# Changes in Fruit and Vegetable Consumption of Third Grade Students in Body Quest: Food of the Warrior, a 17-class Childhood Obesity Prevention Program

by

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Abstract

Objective: To increase fruit and vegetable (F/V) consumption, third grade students participated in *Body Quest* (BQ), a 17-class childhood obesity prevention program.

Methods: Students (n = 2,477) were randomly assigned to treatment (n = 1,674) and control (n = 803) groups; half were female and half were Black. Two weeks each of *What's for Lunch* (W4L) pre- and post-assessments were given to treatment and control groups. F/V tastings were given to only treatment group students during pre- and post-assessments. Between pre- and post-assessments, treatment group students received 17 classes using iPad apps/pencil-and-paper activities and weekly F/V tastings. After lunch, students reported foods consumed on a W4L form. W4L assessed changes in F/V consumption throughout the program. Growth modeling examined patterns of change in F/V consumption.

Results: There were significant increases in fruit ($p<.01$) and vegetable ($p<.001$) consumptions at post for treatment group students compared to control group students. When analyzing only treatment group students, significant increases in fruit ($p<.001$) and vegetable ($p<.001$) consumption from pre to post were found. Both F/V consumptions increased up to class 10, and then stabilized. Race was found as a predictor of F/V consumption. Black students in the treatment group reported higher F/V servings compared to non-Black students.

Conclusions: F/V intakes of youth can be increased through childhood obesity prevention programs. Long-term programs lasting at least 10 classes are desirable to allow students to adopt new F/V habits.

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*"Whatever I have, wherever I am, I can make it through*

*anything in the One who makes me who I am."*

*~Philippians 4:13 (MSG)*

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## List of Abbreviations

| | |
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| ACES | Alabama Cooperative Extension System |
| BMI | Body Mass Index |
| BQ | Body Quest |
| CDC | Centers for Disease Control and Prevention |
| FFVP | Fresh Fruit and Vegetable Program |
| FRL | Free and Reduced-price Lunch |
| F/V | Fruit and Vegetable |
| NEP | Nutrition Education Program |
| NHANES | National Health and Nutrition Examination Survey |
| RDA | Recommended Dietary Allowance |
| SES | Socioeconomic Status |
| USDA | United States Department of Agriculture |
| W4L | What’s for Lunch |

# Chapter 1

## Introduction

Consumption of fruits and vegetables (F/V) among youth in the United States is less than ideal (Blanchette & Brug, 2005; Dennison, Rockwell, & Baker, 1998; Dietary Guidelines for Americans, 2010; Story, Neumark-Sztainer, & French, 2002; Wardle, Carnell, & Cooke, 2005). Children as young as two years are not meeting daily recommended servings of F/V (Dennison et al., 1998). This trend persists into adolescence with only 13% of twelfth graders consuming two fruits and three vegetables daily (United States Department of Health and Human Services [USDHHS], 2009a).

Several benefits accompany adequate F/V intake. When consumed, necessary nutrients for health are absorbed. If consumption is inadequate, nutrients such as folate, fiber, magnesium, potassium, and vitamins A and C will also be inadequate. In addition to providing essential nutrients, a daily minimum of two and a half cups of F/V for children and adults may help protect against cancer, stroke, and heart attack (Centers for Disease Control and Prevention [CDC] "Fruit and Vegetable," n.d.; Dietary Guidelines for Americans, 2010).

Additionally, F/V are low in calories and may aid in weight management when eaten in place of high-calorie foods (CDC "Fruit & Vegetable"; Dietary Guidelines for Americans, 2010). People in states with high F/V intakes are less obese than those in states with low F/V intakes (Trust for America's Health, 2012). Given the obesity crisis in today's society, adequate intakes of F/V would benefit Americans.

Implementing programs to reduce and prevent childhood obesity are beneficial for youth. Getting children started on healthy living may help to prevent childhood obesity in the future. In addition, health care costs could decrease and productivity could increase with the reduction and prevention of childhood obesity (Wang, McPherson, Marsh, Gortmaker, & Brown, 2011).

Throughout the past two decades, school-based nutrition intervention programs have attempted to increase children's F/V intake (Anderson, Porteous, Foster, Higgins, Stead, Hetherington, Ha, & Adamson, 2005; Bere, Veierod, Bjelland, & Klepp, 2005; Eriksen, Haraldsdottir, Pedersen, & Flyger, 2003; McAleese & Rankin, 2007; Moore & Tapper, 2008; Parker & Fox, 2001; Perry, Bishop, Taylor, Murray, Mays, Dudovitz, Smyth, & Story, 1998; Perry, Bishop, Taylor, Davis, Story, Gray, Bishop, Mays, Lytle, & Harnack, 2004; Wells & Nelson, 2005). The program results are broad and diverse. Some report only an increase in fruit intake (Anderson et al., 2005; Eriksen et al., 2003; Perry et al., 1998; Perry et al., 2004). Some document increases in both F/V intakes (Bere et al., 2005; McAleese & Rankin, 2007). Virtually no studies found increases in only vegetable intakes, and many studies found no change in F/V intakes (Moore & Tapper, 2008; Parker & Fox, 2001; Wells & Nelson, 2005).

Multicomponent intervention programs for youth seem to be more successful in increasing F/V intake compared to programs using only one component (Blanchette & Brug, 2005). Multicomponent attributes have consisted of physical activity, gardening, tastings, newsletters, teacher education, role modeling, social support, parental education, school food service training, and classroom activities (Anderson et al., 2005; Perry et al., 1998; Perry et al., 2004). The duration of these programs and exposure to F/V also have significant impacts on F/V intake (Blanchette & Brug, 2005; Wardle et al., 2005).

Many multicomponent studies have focused on promoting F/V intake primarily to receive health benefits (Parker & Fox, 2001; Perry et al., 2004) or to prevent chronic diseases (Anderson et al., 2005; Eriksen et al., 2003; McAleese & Rankin, 2007; Perry et al., 1998; Perry et al., 2004; Wells & Nelson, 2005). These goals have recently shifted to prevention of childhood obesity. However, few studies have implemented programs for targeting childhood obesity (McAleese & Rankin, 2007; Moore & Tapper, 2008).

This study utilized the obesity epidemic as motivation to develop a statewide childhood obesity prevention program, *Body Quest* (BQ), for elementary-aged youth. BQ is a multicomponent program with four objectives: (1) increase F/V consumption, (2) increase physical activity, (3) enhance nutrition-related sleep hygiene, and (4) promote family involvement. This study addresses the findings related to the first goal. The purpose of this study was to report changes in F/V consumption of third grade students who participated in the school lunch program and also in *Body Quest* (BQ), a 17-class childhood obesity prevention program.

# Chapter 2

## Literature Review

### Childhood Obesity

Obesity is a condition associated with adverse health risks that has escalated to an alarmingly high prevalence in the United States. Obesity is defined as having a Body Mass Index () of 30 or greater in adults or a BMI greater than or equal to sex- and age-specific $95^{th}$ percentile from Centers for Disease Control and Prevention (CDC) Growth Charts for children (CDC, 2011b,, 2011c; Ogden & Carroll, 2010). Obesity among Americans has increased immensely over the past 35 years and has more than doubled in the past 20 years (Ogden & Carroll, 2010; "Weight Control and Obesity," 2002). Healthy People 2010 noted overweight and obesity to be one of 10 leading health indicators (MMWR, 2009).

Rates of obesity in the United States have been increasing despite efforts to minimize this epidemic. National Health and Nutrition Examination Survey (NHANES) uses data to examine the progress of the United States' ability to decrease the national rate of overweight and obesity; however, there has been minimal progress. Statistics from the 2007-2008 NHANES note 16.9% of children and adolescents aged two to 19 years are obese (Ogden & Carroll, 2010). Between 1976-1980 and 2007-2008, obesity trends doubled from 5% to 10.4% among children aged two to five years. Even greater increases were seen in the age groups six to 11 years and 12-19 years, with increases from 6.5% to 19.6% and 5% to 18.1%, respectively.

*Geographical Location and Obesity*

The highest rates of obesity reside in the Southeast and Appalachian areas of the United States. Three-quarters of counties within Alabama, Georgia, Louisiana, Mississippi, and South Carolina and 81% of counties in the Appalachian region within Kentucky, Tennessee, and West Virginia have obesity rates greater than or equal to 30% (CDC, 2011c; MMWR, 2009). The Healthy People 2010 goal for statewide obesity was 15%, a target that no state met (MMWR, 2009). In just nine years, 2000-2009, state obesity prevalence has increased from greater than or equal to 30% obesity in zero states to nine states. The state of Alabama is included among these nine states with an obesity prevalence of 31% (CDC, 2011c; MMWR, 2010). Obesity rates by selected counties in Alabama are as follows: Greene-43.5%, Dallas-41.2%, Perry-40.2%, Macon-40.2%, Lowndes-40.3%, Sumter-40%, Wilcox-39.4%, Hale-38.6%, Bullock-37.3%, Marengo-37%, Pike-36.7%, Choctaw-36.1%, Barbour-36.4%, Monroe-36.2% (Internatioal Business Machines Research [IBM], 2009).

*Race and Ethnicity and Obesity*

Obesity rates not only differ by state and county in the Unites States, but also show significant variation by race and ethnicity. CDC data from 2006-2008 show Blacks have the highest rate of obesity, 51% higher prevalence than Whites. This same data showed Hispanics had 21% higher prevalence of obesity when compared with Whites. Greater prevalence of obesity for these Blacks and Whites were found to be most associated with the Southern and Midwest regions of the United States in comparison to the West and Northeast (CDC, 2011c). For children between the ages of two and four years, the highest rates of obesity were found in American Indian and Alaska Native (20.7%) and Hispanic (17.9%) (Dwyer, Stone, Yang, Webber, Must, Feldman, Nader, Perry, & Parcel, 2000).

*Gender and Obesity*

Approximately two decades ago, differences in obesity rates within and between sexes were not significantly different; however, these rates in obesity by gender have changed dramatically. According to NHANES III in 1988-1994, there was no significant difference in obesity between non-Hispanic White males, non-Hispanic Black males and Mexican American males with a prevalence of 11.6%, 10.7%, and 14.1%, respectively. By 2007-2008, these percentages increased to 16.7%, 19.8% and 26.8%, respectively. Non-Hispanic White females, non-Hispanic Black females, and Mexican American females also showed an increase in obesity between 1988-1994 and 2007-2008. These percentages increased from 8.9% to 14.5%, 16.3% to 29.2%, and 13.4% to 17.4%, respectively. Non-Hispanic Black females were the only group of females who had higher prevalence of obesity when compared to same race males (Ogden & Carroll, 2010). A study by Dwyer et al. (2000) indicated 12% of nine year old males and 7% of nine year old females were obese.

*Socioeconomic Status and Obesity*

In addition, socioeconomic status (SES) has an impact on the rate of obesity among children. According to the 2009 Pediatric Nutrition Surveillance System, about one-third of the almost four million low-income children aged two to four years were overweight or obese, with 541,000 being obese. The U.S. Census in 2009 reported the number of Americans in poverty was greater than the estimates released 51 years ago. One possible explanation for the increase in obesity among low SES children is the limited access that low-income families have to healthy food options or opportunities for physical activity in safe areas (CDC, 2012).

*Risks of Obesity*

Childhood obesity leads to many health problems. Added health risks, such as heart disease, stroke, insulin resistance, diabetes, sleep apnea, asthma, musculoskeletal discomfort, gastro-esophageal reflux, arthritis, hypertension, and high cholesterol can persist and worsen into adulthood (CDC, 2001b; Kruger, Ham, & Prohaska, 2009; Yanovski & Yanovski, 2011). Being overweight or obese as a child immediately increases the risk for these diseases and conditions ("Weight Control and Obesity," 2002).

As a child becomes heavier, fat cells increase in number and expand in size. If the weight is lost, the size of adipose cells decrease; however, the number remains constant, making it easier to gain weight and harder to lose weight (CDC, 2011b; Kruger et al., 2009; "Weight Control and Obesity," 2002; Yanovski & Yanovski, 2011). In addition, diseases once considered to be "adult" conditions, such as type 2 diabetes and nonalcoholic fatty liver disease, are manifesting in obese children. Obese children are also more likely to become obese adults (CDC, 2011b; Yanovski & Yanovski, 2011).

**Fruit and Vegetable Consumption**

Consumption of F/V among children and adolescents in the United States is less than ideal (Blanchette & Brug, 2005; Dennison et al., 1998; Story et al., 2002; Wardle et al., 2005). The State Indicator Report on F/V in 2009 reported only 32% and 13% of adolescents in grades nine through twelve were consuming at least two fruits and three vegetables per day, respectively. Only 9.5% of adolescents consume both two fruits and three vegetables daily. Currently, only seven states in the United States have children who consumed at least two F/V for 10% to 14% of their adolescents (grades nine through twelve). They are: Maine, Connecticut, New Hampshire, Vermont, Illinois, Kansas, and Florida. The remaining states either report no data or found that less than 10% of adolescents consumed these recommended amounts of produce. The goal for F/V consumption from Healthy People 2010 is for at least 75% of adults and adolescents to consume a minimum of two fruits and 50% to eat a minimum of three vegetables each day (Brug, Tak, Velde, Bere, & Bourdeaudhuij, 2008; USDHHS, 2009a). Recent guidelines for children and adolescents recommend filling half their plate with F/V at each meal (United States Department of Agriculture [USDA], 2011a).

A study by Dennison et al. (1998) revealed 2- and 5-year-old children are not consuming the recommended amount of F/V servings each day. This study examined the eating behaviors of 116 two-year-olds and 107 five-year-olds via seven-day written dietary records. Serving sizes were based on the U.S. Department of Agriculture definitions, two fruits and three vegetables per day. The study found no significant difference between 2- and 5-year-olds regarding daily servings of fruits, fruit juices, and total F/V. Fruit consumption was primarily in the form of juice, contributing to 54% of all fruit servings and 42% of all F/V servings combined. Two-year-olds ate $1.8 \pm 1.1$ servings of fruit daily versus $1.5 \pm 1.0$ servings in 5-year-olds. Vegetables were under-consumed by both age groups as well. Two-year-olds consumed $0.4 \pm 0.5$ servings of vegetables daily, while 5-year-olds ate $0.6 \pm 0.5$ servings.

Children consuming less than two total servings of F/V were three times less likely to meet the Recommended Dietary Allowance (RDA) for vitamin A, were at risk for not meeting the RDA for vitamin C, and also lacked an adequate amount of fiber in the diet. Similar studies showed parallel results—almost all children consumed less than the recommended servings of F/V daily (Dennison et al., 1998; USDHHS, 2009a). A major barrier to F/V consumption was low SES coupled with high cost of produce (Dennison et al., 1998).

In addition to low SES, research suggests other reasons for inadequate intake. Children's dietary intakes could be rooted in habits formed in early childhood, which tend to be carried into adulthood. Other factors inversely associated with under-consumption of F/V by children is the dietary habits of their parents, accessibility of produce, influence by peers, and exposure to television advertisements (Blanchette & Brug, 2005; Wardle et al., 2005).

*Taste Preference*

Taste preference is thought to be the largest personal contributor to F/V intake, with partiality toward fruits (Blanchette & Brug 2005; Brug et al., 2008). An enjoyment of F/V boosts daily consumption, deeming taste preference important (Brug et al., 2008). Predisposition for sweet and salty opposed to bitter and sour offers reasoning for this preference. This predisposition can be altered with repeated exposure to the disliked foods (Brug et al., 2008). Parents are encouraged to purchase produce and prepare simple meals or snacks to increase the exposure of F/V to their children. Exposure to foods parents are consuming could likely lead children to acceptance of these foods (Brug et al., 2008). A study of 191 White American families with 5-year-old daughters found that those parents, especially mothers, who consumed more produce, had daughters who consumed more produce. This indicates a positive correlation between intake of F/V by parents and intake in their daughters (Blanchette & Brug 2005; Wardle et al., 2005).

*Environment*

In addition to taste preferences and modeling parental eating patterns, children and adolescents' eating behaviors could be due to lifestyle and developmental, social, and environmental changes. Lack of time and convenience are two barriers (O'Dea, 2003; Story et al., 2002). Adolescents reported the desire to sleep longer in the morning instead of waking up earlier to eat breakfast, eating fast food due to time constraints, and reluctance to wait in a long lunch line in the school cafeteria (Story et al., 2002). Food neophobia, an unwillingness to try new foods, has also been associated with inadequate F/V intakes of children (Wardle et al., 2005).

*Gender*

Gender differences exist when observing F/V intakes. Girls, compared to boys, prefer F/V (Bere, Brug, & Klepp, 2007; Brug et al., 2008; Cooke & Wardle, 2005; Wardle et al., 2005). Younger boys like significantly less foods than younger girls; however, this is reversed in older boys and girls (Cooke & Wardle, 2005). When taking food neophobia into consideration, boys exhibit an increased unwillingness to eat F/V compared to girls. This is shown by higher scores on the Child Food Neophobia Scale, a 10-item scale measuring willingness to try novel foods. The scores correlate with behavioral measures of neophobia (Wardle et al., 2005). Nine-year-old boys were more likely to have a higher score on the scale compared to 9-year-old girls. In general, younger children had higher food neophobia and general neophobia in comparison to older children (Hursti & Sjoden, 1997).

Another study found no difference in the frequency of fruit consumption between 2- to 6-year-old boys and girls; however, boys chose vegetables less frequently than girls. Vegetables were eaten daily by 37.1% of boys compared to 44% of girls. The less frequent consumption of vegetables by boys was significantly associated with their food neophobia (Wardle et al., 2005).

Among both boys and girls, vegetables have been ranked as one of their least favorite foods (Cooke & Wardle, 2005). Children quickly learn to enjoy high-energy dense foods that are typically high in fat and/or sugar. Since vegetables are a low-energy dense food and can taste bitter, children do not prefer these foods (Brug et al., 2008). Boys tend to have a greater liking for high-energy dense foods compared to girls, which could be related to their greater energy requirements (Bere, Brug, & Klepp, 2007).

A cross-sectional study conducted in nine European countries, as part of the Pro Children project, found 47.7% of school-aged girls and 38.9% of boys ate fruit daily, while 51.8% of girls and 40.5% of boys ate vegetables daily (Brug et al., 2008). A similar study from two Norwegian counties observed 896 sixth and seventh graders on their F/V intake. A questionnaire was distributed, measuring the frequency and type of F/V consumed. Results showed girls consumed produce 14.5 times each week, while boys consumed produce 11.9 times per week. From this study, researchers point to the possibility of taste preference in determining why boys eat less F/V than girls. It is hypothesized boys do not prefer the taste of produce as much as girls, leading to their less frequent consumption (Bere et al., 2007).

*Socioeconomic Status*

SES, defined by education level and income or occupation of an individual, plays a role in the type of diet consumed (Crawford, Lamp, Nicholson, Krathwohl, Hudes, & Townsend, 2007; Darmon & Drewnowski, 2008; Dubowitz, Heron, Bird, Jurie, Finch, Hale, & Escarce, 2008). Those with lower SES have poorer diet quality, evidenced by elevated intakes of high-energy dense and processed foods, and low F/V consumptions. Reasons for this type of diet in a lower SES individual could relate to the limited availability or access to healthy options and an unwillingness to pay for higher-priced produce. The opposite can be true for those of higher SES. Whole grains, lean meats, fish, low-fat dairy products, and fresh produce are more likely to be consumed among those with a higher social status (Darmon & Drewnowski, 2008).

Restricted intakes of F/V paired with high consumption of high-energy dense foods leads to increased risk for obesity, diabetes, cardiovascular disease, osteoporosis, dental caries, cancer, and ultimately increased mortalities (Darmon & Drewnowski, 2008; Dubowitz et al., 2008). Those with lower SES have poorer diets overall and also have higher rates of morbidity and mortality.  In opposition, those with higher SES have lower overall rates of morbidity and mortality, which are linked to a higher-quality diet.  Higher SES individuals ate a larger amount of produce, in some cases two additional servings per week (Dubowitz et al., 2008), and also a greater variety.  Higher SES groups have typically had more education than lower SES groups, which suggests the level of education of an individual is correlated with the quality of diet (Darmon & Drewnowski, 2008).

Not only do the types of foods eaten differ among low and high SES families, the amount of foods eaten or served and the reasons for eating foods differ.  Mothers in food-insecure homes served less food to children compared to mothers in food-secure homes. The motive for this in food-insecure homes is to practice restrictive feeding to accommodate possible food shortages in the future. Mothers in the food-insecure homes also were more likely to use food as a reward (Crawford et al., 2007).

Children and adolescents of semiskilled and unskilled workers in France consumed significantly more sweets, starches (breads, potatoes, cereals), and deli meats (Darmon & Drewnowski, 2008). In comparison, children from a higher SES group consumed more whole grain breads, fresh F/V, lean meats, and seafood.  Similarly, children in the United States from low SES groups and from families with lower education levels consumed less F/V and more calorically-dense foods such as sweetened beverages (Darmon & Drewnowski, 2008).

Other studies have shown results parallel to those found in France and the United States. Children and adolescents from low SES families consumed more soft drinks and smaller amounts of produce compared to children from higher SES families (Darmon & Drewnowski, 2008). The lower SES group consumed more white breads and pastas, organ meats, fried fish, whole milk, added fats and sugars, sweetened beverages, and beer. The higher SES group had a greater intake of whole grain breads, F/V, fruit juice, nuts, lean meats, low-fat milk, and cheese (Darmon & Drewnowski, 2008).

*Intervention Programs as a Solution*

Obesity is a multifaceted disease, and needs combined efforts to reduce and prevent future increases. Solutions to decrease the obesity epidemic can be implemented among schools, the government, states, communities, health professionals, and parents. Increasing opportunities for physical activity, increasing the availability of healthy food choices, understanding the consequences of obesity, and providing multicomponent programs in schools can aid in decreasing obesity (CDC, 2011a, 2011d; French & Stables, 2003; Reynolds, Franklin, Binkley, Raczynski, Harrington, & Kirk, 2000; USDA, 2010b; USDHHS, 2009b).

Several studies comprised in a comprehensive review by French and Stables (2003), discussed hereafter, have examined approaches to improve F/V consumption. One intervention conducted by Reynolds et al. (2000) targeted fourth and fifth grade students for a total of two years, using a three-component intervention strategy. Components consisted of: (1) classroom curricula presented by trained research staff, (2) parental activities at home with children, and (3) cafeteria food service changes to increase purchase, preparation, and promotion of F/V. Twenty-four-hour recalls and consumption of produce during lunch were used to measure intake. By the end of year one and year two, this intervention significantly increased the students' fruit intake by 0.56 servings per day, vegetable intake by 0.35 servings per day, and total F/V intake by 0.99 servings per day. There was no significant difference among gender, SES, or ethnicity (French & Stables, 2003).

A similar study by Perry et al. (1998) in fourth and fifth grade students used the same three components as the intervention strategy used in Reynolds et al. (2000)—classroom curricula, food service changes, and parent-child home-based activities for one year. The results were consistent with Reynolds et al. (2000) suggesting multicomponent intervention strategies can significantly increase F/V intake among young students (French & Stables, 2003).

Baranowski, Davis, Resnicow, Baranowski, Doyle, & Lin (2000) conducted another multicomponent intervention in fourth and fifth grade students; however, the food service component was omitted and replaced with a community, grocery store activity once per year, for two years. This intervention did not increase the intake of vegetables or total F/V intake. This suggests the possible need for cafeteria intervention, using food service to aid in promotion of F/V (French & Stables, 2003).

A study by Foerster, Hamagami, & McArdle (1998) examined F/V consumption through multicomponent school-based components. The study was conducted among fourth and fifth grade students and used classroom curricula via the California Children's 5-A-Day Power Play resource kit. It also used a community component, consisting of activities in grocery stores, youth organizations, farmers markets, and mass media. Twenty-four-hour recalls via self-reported food diaries were used to assess F/V intake. Significant increases in total F/V intake, especially in those students who participated in school-plus-community interventions, by 0.4 servings per day were demonstrated. Those participating in only school-based interventions increased their total F/V intake by 0.2 servings per day, and those in the control group decreased F/V intake by 0.3 servings per day (French & Stables, 2003).

An additional study conducted by Reynolds et al. (2000) performed a multicomponent approach, High 5, to increase F/V in fourth grade students. Twenty-eight elementary schools and 1,698 families of fourth grade students participated in this study for two years. Similar to some previous studies, classroom, parent, and cafeteria factors were used to increase consumption of produce. The classroom criteria included monitoring, self-monitoring, problem solving, reinforcement, and taste testing. Characters, such as "Indiana Banana" and "Freggie" (fruit + veggie), were used in the lessons for easy recognition (Reynolds et al., 2000).

Lessons consisted of a check-up to review information from previous lessons, the High 5 Cheer to encode key concepts, a "Freggie Fact" to learn new information, a Learning Activity Section to build skills, and homework to reinforce skills. On "High 5 Days", children were encouraged to consume five F/V, then record their choices. Parents were encouraged to help children meet this goal. Other parent activities involved helping their children with the Freggie Book, which contained seven homework assignments for the week (Reynolds et al., 2000).

Food service staff in the cafeterias were instructed on proper purchasing and preparing techniques for F/V. They were encouraged to serve a minimum of 10 F/V each week. The cafeterias received a "Star Status" determined by nutritionists to provide reinforcement for those cafeterias meeting the goals. Dietary recalls and cafeteria observations were used to help determine consumption status of each child (Reynolds et al., 2000).

This study found children increased their F/V consumptions from baseline when assessed at Follow-up one (one year after baseline) and Follow-up two (two years after baseline). Daily F/V servings combined were 2.61 at baseline and 3.96 and 3.20 at Follow-up one and Follow-up two, respectively. This High 5 Program was most effective in children whose parents were married. This finding suggests more stable eating patterns or more available time to devote to High 5 activities in homes with married parents (Reynolds et al., 2000).

Interventions most effective in enhancing F/V intakes have used combinations of school cafeteria food service changes in availability and promotion, classroom curricula, and parent-child activities at home. This may be indicative of using a multicomponent approach to increase the consumption of F/V, opposed to manipulating just one variable (French & Stables, 2003; Reynolds et al., 2000). The dosage, or length of intervention, for these studies was inconsistent when determining increases in F/V intake. Effective intervention time frames ranged from eight weeks (Foerster et al., 1998), to one year (Perry et al., 1998) or two years (Reynolds et al., 2000).

In addition to school-based programs, governmental initiatives such as USDA's Fresh Fruit and Vegetable Program (FFVP) have been put into place to increase children's F/V consumption. The FFVP began during the 2011-2012 school year and was developed under the National School Lunch Act as a part of the Obama administration's efforts to improve children's health. The program provides free fresh fruits and vegetables to elementary-aged children throughout each school day. Participating low-income schools are selected by each state and provided $50 to $75 worth of fresh produce per student over the course of the school year (USDA, 2011b).

## Justification

Multicomponent nutrition education programs implemented in elementary schools can aid in accessibility and availability of F/V (Baranowski et al., 2000; Foerster et al., 1998; French & Stables, 2003; Perry et al., 1998; Reynolds et al., 2000). Since produce is not always readily available to some children at home, consumption may be inadequate. Bringing F/V into schools can remove this barrier and introduce children to foods unavailable to them. Interventions also provide opportunities for children to learn about the benefits of F/V while participating in nutrition education opportunities.

Children who are exposed to interventions including F/V tastings, nutrition education, and cafeteria changes benefit more than those exposed to interventions with one component. Initial or short-term behavior change and knowledge change have been observed in children participating in multicomponent interventions; however, long-term behavior change is questionable due to limited exposure. Nutrition education intervention programs can be effective tools to increase the amount of F/V in a child's diet (Anderson et al., 2005; Bere et al., 2005; Eriksen et al., 2003; French & Stables, 2003; McAleese & Rankin, 2007; Moore & Tapper, 2008; Parker & Fox, 2001; Perry et al., 1998; Perry et al., 2004; Reynolds et al., 2000; Wells & Nelson, 2005;).

The purpose of this study was to report changes in F/V consumption of third grade students who participated in the school lunch program and also in *Body Quest* (BQ), a 17-class childhood obesity prevention program.   Goals of this research study were to:

1. Develop a childhood obesity prevention program for third grade students in Supplemental Nutrition Assistance Program-Education eligible schools to increase F/V consumptions and
2. Recognize the length of intervention (dosage) needed to observe F/V behavior change, using the *What's for Lunch* tool.

This study was conducted through the Nutrition Education Program (NEP) of the Alabama Cooperative Extension System (ACES). NEP is Alabama's Supplemental Nutrition Assistance Program-Education program co-sponsored by ACES and the Alabama Department of Human Resources.

## Chapter 3

## Changes in Fruit and Vegetable Consumption of Third Grade Students in Body Quest: Food of the Warrior, a 17-class Childhood Obesity Prevention Program


### Abstract

**Objective**: To report changes in fruit and vegetable (F/V) consumption of third grade students who participated in both the school lunch program and *Body Quest* (BQ), a 17-class childhood obesity prevention program.

**Design**: BQ materials (curriculum, iPad® apps, pencil-and-paper activities) were based on the Experiential Learning Model.

**Setting:** Extension educators implemented BQ in 60 Supplemental Nutrition Assistance Program-Education eligible schools in 38 rural counties in Alabama.

**Participants:** Students (n = 2,477) were randomly assigned to treatment (n = 1,674) and control (n = 803) groups; half were female and half were Black.

**Intervention:** Two weeks each of *What's for Lunch* (W4L) pre- and post-assessments were given to treatment and control groups. F/V tastings were given only to treatment group students during pre- and post-assessments. Between pre- and post-assessments, treatment group students received 17 classes using iPad apps/pencil-and-paper activities and weekly F/V tastings.

**Main Outcome Measure:** After lunch, students reported foods consumed on a W4L form. W4L assessed student changes in F/V consumption throughout the 17-class period.

**Analysis:** Growth modeling examined patterns of change in F/V consumption.

**Results:** There were significant increases in fruit ($p<.01$) and vegetable ($p<.001$) consumptions at post for treatment group students compared to control group students. When analyzing only

treatment group students, significant increases in fruit ($p<.001$) and vegetable ($p<.001$) consumption from pre to post were found. Both F/V consumptions increased up to class 10, and then stabilized. Race was found as a predictor of F/V consumption. Black students in the treatment group reported higher F/V servings compared to non-Black students.

**Conclusions and Implications:** F/V intakes of youth can be increased through childhood obesity prevention programs. Long-term programs lasting at least 10 classes are desirable to allow students to adopt new F/V habits.

## Introduction

Consumption of fruits and vegetables (F/V) among youth in the United States is less than ideal (Blanchette & Brug, 2005; Dennison et al., 1998; Dietary Guidelines for Americans, 2010; Story et al., 2002; Wardle et al., 2005). Children as young as two years are not meeting daily recommended servings of F/V (Dennison et al., 1998). This trend persists into adolescence with only 13% of twelfth graders consuming two fruits and three vegetables daily (USDHHS, 2009a).

Several benefits accompany adequate F/V intake. When consumed, necessary nutrients for health are absorbed. If consumption is inadequate, nutrients such as folate, fiber, magnesium, potassium, and vitamins A and C will also be inadequate. In addition to providing essential nutrients, a daily minimum of two and a half cups of F/V for children and adults may help protect against cancer, stroke, and heart attack (CDC "Fruit and Vegetable," n.d.; Dietary Guidelines for Americans, 2010).

Additionally, F/V are low in calories and may aid in weight management when eaten in place of high-calorie foods (CDC "Fruit & Vegetable"; Dietary Guidelines for Americans, 2010). People in states with high F/V intakes are less obese than those in states with low F/V intakes (Trust for America's Health, 2012). Given the obesity crisis in today's society, adequate intakes of F/V would benefit Americans.

Implementing programs to reduce and prevent childhood obesity are beneficial for youth. Getting children started on healthy living may help to prevent childhood obesity in the future. In addition, health care costs could decrease and productivity could increase with the reduction and prevention of childhood obesity (Wang, McPherson, Marsh, Gortmaker, & Brown, 2011).

Throughout the past two decades, school-based nutrition intervention programs have attempted to increase children's F/V intake (Anderson et al., 2005; Bere et al., 2005; Eriksen et al., 2003; McAleese & Rankin, 2007; Moore & Tapper, 2008; Parker & Fox, 2001; Perry et al., 1998; Perry et al., 2004; Wells & Nelson, 2005). The program results are broad and diverse. Some report only an increase in fruit intake (Anderson et al., 2005; Eriksen et al., 2003; Perry et al., 1998; Perry et al., 2004). Some document increases in both F/V intakes (Bere et al., 2005; McAleese & Rankin, 2007). Virtually no studies found increases in only vegetable intakes, and many studies found no change in F/V intakes (Moore & Tapper, 2008; Parker & Fox, 2001; Wells & Nelson, 2005).

Multicomponent intervention programs for youth seem to be more successful in increasing F/V intake compared to programs using only one component (Blanchette & Brug, 2005). Multicomponent attributes have consisted of physical activity, gardening, tastings, newsletters, teacher education, role modeling, social support, parental education, school food service training, and classroom activities (Anderson et al., 2005; Perry et al., 1998; Perry et al., 2004). The duration of these programs and exposure to F/V also have significant impacts on F/V intake (Blanchette & Brug, 2005; Wardle et al., 2005).

Many multicomponent studies have focused on promoting F/V intake primarily to receive health benefits (Parker & Fox, 2001; Perry et al., 2004) or to prevent chronic diseases (Anderson et al., 2005; Eriksen et al., 2003; McAleese & Rankin, 2007; Perry et al., 1998; Perry et al., 2004; Wells & Nelson, 2005). These goals have recently shifted to prevention of childhood obesity. However, few studies have implemented programs for targeting childhood obesity (McAleese & Rankin, 2007; Moore & Tapper, 2008).

This study utilized the obesity epidemic as motivation to develop a statewide childhood obesity prevention program, *Body Quest* (BQ), for elementary-aged youth. BQ is a multicomponent program with four objectives: (1) increase F/V consumption, (2) increase physical activity, (3) enhance nutrition-related sleep hygiene, and (4) promote family involvement. This study addresses the findings related to the first goal. The purpose of this study was to report changes in F/V consumption of third grade students who participated in the school lunch program and also in *Body Quest* (BQ), a 17-class childhood obesity prevention program.

## Methods

### Design

BQ was an experimental design intervention conducted throughout Alabama. Participants were third grade students attending schools eligible for Supplemental Nutrition Assistance Program-Education. Eligibility requires a school to have 50% or more students receiving Free or Reduced-price Lunch (FRL). The Institutional Review Board at Auburn University approved this research. Informed consent (Appendix A) was obtained from parents of participating students and standardized scripts (Appendix B) were used to recruit students.

The BQ curriculum and supporting materials are based on the Experiential Learning Theory (Kolb & Boyatzis, 2000), and are behaviorally-focused and developmentally appropriate. BQ curriculum and activities were comprised of many components and are being prepared for publication (*in press*). All nutrition education was provided by 24 Supplemental Nutrition Assistance Program-Education educators. F/V were tasted during each of the 17 classes, but only by the treatment group. The goal of tastings was to repetitively expose students to F/V. Nutrition education was coupled with other components including a mini physical activity “Warrior

Workouts" and nutrition-based sleep education. Take-home messages and activities for family members were sent home weekly.

One unique aspect of BQ is that education was provided in part via iPad app technology. Seven apps with animé characters were developed by Alabama Cooperative Extension System personnel to accompany the BQ curriculum (*in press*). While engaging in these lessons, students learned about healthy diets and nutritious snacks, and answered questions on nutrients in each food group.

In comparison to other studies, BQ had a unique approach and included factors that could have played a role in F/V consumption increases. Trained nutrition educators implemented BQ classes and were dedicated to the classes, an advantage this study had over others who recruited school teachers or food service staff as nutrition educators (Anderson et al., 2005; McAleese & Rankin, 2007; Perry et al., 2004).

Educators randomly chose six third-grade classes from schools in a two-county area. Each class was randomly assigned as a treatment (iPad/pencil-and-paper education) or control group. Treatment groups were in different schools from control groups.

During the 2011-2012 school year, educators provided 17 BQ classes on a weekly basis to the treatment group. BQ classes for the treatment group consisted of pre-assessments (Weeks 1-2), intervention (Weeks 3-15), and post-assessments (Weeks 16-17). F/V tastings were provided for all 17 classes for the treatment group only. In contrast, control groups were given pre- and post-assessments, but did not receive nutrition intervention or F/V tastings. During the intervention (Weeks 3-15), six nutrition lessons were taught; the week following each lesson was used as reinforcement and taught via iPad app/pencil-and-paper.

In addition, F/V tastings were provided 17 times throughout the program (pre1 and 2, Classes 3-15, and post1 and 2). Tastings were an integral part of this program because they exposed students to commonly consumed F/V served during lunch and removed the accessibility barrier many students may face at home. Tastings consisted of four, fresh F/V and alternated weekly. Fruits included: blueberries, cantaloupe, strawberries, oranges, pears, pineapples, and peaches. Vegetables included: tomatoes, squash, broccoli, cauliflower, pickled okra, carrots, bell peppers, spinach, and dark leafy lettuce. A one-ounce cup of ranch dressing was distributed with vegetables for dipping. Although the study took place in rural Alabama, most foods were available at local stores throughout the school year.

Demographic data were collected by educators at the beginning of the study. Each school administrator provided student's gender and race. FRL data were provided by the 2011-2012 Alabama Department of Education (Alabama Department of Education, 2011). Each school's Child Nutrition Program Director reported on participation in FFVP (USDA, 2011b).

A *What's for Lunch* (W4L) form (Appendix C) was developed to assess changes in F/V consumption of students participating in BQ and who eat a school lunch. W4L was an easy-to-use checklist for students to self-report consumption of foods provided as part of Child Nutrition Program school lunch immediately after lunch. Treatment group students completed a W4L form each school day for the entirety of the program. Control group students completed a W4L form during the two weeks in both pre- and post-assessments. Since the form was a checklist, readability was dependent upon food items listed on daily menu choices. Educators printed or typed food items as largely and neatly as possible on the form. Besides food items, only a few words were on the form (e.g. name, day, and date). Options for students to self-report were simple words such as yes and no. Other statements regarding “foods not served” and “did not eat a school lunch today” were considered age-appropriate.

As shown in Illustration 3.1, educators customized the W4L forms based on each school’s lunch menu for a 5-day period. After customizing, educators personalized a copy for students by writing each student’s name on a form. Sufficient copies of the customized and personalized W4L form were made, and distributed prior to the 5-day period corresponding to the form. Completed student forms were collected the following week by educators. Thus, educators were always distributing forms to be completed and collecting completed forms in the same week.

Immediately after lunch, students reported foods consumed during lunch on the W4L form. Prior to BQ, educators enlisted classroom teachers’ help by asking them to remind students to complete the form. Some students kept the form in a BQ folder in their desks; for others, teachers distributed folders.

**Coding and Data Entry of Fruits and Vegetables**

Upon weekly collection of W4L forms from students, educators entered data into spreadsheets on SharePoint, a shared network site. Only F/V were coded and entered; all other food items were ignored. Fruits were collapsed into one category, as were vegetables. Once F/V were coded, educators entered the coded responses into class-specific spreadsheets. One F/V code was entered per column on the spreadsheet per participant.

**Validity**

For eight years prior to this study, the W4L methodology was used in poster format and displayed in classrooms by Extension education in nutrition programming. For this study, school teachers and educators recommended transforming the poster into an individualized form. The poster format was easily adapted into the form.

Content validity of the W4L form was determined by conducting a six-week pilot study. The pilot study included 800 students in 40 classrooms in 40 Alabama counties. W4L forms were customized with appropriate foods, distributed to third graders, and collected weekly by educators. Classroom teachers facilitated daily reporting of school lunch foods by students immediately after lunch. A process evaluation was provided to educators (n = 24) and teachers (n = 40) to allow him/her to detail any strengths or weaknesses of the form. Questions also probed for usefulness, ease-of-use, and readability. In addition, university faculty, school administrators, and parents reviewed materials. After careful consideration, W4L was revised to its final format.

**Subjects**

Third grade (n = 2,477) students from 60 schools located in 38 Alabama counties (Appendix D) participated in BQ. Treatment group students (n = 1,674) were 51% male, 46% Black, and 54% non-Black, predominantly White. All students came from schools with 50% or more students receiving FRL. Of these schools, 46% of students came from schools classified as high FRL (i.e. 75-100% of students receiving FRL). One-third of students came from schools participating in the FFVP. Student demographics in the control group (n = 803) paralleled those in the treatment group.

**Statistical Analysis**

Growth modeling was used to examine overall change in F/V consumption using Mplus version 6.11 (Duncan & Duncan, 2004; Muthen & Khoo, 1996; Muthen & Muthen, 2010). F/V consumption was defined as self-reported servings of F/V eaten as provided by the school lunch. Servings of F/V were calculated based on 17, 5-day periods.

Analyses were conducted using two data sets. In the first set, data from students in treatment and control groups were analyzed for changes in F/V consumption across four periods: pre1, pre2, post1, and post2 (Figures 3.1, 3.2). In the second set, data from only treatment group students (n = 1,674) were analyzed for changes in F/V consumption across the 17-class program. In the second set, consecutive classes for all analyses were combined and averaged to eight time points: pre = pre1 and pre2; C1 = Classes 1 and 2; C3 = Classes 3 and 4; C5 = Classes 5 and 6; C7 = Classes 7, 8, and 9; C10 = Classes 10 and 11; C12 = Classes 12 and 13; and, post = post1 and post2). C7 consisted of three classes compared to other time periods consisting of two classes. This clustering was mid-intervention, to prevent skewing the end points. Across both analyses, time was centered at the final time point (post2 for the first set of analyses and an average of post1 and post2 for the second set; Ferrer, Hamagami, & McArdle, 2009; Ram & Grimm, 2007).

At the onset of analyses, a series of unconditional growth models were estimated to examine changes in F/V consumption across the 17 classes. The first model tested in the series was an unconditional linear growth model. The next models tested were quadratic and latent basis growth models that estimated nonlinear change. The model with the better fit was chosen.

The nonlinear latent basis model was chosen and used for all analyses (Ferrer et al., 2009; Ram & Grimm, 2007). Using this growth model, the last time point was fixed at 0 and the first time point was fixed at -1. All other time points were freely estimated, allowing for an optimal shape. The intercept mean indicated the average F/V consumption at post. The nonlinear slope indicated the change from the first (pre) to last classes (post) of the program (Table 3.1).

A series of nested growth models examined the overall pattern of change in F/V consumption throughout the 17-class program (Figures 3.1-3.9). These models were called conditional or unconditional when predictors were included or not included in the model, respectively. For the first data set using treatment and control groups, analyses were conditional by adding treatment group as the predictor (Figures 3.1, 3.2). In the second data set using only treatment group students, the initial analysis of F/V consumption was unconditional and did not include predictors (Figures 3.3, 3.4; Table 3.1). However, all remaining analyses in the second set were conditional and included four demographic predictors: (1) gender, (2) race, (3) FRL, and (4) FFVP. For data analyses, FRL was divided into two groups based on percentage of students receiving FRL in schools: low = 50-74% and high = 75-100%. For the sake of parsimony, only significant predictors were retained (Figures 3.1, 3.2, 3.5-3.9; Table 3.1).

## Results

### F/V Consumption between Students in Treatment and Control Groups

*Conditional Model.* At the end of BQ (post 2), fruit consumption of treatment group students was significantly ($p < .01$) greater compared to control group students (Figure 3.1). The rate of change (slope) also was significantly ($p < .001$) greater in the treatment group. At pre1, the treatment group began BQ with a slightly lower fruit consumption (3.05 weekly servings) compared to the control group (3.20 weekly servings). By post2, fruit consumption for treatment group students was 3.40 weekly servings. Overall fruit consumption remained unchanged throughout the study for control group students.

At the end of BQ (post 2), vegetable consumption of treatment group students (4.69 weekly servings) was significantly ($p < .001$) greater compared to control group students (4.26 weekly servings; Figure 3.2). In addition, the rate of change was significantly ($p < .001$) greater in the treatment group students. Both treatment and control groups self-reported essentially the same vegetable consumption at pre1.

**F/V Consumption of Students in Treatment Group**

*Unconditional Model.* A series of unconditional growth models examined F/V consumption across the 17-class period. The first model tested in the series was an unconditional linear growth model. For both F/V, the model had good fit to data.

The next set of models in the series were quadratic and latent basis growth models to estimate nonlinear change of F/V consumption. All models had good fit to data. However, the quadratic and latent basis had significantly better fit than the linear model, indicative of nonlinear change. The latent basis model, for both conditional and unconditional analyses, was chosen in place of the quadratic model since it provided the best approximation to the pattern of change for both F/V consumptions (Table 3.1).

The fitted trajectory of the average child's fruit consumption for treatment group students is shown in Figure 3.3. Overall fruit consumption significantly ($p<.001$) increased by 0.35 weekly servings from pre (2.97) to post (3.31; Table 3.1). Results indicated the total amount of intra-individual change from pre to C1 was 10%, with an increase of 45% at C5. Most of the change (90%) had taken place by C10 and 100% of change at post. The average total amount of growth is indicated by the mean value of 0.35 ($\beta_{1,}$ Slope = 0.35, $p < .001$). Thus, the formula to calculate fruit consumption for each time point is as follows: [3.31 + 0.35 (-1)] = 2.96 at pre, with increases up to 3.09 (C3), 3.19 (C7), and 3.28 (C12). There was a small increase up to 3.31 by post.

The fitted trajectory of the average child's vegetable consumption for treatment group students throughout the intervention is illustrated in Figure 3.4. Overall vegetable consumption significantly ($p<.001$) increased by 0.66 from pre (4.03) to post (4.69; Table 3.1). Results indicated the total amount of intra-individual change from pre to C1 was 21%, with an increase of 55% at C5. Most of the change (98%) had taken place by C10, following a stable pattern with 100% of change at C12 and thereafter. The average total amount of growth is indicated by the mean value of 0.66 ($\beta_{1,}$ Slope = 0.66, $p < .001$). Thus, the formula to calculate vegetable consumption for each time point is as follows: [4.69 + 0.66 (-1)] = 4.03 at pre, with increases up to 4.32 (C3), 4.61 (C7), and 4.69 (C12 and post).

*Conditional Model.* A series of conditional nested growth models were fit to examine the role of four demographic predictors of students: (1) gender, (2) race, (3) FRL, and (4) FFVP. The prediction of the intercept (final status) and slope in F/V consumption were examined. Each predictor was retained when the Wald delta chi-square test indicated significance. Table 3.1 presents the unstandardized parameter estimates of the growth, fit statistics, and R-squares for all models. The final models in each series explained significant variance over the previous model (indicated by fit statistics and the $\Delta_X 2$ statistics). For fruit consumption, predictors included race, FRL, and FFVP. For vegetable consumption, predictors included gender and race.

Race was found to be the only predictor common to both F/V consumptions, predicting the intercept (Figures 3.5 and 3.9; Table 3.1). For fruits, Black students reported significantly ($p<.001$) higher fruit consumption at the intercept (post = 3.45 weekly servings) compared to non-Black students (post = 3.19 weekly servings). For vegetables, Black students reported significantly ($p\leq.05$) higher vegetable consumption at the intercept (post = 4.94 weekly servings) compared to non-Black students (post = 4.68 weekly servings).

FRL was found as another predictor of the intercept for fruit consumption (Figure 3.6; Table 3.1). Students attending schools with high FRL (75-100%) reported significantly ($p<.001$) higher fruit consumption at the intercept (post = 3.53 weekly servings) compared to consumption of those attending schools with low FRL (50-74%; post = 3.12).

FFVP was found as a predictor of the slope in fruit consumption (Figure 3.7; Table 3.1). School participation in FFVP predicted the slope, but not the intercept. Students attending schools that did not participate in the FFVP reported lower fruit consumption at pre (2.75 weekly servings) compared to students attending schools that did participate (pre = 3.16). Consumption of students from non-participating schools "caught up" with those in schools that were participating by post (3.26 and 3.38, respectively).

Lastly, gender was found as a predictor of the intercept and slope in vegetable consumption (Figure 3.8; Table 3.1). Males reported significantly ($p<.05$) higher vegetable consumption at post (4.95 weekly servings) compared to consumption at post (4.70) for females. Results showed males and females reported the same vegetable consumption at pre (3.88 and 3.91, respectively), but consumption of males increased at a significantly ($p<.05$) higher rate compared to consumption of females.

## Discussion

The motivation for developing BQ was an intimidating statistic: 17% of children two to 19 years are obese and one-third are overweight or obese. By 2030, obesity rates are predicted to increase to 60% in 13 states. If this trend continues, the current generation of young people could be the first in U.S. history to live sicker and die younger than their parents' generation (Ogden, Carroll, Kit, & Flegal, 2012). Overweight and obese children have a greater risk for cardiovascular disease and factors leading up to it, such as elevated serum cholesterol and triglycerides, insulin resistance, and hypertension. The future health of the nation is at the mercy of today's youth. Childhood obesity trends can be reversed, but investments in effective nutrition intervention programs and policies need to be made (Trust for America's Health, 2012). To this end, BQ was developed as a multicomponent childhood obesity prevention program. BQ emphasized F/V consumption, physical activity, nutrition-related sleep hygiene, and family involvement.

The objective of this study was to promote F/V consumption of third grade students (n = 2,477) throughout Alabama, a state characterized by high rates of poverty and obesity. All students attended rural schools with 50% or more of the students participating in FRL. Out of the 60 schools in the study, one-fourth had 90% or more students receiving FRL (Alabama State Department of Education, 2011-2012).

There were three benefits of BQ. First, students could receive one-on-one interaction with educators during all 17 classes. Since BQ was based on the Experiential Learning Model, students had opportunities to experience, share, process, generalize, and apply nutrition concepts. Second, tastings of commonly consumed F/V occurred during each of the 17 classes, and mirrored F/V offered during school lunch. These tastings exposed students to F/V that were served during lunch, increasing students' awareness of these lunchtime F/V. A third benefit was that this research was among the first longitudinal childhood obesity prevention studies to use iPad technology in combination with pencil-and-paper activities. Due to this aspect, BQ was well-received by school administrations. Students were the biggest winners in that they learned nutrition information while using iPad app technology. iPad app education is novel, but forthcoming in today's society.

The W4L methodology had many advantages. It was easy for students to use, convenient for teachers to implement, and simple for educators to code and report data. The W4L form allowed educators to capture a snapshot of F/V consumed by students. Students completed customized forms immediately following school lunch by simply checking whether they ate listed foods. This allowed elementary students to report food consumption as accurately as possible.

The statistical analyses used in this study also were relatively novel within nutrition literature. Growth modeling examined absolute change and the pattern of change in F/V consumptions across the 17 classes. Many previous studies only examined absolute change by observing pre, post, and sometimes mid-time assessments (Anderson et al., 2005; Bere et al., 2005; Eriksen et al., 2003; McAleese & Rankin, 2007; Moore & Tapper, 2008). In general, these studies missed the opportunity provided by growth modeling to examine patterns in data. For this study, patterns of F/V changes were detected. Students increased F/V servings up to C10.

There are four major findings of this study. First, there were significant increases in both F/V consumptions for treatment group students compared to control group students by the end of BQ. Interestingly, vegetable consumption increased more than fruit consumption for treatment group students. Given that fruit consumption is typically easier to adopt than vegetable consumption (Brug et al., 2008), researchers were pleased with this finding.

Second, there were significant increases in overall F/V consumptions from pre to post for treatment group students. At pre, students consumed 2.97 weekly fruit servings and 4.03 weekly vegetable servings, resulting in seven weekly combined F/V servings. At post, these students consumed 3.31 weekly fruit servings and 4.69 weekly vegetable servings, resulting in eight weekly combined F/V servings. These combined F/V totals provide insight on how well students were eating school lunch F/V. According to the Traditional Food Based Menu Planning through the Child Nutrition Program (USDA, 2011-2012), a minimum of two total F/V must be offered each day, totaling a minimum of 10 F/V offered per week. Based on these guidelines, students from this study consumed 70% of the weekly F/V offered at the beginning of the study, and increased to 80% of the weekly F/V offered by the end of the study.

Third, both F/V increases followed similar patterns of change. There were increases in both F/V consumptions up to class 10 followed by a stable pattern to the end of the study. This suggests programs can be implemented with at least 10 lessons and still report F/V increases. Beyond 10 classes, additional significant F/V increases were not found.

Fourth, some characteristics were found as predictors for F/V consumption for treatment group students. Race was found to be a common predictor for both F/V consumptions. Black students reported greater F/V consumptions than non-Black students throughout the entire intervention. Black children, compared to White children, have a higher risk for obesity and have not always shared equally in obesity-related declines (CDC, 2011c). BQ was able to increase F/V consumption of Black students, suggesting BQ can help reduce the disparities gap between Black and non-Black students. However, other characteristics did not predict consumption for both F/V. For fruits, only students in schools with no FFVP reported significantly lower fruit consumption initially. At post, both groups, those with or without FFVP reported similar fruit consumptions. This finding suggests nutrition interventions can increase fruit intakes even if the FFVP is not present.

Results from this study found that gender predicted vegetable consumption for treatment group students. Both males and females reported the same consumption at pre, but males increased at a higher rate and consumed significantly more vegetables than females at the end of the intervention. These results are inconsistent with the literature. Other studies have found higher vegetable consumption, as well as fruit consumption, among females (Bere, Brug, & Klepp, 2007; Brug et al., 2008; Cooke & Wardle, 2005; Wardle et al., 2005). Both males and females participating in BQ received identical education, used the same tools, and were equal in number; therefore, researchers are unsure as to why these results are inconsistent with the literature.

Multicomponent childhood obesity prevention programs have effectively increased F/V consumption, which can aid in weight management (Anderson et al., 2005; McAleese & Rankin, 2007; Perry et al., 1997; Perry et al., 2004). In this study, F/V consumption continued to increase up to 10 classes, where stabilization was seen with only slight increases thereafter. Hence, this study supports long-term education. Other studies have shown inconsistent increases in F/V consumptions relative to the duration of education. Increases in both F/V were seen in a study conducted for a duration of 12 weeks (McAleese & Rankin, 2007). However, other studies showed no increases in F/V when conducted for a longer duration of two years (Parker & Fox, 2001; Wells & Nelson, 2005). Understanding the role of dosage in the literature is evolving. This study adds to that emerging literature to better understand what number of nutrition education classes is needed to bring about behavior change.

In this study, increases in F/V consumption occurred early, even during the two-week pre-assessment period. By C1, the third meeting between educators and students, increases in F/V intakes were observed (10% and 21% increases in F/V consumption, respectively), and continued as the program proceeded. This suggests students were eager to increase F/V consumption from the beginning. Results from this study indicated that 10 classes, plus an additional two weeks of pre-assessment, showed stabilization of both F/V consumptions.

Previous studies reported difficulty in increasing children's vegetable intake due to predisposition for sweet, rather than bitter, foods. Researchers suggested repeated exposure to vegetables could overcome this obstacle (Blanchette & Brug 2005; Wardle et al., 2005). BQ seemed to traverse this obstacle by repeatedly exposing students to vegetables during tastings and showed an increase in vegetable consumption. This suggests repeated exposure to disliked foods such as vegetables can succeed in increasing vegetable intake in students.

Using the Experiential Learning Theory allowed students to experience, share, process, generalize, and apply information taught during BQ. Using iPads/pencil-and-paper allowed for sharing and processing of learned information. Students could generalize and apply this information to their own lives while making daily school lunch choices by eating or not eating F/V offered during school lunch.

**Limitations**

A typically-used measurement in obesity studies is BMI; however, no anthropometric assessments were done to examine body height, weight, or body composition.

Students self-reported their school lunch F/V intakes, allowing for personal error and forgetfulness, even though this was controlled for as much as possible through reporting immediately after lunch. Also, inherent to any collection tool, students could have been eager to please the tester, altering their actual food consumptions. In addition, the amount eaten was not recorded, so students could not clarify if one bite or the entire serving was eaten.

SES was recorded for each school, but not for each student. However, all schools participating in the study were Supplemental Nutrition Assistance Program-Education eligible. In the event the individual SES was obtained, this information could have been useful when comparing this study's findings to other findings.

## Implications for Research and Practice

Findings from this study support school-based childhood obesity prevention programs up to 10 classes to increase F/V consumptions of children. In terms of nutrition, programs similar to the current study can aid in the fight against childhood obesity by teaching children the importance of a healthy diet, engaging them in nutrition-related activities, and exposing them to F/V tastings. Although this study focused on only one BQ objective, it would be interesting to control for other study objectives such as physical activity, nutrition-related sleep behavior, and family involvement in future studies. In addition, a follow-up with the same students during the 2012-2013 school year would be helpful in determining lasting effects of BQ. Future studies need to focus on long-term behavior change to indicate a true adoption of F/V consumption.

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**Table 3.1**. Results of Fitting a Taxonomy of Models for Demographic Variables as Predictors of Change in Fruit and Vegetable Consumption for Students in Treatment Group (n = 1,674) during a 17-class Body Quest Program

| | **Fruit Consumption** | | **Vegetable Consumption** | |
|---|---|---|---|---|
| | **Unconditional Latent Basis Model (Figure 3.3)** | **Conditional Latent Basis Model with Predictors (Figures 3.1, 3.5-3.7)** | **Unconditional Latent Basis Model (Figure 3.4)** | **Conditional Latent Basis Model with Predictors (Figures 3.2, 3.8, 3.9)** |
| **Fixed Effects** | | | | |
| Intercept[a] | 3.31 (0.03)*** | 3.32 (0.03)*** | 4.69 (0.06)*** | 4.81 (0.15)*** |
| Gender (Female) | - | 0.01 (0.05) | - | -0.21 (0.11)* |
| Race (Black) | - | 0.26 (0.07)*** | - | 0.27 (0.13)* |
| FRL | - | -0.42 (0.07)*** | - | -0.19 (0.14) |
| FFVP | - | 0.12 (0.06)` | - | -0.08 (0.11) |
| Slope[b] | 0.35 (0.04)*** | 0.37 (0.04)*** | 0.66 (0.06)*** | 0.91 (0.16)*** |
| Gender (Female) | - | -0.05 (0.07) | - | -0.24 (0.11)* |
| Race (Black) | - | -0.10 (0.09) | - | -0.08 (0.14) |
| FRL | - | 0.07 (0.09) | - | -0.09 (0.14) |
| FFVP | - | -0.31 (0.08)*** | - | -0.20 (0.12) |
| Variance | | | | |
| Intercept[a] | 0.84 (0.05)*** | 0.75 (0.05)*** | 3.27 (0.18)*** | 3.44 (0.19)*** |
| Slope[b] | 0.61 (0.08)*** | 0.61 (0.08)*** | 2.01 (0.25)*** | 2.11 (0.26)*** |
| Covariance | 0.28 (0.05)*** | 0.33 (0.05)*** | 1.35 (0.19)*** | 1.55 (0.19)*** |
| Model Fit | | | | |
| AIC | 31498.12 | 39867.18 | 44348.49 | 53000.21 |
| BIC | 31557.78 | 40046.14 | 44408.14 | 53184.59 |
| Chi Square (df) | 118.78 (33) | 216.21 (57) | 205.06 (33) | 297.30 (56) |
| Wald $\Delta\chi^2$ Test ($\Delta$df) | - | 321.93 (8)*** | - | 33.18 (8)*** |
| CFI | 0.97 | 0.95 | 0.96 | 0.94 |
| TLI | 0.98 | 0.95 | 0.96 | 0.94 |
| RMSEA (Sig) | 0.04 (0.99) | 0.04 (0.99) | 0.06 (0.09) | 0.05 (0.40) |
| SRMR | 0.05 | 0.04 | 0.05 | 0.04 |
| $R^2$ | | | | |
| Intercept | - | 11.3 | - | 1.6 |
| Slope | - | 4.3 | - | 1.2 |

FRL indicates Free and Reduced-price Lunch; FFVP, Fresh Fruit and Vegetable Program; AIC, Akaike; BIC, Bayesian; df, degrees of freedom; CFI, Comparative Fit Index; TLI, Tucker Lewis Index; RMSEA, Root Mean Square Error of Approximation; SRMR, Standardized Root Mean Square Residual.
[a] Final status at Post; [b] Rate of change between Pre and Post.
`*p*< .10, **p* <.05, ***p* <.01, *** *p* <.001
Note: Negative values indicate associations of the predictor with the intercept or slope, but are not directly interpreted for this table. Interpretations can be made for these predictors via Figures 3.1-3.9.

**Illustration 3.1.** What's for Lunch form customized with food items from the school lunch menu.

Name: John Smith

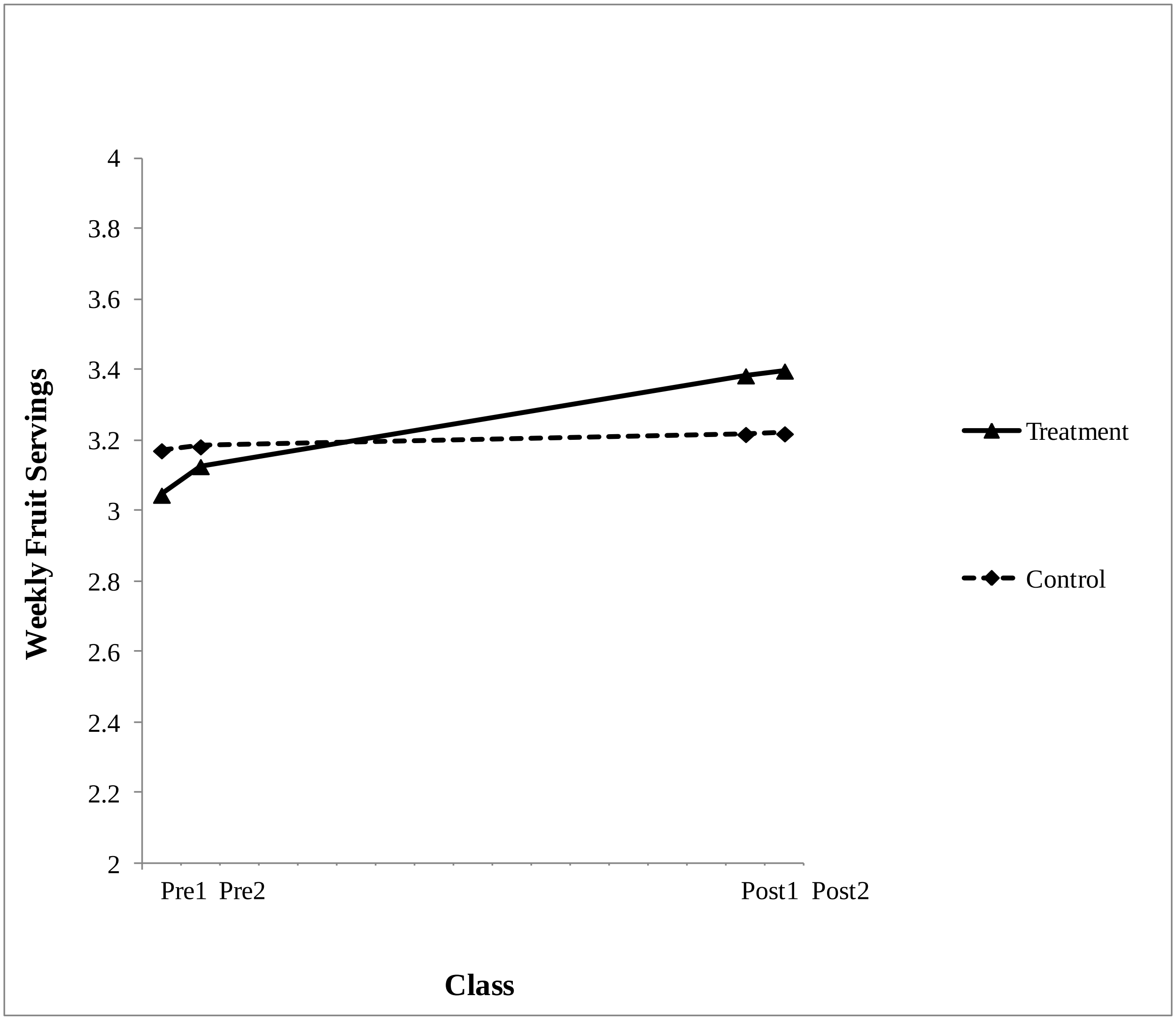
## What's for Lunch?

Day / Date: Monday, August 20TH

| | Did you eat the food? | | Food was not served. |
|---|---|---|---|
| Chicken Nuggets | Yes | No | |
| Roll | Yes | No | |
| Sweet Potato Fries | Yes | No | |
| Steamed Broccoli | Yes | No | |
| Fresh Fruit | Yes | No | |
| Milk | Yes | No | |

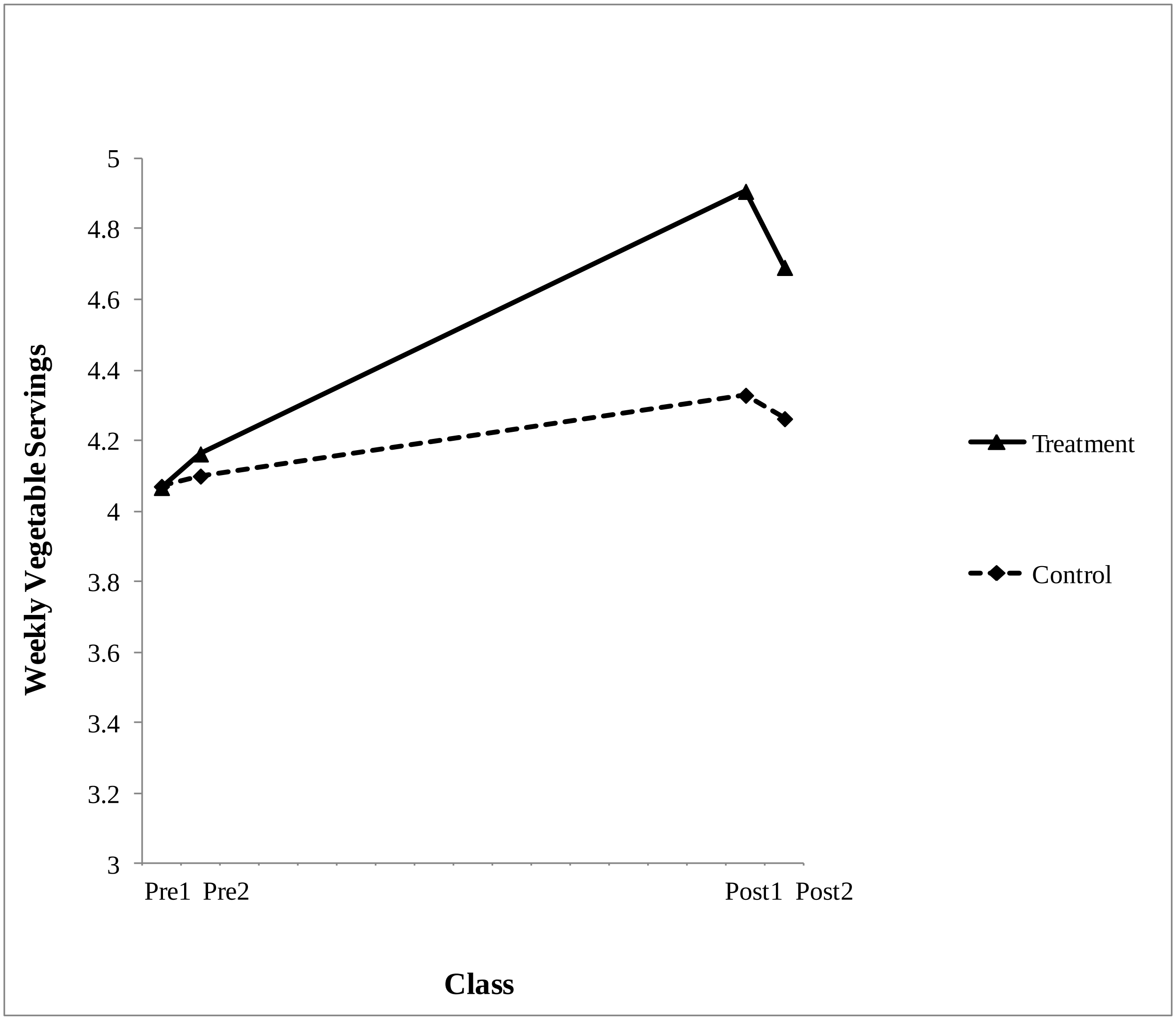
If you did not eat a school lunch today, check here: ______

**Figure 3.1.** Changes in fruit consumption of third grade students in treatment (n = 1,674) and control (n = 803) groups participating in a 17-class Body Quest program.[a]



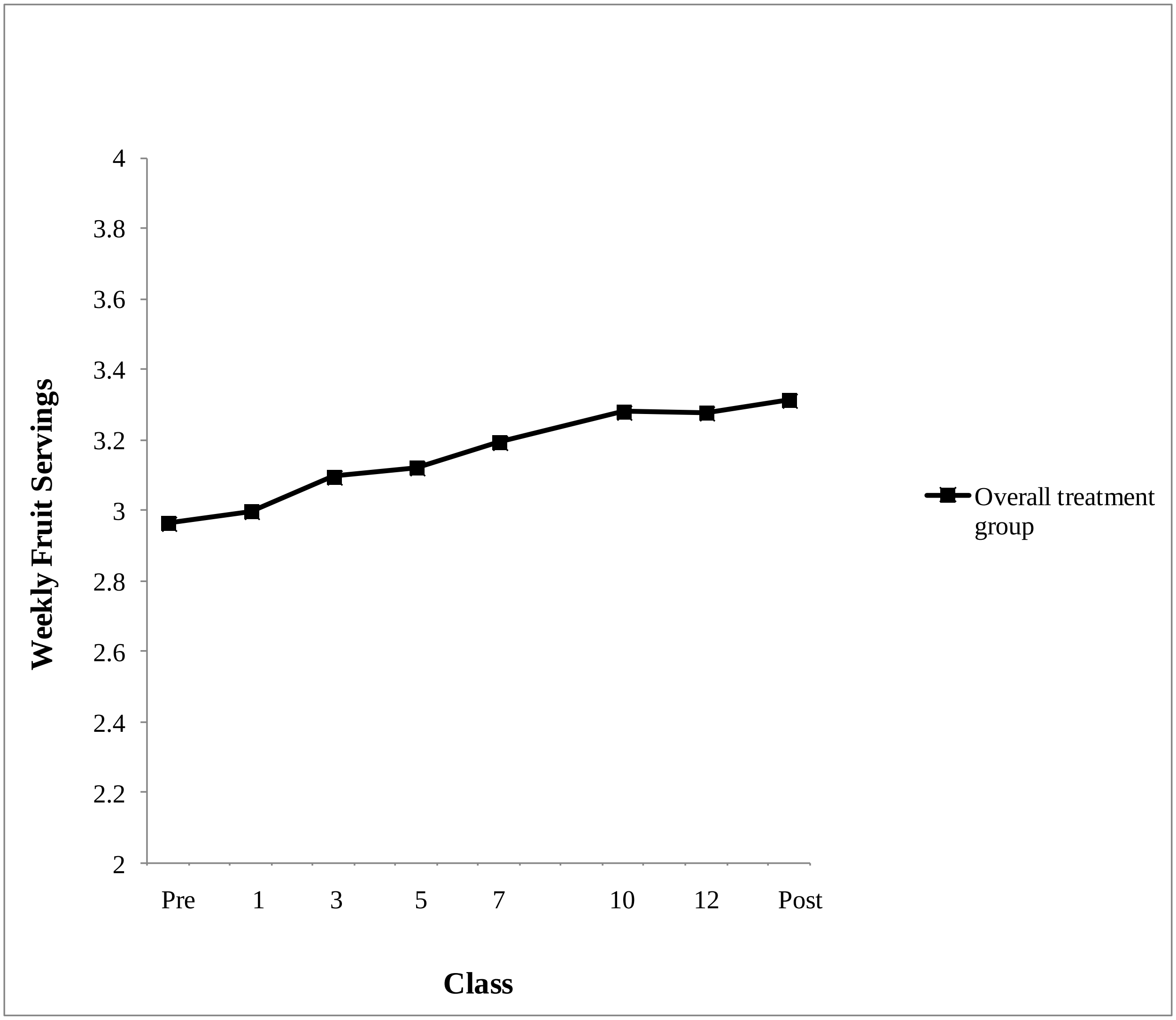

[a] Data analyzed by conditional growth modeling.
Significance of intercept (post, p<.01); significance of slope (Rate of change, p<.001).

**Figure 3.2.** Changes in vegetable consumption of third grade students in treatment (n = 1,674) and control (n = 803) groups participating in a 17-class Body Quest program.[a]



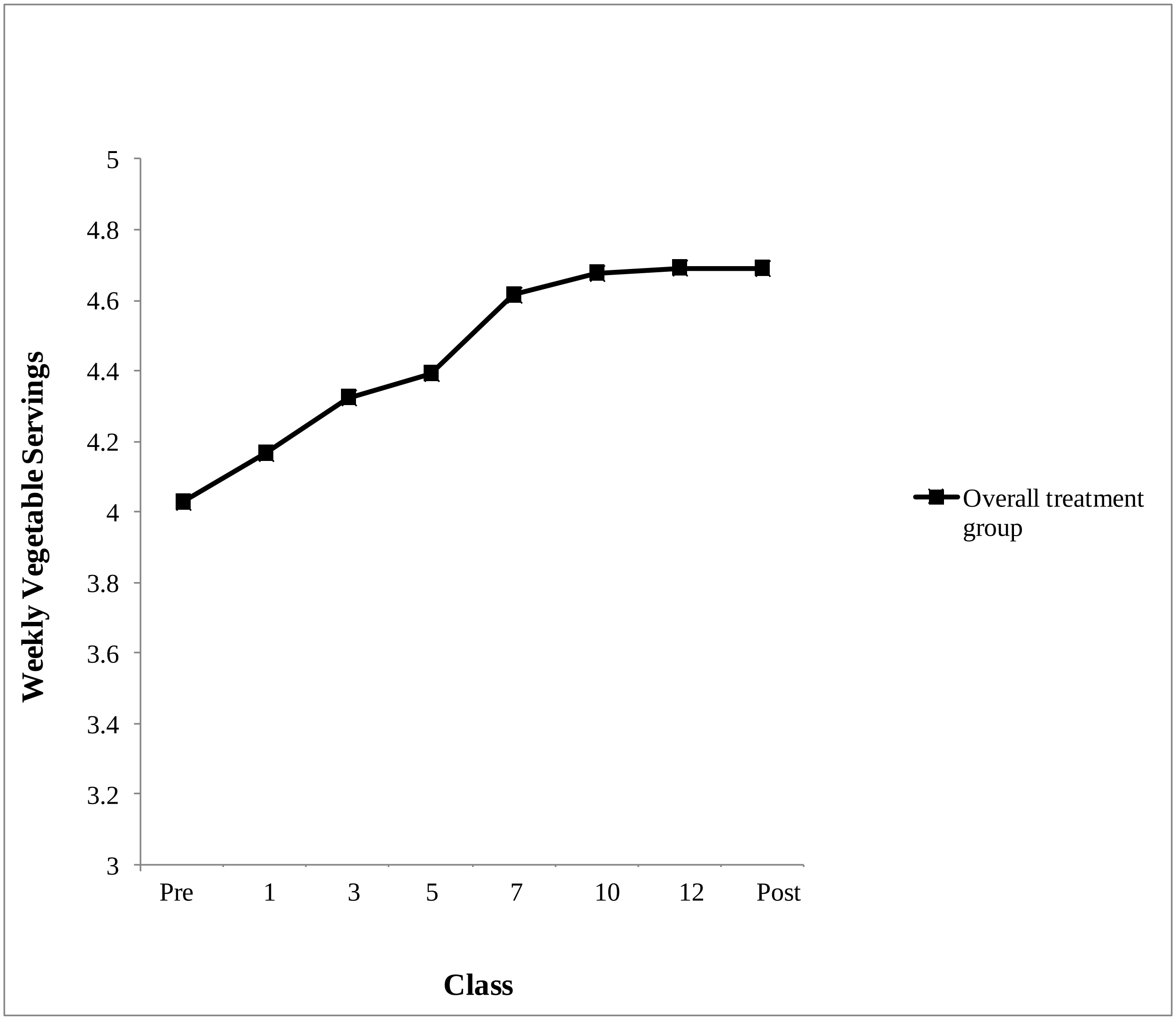

[a] Data analyzed by conditional growth modeling.
Significance of intercept (post, p<.001); significance of slope (Rate of change, p<.001).

**Figure 3.3.** Changes in fruit consumption of third grade students the in treatment group (n = 1,674) participating in a 17-class Body Quest program.[a]



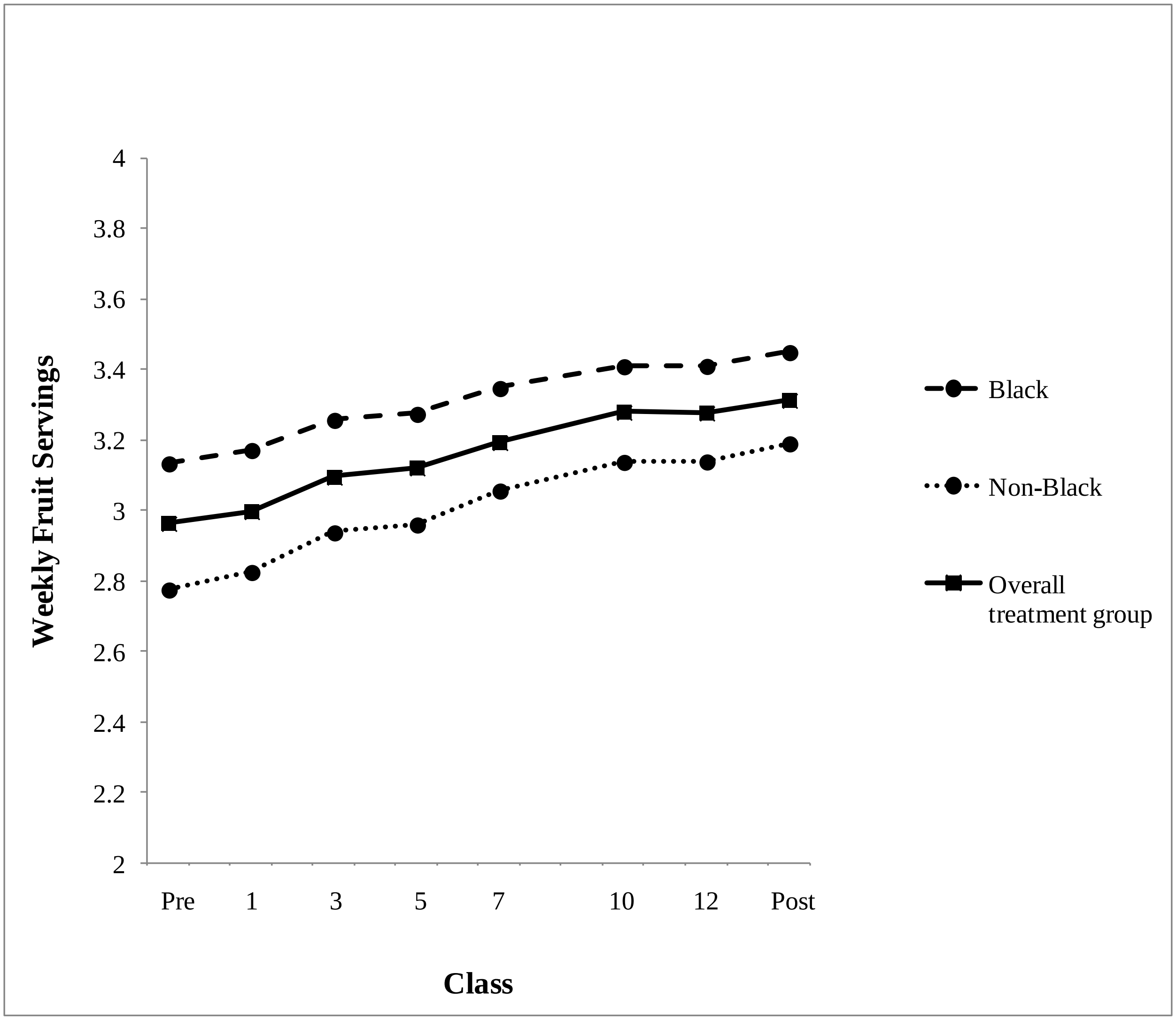

[a] Data analyzed by unconditional growth modeling.
Significance of intercept (post, p<.001); significance of slope (Rate of change, p<.001).

**Figure 3.4.** Changes in vegetable consumption of third grade students in the treatment Group (n = 1,674) participating in a 17-class Body Quest program.[a]



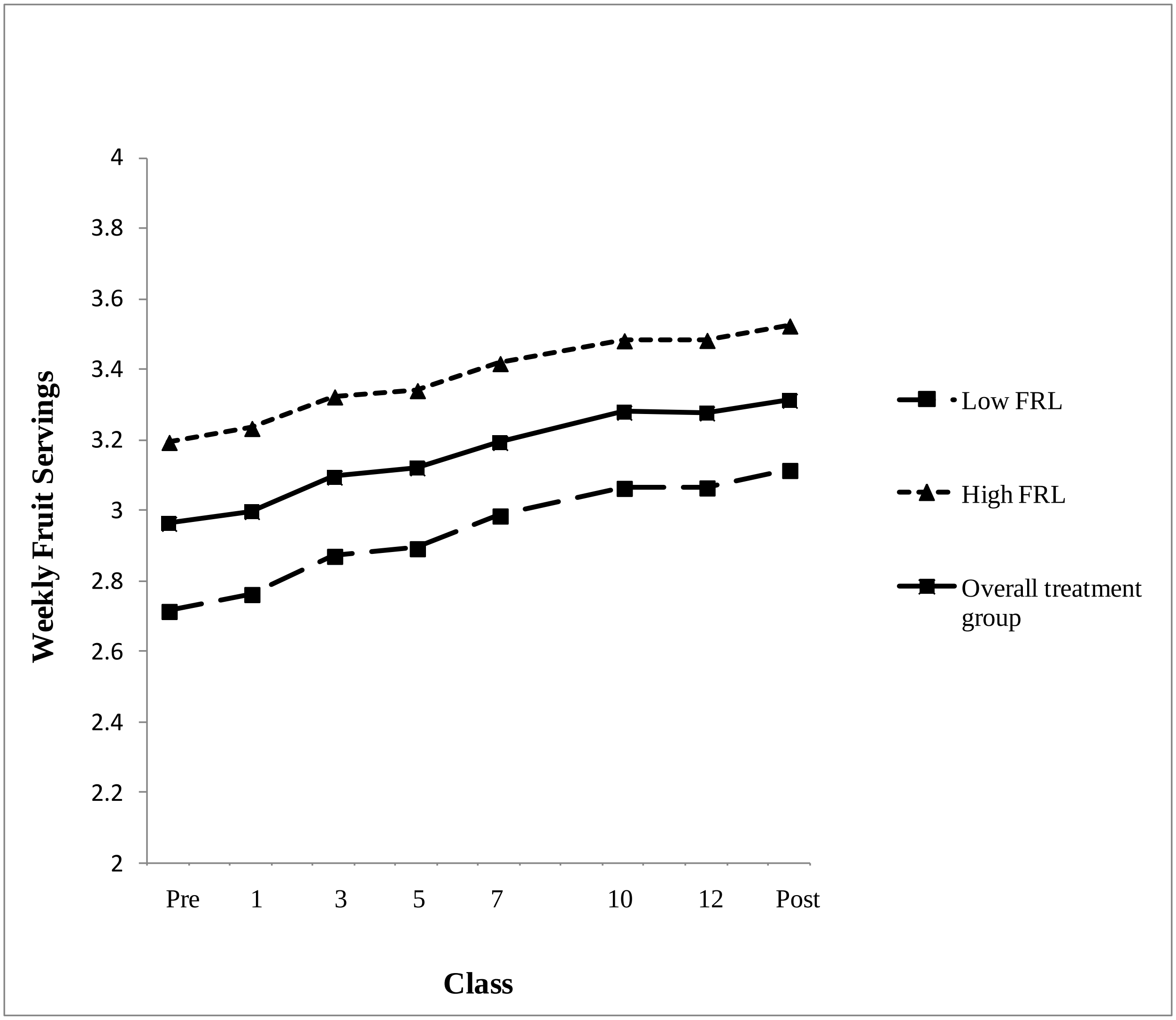

[a] Data analyzed by unconditional growth modeling.
Significance of intercept (post, $p<.001$); significance of slope (Rate of change, $p<.001$).

**Figure 3.5.** Changes in fruit consumption using race as a predictor for third grade students in the treatment group (n = 1,674) of a 17-class Body Quest program.[a]




[a] Data analyzed by conditional growth modeling.
Significance of intercept (post, p<.001); slope is insignificant.

**Figure 3.6.** Changes in fruit consumption using FRL as a predictor for third grade students in the treatment group (n = 1,674) of a 17-class Body Quest program.[a]

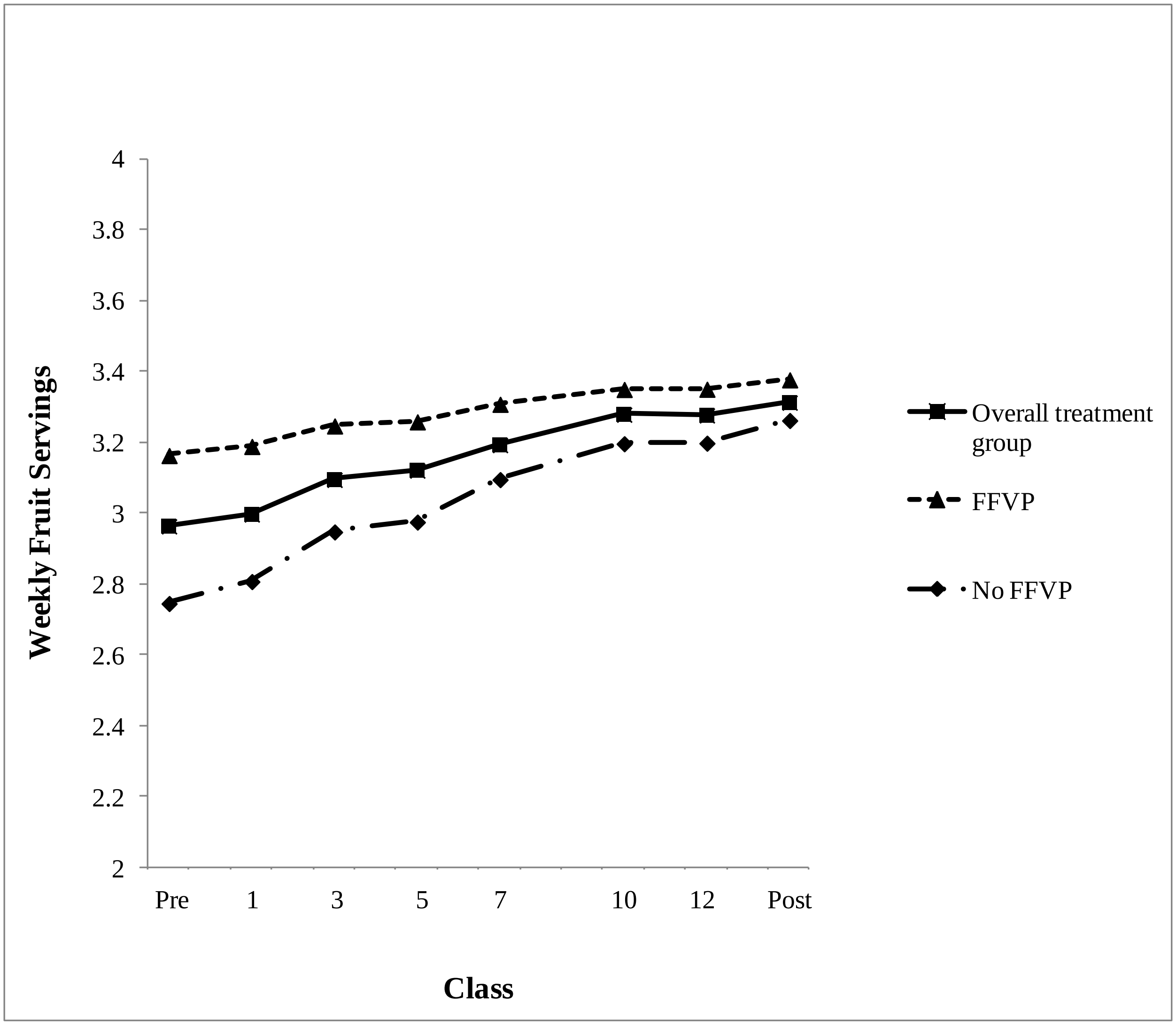



FRL indicates Free and Reduced-price Lunch; Low FRL, 50-74%; High FRL, 75-100%.

[a] Data analyzed by conditional growth modeling.

Significance of intercept (post, p<.001); slope is insignificant.

**Figure 3.7.** Changes in fruit consumption using FFVP as a predictor for third grade students in the treatment group (n = 1,674) of a 17-class Body Quest program.[a]

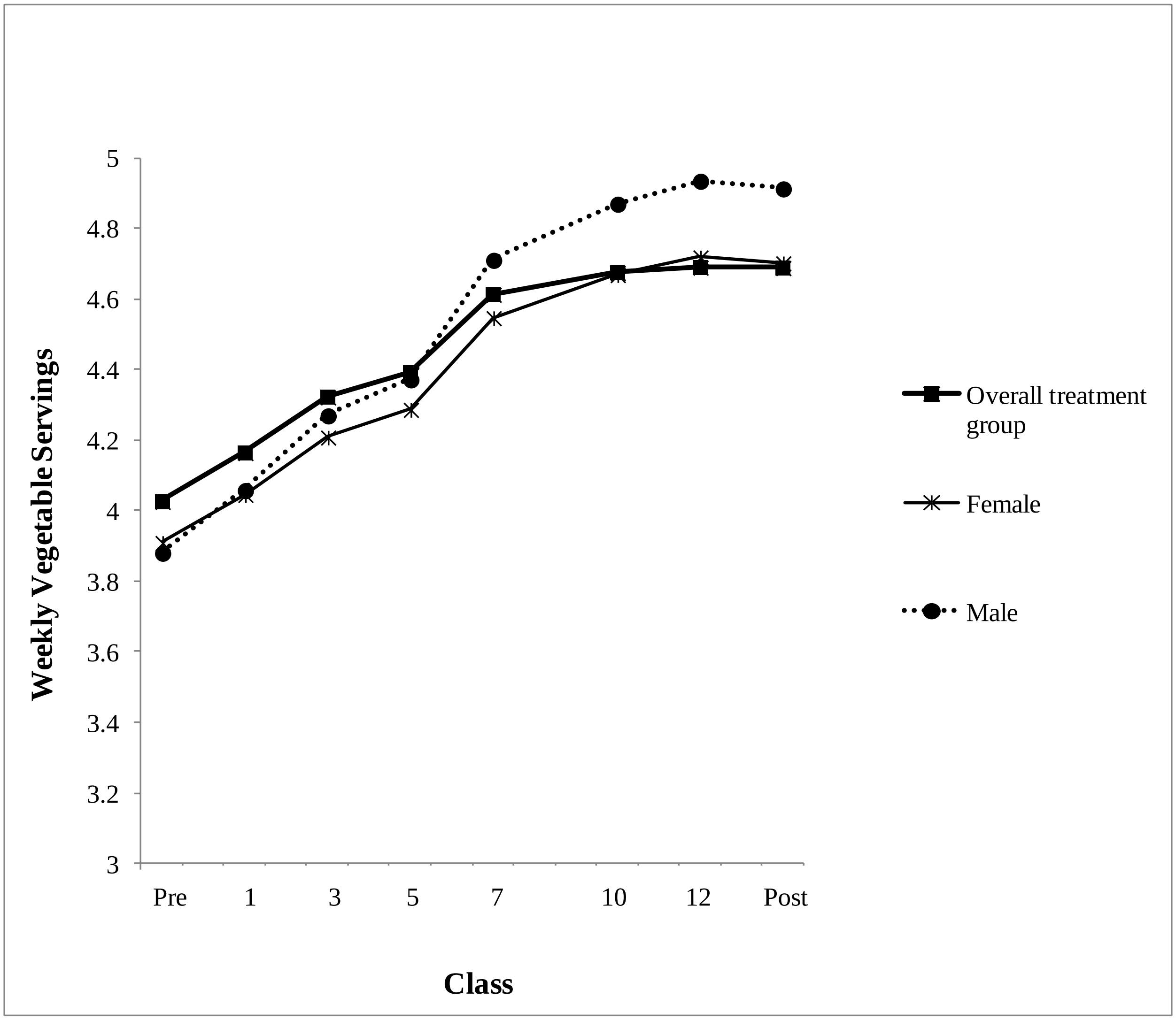



FFVP indicates Fresh Fruit and Vegetable Program.

[a] Data analyzed by conditional growth modeling.

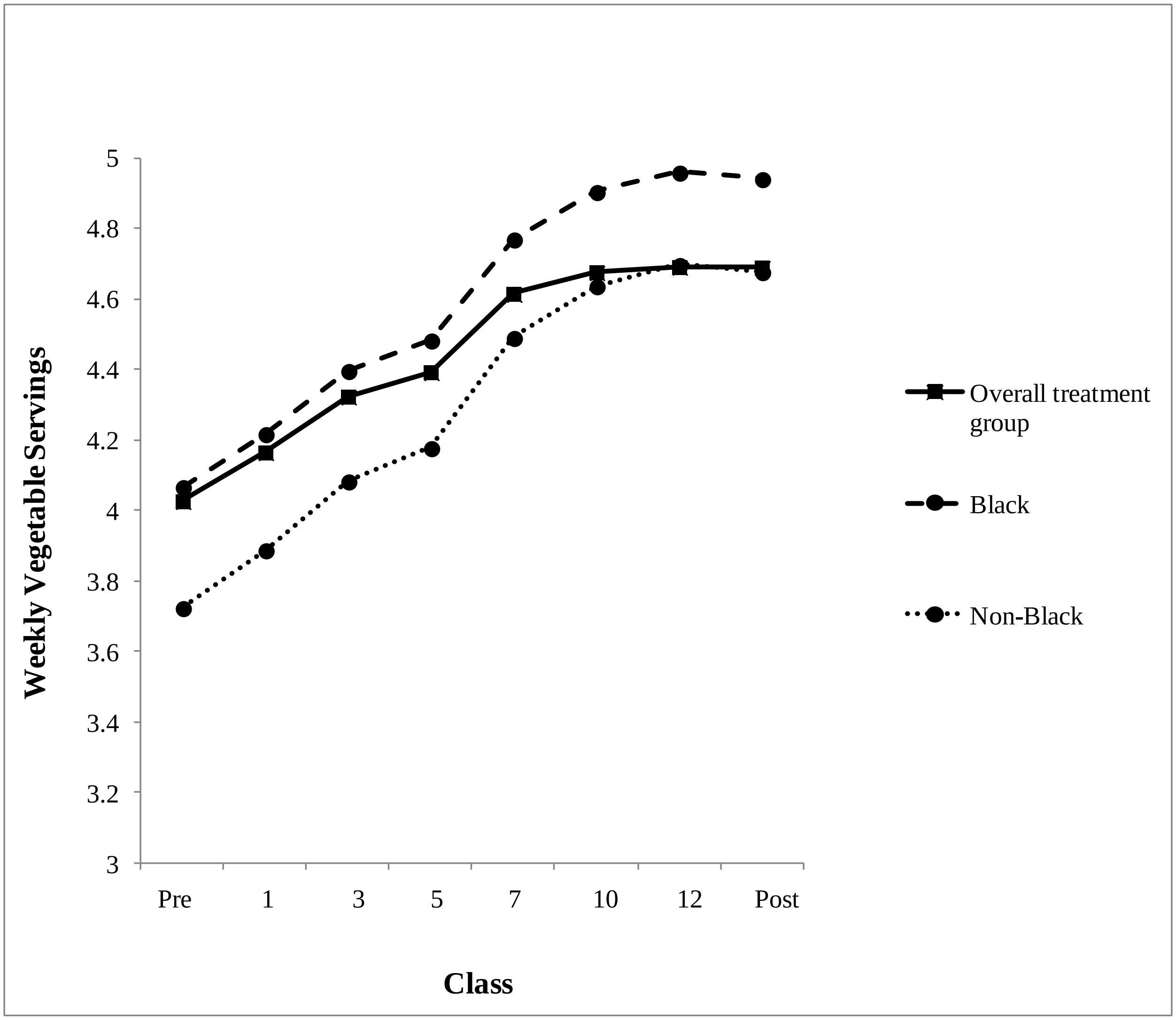
Insignificant intercept; significance of slope (Rate of change, $p<.001$).

**Figure 3.8.** Changes in vegetable consumption using gender as a predictor for third grade students in the treatment group (n = 1,674) of a 17-class Body Quest program.[a]




[a] Data analyzed by conditional growth modeling.
Significance of intercept (post, p<.05); significance of slope (Rate of change, p<.05).

**Figure 3.9.** Changes in vegetable consumption using race as a predictor for third grade students in the treatment group (n = 1,674) of a 17-class Body Quest program.[a]




[a] Data analyzed by conditional growth modeling.
Significance of intercept (post, p<.05); slope is insignificant.

## Chapter 4

## Summary of Findings

After growth modeling analyses were conducted, significant increases in both F/V consumptions were observed among third grade students in the treatment group compared to the control group. These increases were observed in two ways. The first significant increase is evidenced by a significant rate of change in both F/V consumptions of the treatment group between pre1 and post2. The second significant increase is observed when comparing pre1 F/V consumptions to post2 F/V consumptions in the treatment group.

A latent basis model was used to analyze F/V consumptions across the entire program. When analyzing only the treatment group with no predictors (unconditional), the majority of change in F/V consumptions occurred by the tenth class, 98% of change for vegetables and 90% of change for fruits. Childhood obesity prevention programs can be implemented for at least 10 classes and observe F/V increases.

When analyzing the treatment group with predictors (conditional), gender, race, FRL, and FFVP were found to predict the F/V consumptions of students. Gender significantly predicted the intercept and slope (rate of change) in only vegetable consumption. Males reported higher vegetable consumption compared to females. Race was the only predictor common in both F/V consumptions. Race significantly predicted the intercept, but not the slope of F/V consumptions. Black students reported higher F/V consumptions than non-Black students. FRL significantly predicted the intercept of fruit consumption. Students attending schools with a higher percentage of FRL reported higher fruit consumption than those attending schools with a lower percentage of FRL. FFVP significantly predicted the slope, but not the intercept of fruit consumption. Students attending schools that did not participate in the FFVP reported lower fruit consumption at the beginning of the study, but caught up to the consumption of those attending schools that did participate in the FFVP.

## Chapter 5

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# Appendices

## Appendix A: Parental Consent Form

ALABAMA
COOPERATIVE
Extension
SYSTEM

PARENT PERMISSION
for a Research Study called
***Body Quest: Food of the Warrior***
***How to Get Children to Eat More Fruits and Vegetable***

All students in your child's class are invited to help us study how to get children to eat more fruits and vegetables. It also will teach your child how to stay healthy by exercising and getting enough sleep. The program, called Body Quest, will take 30 minutes once a week for 17 weeks in class.

During Body Quest, your child will taste some fruits and vegetables. But your child does not have to eat any that he/she doesn't like or is allergic to. Circle any of these foods that your child is allergic to.

FRUIT: Blueberries, Cantaloupe, Strawberries, Oranges, Pears, Pineapple, Peaches

VEGETABLE: Tomatoes, Squash, Broccoli, Cauliflower, Pickled okra, Carrots, Peppers, Spinach, Lettuce

After tasting foods, we will ask questions about what your child tasted. Your child also will tell us what they ate at lunch and how they like to use things, like computers, in class. Everything your child tells us will be kept private.

During this nutrition program, your child:

1. Will use an iPad computer, either during or at the end of Body Quest.
2. May complete worksheets about eating healthy foods.
3. Will get things like a t-shirt and card deck that we will use in class.

If you let your child help us, we will use your child's worksheets and other information in our study. There are no good or bad answers. Your child's grades will not change because of anything your child says or does. Everything will be kept private.

Being a part of this study is totally up to you and your child. Your child can drop out any time.

Nothing bad will happen to your child if he or she does not want to be in this study or drops out. Your child will still stay in the classroom during Body Quest. Your child's grade will not change if he or she is not in the study. But your child will not get the teaching items like the t-shirt and card deck

Initial here to show that you read this page______

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Protocol # 11-213 MR 1107

the time. Your child may remain in the class to hear some of the presentations, complete nutrition worksheets, or engage in some other activity. Children that do not sign up for the study will not be asked to taste any of the fruits and vegetables or to complete any of the surveys, and they may not be able to use the iPad computers. Whether or not your child participates in the study will not impact your child's school grades.

All answers to questions given by your child will be confidential. There is always a risk of your child's answers being identified. We will work very hard to keep your child's answers a secret. There are no bad or mean questions being asked. Your child's school grades will not be hurt or helped by your child being in this study. Answers to questions are for research only, not for student grades.

To thank your child for being in this study, your child will get a Body Quest t-shirt. If your child wants, he or she can wear the t-shirt on the days of the program. During the program, your child also will get many items that help teach like a Body Quest warrior (1) card deck, (2) vow card and (3) power band. Children that do not participate will not receive any of these items.

If you or your child change your mind about being in the study, your child can drop out of the study at any time. Being a part of the study is voluntary. If your child drops out of the study, this will not affect your child's grades. If you take your child out, your child's data can be removed as long as it is identifiable. Your decision about whether or not to allow your child to be or not to be in the study or to stop will not hurt you or your child's future relations with Auburn University or the Alabama Cooperative Extension System.

Your child's privacy will be protected. Any information from this study will be a secret. All information will be kept safe in files that need a password. Information from your child in this study may be used to do an educational project, give a professional meeting and/or write it up in a professional book.

If you (or your child) have questions, ask them now or call Barb Struempler (334-844-2217) or Sondra Parmer (334-844-2231). You will get a copy of this letter to keep.

If you have questions about your child's rights for being in this study, contact the Auburn University Office of Human Subjects Research or the Institutional Review Board (phone 334-844-5966 or e-mail at hsubjec@auburn.edu or IRBChair@auburn.edu).

HAVING READ THIS INFORMATION, YOU MUST DECIDE WHETHER OR NOT YOU WISH FOR YOUR CHILD TO BE A PART OF THIS RESEARCH STUDY. YOUR SIGNATURE SHOWS YOUR WILLINGNESS TO LET YOUR CHILD BE IN THE STUDY.

| | |
|---|---|
| Parent/Guardian Signature     Date | Investigator obtaining consent     Date |
| Printed Name | Printed Name |
| Print Name of Child | |

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## Appendix B: Recruitment Script

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## Extension Body Quest Educator's Recruitment Script

## to be Read to Students as an Invitation to be in Body Quest

Hello. My name is _________________. I am a teacher with the Alabama Cooperative Extension System at Auburn University. Today I'm going to tell you about a nutrition program, called Body Quest that you might be interested in.

All students in this class are invited to help me study how kids can eat more fruits and vegetables. The study, Body Quest, also will teach you how to stay healthy by exercising and getting enough sleep. Body Quest, will take 30 minutes once a week for 17 weeks in class.

During this education, you will taste some fruits and vegetables. But, you don't have to eat anything that you don't like or are allergic to. Here are the foods you will be tasting.

FRUIT: Blueberries, Cantaloupe, Strawberries, Oranges, Pears, Pineapple, Peaches

VEGETABLE: Tomatoes, Squash, Broccoli, Cauliflower, Pickled okra, Carrots, Peppers, Spinach, Lettuce

After tasting foods, I will ask you questions about what you tasted. I also will ask you to tell me what you ate at lunch and how you like to use things, like computers, in the classroom.

Every week, you will get the chance to use "clickers" to answer questions. Clickers are like TV remotes and they let you push a button to answer a question. There is no right or wrong answer to the questions. And, the answers to these questions do not affect your grades in this class. All answers will be kept private.

During this nutrition program, you:

1. Will use an iPad computer, either during or at the end of Body Quest. **(Show iPad)**
2. Will get things like a t-shirt, deck of cards, promise card and power band. **(Show items)**

If you start in the study and decide you don't want to continue, you can drop out at any time. Just tell your parents, school teacher or me. No one will be angry with you if you stop, and it will not make any difference in your school grades.

For those of you who don't even want to sign up for Body Quest, you will still stay in the same classroom while I'm teaching Body Quest to the other students. Your teacher will give you

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some worksheets to do. Your grades will not change if you are not in the study. But, you will not get the teaching items like a t-shirt, deck of cards, promise card or power band.

Before you can be in Body Quest, your parent or guardian needs to give us their okay. Here is a permission form that they will need to sign. **(Show Parent Consent Form)**. If it is okay for you to be in Body Quest, they need to put their initials on the front piece of paper and then sign their name on the second page. **(Show students initial place and where parent needs to sign.)** Also, make sure they put your name on the page. **(Show students)** Take this home ***(today or in your weekly folder).*** Return the signed form to me on ____________. When you bring this form back with your parent's permission for you to be in Body Quest you will receive this Body Quest t-shirt. **(Show t-shirt)** Let's all try to wear our Body Quest t-shirt on the day I come and teach you nutrition.

Do you have any questions now? If you think of questions later, write them down and we can talk about them next time I am here.

# # # # END OF RECRUITMENT SCRIPT # # # #

Body Quest Educators: Every week before you begin your BQ class, please remind the students:

**You don't have to do any of the Body Quest activities today if you don't want to.**

**Appendix C: What's for Lunch Form**

Name: ________________________________

# What's for Lunch?

| Day / Date: ______________________ | Did you eat the food? | | Food was not served. |
|---|---|---|---|
| ______________________ | Yes | No | ☐ |
| ______________________ | Yes | No | ☐ |
| ______________________ | Yes | No | ☐ |
| ______________________ | Yes | No | ☐ |
| ______________________ | Yes | No | ☐ |
| Milk | Yes | No | ☐ |

If you did not eat a school lunch today, check here: ______

| Day / Date: ______________________ | Did you eat the food? | | Food was not served. |
|---|---|---|---|
| ______________________ | Yes | No | ☐ |
| ______________________ | Yes | No | ☐ |
| ______________________ | Yes | No | ☐ |
| ______________________ | Yes | No | ☐ |
| ______________________ | Yes | No | ☐ |
| Milk | Yes | No | ☐ |

If you did not eat a school lunch today, check here: ______

Day / Date:____________________________________

| | Did you eat the food? | | Food was not served. |
|---|---|---|---|
| | Yes | No | |
| | Yes | No | |
| | Yes | No | |
| | Yes | No | |
| | Yes | No | |
| Milk | Yes | No | |

If you did not eat a school lunch today, check here: ______

Day / Date:____________________________________

| | Did you eat the food? | | Food was not served. |
|---|---|---|---|
| | Yes | No | |
| | Yes | No | |
| | Yes | No | |
| | Yes | No | |
| | Yes | No | |
| Milk | Yes | No | |

If you did not eat a school lunch today, check here: ______

Day / Date:____________________________________

| | Did you eat the food? | | Food was not served. |
|---|---|---|---|
| | Yes | No | |
| | Yes | No | |
| | Yes | No | |
| | Yes | No | |
| | Yes | No | |
| Milk | Yes | No | |

If you did not eat a school lunch today, check here: ______

## Appendix D: County and School List

**Alabama Counties and Schools Participating in Body Quest during 2011-2012 School Year**

Barbour County

- Barbour County Intermediate School

Bibb County

- Woodstock Elementary

Bullock County

- Union Springs Elementary

Butler County

- Greenville Elementary
- Georgiana Elementary

Calhoun County

- Piedmont Elementary
- Cobb Elementary
- Constantine Elementary

Chambers County

- Eastside Elementary

Cherokee County

- Centre Elementary

Chilton County

- Maplesville High School

Clarke County

- Thomasville Elementary
- Jackson Intermediate

Clay County

- Ashland Elementary

Cleburne County

- Cleburne Elementary
- Pleasant Grove Elementary

Coffee County

- Kinston School
- New Brockton Elementary

Conecuh County

- Evergreen Elementary
- Conecuh County Junior High School

Coosa County

- Central Elementary

Covington County

- Straughn Elementary
- Red Level Elementary

Crenshaw County

- Highland Home School

Cullman County

- Welti Elementary
- Parkside Elementary

Dallas County

- Meadowview Elementary
- Five Points Elementary

Dekalb County

- Henagar Junior High
- Collinsville Elementary

Franklin County

Red Bay Elementary

Tharptown Elementary

Geneva County

Mulkey Elementary

Greene County

Eutaw Primary

Paramount Junior High

Hale County

Akron Community School

Sunshine School

Henry County

Headland Elementary

Abbeville Elementary

Jackson County

Hollywood Elementary

Lowndes County

Ft. Deposit Elementary

Macon County

George Washington Carver Elementary

DC Wolfe Elementary

Marshall County

Claysville Elementary

Union Grove

Pickens County

Aliceville Elementary

Pike County

Banks Primary School

Goshen Elementary

Randolph County

Rocks Mills Junior High

Wadley High School

Russell County

Ridgecrest Elementary

Sumter County

Kinterbish Junior High

Talladega County

Houston Elementary

Graham Elementary

Tallapoosa County

Dadeville Elementary

Horseshoe Bend Elementary

Washington County

Fruitdale Elementary

Wilcox County

J.E. Hobbs Elementary

Irvin Elementary

Winston County

Lynn Elementary