' intent score at post. A table presenting findings comparing students in the control and intervention group for individual items within the scale is presented in Appendix E.

Table 10. Comparison of Control and Intervention Groups' Intent to Choose Healthy Foods Items at Post Intervention

Item	Control (N=126) Mean ± SD[a]	Intervention (N=114) Mean ± SD[a]	*P*- Value[b]
Intent	4.10 ± 2.25	4.20 ± 1.98	0.721

[a] Scale score range was 0 to 8 with 0 = low intent and 8 = high intent as analyzed by one-way ANOVA.
[b] Mean difference significant at $p < 0.05$

Nutritional Self-efficacy

Self-efficacy was analyzed through a one-way ANOVA, results shown in Table 11. There was no significant difference between intervention and control groups' self-efficacy prior to

intervention. A table presenting findings comparing students in the control and intervention group for individual items within the scale is presented in Appendix F.

Table 11. Comparison of Control and Intervention Groups' Self-Efficacy at Pre Intervention

Item	Control (N=124) Mean ± SD[a]	Intervention (N=109) Mean ± SD[a]	*P*- Value[b]
Self-Efficacy	11.61 ± 3.44	10.93 ± 3.73	0.152

[a] Scale score range was 0 to 24 with 0 = low and 24 = high self-efficacy as analyzed by one-way ANOVA.
[b] Mean difference significant at $p < 0.05$

Self-efficacy within the intervention group from pre to post was analyzed through a paired t-test. Results, presented in Table 12, indicate there is no significant difference in intervention students' self-efficacy from pre to post. Appendix G presents responses to individual items within the scale for the intervention group between pre and post.

Table 12. Comparison of Intervention Group's Self-Efficacy from Pre to Post Intervention

Item	Pre (N=105) Mean ± SD[a]	Post (N=105) Mean ± SD[a]	*P*- Value[b]
Self-Efficacy	10.91 ± 3.67	10.95 ± 3.89	0.923

[a] Scale score range was 0 to 24 with 0 = low and 24 = high self-efficacy as analyzed by paired t-test.
[b] Mean difference significant at $p < 0.05$

A one-way ANOVA analyzing self-efficacy between control and intervention groups self-efficacy at post indicate there was no significant difference between groups. Results are presented in Table 13. A table presenting findings comparing students in the control and intervention group for individual items within the scale is presented in Appendix H.

Table 13. Comparison of Control and Intervention Groups' Self-Efficacy at Post Intervention

Item	Control (N=124) Mean ± SD[a]	Intervention (N=115) Mean ± SD[a]	*P*- Value[b]
Self-Efficacy	11.02 ± 2.25	10.75 ± 4.06	0.616

[a] Scale score range was 0 to 24 with 0 = low and 24 = high self-efficacy as analyzed by one-way ANOVA
[b] Mean difference significant at $p < 0.05$

Behavioral Capability

Behavioral capability was analyzed using a one-way ANOVA. Table 14 represents the results comparing the control and intervention group at pre intervention. There was no statistical difference in the mean scores of students demonstrating the ability to choose the healthier food item when presented with a pair of similar items (e.g. whole wheat bread or white bread). A table presenting findings comparing students in the control and intervention group for individual items within the scale is presented in Appendix I.

Table 14. Comparison of Control and Intervention Groups' Behavioral Capabilities at Pre Intervention

Item	Control (N=125) Mean ± SD[a]	Intervention (N=111) Mean ± SD[a]	*P*- Value[b]
Behavioral Capability	7.12 ± 2.09	7.09 ± 2.34	0.920

[a] Scale score range was 0 to 10 with 0 = low behavioral capability and 10 = high behavioral capability as analyzed by one-way ANOVA.
[b] Mean difference significant at $p < 0.05$

Table 15 illustrates the results of a paired t-test comparing the intervention group's behavioral capability from pre to post. There was no significant difference between students' responses from pre to post intervention. A table presenting findings for individual items within the scale for the intervention group between pre and post is presented in Appendix J.

Table 15. Comparison of Intervention Group's Behavioral Capability from Pre to Post Intervention

Item	Pre (N=106) Mean ± SD[a]	Post (N=106) Mean ± SD[a]	*P*- Value[b]
Behavioral Capability	7.09 ± 2.37	6.99 ± 2.36	0.687

[a] Scale score range was 0 to 10 with 0 = low behavioral capability and 10 = high behavioral capability as analyzed by paired t-test.
[b] Mean difference significant at $p < 0.05$

There was a significance difference between control and intervention groups at post (p=0.021) Results are presented in Table 16. The mean scores of control students were higher on behavioral capability score than the intervention students (7.6693 and 7.0088, respectively). A

table presenting responses of students in the control and intervention groups for individual items within the scale are presented in Appendix K.

Table 16. Comparison of Control and Intervention Behavioral Capabilities Post Intervention

Item	Control (N=127) Mean ± SD[a]	Intervention (N=114) Mean ± SD[a]	*P*- Value[b]
Behavioral Capability	7.66 ± 2.10	7.00 ± 2.31	0.021[b]

[a] Scale score range was 0 to 10 with 0 = low behavioral capability and 10 = high behavioral capability as analyzed by one-way ANOVA.
[b] Mean difference significant at $p < 0.05$

Behavior

Food behaviors were assessed using a food frequency style of question. A one-way ANOVA was used to identify pre-intervention differences between the study groups regarding food behavior. Results are summarized in Table 17. Only one behavior, consumption of vegetables, varied significantly (p=0.010) between intervention and control group prior to the intervention implementation, with students in the control group (mean = 2.25) reporting on average eating vegetables more often than students in the intervention group (mean = 1.97)

Table 17. Comparison of Control and Intervention Groups' Food Frequency Behavior at Pre Intervention

Questionnaire Item	Control Mean ± SD	Intervention Mean ± SD	*P*- Value[c]
I ate French fries or chips yesterday.[a]	N=163 3.42 ± 0.71	N=159 3.42 ± 0.84	0.925
I ate vegetables yesterday.[a]	N=162 2.25 ± 1.05	N=158 1.97 ± 0.91	0.010[b]
I ate beans yesterday.[a]	N=162 1.29 ± 0.68	N=159 1.29 ± 0.68	0.180
I ate fruit yesterday.[a]	N=163 2.26 ± 1.01	N=159 2.07 ± 0.95	0.087
I ate sweets yesterday.[b]	N=163 1.84 ± 1.00	N=159 1.64 ± 0.93	0.059

[a] 4 point Likert scale was used with the 4=most healthy response and 1=least healthy response
[b] 4 point Likert scale was used with 1=most healthy response and 4=least healthy response as analyzed by one-way ANOVA
[c] Mean difference significant at $p < 0.05$

A paired t-test was conducted to identify change in behavior within the intervention group between pre and post testing. Results are summarized in Table 18. The students' self-reported significant mean behavior change from pre to post-intervention in three categories. Students on average reported an increased consumption of vegetables (p=0.043), an increased consumption of beans (p=0.010), and consumption of fewer sweets (p=0.008).

Table 18. Evaluation of Intervention Group Food Frequency Behavior

Questionnaire Item	Pre Mean ± SD	Post Mean ± SD	*P*- Value[c]
I ate French fries or chips yesterday.[a]	N=116 3.47 ± 0.77	N=116 3.56 ± 0.66	0.283
I ate vegetables yesterday.[a]	N=115 2.00 ± 0.94	N=115 2.22 ± 1.06	0.043[b]
I ate beans yesterday.[a]	N=116 1.09 ± 0.32	N=116 1.28 ± 0.77	0.010[b]
I ate fruit yesterday.[a]	N=116 2.02 ± 0.91	N=116 2.16 ± 1.01	0.165
I ate sweets yesterday.[b]	N=116 1.59 ± 0.91	N=116 1.35 ± 0.68	0.008[b]

[a] 4 point Likert scale was used with the 4=most healthy response and 1=least healthy response
[b] 4 point Likert scale was used with 1=most healthy response and 4=least healthy response as analyzed by paired t-test
[c] Mean difference significant at $p < 0.05$

There were two statistically different responses at post between the intervention and control groups, illustrated in Table 19. At post more control students self-reported consuming greater amounts of fruit (p=0.014). In contrast, intervention students self-reported consuming fewer sweets (p<0.001).

Table 19. Comparison of Control and Intervention Groups' Food Frequency Behavior at Post Intervention

Questionnaire Item	Control Mean ± SD[a]	Intervention Mean ± SD[a]	*P*- Value[c]
I ate French fries or chips yesterday. [a]	N=128 3.57 ± 0.64	N=117 3.56 ± 0.66	0.941
I ate vegetables yesterday.[a]	N=128 2.23 ± 1.02	N=117 2.22 ± 1.06	0.974
I ate beans yesterday.[a]	N=127 1.31 ± 071	N=117 1.28 ± 0.77	0.794
I ate fruit yesterday.[a]	N=128 2.51 ± 1.10	N=117 2.17 ± 1.01	0.014[b]
I ate sweets yesterday.[b]	N=128 1.72 ± 0.90	N=117 1.35 ± 0.68	0.000[b]

[a] 4 point Likert scale was used with the 4=most healthy response and 1=least healthy response
[b] 4 point Likert scale was used with 1=most healthy response and 4=least healthy response as analyzed by one-way ANOVA.
[c] Mean difference significant at $p < 0.05$

Physical Fitness Measures

Physical fitness measures of trunk and upper-body strength (curl-up and flexed arm hang), flexibility (sit and reach) and cardio-endurance (PACER) were analyzed through chi-square goodness-of-fit to determine changes in the proportion of students meeting Healthy Fitness Zone (HFZ) criteria (Meredith & Welk, 2005). Table 20 illustrates the assessment between control and intervention groups at pre intervention of students falling below, within and above the HFZ for each of the physical fitness measures. There was one significant difference between groups at pre intervention, that being a greater proportion of intervention students (28.2%) performed above the HFZ and a smaller proportion of intervention students (37.3%) performed below the HFZ in the flexed arm hang (p=0.007) in comparison to control students (18.0%) above and (49.5%) below the HFZ. Therefore, a larger proportion of intervention students demonstrated greater upper body strength compared to students in the control group at pre test.

Table 20. Comparison of Control and Intervention Students in the Healthy Fitness Zone for Four Measures of Fitness at Pre Intervention

Fitness Test	Control %	Intervention %	P-value
Curl-Up	**N=120**	**N=108**	
Below	20.8	17.6	0.711
Within	34.2	35.2	
Above	45.0	47.2	
Flexed Arm Hang	**N=111**	**N=110**	
Below	49.5	37.3	
Within	32.4	34.5	0.007*
Above	18.0	28.2	
Sit and Reach	**N=121**	**N=95**	
Below	43.8	41.1	
Within	50.4	54.7	0.627
Above	5.8	4.2	
PACER	**N=50**	**N=43**	
Below	42.0	41.9	
Within	50.0	58.1	0.618
Above	8.0	0.0	

* Chi-square goodness-of-fit indicates significant difference between intervention and control students meeting HFZ criteria, $p<0.05$

Between pre and post testing, a chi-square goodness-of-fit analysis revealed there was a significant difference between two physical fitness measures within the intervention group. Results are illustrated in Table 21. A smaller proportion of intervention students performed within HFZ at post in comparison to pre (41.2% and 54.7%, respectively) in the sit and reach test ($p=0.008$). While there were a greater proportion of students performing below the HFZ at post compared to pre (49.4% and 41.1%, respectively), there was a significant increase in students performing above the HFZ at post compared to pre (9.4% and 4.2%, respectively). Also, there was a positive shift in the proportion of students performing within (67.3%) and above (10.2%) the HFZ in the PACER cardio endurance test ($p<0.001$) a post than students within (58.1%) and above (0.0%) at pre.

Table 21. Comparison of Intervention Students in the Healthy Fitness Zone for Four Measures of Physical Fitness

Fitness Test	Pre %	Post %	P-value
Curl-Up	**N=108**	**N=115**	
Below	17.6	13.0	0.166
Within	35.2	31.3	
Above	47.2	55.7	
Flexed Arm Hang	**N=110**	**N=115**	
Below	37.3	42.6	
Within	34.5	29.6	0.430
Above	28.2	27.8	
Sit and Reach	**N=95**	**N=85**	
Below	41.1	49.4	
Within	54.7	41.2	0.008*
Above	4.2	9.4	
PACER	**N=43**	**N=49**	
Below	41.9	22.4	
Within	58.1	67.3	0.000*
Above	0.0	10.2	

* Chi-square goodness-of-fit indicates significant difference between intervention and control students meeting HFZ criteria, $p<0.05$

Results from a chi-square goodness-of-fit analysis indicate that there was one significant difference between students in the control and intervention groups at post. Results are shown in Table 22. A greater proportion of control students were within the HFZ versus intervention students (52.2% and 41.2%, respectively) in the sit and reach test ($p=0.042$) at post.

Table 22. Comparison of Control and Intervention Students in the Healthy Fitness Zone for Four Measures of Fitness at Post Intervention

Fitness Test	Control %	Intervention %	P-value
Curl-Up	**N=125**	**N=115**	
Below	13.6	13.0	0.181
Within	24.0	31.3	
Above	62.4	55.7	
Flexed Arm Hang	**N=125**	**N=115**	
Below	40.8	42.6	
Within	33.6	29.5	0.647
Above	25.6	27.8	
Sit and Reach	**N=113**	**N=85**	
Below	36.3	49.4	
Within	52.2	41.2	0.042*
Above	11.5	9.4	
PACER	**N=63**	**N=49**	
Below	36.5	22.5	
Within	55.6	67.3	0.123
Above	7.9	10.2	

* Chi-square goodness-of-fit indicates significant difference between intervention and control students meeting HFZ criteria, $p<0.05$

Standardized Reading and Math Test Scores

Standardized test scores for reading and math were analyzed using one-way ANOVA to evaluate differences between intervention and control groups. Third, fourth, and fifth grade students were evaluated separately. Findings are presented in Table 23. There were no statistically significant differences between intervention and non-intervention cohorts in relation to test scores.

Table 23. Comparison Between Intervention and Control Groups of 3rd, 4th and 5th Grade Students' Standardized Math and Reading Test Scores

	Math Scores			Reading Scores		
Grade Level	**Intervention Group Mean ± SD**	**Control Group Mean ± SD**	**P-Value [a]**	**Intervention Group Mean ± SD**	**Control Group Mean ± SD**	**P-Value [a]**
3rd grade	(N=49) 723.45 ± 82.65	(N=49) 752.94 ± 120.85	0.162	(N=49) 738.80 ± 90.32	(N=49) 738.80 ± 127.82	0.907
4th grade	(N=50) 699.32 ± 134.91	(N=45) 707.08 ± 129.25	0.750	(N=50) 700.08 ± 129.25	(N=45) 702.20 ± 112.74	0.933
5th grade	(N=44) 707.20 ± 141.50	(N=40) 746.60 ± 106.65	0.157	(N=44) 722.07 ± 135.87	(N=41) 736.27 ± 92.90	0.578

[a] Mean difference significant at $P < 0.05$, One-way ANOVA analysis of standardized test scores

CHAPTER V

DISCUSSION, SUMMARY, CONCLUSION

Discussion

The purpose of this study was to evaluate *CATCH Kids Club* after school program's effectiveness in eliciting improved nutrition and physical activity behavior change among third, fourth, and fifth grade students enrolled in Lawton Public Schools during the 2009-2010 school year. *CATCH Kids Club* is based on the SCT and the curriculum aimed to increase self-efficacy, intent, outcome expectancies, and improve nutrition behavior among students. This particular curriculum focused on fruit and vegetable consumption, low-fat/fat-free milk selection, increasing fiber intake, and understanding the USDA MyPyramid and increasing physical activity. Based on research indicating physical activity enhances academic performance (Fox et al., 2010; Chomitz et al., 2009) the study also evaluated differences in standardized reading and math scores between students who participated in the *CATCH Kids Club* program and students enrolled in school sites that did not have the after-school program. Improving nutrition knowledge and dietary and physical activity habits among students can develop behaviors that will benefit their current health and maintain health in the future.

Demographic Characteristics

Students in the control and intervention groups were similar in terms of demographic characteristics with the majority being white. In addition, all students were enrolled in low-income school sites, with the exception of one site that did not meet Oklahoma State Department of Education's definition for low-income school site (Oklahoma Department of Education, 2010).

As such, racial and socio-economic status were unlikely to confound the results of the study and may help to explain the limited differences between students at pre-intervention.

Pre-Intervention Similarities and Differences Between Groups

Prior to intervention, both intervention and control groups were similar in terms of nutrition attributes and physical fitness. However, there were few significant variations among nutrition questionnaire items and physical fitness variables that should be noted, including nutrition questionnaire items regarding knowledge, attitude, and self-reported behaviors, and upper-body strength.

While there was a statistically significant distribution of responses between groups for two nutrition knowledge items, a closer look reveals there were similarities between the groups that should be noted. For example, approximately two-thirds of students in both groups were knowledgeable of which food group they should consume the least amount of each day, that being fats, oil, and sweets, indicating students in both groups had similar knowledge for this item. The significant variation was observed in the difference in the proportion of control students (13.5%) who reported "I don't know" from "which food group to eat the least" compared to 8.2% students in the intervention group. The second knowledge item with significant difference in the distribution of responses was the servings of fruits and vegetables that should be consumed everyday. A closer look shows the proportion of students in the control and intervention groups (25.8% and 25.5% respectively) correctly answering "at least 5 serving" was similar. In addition, the largest proportion of students within each group (41.7% and 35.7%) incorrectly answered "at least 2 servings." This lack of knowledge about the recommended servings of fruits and vegetables to eat each day is reflective of the low consumption of fruits and vegetables among Oklahomans (BRFSS, 2009) and supports the need for nutrition education and environmental approaches that encourage consumption of these nutrient-dense foods.

Nutrition attitude is another variable in which there was a significant difference in the proportion of responses between groups, but closer inspection reveals an important similarity. Students in both groups had similar attitudes about the healthfulness of the foods they chose to eat and drink. The greatest proportion of students within each group reported the foods they ate and drank were "healthy sometimes." The variation in the proportion of responses of students between groups were at the extreme ends; that is thinking they always ate and drank healthy foods and never eating or drinking healthy foods. This finding that students think most of the foods they eat and drink are healthful may be due to the fact that most students in both the control and intervention groups demonstrated inaccurate knowledge regarding the food group from which they should eat most and incorrectly answering that only 2 serving of fruits and vegetables should be eaten daily. For this attitude to be changed it is imperative that students have accurate nutrition knowledge.

Within the food frequency behavior questionnaire item, at pre-intervention students self-reported consuming each type of food item with similar frequency. The exception was the frequency of eating vegetables, with students in the control group self-reporting more frequent consumption of vegetables in comparison to students in the intervention group. The food item consumed most frequently by students in both groups was French fries or chips followed by sweets. This finding supports the fact the students in both groups had inaccurate attitudes regarding the healthfulness of the food items they eat each day. In addition, students in both groups reflected similarly low levels of intent to select healthful foods and similarly moderate levels of self-efficacy to select healthful foods. In contrast, responses of students in both groups were similarly moderately high for behavioral capability for selecting healthful foods.

Regarding physical fitness, there was only one significant difference between groups. More intervention students performed above the healthy fitness zone on the flexed arm hang

assessment versus control students. Otherwise, students in both groups demonstrated similar levels of fitness for trunk strength, flexibility and cardio endurance.

These findings provide evidence that students in both the intervention and control groups were fairly similar in terms of nutrition attributes and physical fitness coming into the study with a few exceptions. As such the conclusion is to reject six of ten of null hypotheses stating there would be differences between students in the control and intervention groups prior to intervention.

$H_{0\text{-}1}$: At pre-intervention there will be differences in the nutrition knowledge between students participating in *CATCH Kids Club* and students not participating in after-school programs. Significant differences were observed with the food group that should be consumed the least each day ($p<0.001$) and the number of fruit and vegetable servings that should be consumed each day ($p<0.001$). Therefore, fail to reject null hypothesis one.

$H_{0\text{-}4}$: At pre-intervention there will be differences in the nutrition attitudes between students participating in *CATCH Kids Club* and students not participating in after-school programs. There was one significant difference observed with the question regarding attitude that the foods one is consuming are healthy ($p=0.001$). Therefore, fail to reject null hypothesis four.

$H_{0\text{-}7}$: At pre-intervention there will be differences in the intent to choose healthful foods between students participating in *CATCH Kids Club* and students not participating in after-school programs. There was no significant difference observed regarding intent to choose healthful foods. Therefore, reject null hypothesis seven.

$H_{0\text{-}10}$: At pre-intervention there will be differences in the nutrition self- efficacy between students participating in *CATCH Kids Club* and students not participating in after-school programs. There was no significant difference observed regarding self-efficacy. Therefore, reject null hypothesis ten.

$H_{0\text{-}13}$: At pre-intervention there will be differences in the nutrition behavioral capability between students participating in *CATCH Kids Club* and students not participating in after-school programs. There was no significant difference observed regarding nutrition behavioral capability. Therefore, reject null hypothesis thirteen.

$H_{0\text{-}16}$: At pre-intervention there will be differences in the nutrition behaviors between students participating in *CATCH Kids Club* and students not participating in after-school programs. There was one significant difference observed regarding nutrition behavior consumption of vegetables ($p=0.010$). Therefore, fail to reject null hypothesis sixteen.

$H_{0\text{-}19}$: At pre-intervention there will be differences in trunk strength between students participating in *CATCH Kids Club* and those not participating in after-school programs. There was no significant difference observed regarding trunk strength. Therefore, reject null hypothesis nineteen.

$H_{0\text{-}22}$: At pre-intervention there will be differences in upper-body strength between students participating in *CATCH Kids Club* and those not participating in after-school programs. There

was a significant difference observed in upper-body strength (p=0.007). Therefore, fail to reject null hypothesis twenty-two.

$H_{0\text{-}25}$: At pre-intervention there will be differences in flexibility between students participating in *CATCH Kids Club* and those not participating in after-school programs. There was no significant difference observed in flexibility. Therefore, reject null hypothesis twenty-five.

$H_{0\text{-}28}$: At pre-intervention there will be differences in cardio endurance between students participating in *CATCH Kids Club* and those not participating in after-school programs. There was no significant difference observed in cardio endurance. Therefore, reject null hypothesis twenty-eight.

Post-Intervention Similarities and Differences Between Groups

As expected, at post intervention there were significant differences between both groups in the areas of knowledge, attitude, behavioral capability, nutrition behavior, and physical fitness measure of flexibility. The first significant difference was the distribution of responses related to the number of servings of fruits and vegetables that should be eaten each day. While the proportion of students in both groups who correctly answered "at least 5 servings" increased, the percent increase for students in the intervention group was 106% compared to a 24% increase in students in the control group. There was also a significant difference in the proportion of responses between groups regarding the food group that should be consumed the most each day. However, only a small proportion of both control or intervention students reported the correct answer of breads, cereals, rice, and pasta. Further, there was little change from pre to post for both groups. A larger percentage of students in the intervention group compared to students in the

control group incorrectly reported meats, fish, poultry, beans, eggs and nuts group and the vegetable group. This might be explained by the fact that the nutrition lessons were designed to emphasize high fiber foods such as beans and vegetables. It should also be noted that while the distribution of responses between students in both groups was similar for the food group to eat the least of every day, the proportion of students within each group indentifying "fats, oils and sweets" as the correct answer increased from pre to post intervention to 78.1% for students in the control group and 73.3% for students in the intervention group. This improved knowledge regarding fruits and vegetables may help to explain the unexpected finding in attitudes. While there was a significant difference in the proportion of responses, a smaller proportion of students in the intervention group believed that the foods they were currently consuming were healthy in comparison to students in the control group. The observed shift in responses for the intervention group was toward "no" indicating a belief that the foods they chose to eat and drink are not healthy. While this may seem concerning, it may reflect that students in the intervention group were more aware of their unhealthful choices due to an improvement in knowledge. As such this is encouraging in that knowledge is essential for behavior change to occur.

At post-intervention students in the control group had a greater mean behavioral capability score compared to intervention students. Also, there were two significant differences among nutrition behaviors. Control students self-reported more frequently consuming fruit compared to students in the intervention group, while intervention students reported consuming fewer sweets. The significant difference in consumption of fruit by students in the control groups may be explained by the fact that 10 of the 13 control schools participated in various nutrition programs. These programs included Oklahoma Cooperative Extension Service's Community Nutrition Education Program (CNEP) which offers classroom based lessons on selecting healthy foods and food safety. Aside from CNEP other schools conducted teacher presented nutrition lessons within the classroom, health fairs, and had community and school based nutrition

specialists' presentations. One other unique program within one school is a fruit bar they offer in the cafeteria with lessons encouraging fruit and vegetable uptake. Specifically, this may have impacted students in the control group self-reporting more frequent consumption of fruits. Lower self-reported frequency of consuming of sweets by students in the intervention group is consistent with their demonstrated knowledge of the recommendation to eat fewer fats, oils and sweets.

Regarding physical fitness, a greater proportion of control students were able to perform within the healthy fitness zone on the sit and reach assessment in comparison students in the intervention group. While there were not significant differences in the mean score of students falling within and above the HFZ for each of the other physical fitness measures, there were positive trends for students within each group indicating there was some improvement in fitness levels.

These findings support five of ten null hypotheses regarding nutrition attributes and physical fitness stating there will no differences between students in the control and intervention groups at post intervention.

$H_{0\text{-}2}$: At post-intervention there will be no difference in nutrition knowledge between students participating in *CATCH Kids Club* and students not participating in after-school programs. There were two significant differences observed for the food group that should be consumed the most each day ($p<0.001$) and the number of fruit and vegetable servings that should be consumed each day ($p<0.001$). Therefore, reject null hypothesis two.

$H_{0\text{-}5}$: At post-intervention there will be no difference in nutrition attitudes between students participating in *CATCH Kids Club* and students not participating in after-school programs. There

was one significant difference observed with the question regarding attitude that the foods one is consuming are healthy (p=0.035). Therefore, reject null hypothesis five.

$H_{0\text{-}8}$: At post-intervention there will be no difference in intent to choose healthful foods between students participating in *CATCH Kids Club* and students not participating in after-school programs. There was no significant difference observed regarding intent to choose healthful foods. Therefore, fail to reject null hypothesis eight.

$H_{0\text{-}11}$: At post-intervention there will be no difference in nutrition self-efficacy between students participating in *CATCH Kids Club* and students not participating in after-school programs. There was no significant difference observed regarding self-efficacy. Therefore, fail to reject null hypothesis eleven.

$H_{0\text{-}14}$: At post-intervention there will be no difference in nutrition behavioral capability between students participating in *CATCH Kids Club* and students not participating in after-school programs. There was a significant difference observed with regard to mean behavioral capability score (p=0.021). Therefore, reject null hypothesis fourteen.

$H_{0\text{-}17}$: At post intervention there will be no difference in nutrition behaviors between students participating in *CATCH Kids Club* and students not participating in after-school programs. There were two significant differences observed regarding nutrition behavior consumption of fruit (p=0.014) and consumption of sweets (p<0.001). Therefore, reject null hypothesis seventeen.

$H_{0\text{-}20}$: At post-intervention there will be no difference in trunk strength among students participating in *CATCH Kids Club* and students not participating in after-school programs. There was no significant difference observed regarding trunk strength. Therefore, fail to reject null hypothesis twenty.

$H_{0\text{-}23}$: At post-intervention there will be no difference in upper-body strength among students participating in *CATCH Kids Club* and students not participating in after-school programs. There was no significant difference observed in upper-body strength. Therefore, fail to reject null hypothesis twenty-three.

$H_{0\text{-}26}$: At post-intervention there will be no difference in flexibility among students participating in *CATCH Kids Club* and students not participating in after-school programs. There was a significant difference observed in flexibility ($p=0.042$). Therefore, reject null hypothesis twenty-six.

$H_{0\text{-}29}$: At post-intervention there will be no difference in cardio endurance among students participating in *CATCH Kids Club* and students not participating in after-school programs. There was no significant difference observed in cardio endurance. Therefore, fail to reject null hypothesis twenty-nine.

Changes Within Students the Intervention Group

Students that participated in the *CATCH Kids Club* program reported some statistically significant changes from pre to post intervention. The SCT can facilitate a greater understanding of the applied nutrition curriculum. Figure 1 illustrates the triad relationship between the three factors for intervention students. Intervention students reported a greater understanding of the recommended amount of fruit and vegetable servings per day at post, demonstrating increased knowledge. Knowledge is a key component to behavioral change (Contento, 2007). Intervention students indicated their knowledge had increased from pre to post, which was also reflected in behavior change as reported consuming more vegetables at post. Students also stated significant changes for two other behaviors; increasing bean consumption and decreasing consumption of sweets. Improved knowledge is also demonstrated in students' attitude. At post intervention there was a shift in the proportion of students that believed the foods they were currently consuming were healthy. Of interest is a greater proportion of students at post who felt that the foods they were currently consuming were not healthy compared to pre-intervention responses. This might be explained by the fact that students are more aware of foods that were healthy, and therefore had a greater understanding that the foods they were consuming were not healthy. Another key aspect of SCT is self-efficacy which is crucial in the "initiation, modification, and maintenance of complex behaviors such as healthful eating" (Contento, 2007; pg. 118). While there was no significant improvement in self-efficacy of students in the intervention group, their mean pre intervention scores were moderate. The improved knowledge and moderate level of self-efficacy may explain the significantly improved intent to choose healthful foods, if available. These changes in cognitive factors help to explain the self-reported changes in behaviors. Intervention students reported consuming vegetables and beans more frequently and sweets less frequently at post compared to pre. While the changes among intervention students are few, a platform is being laid to help aid students develop healthy nutrition habits for the future.

Along with significant nutrition changes, the intervention provided a change in the after school environment providing increased opportunity for students to be moderately to vigorously active on a daily basis. As such students exhibited an important and significant improvement in one measure of physical fitness, that being cardio endurance. Improved aerobic capacity is especially noteworthy because it is the most important part of any fitness routine (Meredith & Welk, 2007). Cardio respiratory activity is associated with numerous health benefits including decreased risk of cardiovascular disease, coronary artery disease, hypertension, diabetes, obesity, and some forms of cancer (Surgeon General, CDC, 1996).

CATCH Kids Club provided the nutrition education that positively influenced the cognitive factors of knowledge and intent of the students. Also, the after-school program provided an environment in which students could participate in regular physical activity and try healthy snacks which may explain the behavior changes observed among intervention students.

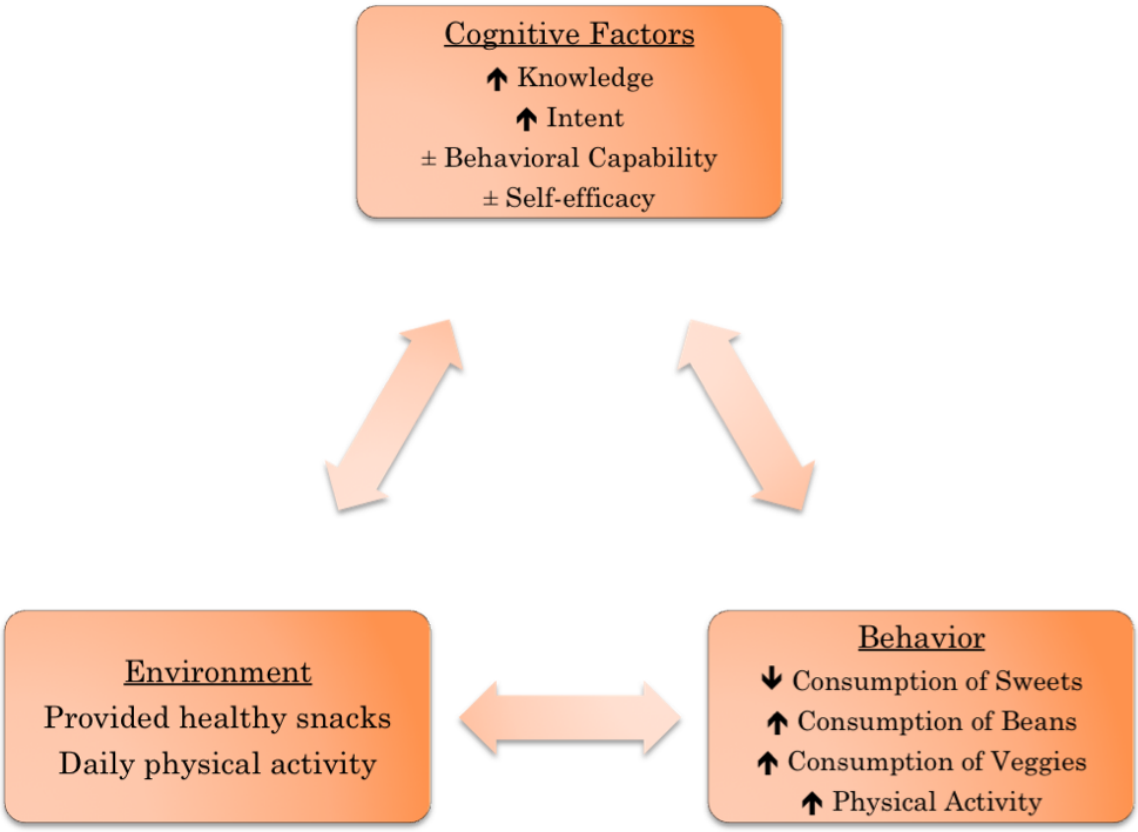

Figure 1: SCT Triad for Intervention Students

The findings related to changes in students in the intervention group support a conclusion to reject the null hypotheses for four of the six nutrition variables and two of the four physical fitness variables. As such, the CATCH Kids Club proved effective in positively impacting students nutrition attributes and physical fitness measures.

$H_{0\text{-}3}$: From pre to post-intervention there will be no difference in nutrition knowledge among students participating in *CATCH Kids Club*. There were two significant differences observed for the food group that should be consumed the most each day ($p=0.006$) and the number of fruit and vegetable servings that should be consumed each day ($p<0.001$). Therefore, reject null hypothesis three.

$H_{0\text{-}6}$: From pre to post-intervention there will be no difference in nutrition attitudes among students participating in *CATCH Kids Club* after-school program. There was one significant difference observed with the question regarding attitude that the foods one is consuming are healthy (p=0.015). Therefore, reject null hypothesis six.

$H_{0\text{-}9}$: From pre to post-intervention there will be no difference in intent to choose healthful foods among students participating in *CATCH Kids Club*. There was a significant difference observed regarding the intent to choose healthful foods (p-0.002). Therefore, reject null hypothesis nine.

$H_{0\text{-}12}$: From pre to post-intervention there will be no difference in nutrition self-efficacy among students participating in *CATCH Kids Club*. There was no significant difference observed regarding self-efficacy. Therefore, fail to reject null hypothesis twelve.

$H_{0\text{-}15}$: From pre to post-intervention there will be no difference in nutrition behavioral capability among students participating in *CATCH Kids Club* after-school program. There was no significant difference observed regarding nutrition behavioral capability. Therefore, fail to reject null hypothesis fifteen.

$H_{0\text{-}18}$: From pre to post-intervention there will be no difference in nutrition behaviors among students participating in *CATCH Kids Club* after-school program. There were three significant differences observed regarding nutrition behavior consumption of vegetables (0.043),

consumption of beans (0.010), and consumption of sweets (0.008). Therefore, reject null hypothesis eighteen.

$H_{0\text{-}21}$: From pre to post-intervention there will be no difference in trunk strength among students participating in *CATCH Kids Club*. There was no significant difference observed regarding trunk strength. Therefore, fail to reject null hypothesis twenty-one.

$H_{0\text{-}24}$: From pre to post-intervention there will be no difference in upper- body strength among students participating in *CATCH Kids Club*. There was no significant difference observed in upper-body strength. Therefore, fail to reject null hypothesis twenty-four.

$H_{0\text{-}27}$: From pre to post-intervention there will be no difference in flexibility among students participating in *CATCH Kids Club*. There was a significant difference observed in flexibility ($p=0.008$). Therefore, reject null hypothesis twenty-seven.

$H_{0\text{-}30}$: From pre to post-intervention there will be no difference in cardio endurance among students participating in *CATCH Kids Club*. There was a significant difference observed in cardio endurance ($p<0.001$). Therefore, reject null hypothesis thirty.

Academic Performance

Another finding of this study was that there was no difference in standardized test scores between control and intervention students. Intervention students participating in regular physical activity did not perform better on the Oklahoma Core Curriculum standardized test. However, this was just the finding after one year of intervention evaluation, given more time, the intervention might exhibit a greater effect on academic achievement among intervention students. A physical education program was in place for 17 years in schools in Naperville, Illinois before it was evaluated, and there was a significant correlation between academic achievement and participation in the physical education program (Ratey & Hagerman, 2008). In conclusion the finding supports the null hypothesis related to academic performance.

$H_{0\text{-}31}$: There will be no difference in standardized test scores between students participating in *CATCH Kids Club* after-school programs and students not participating in *CATCH Kids Club.* There was no significant difference observed between standardized test scores. Therefore, fail to reject null hypothesis thirty-one.

The current study yielded similar results as the pilot study conducted by Kelder et al. (2004). Intervention students in the pilot study had increased time walking and decreased time standing (Kelder et al., 2004), while intervention students of the current study demonstrated a significant increase in cardio endurance. This can be explained by the fact that the *CATCH Kids Club* program is designed to increase the amount of time students spend in moderate to vigorous levels of structured activity after school.

There were also similar findings between studies regarding nutrition. In both studies students in the intervention groups demonstrated improved knowledge in the number of servings of fruits and vegetables that should be consumed each day compared to reference/control students (Kelder et al., 2004). Also, in both studies intervention students self-reported consuming vegetables more frequently in comparison to reference/control students at post (Kelder et al., 2004). While there were similarities in the findings of the two studies, there were a few differences. Unlike Kelder's study, students in the current study demonstrated a change in attitude regarding the healthfulness of the foods they were eating, improvement in the intent to select the more healthful food options, more frequent consumption beans and less frequent consumption of sweets. While further investigation is needed, these differences may be explained by differences in the delivery of the nutrition lessons and/or availability of foods in the students' environments. However, it can be concluded that both the pilot and current study have provided evidence that *CATCH Kids Club* is effective in improving nutrition and physical activity behaviors among students participating in the program.

Summary

At pre-intervention students in both the intervention and control groups were similar in that they had accurate knowledge that fats, oils and sweets should be consumed least often, but this accurate knowledge was not reflected in the reported frequency for consuming French fries and sweets. This may suggest that students had low self-efficacy in their ability to not select these foods or that they may be exposed to environments in which high fat and sweet foods are the only option. Also, it might suggest a disconnect between knowledge and behavior.

From pre to post-intervention students in the intervention group demonstrated improved nutrition knowledge regarding the amount of fruit to each day, and a larger percentage of students recognized the need to eat limited amounts of fats, oils and sweets. This change in knowledge

may explain why after participating in the *CATCH Kids Club* more students in the intervention group felt the foods they chose to eat were not healthful compared to the percentage of students in the control group.

Another finding of interest is that at post-intervention more students in the control group reported increased behavioral capability and eating fruit on a more frequent basis compared to students in the intervention group. This may be the result of a control school site implementing the fresh fruit and vegetable project. If so, it is in keeping with the SCT that suggests that changes in the environment can result in a reciprocal change in behaviors and demands further investigation into the benefits of interventions aimed at changing the environment in which students make food choices. Finally, the SCT is useful in explaining positive changes within students in the intervention group over the course of the project.

Limitations

There are a few limitations to this study. First, all the data on the questionnaire was self-reported, lending itself toward bias. Students may have reported changed behavior, attitude, intent, or self-efficacy because they knew it was the more healthful response rather than recording their actual behavior or basing responses on their actual attitude, intent or self-efficacy. Second, the questionnaire administered to students was lengthy with 58 total items. Therefore, students may have experienced questionnaire fatigue and just bubbled a response without really considering the proper response for the item. Next, the fitnessgram tests were conducted with the equipment available within the schools; equipment was not the same in all schools. Because equipment between schools varied and may not have been calibrated properly, physical fitness results might have been inaccurate. Also, a variable that could not be controlled was nutrition education programming presented to control students. Control students from 10 of the 13 schools were exposed to nutrition education, which may have resulted fewer significant changes between

the study groups at post intervention. Finally, the program was conducted by teachers or after school volunteers, not professionals. While the teachers and volunteers were educated on how to conduct fitnessgram tests, there may have been variations in the way the assessments were conducted based on what the teachers and volunteers understood from their training sessions and level of motivation.

Conclusion

After participating in the *CATCH Kids Club* after-school program students self-reported some positive, significant changes in nutrition cognitive factors and nutrition behaviors. In addition, exposure to daily structured physical activity improved students' cardio endurance. Therefore, the findings of this study indicate nutrition education programming and exposure to daily structured physical activity in after-school settings results in improved nutrition behaviors and level of cardio endurance fitness.

Recommendations for Future Research

In future studies analyzing report cards at various intervals during the intervention might be a better indicator of the impact physical fitness has on academic outcomes rather than utilizing one test score from an isolated day. Also, providing more extensive training for after school program administrators so that fitnessgram measurements, and program implementation can be a controlled as much as possible, limiting chance for error and variations between schools. Finally, administer a revised questionnaire at pre and post that is shorter than the 58-item one administered in this study, and specifically clarify nutrition knowledge questions.

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APPPENDICES

APPENDIX A

Oklahoma State University Institutional Review Board Approval

Oklahoma State University Institutional Review Board

Request for Determination of Non-Human Subject or Non-Research

B. Does the study involve intervention or interaction with a "human subject"?
☐ No ☐ Yes

C. Does the study involve access to identifiable private information?
☐ No ☐ Yes

D. Are data/specimens received by the Investigator with identifiable private information?
☐ No ☐ Yes

E. Are the data/specimen(s) coded such that a link exists that could allow the data/specimen(s) to be re-identified?
☐ No ☐ Yes
If "*Yes*," is there a written agreement that prohibits the PI and his/her staff access to the link?
☐ No ☐ Yes

6. Signatures

Signature of PI Katie Rumph **Date** 11·03·09

Signature of Faculty Advisor (If PI is a student) Deana A. Hildebrand **Date** 11·03·09

☒ Based on the information provided, the OSU-Stillwater IRB has determined that this project **does not** qualify as human subject research as defined in 45 CFR 46.102(d) and (f) and **is not subject to oversight by the OSU IRB.**

☐ Based on the information provided, the OSU-Stillwater IRB has determined that this research **does** qualify as human subject research and **submission of an application for review by the IRB is required.**

Dr. Shelia Kennison, IRB Chair — Date 11/17/09

Revision Date: 04/2006 5 of 5

APPENDIX B

Questionnaire

CATCH KIDS CLUB
AFTER-SCHOOL STUDENT QUESTIONNAIRE

The following questions ask about foods and meals you eat, and what you know about nutrition and physical activity. **This is not a test.** We want to learn about what kids your age eat and know about nutrition and about physical activity.

The answers you give will be kept private. No one will ever know what you say unless you tell them. Your name will never be used.

Taking this survey is up to you. Your choice about taking it will not affect how you are treated in this program. You may choose to stop answering questions at any time.

Please be as honest as you can. If you agree to take this survey, please write your name and today's date on the lines below. This page will be separated from the survey when you hand it in. Your name will not be on the survey itself.

Name: _____

Today's Date: _____

CATCH KIDS CLUB
AFTER-SCHOOL STUDENT QUESTIONNAIRE

1. What grade are you in? _____

2. How old are you? _____ years old

3. Are you a boy or a girl?

- ☐ Boy
- ☐ Girl

4. How do you describe yourself?

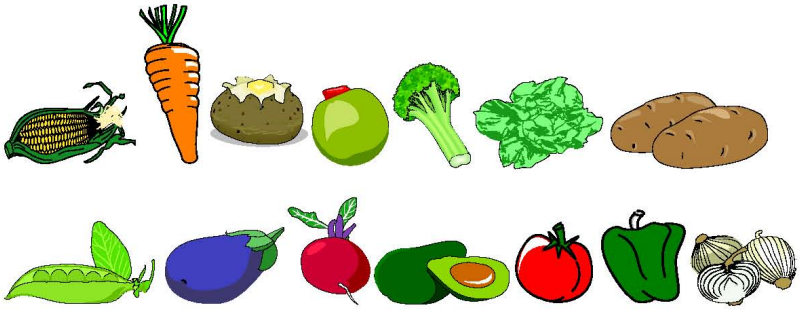
- ☐ WHITE
- ☐ BLACK
- ☐ HISPANIC
- ☐ ASIAN or PACIFIC ISLANDER
- ☐ AMERICAN INDIAN or ALASKAN NATIVE
- ☐ OTHER

INSTRUCTIONS: Please <u>CIRCLE</u> your answer.

5. Yesterday, did you eat French fries or chips?
Chips are potato chips, tortilla chips, cheetos, corn chips, or other snack chips.

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

6. Yesterday, did you eat any vegetables?
***Vegetables* are salads; boiled, baked and mashed potatoes; and all cooked and uncooked vegetables.**
<u>Do not count</u> French fries or chips.

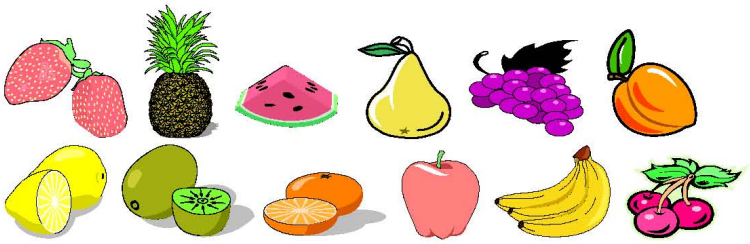


a. No, I didn't eat any vegetables yesterday.
b. Yes, I ate vegetables **1 time** yesterday.
c. Yes, I ate vegetables **2 times** yesterday.
d. Yes, I ate vegetables **3 or more times** yesterday.

7. Yesterday, did you eat beans such as pinto beans, baked beans, kidney beans, refried beans, or pork and beans?
<u>Do not count</u> green beans.

a. No, I didn't eat any beans yesterday.
b. Yes, I ate beans **1 time** yesterday.
c. Yes, I ate beans **2 times** yesterday.
d. Yes, I ate beans **3 or more times** yesterday.

8. Yesterday, did you eat fruit?
<u>Do not count</u> fruit juice.



a. No, I didn't eat any fruit yesterday.
b. Yes, I ate fruit **1 time** yesterday.
c. Yes, I ate fruit **2 times** yesterday.
a. Yes, I ate fruit **3 or more times** yesterday.

9. Yesterday, did you drink fruit juice?
<u>Fruit juice</u> is a drink, which is 100% juice, like orange juice, apple juice, or grape juice.
<u>Do</u> <u>not</u> <u>count</u> punch, kool-aid, sports drinks, and other fruit-flavored drinks.

a. No, I didn't drink any fruit juice yesterday.
b. Yes, I drank fruit juice **1 time** yesterday.
c. Yes, I drank fruit juice **2 times** yesterday.
d. Yes, I drank fruit juice **3 or more times** yesterday.

10. Yesterday, did you eat sweet rolls, doughnuts, cookies, brownies, pies, or cake?

a. No, I didn't eat any of the foods listed above yesterday.
b. Yes, I ate one of these foods **1 time** yesterday.
c. Yes, I ate one of these foods **2 times** yesterday.
d. Yes, I ate one of these foods **3 or more times** yesterday.

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

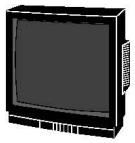
a. YES
b. NO

12. How many TV shows or videos do you watch during the week?

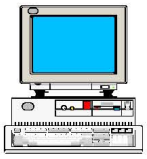
a. I didn't watch TV or videos
b. 1
c. 2
d. 3 or more

13. How many TV shows or videos do you watch during the weekend?

a. I didn't watch TV or videos
b. 1
c. 2
d. 3 or more

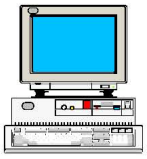


14. During the week, how many hours <u>per day</u> do you <u>usually</u> play video games like Nintendo, Sega, games at the arcade, or use the computer to surf the Internet?



a. I don't play video games or use the computer
b. Less than 1 hour a day
c. 1-2 hours a day
d. 3-4 hours a day
e. More than 4 hours a day

15. During the weekend, how many hours <u>per day</u> do you <u>usually</u> play video games like Nintendo, Sega, games at the arcade, or use the computer to surf the Internet?



a. I don't play video games or use the computer
b. Less than 1 hour a day
c. 1-2 hours a day
d. 3-4 hours a day
e. More than 4 hours a day

16. During the past 12 months, on how many sports teams did you play? Sports teams are baseball teams, soccer teams, swim teams, basketball teams or football teams.

a. 0 teams
b. 1 team
c. 2 teams
d. 3 or more teams

17. Do you ever read the nutrition labels on food packages?

a. Almost always or always
b. Sometimes
c. Almost never or never

18. From which food group should you eat the *most* servings each day? Choose only one group.

a. breads, cereals, rice, pasta
b. dairy products (milk, cheese)
c. fats, oils, sweets
d. fruits
e. meats, fish, poultry, beans, eggs, nuts
f. vegetables
g. don't know

19. From which food group should you eat the *fewest* servings each day? Choose only one group.

a. breads, cereals, rice, pasta
b. dairy products (milk, cheese)
c. fats, oils, sweets
d. fruits
e. meats, fish, poultry, beans, eggs, nuts
f. vegetables
g. don't know

20. How many total servings of fruits and vegetables should you eat each day?

a. At least 2
b. At least 5
c. At least 8
d. At least 10
e. I don't know

21. What you eat can make a difference in your chances of getting heart disease or cancer.

a. YES
b. NO
c. I don't know

22. The foods that I eat and drink now are healthy.

a. Yes, all of the time
b. Yes, sometimes
c. No

23. I like to try new foods.

a. Almost always or always
b. Sometimes
c. Almost never or never

24. Do you ever eat high fiber cereal?

a. Almost always or always
b. Sometimes
c. Almost never or never

25. Do you ever eat whole wheat bread?

a. Almost always or always
b. Sometimes
c. Almost never or never

26. Do you ever drink 100% fruit juice?

a. Almost always or always
b. Sometimes
c. Almost never or never

27. Do you ever eat fruit for lunch?

a. Almost always or always
b. Sometimes
c. Almost never or never

28. Do you ever eat vegetables for dinner?

a. Almost always or always
b. Sometimes
c. Almost never or never

INSTRUCTIONS: Please CIRCLE one of the two foods that you would pick if you had to choose just one.

29. If you were at the movies, which one would you pick?

a. popcorn with butter

b. popcorn without butter

30. Which would you pick to drink?

a. regular milk

b. low fat or skim milk

31. Which food would you eat for a snack?

a. candy bar

b. fresh fruit

32. Which would you do if you were going to eat a piece of chicken?

a. leave on the skin

b. take off the skin and not eat the skin

33. Which food would you ask for?

a. frozen yogurt

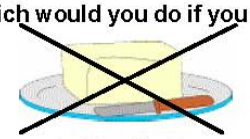
b. ice cream

34. Which would you choose to cook if you were going to help make dinner at home?

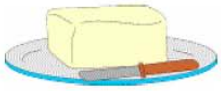
a. French fries

b. baked potato

35. **Which would you do if you were going to eat cooked vegetables?**



a. eat <u>without</u> butter



b. add butter

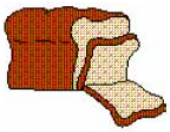
36. **Which would you order if you were going to eat at a fast food restaurant?**

a. a regular hamburger

b. a grilled chicken sandwich

INSTRUCTIONS: Please <u>CIRCLE ONE</u> of the two foods that you think is better for your health.

37.

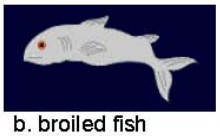


a. whole wheat bread

b. white bread

38.

a. broiled beef



b. broiled fish

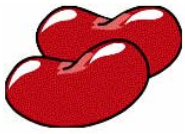
39.

a. cereal

b. eggs and bacon

40.

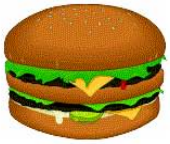
a. beef



b. beans

41.

a. chicken



b. regular hamburger

42.

a. regular milk

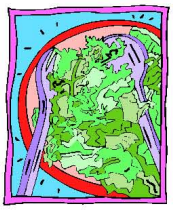
b. low fat or skim milk

43.

a. frozen yogurt

b. ice cream

44.



a. green salad

b. French fries

45.

a. French fries

b. baked potato

46.

a. 100% fruit juice

b. fruit punch

INSTRUCTIONS: The questions in this section ask how sure you are about being able to eat some of the foods below. Please answer by circling either NOT SURE, A LITTLE SURE or VERY SURE for each question.

47. How sure are you that you can drink low fat or skim milk instead of regular white milk?

a. Not sure
b. A little sure
c. Very sure

48. How sure are you that you can eat high fiber cereal instead of a donut?

a. Not sure
b. A little sure
c. Very sure

49. How sure are you that you can eat fresh fruit instead of a candy bar?

a. Not sure
b. A little sure
c. Very sure

50. How sure are you that you can take the skin off of chicken (and not eat the skin)?

a. Not sure
b. A little sure
c. Very sure

51. How sure are you that you can ask for frozen yogurt instead of ice cream?

a. Not sure
b. A little sure
c. Very sure

52. How sure are you that you can eat a baked potato instead of French fries?

a. Not sure
b. A little sure
c. Very sure

53. How sure are you that you can drink fruit juice instead of a soft drink (a soda pop)?

a. Not sure
b. A little sure
c. Very sure

54. How sure are you that you can order a grilled chicken sandwich at a fast food restaurant instead of ordering a hamburger?

a. Not sure
b. A little sure
c. Very sure

INSTRUCTIONS: The questions in this section ask how sure you are about being physically active. Please answer by circling either NOT SURE, A LITTLE SURE or VERY SURE for each question.

55. How sure are you that you can be physically active 3-5 times a week?

a. Not sure
b. A little sure
c. Very sure

56. How sure are you that you can exercise and keep moving for most of the time in your after school program?

a. Not sure
b. A little sure
c. Very sure

57. How sure are you that you can improve your physical fitness by running or biking 3-5 times a week?

a. Not sure
b. A little sure
c. Very sure

58. How sure are you that you can keep up a steady pace without stopping for 15-20 minutes when you are physically active?

a. Not sure
b. A little sure
c. Very sure

Thank you for your help!

Appendix C. Chi-Square Comparison of Intervention and Control Groups' Intent to Choose Healthy Food Items at Pre Intervention

Questionnaire Item	Control %	Intervention %	P-Value
Would you pick buttered or unbuttered popcorn?			
Buttered	68.3	74.2	0.115
Unbuttered	31.7	25.8	
Would you pick regular or low fat/skim milk to drink?			
Regular	60.1	57.5	0.514
Low-fat/Skim	39.9	42.5	
Would you pick a candy bar or apple for a snack?			
Candy bar	36.6	40.5	0.314
Apple	63.4	59.5	
Would you eat with chicken with our without skin?			
With Skin	71.6	70.8	0.821
Without Skin	28.4	29.2	
Would you choose frozen yogurt or ice cream?			
Frozen Yogurt	52.5	42.2	0.011*
Ice Cream	47.5	57.8	
Would you choose French fries or a baked potato?			
French fries	43.8	37.0	0.090
Baked Potato	56.2	63.0	
Would you eat vegetables with or without butter?			
Vegetables with butter	39.8	44.4	0.304
Vegetables without butter	60.2	55.6	
Would you eat a burger or chicken sandwich?			
Burger	50.0	57.2	0.074
Chicken Sandwich	50.0	42.8	

* Chi-square goodness-of-fit indicates significant difference between intervention and control group, $p<0.05$

Appendix D. Chi-Square Comparison of Intervention Group's Intent to Choose Healthy Food Items from Pre to Post Intervention

Questionnaire Item	Pre %	Post %	P-Value
Would you pick buttered or unbuttered popcorn?			
Buttered	74.2	68.7	0.177
Unbuttered	25.8	31.3	
Would you pick regular or low fat/skim milk to drink?			
Regular	57.5	56.9	0.895
Low-fat/Skim	42.5	43.1	
Would you pick a candy bar or apple for a snack?			
Candy bar	40.5	32.8	0.089
Apple	59.5	67.2	
Would you eat with chicken with our without skin?			
With Skin	70.8	63.5	0.084
Without Skin	29.2	36.5	
Would you choose frozen yogurt or ice cream?			
Frozen Yogurt	42.2	38.8	0.000*
Ice Cream	57.8	61.2	
Would you choose French fries or a baked potato?			
French fries	37.0	37.1	0.988
Baked Potato	63.0	62.9	
Would you eat vegetables with or without butter?			
Vegetables with butter	44.4	39.7	0.304
Vegetables without butter	55.6	60.3	
Would you eat a burger or chicken sandwich?			
Burger	57.2	44.0	0.004*
Chicken Sandwich	42.8	56.0	

* Chi-square goodness-of-fit indicates significant difference between intervention and control group, $p<0.05$

APPENDIX E

Appendix E. Chi-Square goodness-of-fit Comparison of Intervention and Control Groups' Intent to Choose Healthy Foods Items at Post Intervention

Questionnaire Item	Control %	Intervention %	P-Value
Would you pick buttered or unbuttered popcorn?			
Buttered	60.2	69.9	0.063
Unbuttered	39.8	31.1	
Would you pick regular or low fat/skim milk to drink?			
Regular	68.5	56.9	0.007*
Low-fat/Skim	31.5	43.1	
Would you pick a candy bar or apple for a snack?			
Candy bar	28.1	32.8	0.264
Apple	71.9	67.2	
Would you eat with chicken with our without skin?			
With Skin	62.5	63.5	0.828
Without Skin	37.5	36.5	
Would you choose frozen yogurt or ice cream?			
Frozen Yogurt	60.2	61.2	0.825
Ice Cream	39.8	38.8	
Would you choose French fries or a baked potato?			
French fries	42.2	37.1	0.263
Baked Potato	57.8	62.9	
Would you eat vegetables with or without butter?			
Vegetables with butter	43.8	39.7	0.373
Vegetables without butter	56.3	60.3	
Would you eat a burger or chicken sandwich?			
Hamburger	46.5	44.0	0.584
Chicken Sandwich	53.5	56.0	

* Chi-square goodness-of-fit indicates significant difference between intervention and control group, $p<0.05$

APPENDIX F

Appendix F. One-way ANOVA Comparison of Intervention and Control Groups' Self-Efficacy at Pre Intervention

Questionnaire Item	Intervention Mean ± SD[a]	Control Mean ± SD[a]	*P*- Value[b]
How sure are you that you can choose skim milk?	2.07 ± 0.874	2.09 ± 0.871	0.887
How sure are you that you can eat high fiber cereal?	2.33 ± 0.820	2.48 ± 0.741	0.098
How sure are you that you can choose fruit?	2.51 ± 0.757	2.64 ± 0.694	0.117
How sure are you that your can eat chicken without skin?	2.02 ± 0.895	2.22 ± 0.871	0.049[b]
How sure are you that you can choose frozen yogurt?	2.51 ± 0.727	2.59 ± 0.728	0.351
How sure are you that you can choose a baked potato?	2.45 ± 0.787	2.45 ± 0.765	0.970
How sure are you that you can choose fruit juice?	2.51 ± 0.753	2.48 ± 0.741	0.737
How sure are you that you can choose a grilled chicken sandwich?	2.24 ± 0.809	2.44 ± 0.811	0.023[b]

[a] 3 point Likert scale was used with the 3=most confident, 2=somewhat confident, 1=least confident

[b] Mean difference significant at $\alpha = 0.05$

APPENDIX G

Appendix G. Paired t-test Comparison of Intervention Group's Self-Efficacy from Pre to Post Intervention

Questionnaire Item	Pre Mean ± SD[a]	Post Mean ± SD[a]	*P*- Value[b]
How sure are you that you can choose skim milk?	2.05 ± 0.882	2.25 ± 0.880	0.044[b]
How sure are you that you can eat high fiber cereal?	2.41 ± 0.784	2.27 ± 0.824	0.131
How sure are you that you can choose fruit?	2.57 ± 0.715	2.47 ± 0.769	0.217
How sure are you that your can eat chicken without skin?	2.08 ± 0.900	2.07 ± 0.885	0.932
How sure are you that you can choose frozen yogurt?	2.45 ± 0.762	2.55 ± 0.750	0.288
How sure are you that you can choose a baked potato?	2.52 ± 0.755	2.52 ± 0.730	1.000
How sure are you that you can choose fruit juice?	2.50 ± 0.763	2.46 ± 0.762	0.691
How sure are you that you can choose a grilled chicken sandwich?	2.30 ± 0.785	2.27 ± 0.856	0.783

[a] 3 point Likert scale was used with the 3=most confident, 2=somewhat confident, 1=least confident

[b] Mean difference significant at $\alpha = 0.05$

Appendix H. One-way ANOVA Comparison of Intervention and Control Groups' Self-Efficacy at Post Intervention

Questionnaire Item	Intervention Mean ± SD[a]	Control Mean ± SD[a]	*P*- Value[b]
How sure are you that you can choose skim milk?	2.22 ± 0.873	1.97 ± 0.869	0.028[b]
How sure are you that you can eat high fiber cereal?	2.26 ± 0.825	2.54 ± 0.734	0.005[b]
How sure are you that you can choose fruit?	2.46 ± 0.773	2.57 ± 0.750	0.246
How sure are you that your can eat chicken without skin?	2.09 ± 0.880	2.17 ± 0.870	0.446
How sure are you that you can choose frozen yogurt?	2.53 ± 0.751	2.39 ± 0.847	0.201
How sure are you that you can choose a baked potato?	2.50 ± 0.742	2.55 ± 0.719	0.586
How sure are you that you can choose fruit juice?	2.45 ± 0.773	2.55 ± 0.685	0.255
How sure are you that you can choose a grilled chicken sandwich?	2.26 ± 0.856	2.32 ± 0.844	0.557

[a] 3 point Likert scale was used with the 3=most confident, 2=somewhat confident, 1=least confident
[b] Mean difference significant at $\alpha = 0.05$

APPENDIX I

Appendix I. Chi-Square goodness-of-fit Comparison of Intervention and Control Groups' Behavioral Capabilities at Pre Intervention

Questionnaire Item	Control %	Intervention %	*P*- Value[b]
Which is better white or wheat bread?			
White Bread	20.9	24.2	0.318
Wheat Bread	79.1	75.8	
Which is better broiled beef or broiled fish?			
Broiled Beef	53.1	43.8	0.021*
Broiled Fish	46.9	56.2	
Which is better cereal or eggs and bacon?			
Cereal	47.9	49.7	0.661
Eggs and Bacon	52.1	50.3	
Which is better beef or beans?			
Beef	43.6	41.8	0.659
Beans	56.4	58.2	
Which is better chicken or a regular hamburger?			
Chicken	79.5	80.9	0.664
Regular Hamburger	20.5	19.1	
Which is better regular or low-fat/skim milk?			
Regular Milk	41.4	34.0	0.063
Low-fat/Skim Milk	58.6	66.0	
Which is better ice cream or frozen yogurt?			
Ice Cream	17.3	22.4	0.099
Frozen Yogurt	82.7	77.6	
Which is better green salad or French fries?			
Green Salad	87.7	86.3	0.591
French fries	12.3	13.7	
Which is better French fries or a baked potato?			
French fries	17.9	16.3	0.615
Baked potato	82.1	83.7	
Which is better 100% fruit juice or fruit punch?			
100% fruit juice	90.8	84.2	0.005*
Fruit Punch	9.2	15.8	

* Chi-square goodness of fit indicates significant difference between intervention and control group

APPENDIX J

Appendix J. Chi-Square goodness-of-fit Comparison of Intervention Group's Behavioral Capability from Pre to Post Intervention

Questionnaire Item	Pre %	Post %	P-Value
Which is better white or wheat bread?			
White Bread	24.2	25.0	0.841
Wheat Bread	75.8	75.0	
Which is better broiled beef or broiled fish?			
Broiled Beef	43.8	49.1	0.247
Broiled Fish	56.2	50.9	
Which is better cereal or eggs and bacon?			
Cereal	49.7	47.4	0.622
Eggs and Bacon	50.3	52.6	
Which is better beef or beans?			
Beef	41.8	40.9	0.840
Beans	58.2	59.1	
Which is better chicken or a regular hamburger?			
Chicken	80.9	75.0	0.106
Regular Hamburger	19.1	25.0	
Which is better regular or low-fat/skim milk?			
Regular Milk	34.0	44.8	0.014*
Low-fat/Skim Milk	66.0	55.2	
Which is better ice cream or frozen yogurt?			
Ice Cream	22.4	17.2	0.183
Frozen Yogurt	77.6	82.8	
Which is better green salad or French fries?			
Green Salad	86.3	81.9	0.168
French	13.7	18.1	
Which is better French fries or a baked potato?			
French fries	16.3	19.1	0.411
Baked Potato	83.7	80.9	
Which is better 100% fruit juice or fruit punch?			
100% Fruit Juice	84.2	89.7	**0.107**
Fruit Punch	15.8	10.3	

* Chi-square goodness-of-fit indicates significant difference between intervention and control group, $p<0.05$

APPENDIX K

Appendix K. Chi-Square goodness-of-fit Comparison of Intervention Group's Behavioral Capability from Pre to Post Intervention

Questionnaire Item	Control %	Intervention %	*P*- Value[b]
Which is better white or wheat bread?			
White Bread	14.8	25.0	0.002*
Wheat Bread	85.2	75.0	
Which is better broiled beef or broiled fish?			
Broiled Beef	46.9	49.1	0.629
Broiled Fish	53.1	50.9	
Which is better cereal or eggs and bacon?			
Cereal	64.1	47.4	0.000*
Eggs and Bacon	35.9	52.6	
Which is better beef or beans?			
Beef	39.1	40.9	0.697
Beans	60.9	59.1	
Which is better chicken or a regular hamburger?			
Chicken	74.2	75.0	0.844
Regular Hamburger	25.8	25.0	
Which is better regular or low-fat/skim milk?			
Regular Milk	31.5	44.8	0.002*
Low-fat/Skim Milk	68.5	55.2	
Which is better ice cream or frozen yogurt?			
Ice Cream	10.9	17.2	0.028*
Frozen Yogurt	89.1	82.8	
Which is better green salad or French fries?			
Green Salad	92.2	81.9	0.000
French fries	7.8	18.1	
Which is better French fries or a baked potato?			
French fries	15.6	19.1	0.297
Baked potato	84.4	80.9	
Which is better 100% fruit juice or fruit punch?			
100% fruit juice	93.8	89.7	0.072
Fruit Punch	6.3	10.3	

* Chi-square goodness-of-fit indicates significant difference between intervention and control group, $p<0.05$

VITA

Mary Katherine Rumph

Candidate for the Degree of

Master of Science

Thesis: EVALUATION OF CATCH KIDS CLUB AFTER SCHOOL PROGRAM: A NUTRITION AND PHYSICAL FITNESS INTERVENTION FOR THRID, FOURTH, AND FIFTH GRADE STUDENTS

Major Field: Nutritional Sciences

Biographical:

Education: Graduated from Bartlesville High School, Bartlesville, Oklahoma in May 2004. Attended Oklahoma State University from August 2004 to July 2009 completed the requirements for a Bachelor of Science in Nutritional Sciences at Oklahoma State University, Stillwater, Oklahoma in July 2009. Attended graduate school at Oklahoma State University from August 2009 to July 2011, completed requirements for a Master of Science in Nutritional Sciences at Oklahoma State University, Stillwater, OK, in July 2011; completed all the requirements to for the Oklahoma State University Dietetic Internship program at Oklahoma State University, Stillwater, Oklahoma in July 2011.

Experience: Dietetic Intern May 2010 to July 2011. Employed by Oklahoma State University as a Graduate Research Assistant, August 2009 to May 2010.

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Institution: Oklahoma State University Location: OKC or Stillwater, Oklahoma

Title of Study: EVALUATION OF CATCH KIDS CLUB AFTER SCHOOL PROGRAM: A NUTRITION AND PHYSICAL FITNESS INTERVENTION FOR THRID, FOURTH, AND FIFTH GRADE STUDENTS

Pages in Study: 115 Candidate for the Degree of Master of Science

Major Field: Nutritional Sciences

Scope and Method of Study: The objective of this study was to evaluate the impact of *CATCH Kids Club* after school which focused on improving nutrition knowledge, attitude, intent, self-efficacy, behavioral capability, and behavior, and also focused on improving physical fitness among third, fourth, and fifth grade students. Additionally, Oklahoma Core Curriculum standardized test scores were evaluated to see if students participating in regular physical activity performed better. Intervention (n = 160) and control (n = 163) school sites were part of the Lawton Public School System. Nutritional knowledge, attitude, intent, self-efficacy, behavioral capability, and behaviors were measured by a questionnaire administered to students. Physical fitness was measured by curl-up, flexed-arm hang, sit and reach, and PACER cardiovascular test using the Cooper Institute's Fitnessgram protocol. Data was collected by the Physical Education, and Wellness Coordinator for the Lawton Public School District and then submitted to Oklahoma State University for analysis. Chi-square goodness-of-fit, one-way ANOVA, and paired t-tests were utilized to evaluate student responses between control and intervention groups at pre and post, and evaluate intervention students' responses from pre to post.

Findings and Conclusions: Findings of this study indicated students that participated in *CATCH Kids Club* had improved nutrition knowledge, intent, and behaviors from pre to post intervention. Also, intervention students demonstrated improved cardio endurance from pre to post intervention. Overall, *CATCH Kids Club* was effective in eliciting positive nutrition and physical activity changes among students.

ADVISER'S APPROVAL: Dr. Deana Hildebrand