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Using Nutrition and Fitness Awareness to Reduce Overweight and Obesity in Adolescents

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Walden University
2016

Abstract

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MS, Walden University, 2014

MBA, National University, 1986

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Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

Clinical Psychology

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Abstract

In the United States, adolescent obesity rates continue to increase unabated, yet there is a paucity of programs to address these conditions for this population. The current study evaluated an after-school program in California high schools that uses a mentoring model with youth to promote regular exercise and healthy food choices. It is grounded in Social Cognitive Theory which focuses on both the impact of the environment on shaping behaviors and the ability of an individual to construct his or her own suitable environment. A quantitative single-group pretest–posttest design using archived participant responses was utilized in order to determine whether the program was effective in changing nutrition and fitness behaviors. Data from The Food Behavior Checklist, The Perceived Self-Descriptive Questionnaire, and the Nutrition Knowledge Checklist (N = 93) was used to obtain the answers to 5 research hypotheses. Paired sample t-tests and mediational analyses (using multiple regression) were conducted. The findings showed that participants in the program increased fruit and vegetable consumption, levels of physical activity, and the quality of their diet but had no significant effect on their perception of general fitness. It is clear that programs such as this one can be effective in altering the health behaviors of adolescents. The results of this study will positively contribute to social change by providing empirical support for the effectiveness of an intervention to improve nutrition and fitness activities in adolescents and modeling healthy behaviors to families and communities in an effort to reduce not only early-age mortality but also the increased health care costs associated with obesity.

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Dedication

I would like to dedicate this dissertation to God the Father, God the Son, and God the Holy Spirit. My journey would not have been possible without believing in God's ability to keep and sustain me.

I would also like to dedicate this to my parents and dearest Aunt Daisy, who provided me with mountains of encouragement on this journey until they left this earth.

Finally, to my son, daughter-in-law, and grandson, I dedicate this to you. Never, never, never give up!! "God so loved the world that he gave his one and only Son, that whoever believes in him shall not perish but have eternal life" (John 3:16, NIV).

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Chapter 1: Introduction to the Study

Approximately 21% of adolescents in the United States are obese (National Center for Health Statistics [NCHS], 2015; Ogden, Carroll, Fryar, & Flegal, 2015). This health concern is further compounded by the 37% of adults in the United States who are also obese, including parents of obese and overweight adolescents (NCHS, 2015; Ogden et al., 2015; S. L. Williams & Mummery, 2011). Consequently, adolescents may not have parental role models who convey the importance of a healthy lifestyle that includes physical activity. S. L. Williams and Mummery (2011) suggested that parents who are obese or overweight have a diminished ability to influence participation in physical activity in adolescents. Additionally, when adolescents perceive that their parents are restricting their food or pressuring them to eat, those adolescents are more likely to adopt unhealthy eating habits and are at an increased risk of developing eating disorders (Haycraft, Goodwin, & Meyer, 2013). To address this health crisis of adolescent obesity and to positively influence food choices of adolescents, the ABC program, an after-school health education intervention conducted at selected high school sites in a major metropolitan school district, provides a nutrition and fitness program to adolescents (the ABC program and the Parent Company are pseudonyms used in lieu of the real names in this study). The goals of this intervention program are to

> address the childhood obesity epidemic that disproportionately affects families in a large metropolitan city area; teach high school students the importance of making healthy food choices and exercising regularly; reduce the rate of childhood obesity and related illnesses among youth in a large metropolitan city;

> increase youth participation in regular physical activity; improve students' overall health and fitness levels; and to empower students to become advocates for healthy eating and increased physical activity. (Parent Company, n.d.)

The efficacy of the ABC program as an intervention to promote healthy lifestyle choices through education has not received a comprehensive evaluation since the program's inception in 2006. A cursory evaluation related to grant funding was performed in or around 2008. This evaluation included 16 participants, had mixed results, and is more fully discussed in Chapter 2. Evaluation is an essential aspect of a program to determine how well the program achieves its intended goal, to identify specific features attributed to positive and negative results, and to assess the economic practicality of the program (Branscum, Kaye, & Warner, 2013; Schulberg & Baker, 1968; Summerbell et al., 2009).

The focus of this research was to ascertain the effect of the program in changing behaviors related to the physical activity and nutrition of its participants. Changes in these areas may contribute to a reduction in overweight and obesity conditions in adolescents. Conducting an outcome evaluation of the ABC program will contribute to positive social change by increasing the existing knowledge of intervention programs to improve adolescent nutrition and fitness literacy. Improvements in this area may serve to reduce the chronic rate of obese and overweight adolescents, who often maintain the same conditions into adulthood, resulting in early mortality (Babey, Wolstein, Diamant, Bloom, & Goldstein, 2012; Ogden, Carroll, Kit, & Flegal, 2013).

This chapter provides the background of the problem, the purpose of the study, the research hypotheses, and the theoretical framework. Additionally, the following sections address the nature of the study, definitions, assumptions, limitations and delimitations, the significance of the study, and a summary and transition to the literature review contained in Chapter 2.

Background of the Study

Currently in the United States, 37% of adults and 21% of adolescents are obese or overweight (Ogden et al., 2013; Ogden et al. 2015; U.S. Census Bureau, 2014). The adult obesity rate has increased substantially since 1962; initial data obtained in 1962 revealed that 13% of adults were obese (Ogden & Carroll, 2011). Some of the increases in obesity in this period are attributable to economic, societal, and work changes (e.g., dual earners, more single mothers entering the workplace). The convenience of serving prepackaged foods replaced home-prepared meals, and there was a reduction in physical activity resulting from long work hours, television viewing, and other demands (Cawley & Liu, 2012). Adult obesity substantially increased from 13% to 23% from 1988 to 1994, followed by additional increases up to 35% from 1995 to 2012 (Flegal, Carroll, Ogden, & Johnson, 2002; Ogden, Carroll, Kit, & Flegal, 2014). Overall, persistent increases in obesity are suggestive of an aggregation of multiple influences, including environmental, economic, and technological growth during the last half-century (Swinburn et al., 2011; World Health Organization [WHO], 2015b).

The interest in childhood and adolescent obesity began in the mid-1950s to early 1960s, as diabetes began increasing among the population of the United States and

Europe (Gale, 2002). The rate of adolescent obesity was 5% in 1966 to 1970, when the Centers for Disease Control and Prevention (CDC) began collecting data (Fryar, Carroll, & Ogden, 2012). Adolescent obesity levels increased to 11% from 1988 to 1994, coinciding with significant increases in adult obesity rates, then to 15% in 1999 to 2000, and finally to the current national rate of 21% in 2014 (Fryar et al., 2012; Ogden et al., 2015). The national rate of adolescent obesity obscures the racial demographics that reveal a greater prevalence of adolescent obesity among Mexican American boys and non-Hispanic Black girls in comparison to other ethnic groups (Babey, Wolstein, & Diamant, 2011; Schaefer et al., 2008; Van Hook & Baker, 2010). Between 1988–1994 and 2009–2012, the rate of obesity among Mexican American boys increased from 14% to 27% (Fryar et al., 2012; NCHS, 2015). Among non-Hispanic Black girls, the rate of obesity for the same period increased from 16% to 24% (Fryar et al., 2012; NCHS, 2015). Increases in adolescent obesity are associated with a combination of energy imbalance, poor dietary behaviors, physical inactivity, societal and environmental factors, and individual and biological issues (Rayner et al., 2010; Schwarz, 2013; Spruijt-Metz, 2011).

Poor dietary behaviors and physical inactivity influence the growth of adolescent obesity. Ervin and Ogden (2013) noted that adolescents eat fewer fruits and vegetables, consume more sugar-sweetened foods, and ingest 40% of their calories in sweetened beverages. As an example, responses on the 2013 National Youth Risk Behavior Survey (Kann et al., 2014; NCHS, 2015) by high school students indicated that 7 days prior to the survey, 84% of students ate up to two vegetables daily, and 63% of students

consumed one or more fruits or drank 100% fruit juice daily (Kann et al., 2014; NCHS, 2015). However, during the same period, there was notable physical inactivity, as 33% of the responding high school students spent 3 or more hours daily watching television and 41% of students played video or computer games daily, whereas only 27% of students engaged in physical activity daily (Kann et al., 2014; NCHS, 2015). While a contributing factor to the low level of physical activity may be neighborhood safety concerns, especially in low-income areas, there is a noticeable increase in media usage (i.e., televisions, video games; Levine, 2011; Sallis, Floyd, Rodriguez, & Saelens, 2012).

An effect compounding the ascending levels of adolescent obesity is the continuous growth in fast-food restaurants and convenience stores and limited access to regional markets with healthy foods (Hattori, An, & Sturm, 2013; Hillier et al., 2011; Oka, Link, & Kawachi, 2012; J. Williams et al., 2014). These environmental factors, occurring in primarily low-income and urban communities, serve to increase the proclivity toward unhealthy eating and adolescent obesity (Gebauer & Laska, 2011; Hillier et al., 2011; Langellier, 2012; J. Williams et al., 2014).

Methods to prevent adolescent obesity have included family-based or school-based interventions and have shown varying degrees of success (Barr-Anderson, Adams-Wynn, DiSantis, & Kumanyika, 2013; Jain & Langwith, 2013; Kong et al., 2013; Van Ryzin & Nowicka, 2013). Pharmacological treatment and surgical procedures such as bariatric surgery have also been used in extreme cases of adolescent obesity (Chuang, Zeller, Inge, & Crimmins, 2013; Kelly et al., 2013; Matsuo et al., 2013). However, medical treatments and interventions remain relatively rare solutions to adolescent

obesity, with limited research regarding long-term effects (Chuang et al., 2013; Matsuo et al., 2013).

More recent efforts at the national level began in 2010 as President Obama mandated executive departments and agencies within the government to develop accelerated strategies to prevent and reduce childhood obesity (White House Task Force on Childhood Obesity [TFCO], 2010). These strategies were operationalized through the Let's Move! initiative and have resulted in corporate partnerships affecting school environments, advertising, nutritional labeling and quality of food, and commitments by large regional grocers to build markets in underserved areas (TFCO, 2010; Wojcicki & Heyman, 2010). Additional steps to improve access to physical activities have also been coordinated through corporate sponsorships to create safe locations and community-based physical activity programs (TFCO, 2010; Wojcicki & Heyman, 2010).

This study is needed, as the rate of adolescent obesity has not abated significantly since 2005, and this study may contribute to the existing body of knowledge on effective intervention efforts for increasing adolescent knowledge of healthy lifestyle choices. This would create the ability to effect positive social change by reducing the economic burden of costs related to future hospitalization for obesity and obesity-related diseases.

Problem Statement

In a large major California county, 42% of fifth-, seventh-, and ninth-grade students are overweight or obese (Babey et al., 2011). Among this diverse population, Hispanic (45%), American Indian (41%), and African American (39%) youths disproportionately have the highest rates of overweight and obesity in California (Babey

et al., 2012; Madsen, Weedn, & Crawford, 2010). Obese and overweight children transition into adolescence with increased autonomy and continue to make poor food choices without understanding the long-term effects on their health (Freedman & Nickell, 2010). They are not always aware that consuming low-nutrient foods contributes to overweight and obesity, which are associated with hypertension, type 2 diabetes, and cardiovascular and other diseases that influence early mortality in adulthood (Centers for Disease Control and Prevention [CDC], 2015b; Ogden et al., 2013). In 2010, obesity was listed as one of several conditions attributing to death for 8% of the population. This is a 52% increase from 1999 mortality rates for the same category; meanwhile, the population has only increased by 7% during the same time period. More importantly, this mortality rate is likely to be understated because data may be omitted on death certificates (CDC, 2012). These health concerns and potential medical costs highlight the importance of exposing adolescents to nutrition and fitness information that will enable them to make healthy lifestyle choices. The ABC program is an example of an overweight and obesity intervention that is conducted after school and provides participants with nutrition literacy and fitness activity to make healthier life choices (Parent Company, n.d.).

Currently more than 6,000 students have taken part in the ABC program (Parent Company, n.d.). However, the problem is that the positive and negative effects associated with providing nutrition and fitness literacy to the participants in the ABC program are vague. Participants may have experienced changes in eating and fitness behaviors while attending the program; however, it is also possible that participants did not receive any benefit by attending the program. Walker, Graves, Montoya-Soto, and Rios (2008) noted

the following in a cursory review of 16 participants who regularly attended the program: soda consumption decreased and the intake of fruit as snacks increased, but there were mixed results in the level of nutrition knowledge. Considering that a large number of students have attended the program and the high rate of obesity and overweight among adolescents in the large California county, it is important to determine if the program is effective in meeting its goals. The literature on intervention programs addressing adolescent overweight and obesity is limited and widely varies in methodology and outcomes. The results of this program evaluation will contribute to the effective development and improvement of present and future nutrition intervention programs. The program may also contribute to the proposed activities in the City Trust for Children's Health 2014 and the 3-year strategic plan for a large metropolitan school district, according to school district internal documents. Finally, it may inform health care professionals on an intervention practice for adolescents that may reduce obesity-related illnesses and medical costs and build on the existing body of research on interventions related to reducing overweight and obesity among adolescents.

Purpose of the Study and Research Hypotheses

The overall intent of this research is to examine the efficacy of the ABC program in affecting nutrition and fitness behavior changes that can lead to the reduction of obesity and overweight in adolescents at high schools in a large California city participating in the program. The ABC program goals are to

> teach high school students the importance of making healthy food choices and exercising regularly; reduce the rate of childhood obesity and related illnesses

> among Los Angeles youth; increase youth participation in regular physical activity; improve students' overall health and fitness levels; and to empower students to become advocates for healthy eating and increased physical activity, and address the childhood obesity epidemic that disproportionately affects families in the large metropolitan city area. (Parent Company, n.d.)

ABC Program Description and Recruitment

High school teachers expressing an interest in the ABC program recruit participants in classrooms and by posting flyers at the school. The program includes 5 weeks of nutrition and fitness classes, an orientation class, and a culmination session. Adult mentors who instruct and facilitate the classes are professionals, certified teachers, and graduate students (Parent Company, 2013; Walker et al., 2008). The information acquired by participants is reinforced by serving as peer instructors in nutrition classes at local elementary or middle schools. Durlak, Weissberg, and Pachan (2010) and Jomaa et al. (2010) noted that peer influence among adolescents increases the receptivity of healthy lifestyle behaviors and provides opportunities for personal growth and leadership. The effects of the program on elementary and middle school participants are not included in this study.

Program participants receive incentives for attendance in the form of raffle prizes, and when they complete the program, they are given 20 hours of community service credit to apply to their service learning requirement for high school. The program is open to all students; however, the participants are primarily Hispanic and African American adolescents, who typify the demographics of the nearby neighborhood and schools.

Study Population

An adolescent population was selected for this study in view of the paucity of research relative to interventions to prevent and reduce obesity in adolescents and the potential to contribute to the body of existing research in this area (Branscum et al., 2013; Brooks & Begley, 2013; Durlak et al., 2010; Waters et al., 2011). Hence, given the elevated rate of obesity and overweight among Hispanic and African American adolescents, it is important to determine if the ABC program is meeting its goals of effecting change among the program participants.

A quantitative methodology was used in this evaluative study as it provides an unbiased numerical analysis of the relationship, if any, between the independent variable and the dependent variables; can quantify changes over time; and can provide a statistical response to the research hypotheses (Shuttleworth, 2008). The overarching research inquiry was to determine if the ABC program achieves its goal of improving overall health and fitness by changing the eating behaviors and improving the physical activity of its participants. This research inquiry was guided by five hypotheses.

A single-group pretest–posttest research design was used for Hypotheses 1–4 to determine if there were significant effects on ABC program participants (Creswell, 2009). The intervention was the independent variable, and the dependent variable was change in participant scores in fruit and vegetable intake, quality of diet, perception of general fitness, physical activity level, and nutrition knowledge. Additionally, a correlational research design was used for Hypothesis 5 to examine mediation effects of the intervention. The independent variable was quality of diet, the mediating variable was

perception of general fitness, and body self-perception was the dependent variable for the mediation hypothesis. In this study, the manipulation between the independent and dependent variables occurred through the attendance of the participants at the intervention; there was no control of these variables, which change with time.

In this study, I used archival data consisting of participant responses to the University of California Cooperative Extension Food Behavior Checklist (FBC), Perceived Self-Descriptive Questionnaire (PSDQ), and Nutritional Knowledge Checklist (NKC) maintained by the ABC program (Kristal et al., 1990; Townsend, Kaiser, Allen, Joy, & Murphy, 2003). The FBC has 16 questions with two or more response choices; it assesses behaviors related to fruit and vegetable intake, fat and cholesterol, diet quality, food security, and milk intake. The PSDQ contains 18 questions requiring a 6-point Likert-type scale response ranging from 1 (*false*) to 6 (*true*); it assesses self-perception of body fat, physical activity, and general fitness. The NKC has 12 multiple-choice questions with each question requiring a selection of one out of four possible answers; it is used to determine the student's knowledge of healthy foods, exercise, nutrition, and dietary guidelines.

The overarching research inquiry to determine if the ABC program promotes health behavior change through its goal of improving healthy food choices and regular exercise in adolescents attending high school in a large school district was guided by the following five hypotheses:

$H1_0$: As students' knowledge about nutrition and fitness increases from pretest to posttest, there will be no change in the amount of fruits and vegetables they consume.

$H1_1$: As students' knowledge about nutrition and fitness increases from pretest to posttest, they will consume more fruits and vegetables.

$H2_0$: As students' knowledge about nutrition and fitness increases from pretest to posttest, there will be no change in the quality of their diet.

$H2_1$: As students' knowledge about nutrition and fitness increases from pretest to posttest, the quality of their diet will increase.

$H3_0$: As students' knowledge about nutrition and fitness increases from pretest to posttest, there will be no change in their perception of general fitness.

$H3_1$: As students' knowledge about nutrition and fitness increases from pretest to posttest, their perception of general fitness will increase.

$H4_0$: As students' knowledge about nutrition and fitness increases from pretest to posttest, there will be no change in their level of physical activity.

$H4_1$: As students' knowledge about nutrition and fitness increases from pretest to posttest, their level of physical activity will increase.

$H5_0$: As students' knowledge of nutrition and fitness increases from pretest to posttest, there will be no effect on their quality of diet, level of general fitness, and body self-perception.

*H*5$_1$: As students' knowledge of nutrition and fitness increases from pretest to posttest, their quality of diet will improve, leading to increased levels of general fitness and improved body self-perception.

An evaluative study of the ABC program identified aspects of the program that will enable the primary stakeholders to determine changes that may be needed to increase the effectiveness of the program and eliminate parts of the program that are not efficient. The importance of this evaluative approach is its ability to add to the current body of knowledge on interventions to reduce obesity and overweight in adolescents and contribute to future interventions in this area.

Nature of the Study

A program outcome evaluation design was selected, as it provided insight into the efficacy of the ABC program and contributed useful information to enhance the effectiveness of the program. This design provided an opportunity to evaluate the program through both a theoretical and advocacy framework in contributing to the existing body of knowledge on what works and does not work in providing nutrition and fitness literacy to adolescents. An adolescent population was selected for this study in view of the paucity of research relative to interventions to prevent and reduce obesity in adolescents and the ability to contribute to the body of existing and future knowledge in this area (Branscum et al., 2013; Brooks & Begley, 2013; Durlak et al., 2010; Waters et al., 2011).

The data for this pretest–posttest single-group design were archival data consisting of participant responses to the FBC, PSDQ, and NKC. A quantitative review

of the data helped to identify themes and relationships between the variables and identify areas that support program goal achievement. The key variables for the hypotheses were the intervention and change in participant scores on (a) level of fruits and vegetables consumed, (b) quality of diet, (c) perception of general fitness, (d) level of physical activity, and (e) nutrition knowledge. The key variables for the mediation hypothesis were quality of diet, perception of general fitness, and body self-perception (body fat). All of the participants' identifying information was deleted by the Parent Company, the parent organization of the ABC program.

Measurement Devices Used by ABC

Food Behavior Checklist

The FBC is a published instrument and has demonstrated validity and reliability in psychometric reviews with adult populations and, in a limited way, with children (Blackburn et al., 2006; Branscum, Sharma, Kaye, & Succop, 2010; Murphy et al., 2001; Townsend, 2006; Townsend & Kaiser, 2005; Townsend et al., 2003). The FBC has 16 questions that load onto four subscales: Fruit and Vegetable, Milk, Fat and Cholesterol, and Diet Quality (Townsend et al., 2003). The fruit and vegetable subscale has emerged as the strongest of the subscales with both adults and children (Branscum et al., 2013; Branscum et al., 2010; Kristal et al., 1990; Somerville, Kessler, Wallace, & Burns-Whitmore, 2012). Archival data containing the participant responses to this instrument were used in this study.

Perceived Self-Descriptive Questionnaire

The PSDQ is an unpublished instrument used to assess self-perception of body fat, physical activity, and general fitness (Parent Company, n.d.). The PSDQ has 18 questions that require a 6-point Likert-type scale response ranging from 1 (*false*) to 6 (*true*) that load onto three subscales (Parent Company, n.d.). Archival data containing the participant responses to this instrument were used in this study.

Nutrition Knowledge Pretest–Posttest Checklist

The NKC is an unpublished instrument used to assess nutrition and the student's knowledge of healthy foods, exercise, and dietary guidelines (Parent Company, n.d.). The NKC has 12 multiple-choice questions, and each question requires a selection of one out of four possible answers (Parent Company, n.d.). Archival data containing the participant responses to this instrument were used in this study.

In this study, I evaluated the effectiveness of the ABC program in attaining its goals through quantitative methods that included evaluating changes in participants' knowledge of nutrition and fitness, level of perceived general fitness, intake of fruits and vegetables, diet quality, level of physical activity, and body self-perception (body fat). The instruments and their use in this study are more fully discussed in Chapter 3. These archival data were used to test and report the psychometric properties of the scales that served as the basis of this study.

Theoretical Framework

The theoretical framework guiding this study was social cognitive theory (SCT) and an advocacy perspective that focused on a recommendation from TFCO. While other

theoretical models were considered, SCT is most frequently used in nutrition and fitness interventions for adolescents and children, as SCT recognizes both the impact of the environment on shaping behaviors and the ability of an individual to construct his or her own suitable environment (McAlister, Perry, & Parcel, 2008). Moreover, adolescence is an appropriate age relative to the ability to recognize the influence of environment on behavior and the consequences of individual behavior (Brooks & Begley, 2013).

SCT ascribes behavioral change to a bidirectional interaction between the environment, personal issues, and behavior with self-efficacy acquired relative to behavioral change (Bandura, 1986). SCT, which provides insight into the cognitive operations between an individual and the environment, evolved from social learning theory, which was rooted in operant conditioning (Grusec, 1992; Pajares, 2002). Outcome expectancy and self-efficacy are two concepts in SCT that were reviewed in this study. Outcome expectancy related to this study was conceptualized as a belief that attending ABC would influence eating behaviors, which is desirable and applicable for the present with future benefits. Self-efficacy was conceptualized in this study as an individual belief that by increasing knowledge of healthy dietary behaviors, an individual can influence quality of life, which will lead to behaviors that support a healthy lifestyle.

Additionally, recommendations from the TFCO (2010) to promote good nutrition and provide dietary guidelines to reduce obesity were viewed as a supportive framework toward behavioral change. Additional information regarding the theoretical framework and the advocacy perspective is given in Chapter 2.

Definition of Terms

The following terminology was used throughout this study and is associated with the referenced definitions:

Adolescents: Individuals in Grades 9–12 attending high school.

After-school intervention program: A program that takes place after normal school hours. The location, activities, and program structure can widely vary and have as a goal to address health-related concerns. As an example, programs can be held on the school campus and used to support additional classroom learning (After School Alliance, n.d.).

Body mass index (BMI): BMI is defined by calculating "weight in kilograms divided by height in meters squared, rounded to one decimal place" (Ogden, Carroll, Curtin, Lamb, & Flegal, 2010, p. 243).

Children: Young school-aged children aged 2–11 years (Ogden & Carroll, 2010).

Obese: As defined in the United States, having a BMI at the 95th percentile and above for children or adolescents of the same age and sex; as defined by the WHO, obese is having a BMI greater than or equal to 30 (CDC, 2015a; WHO, 2015a).

Overweight: As defined in the United States, having a BMI at the 85th percentile and less than the 95th percentile for children or adolescents of the same age and sex; as defined by the WHO, overweight is having a BMI greater than or equal to 25 (CDC, 2015a; WHO, 2015a).

School-based intervention program: A program that occurs during normal school hours and addresses health-related concerns. The term *school-based* is also sometimes

used loosely to describe after-school nutrition programs that are conducted on the school campus site.

Assumptions

Assumptions relate to the reliance on the accuracy of all data provided during the study, including participant responses and Web site content. For this study, it was assumed that the information provided by the key stakeholders of the Parent Company was accurate. It was also assumed that all relevant information was provided by the key stakeholders at the Parent Company to provide an objective evaluation of the program.

Limitations and Delimitations

This study had several limitations. Participants attending the ABC program gain leadership and mentoring experience by mentoring elementary and middle school students with the same curriculum. In this study, I did not evaluate the mentoring conducted by the high school students and its effect on elementary and middle school students. SCT was the theoretical framework for this study. While other theories were considered, SCT was the most relevant theory in that it considers the ability of an individual to create a self-suited environment. In addition, I did not use control or comparison groups, randomization, and variables such as socioeconomic status, gender, attendance, and household resources. The participants may receive community service hours from the high school and small incentives from the program sponsors. The study did not evaluate or measure the effect of these incentives on participant attendance. This study did not measure the association between actual weight loss and participant nutrition knowledge during the intervention. The participants in the program attend high schools in

Southern California; therefore the results cannot be generalized to all adolescents or high school students. The ABC program is one of several nutrition and fitness program formats used by the Parent Company. The outcomes from this study cannot be generalized to other programs administered by the parent organization. The effectiveness of this program is limited to the specific goals, requirements, and operations of the program and cannot be generalized to other intervention programs.

Significance of the Study

The significance of this study is that it can be viewed as an opportunity to add to the body of knowledge on adolescent interventions to reduce and prevent obesity. There is limited research on interventions for this population, and the broad spectrum of research outcomes range from no effect to those indicating that behavioral interventions may have some success (Spruijt-Metz, 2011). However, the potential to reduce the economic impact of overweight and obese adolescents and children is also significant. The importance becomes apparent in the cost of treating adolescents and children who are overweight versus those who are normal weight. The cost of medical care for overweight and obese adolescents and children is significantly higher as compared to normal-weight children (Trasande & Chatterjee, 2009). Additionally, as obese and overweight adolescents generally maintain the same physical condition into adulthood, there is a substantial increase in cost for treating morbidities associated with adult overweight and obesity (Cawley, 2009). Finally, overweight and obese children and adolescents use health care facilities and prescriptions at a higher rate than their normal-weight peers. The overuse of health care services and pharmaceuticals contributes to

higher health care costs, which are passed to consumers through health care premiums, Medicare, and Medicaid (Cawley, 2009).

As adolescents become empowered through applying acquired knowledge of healthy food and fitness, the implication for positive social change is the potential for them to model and teach these benefits to their families and within their local communities. Additionally, while providing this information to family, friends, and their community, they may reduce the economic impact of obesity-related disorders. Learning to make healthy nutrition and fitness choices is also one of the recommendations of the TFCO and is within the framework of Let's Move! (Learn the Facts, n.d.). Social change begins with one individual, who can then affect those around him or her and, ultimately, the local community.

Summary and Transition

The level of childhood and adolescent obesity has increased from 5% in 1966 to the current rate of 18% and remains extremely high (Fryar et al., 2012). The prognosis for overweight adolescents is that they will become overweight adults, and the evaluation of the ABC program as an intervention for adolescents has potential economic importance. The consequence of carrying excessive weight into adulthood is obesity-related diseases, economic consequences of lost jobs due to illness, and early mortality. Evaluating the effectiveness of the ABC program contributed to the existing and future knowledge of interventions for adolescents. In Chapter 2, I discuss the literature review of interventions for adolescents and their effectiveness and the theoretical framework used to conceptualize this research. In Chapter 3, I share the methods used for conducting the

evaluative study and analyzing archival data. In Chapter 4, I present the research results, and in Chapter 5, I discuss the results, implications from the research, and future research recommendations.

Chapter 2: Literature Review

The prevalence of obesity is not confined to the United States but has become a global public health problem. Worldwide obesity has doubled since 1990 to 1.4 billion in 2011 and closely rivals worldwide hunger rates (Flegal et al., 2012; Hosper, Nicolau, van Valkengood, Nierkens, & Stronks, 2011; Rayner et al., 2010; Volken, Schaffert, & Ruesch, 2011; WHO, 2015a). The WHO has estimated that 1.9 billion adults worldwide or 39% of individuals aged 18 years or older worldwide are overweight, and of these individuals, 13% or 600 million are obese (WHO, 2015a, 2015b).

Obesity is defined as having a BMI of 30 or higher, which is the same measurement standard for adults and children (WHO, 2015a). The interest in childhood and adolescent obesity was kindled by the rapid increase in childhood diabetes and other obesity-related diseases between the mid-1950s and early 1960s in Europe and the United States (Gale, 2002). Adolescent obesity in the United States increased from 5% in 1966 to 1970 to the current rate of 21% (Ogden et al., 2014). In the past, adolescent obesity paralleled the growth in adult obesity. However, the adult obesity rate has not changed meaningfully and remains at 37% (NCHS, 2015; Ogden et al., 2015).

Adolescent obesity and overweight are associated with poor dietary behaviors, physical inactivity, societal and environmental factors, and individual and biological issues (CDC, 2014; Ogden et al., 2013; Rayner et al., 2010; Schwarz, 2013; Spruijt-Metz, 2011). Consequently, eating behaviors in adolescence carried into adulthood are associated with adult obesity and early-age mortality from cardiovascular disease, diabetes, and other morbidities (CDC, 2014; Freedman, Khan, Dietz, & Srinivasan, 2001;

Freedman & Nickell, 2010; Kumanyika et al., 2008). Additionally, overweight and obesity conditions are associated with low self-esteem and body image in adolescents (McClure, Tanski, Kingsbury, Gerrard, & Sargent, 2010).

Preventive efforts to reduce adolescent obesity have been obscured while research efforts focus on reducing obesity in young children, preadolescents, and adults (Summerbell et al., 2009; Wilson, 2009). The scarcity of research on adolescent obesity thwarts collective efforts to extend the body of knowledge on effective preventive efforts for this population (Kropski, Keckley, & Jensen, 2008; Summerbell et al., 2009; Waters et al., 2011). The goal of this study was to determine the effect of a nutrition and fitness intervention in teaching adolescents attending high school in a large metropolitan school district in California to make healthy food choices and to exercise regularly to reduce overweight and obesity.

The intervention program captures the importance of teaching adolescents about eating behaviors and fitness by integrating lessons on body perception, general fitness, physical activity, and nutrition (diet quality) into the curriculum. The nutrition curriculum was developed using SCT as a framework. SCT constructs of self-efficacy and outcome expectations and their relationship to the variables in this study may contribute to understanding adolescent eating and fitness behaviors that will support the existing body of research on effective intervention programs.

Finally, acknowledging the national crises in the increasing rate of obesity for all age groups, the TFCO, through its agencies and governmental departments, continues to seek strategies to prevent and reduce childhood obesity (TFCO, 2010). Understanding the

evaluation outcome relative to preventing and reducing overweight and obesity in adolescents may contribute more broadly to the national strategy in this area.

In this chapter, I discuss the literature on adolescent nutrition and fitness programs, the theoretical framework, key variables, and how this study will contribute to existing knowledge of intervention programs for adolescents.

Literature Search Strategy

Information on the subject matter was gathered from journal articles, dissertations, books, and Internet articles by using electronic databases and search engines. Research sources included EBSCOhost, Medline, PubMed, Google Scholar, and citation reviews. Research to locate literature for the period from 1986 to 2015 was performed by using combinations of terms, in addition to the name of the particular school district, as follows: *social cognitive theory, social learning theory, program evaluation, after-school, nutrition, school-based, intervention, high school, obesity, prevention, large metropolitan city, California, adolescents, youth, overweight, advertising, childhood, program, food literacy, PSDQ, physical self-descriptive questionnaire, Food Behavior Checklist, nutrition, knowledge, physical activity*, and *obesity*. The literature obtained during the search was included after determining that the information compared favorably to the topic, the constructs of interest, and the methodology of this study. There were a small number of studies for high school adolescent populations as compared to other age groups that were also noted in several studies (Kropski et al., 2008; Sharma, 2011; Summerbell et al., 2009; Waters et al., 2011).

Theoretical Framework

Social Cognitive Theory

SCT is commonly used as a theoretical framework for health interventions and is appropriate for conceptualizing this study, as it integrates perspectives from both psychology and sociology and provides a foundation for understanding the underlying behavioral change (Bandura, 1971; McAlister et al., 2008; Sharma, 2011). Rooted in social learning theory, SCT attributes behavioral change to the constant bidirectional interaction between the environment, the individual (including cognitions and emotions), and behaviors or reciprocal determinism (McAlister et al., 2008). Individuals learn and master a behavior by experiencing personal, nonthreatening activities and observing modeled behaviors and consequences experienced by other individuals, which introduces cognitive blueprints that create new behaviors (Bandura, 1977, 1986; Glanz & Bishop, 2010). Figure 1 shows the reciprocal determinism.

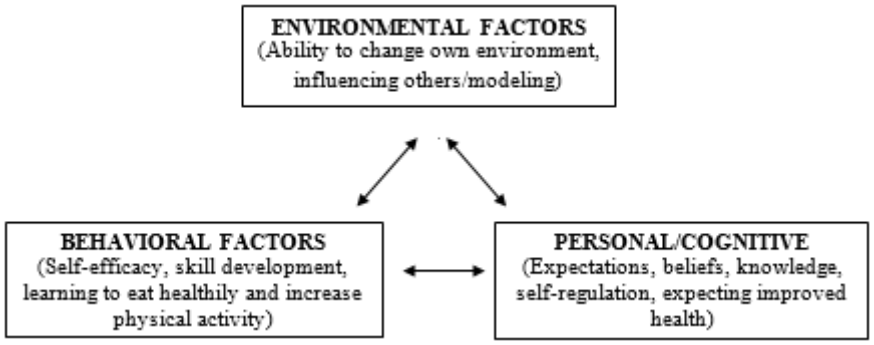

Figure 1. Reciprocal determinism: Bidirectional interaction leading to behavior change.

Self-efficacy and outcome expectancy are two of the nine concepts in SCT that were used to conceptualize this study. Self-efficacy is a meaningful concept in SCT and, unlike some of the other concepts in SCT, has been frequently validated in research (Glanz & Bishop, 2010; Irwin, Irwin, Miller, Somes, & Ritchey, 2009; Sharma, 2011). An individual must believe in his or her ability to change a behavior and that there are benefits from the behavior change (self-efficacy). Therefore, as an individual acquires self-efficacy, conscious self-directed behavior choices are made to avoid negative consequences or to gain positive reward (Bandura, 1971, 1986; Grusec, 1992; Pajares, 2002). Bandura (1977) posited that "the stronger the perceived self-efficacy, the more active the effort" (p. 194).

Outcome expectation is the belief that an individual is likely to perform an activity that will have an outcome that will be beneficial to the individual. This concept is extended in SCT by adding that it is a subjective belief and personal perception of a goal accomplishment with future benefits. Therefore, whether or not an individual decides to engage in a behavior will depend on his or her perceived feelings about performing or not performing a task (McAlister et al., 2008).

SCT and intervention programs. SCT has been used as a guiding source in the development of intervention programs to promote causes such as change in diet, obtaining mammographies and health screening for women in underserved communities, promotion of contraceptive use, and with adolescents and children in school-based and after-school health programs (Glanz & Bishop, 2010; Sharma, 2011). Spahn et al. (2010) argued that the use of SCT as evidence-based theoretical practice in nutritional

counseling has not been validated. This argument was based on the scarcity of research in nutritional counseling using SCT and the failure to show significant benefits when used in individualized settings (Spahn et al., 2010). In contrast, Branscum et al. (2013) pointed to the usefulness of SCT in evaluating the effectiveness of curricula with SCT constructs. Branscum et al. noted that each participant experienced significant improvement in behavioral capabilities to choose healthy food.

SCT and the ABC program. The ABC program is a fitness and nutrition intervention program for adolescents. The curriculum framework was developed using SCT, and SCT constructs of outcome expectancy and self-efficacy were evaluated in this study (McAlister et al., 2008; Spahn et al., 2010). Self-efficacy as related to this study was the belief that an individual can influence his or her quality of life by increasing knowledge of healthy dietary behaviors that will lead to behaviors supportive of a healthy lifestyle. Self-efficacy, hypothesized through Hypothesis 1, looked at the ability to change eating behaviors related to fruits and vegetables after acquiring nutrition knowledge.

Outcome expectancy was viewed as an individual's belief that attending ABC may influence eating behaviors, which is desirable and applicable for the present and has future benefits. Evaluation of outcome expectancy was hypothesized (in Hypothesis 5) as determining if there is an association between nutrition knowledge and dietary behaviors (as measured by quality of diet) and if the dietary behaviors are associated with increased levels of general fitness and body self-perception.

ABC compared to other interventions. Branscum et al. (2013), Freedman and Nickell (2010), and Somerville et al. (2012) used SCT within the intervention framework to add meaning to the behavioral outcomes of a community-based nutrition program and a garden-based nutrition education program. The concepts of outcome expectancy and self-efficacy were selected most often by Branscum et al. (2013). Somerville et al. (2012), with Freedman and Nickell (2010), chose to evaluate all of the SCT concepts in the intervention. The concepts in the interventions were measured by using skill- and knowledge-based activities and surveys worded to solicit self-efficacy and outcome expectations. This study of the ABC program included a review of the concepts of self-efficacy and outcome expectancy; this study is similar to Branscum et al. in research design and methodology, which also reviewed the concepts of self-efficacy and outcome expectations. Branscum et al. noted a significant improvement in the behavioral capability concept as the concept was included in the learning modules; a smaller effect was noted for self-efficacy, and no effect was noted for outcome expectancy. Branscum et al. attributed the findings regarding outcome expectancy to improperly worded questions on the testing instrument.

Other theoretical perspectives considered. While SCT appeared to be the most appropriate theoretical orientation for this study, others were considered. Traditionally, such theories as the transtheoretical model, the health belief model, and the theory of planned behavior/theory of reason have been used in studies of health interventions. However, these tend to disregard the ability of an individual to construct a self-suited environment resulting from the bidirectional influence of individual behavior in the

environment and personal experiences. A self-suited environment is an individually constructed atmosphere supporting new behavior from incentive motivation and resource access (McAlister et al., 2008). Additionally, unlike the theory of planned behavior/theory of reason, SCT ascribes to a self-evaluative process that allows an individual to decide on a behavior, evaluate the cost or benefit associated with the behavior, and assess any emotions associated with the decision (McAlister et al., 2008).

Theory is not always used within the framework of after-school and school-based nutrition and fitness programs; however, when a theory is used, it is most often SCT (Hendrie et al., 2012; Webb, Joseph, Yardley, & Michie, 2010). As an example, in a meta-analysis of adolescent nutrition literacy programs from 2000 to 2012, two-thirds of the studies focused on determinants of adolescent obesity program effectiveness, the program design and delivery, and the components of the program but did not indicate a theoretical framework (Brooks & Begley, 2013). However, Hendrie et al. (2012) noted that effective preventive programs were associated with behavioral change techniques and pointed to an inverse relationship between the intensity in which the theoretical construct was used and the effectiveness of the intervention. This could explain the mixed results noted by Sharma (2011) in outcomes from brief interventions given to an elementary and middle school population between 2006 and 2011 that used SCT.

Advocacy Construct: Let's Move!

Recommendations to the president from TFCO provided 73 action items for reducing childhood obesity by the year 2020 (TFCO, 2010). The executive mandate from President Obama requires all governmental departments and agencies to employ

programs and initiatives that build or contribute to changing obesogenic environments. While strategies to operationalize efforts at all levels of federal, state, and local government to prevent and reduce obesity have been effected through Let's Move!, it is important to identify effective school-based interventions that can be nationally recognized (TFCO, 2010). The efforts to reduce obesity are captured in White House Task Force Recommendation 3.16, which describes the need to promote good nutrition through after-school programs. The construct of promoting good nutrition through ABC was evaluated by using pretest–posttest scores to determine if there was a relationship between nutrition knowledge and diet quality as hypothesized in this study.

Adolescents and Obesity

Rate of Adolescent Obesity

The percentage of obese adolescents has more than quadrupled with no evidence of remitting (CDC, 2015a; Ogden et al., 2013). However, the current rate of obesity among high school students in the school district, which chose to self-identify as obese in the National Youth Risk Behavior Survey, is 14%, with 18% of high school students self-identifying as overweight (CDC, 2014; Kann et al., 2014). Furthermore, 36% of high school students in the school district described themselves as slightly or very overweight (CDC, 2014; Kann et al., 2014). These percentages are more meaningful within the context of understanding that the school district is one of the largest school districts in the United States by enrollment, and approximately 179,000 students (28% of the student population in Grades K–12 in the school district) attend high school in the school district.

Diet and Obesity

At the core of understanding overweight and obesity is the energy imbalance between dietary intake of energy-dense foods and expenditure of energy through physical activity (NCHS, 2015). Consequently, as adolescents eat fewer vegetables, consume more sugar-sweetened and nutrient-poor foods, ingest 40% of their calories in sweetened beverages, and minimize participation in physical activity, overweight and obese conditions will not subside significantly and will continue to increase (Ervin & Ogden, 2013; WHO, 2015a).

The U.S. Department of Health and Human Services Office of Disease Prevention and Health Promotion (ODPHP; 2015) and the U.S. Department of Agriculture (USDA; 2010) provide guidelines to Americans on foods recommended for daily consumption and the serving portions that compose a "healthy diet." These guidelines are communicated through MyPlate (FKA MyPyramid) publications distributed without cost in doctor's offices, public health offices, and public high schools as part of a health curriculum (required for graduation). However, these guidelines are likely to be lost in low-income and urban communities that are primarily non-White, have an overabundance of fast-food restaurants and convenience stores, and have fewer regional markets with healthy food (Hattori et al., 2013; Oka et al., 2012; Rahman, Cushing, & Jackson, 2011; J. Williams et al., 2014). One large California county has more convenience stores near schools in non-White neighborhoods as compared with schools located in majority-White areas. These convenience stores sell fast-food products, including sugar-sweetened beverages and nutrient-poor foods, to adolescents in low-

income neighborhoods (Kumanyika et al., 2008; Langellier, 2012; Rahman et al., 2011). The location and abundance of convenience stores are relevant as a contributing factor to adolescent obesity. Individuals residing in low-income areas are more likely to be overweight or obese as compared to individuals who live in areas associated with a higher socioeconomic status (SES; Braveman, Cubbin, Egerter, Williams, & Pamuk, 2010; Hokayem & Heggeness, 2014). It is important to prepare high school students who reside in a restrictive environment containing a concentration of convenience stores with tools to make healthy food choices; therefore it is important to understand if the ABC program is an effective intervention.

Physical Activity and Obesity

Another factor in obesity is a lack of physical activity (CDC, 2015a). The ODPHP (2015) has published guidelines on the level of physical activity required for healthy development and health maintenance. While the guidelines are published as part of MyPlate and are included in health classes, adolescents still spend an inordinate amount of time on electronic devices and games unrelated to school on a school day (CDC, 2014; Kann et al., 2014). On an average school day, 37% of students spend 3 or more hours on the computer; 34% spend 3 or more hours watching television on an average school day; and 51% did not play on one sports team run by their school or community groups during the 12 months before the survey (CDC, 2014; Kann et al., 2014). However, what is not addressed in ODPHP guidelines, and could be a contributing factor in the statistics, is that participation in neighborhood activities may be restricted due to neighborhood safety associated with SES (Levine, 2011; Rahman et al., 2011). Low SES is associated with

low-income, non-White urban communities that typically have higher rates of obesity but lesser access to regional markets with healthy food (Grow et al., 2010; Hattori et al., 2013; Oka et al., 2012; Rahman et al., 2011; J. Williams et al., 2014). As such, adolescents in low-income neighborhoods may incur an increased risk of obesity, have minimal ability to participate in outside physical activities, and spend more time using media devices (i.e., television, video games; Sallis et al., 2012; Tandon et al., 2012).

Other Influences in Adolescent Obesity

Adolescence is also a developmental period marked by physical and mental transitions resulting in greater independence. Parents experience less control over the food choices made by adolescents, while convenience stores and fast-food restaurants are strategically within close distance of schools, and adolescents are free to choose what they please to eat. In view of the rate of obesity and overweight in adolescents and the 53% of adolescents who are trying to lose weight within the school district, it was important to determine if the ABC program intervention contributed to reducing or preventing overweight and obesity through a combination of diet and physical activity (CDC, 2014; Kann et al., 2014; Parent Company, n.d.; Rahman et al., 2011).

Nutrition Guidelines and Interventions

Nutrition Guidelines

Nutrition and diet or diet quality are often used interchangeably concerning healthy eating. A healthy diet or a quality diet is defined within the context of consuming foods included in the suggested guidelines of MyPlate; that have low saturated fats, trans fats, cholesterol, salt (sodium), and added sugars; and that stay within daily caloric

requirements (CDC, 2015b). The Dietary Guidelines for Americans 2010 were first published in 1980 and prescribed the recommended daily food and food servings for a balanced diet that reduced the risk of cancer, overweight, obesity, hypertension, diabetes, and other chronic diseases (USDA, 2010).

Guidelines for healthy eating are communicated to adolescents through MyPlate, which is distributed by the ODPHP and the USDA in schools; are provided through public health resources, referenced in most textbooks; and are taught in health classes. In response to the increasing rate of obesity and overweight, intervention designs have focused on dietary and nutrition changes that support Department of Health and Human Services guidelines (increased fruit and vegetable servings and reduced consumption of sugar-sweetened foods and beverages).

Nutrition Interventions

Studies on diet or nutrition interventions for adolescents by Branscum et al. (2013), Brooks and Begley (2013), Somerville et al. (2012), and Walker et al. (2008) have concurred that a combination of didactic and/or experiential learning that includes activities such as gardening, cooking, and food preparation has a significant effect on nutrition behaviors. Freedman and Nickell (2010), Walker et al. (2008), and Branscum et al. (2013) introduced snack tasting, and Somerville et al. (2012) used the vegetables from the garden for snacks. Somerville et al. attributed significant effects in the intervention to the use of traditional local foods. These interventions were successful in increasing fruit and vegetable intake; however, the gains were not always sustained at follow-up (Branscum et al., 2013; Freedman & Nickell, 2010). The failure to sustain increased fruit

and vegetable intake might suggest that the length of the programs should be extended to provide more time and exposure to the intervention. Branscum et al. (2013) and Walker et al. (2008) also noted an increase in BMI at posttest. While Walker et al. did not comment, whereas Branscum et al. attributed the increase to the inability of the BMI instrument to register improvement when the individual's BMI exceeded the 99th percentile. Sharma (2011), Branscum et al. (2013), Howerton et al. (2007), Belansky et al. (2006), Neumark-Sztainer, Story, Hannan, Stat, and Rex (2003), and Stice, Shaw, and Marti (2006) suggested that programs were more effective when the curriculum was delivered by nonregular teaching staff (i.e., consultants, dietitians).

Research designs of nutrition programs. A common pattern in intervention programs was the use of a pretest–posttest design to measure behavioral changes. Sharma (2011) described a weakness of the pretest–posttest in its not having an ability to attribute causality. However, Brooks and Begley (2013) noted in an analysis of 23 studies that the majority used pretest–posttest designs to assess achievement of the primary program objectives and that dietary behavior change was an implicit outcome. There was also a pattern of using nonvalidated instruments to measure behavior change, including a Child Modified Food Behavior Checklist (FBC-MC; Branscum et al., 2013; Brooks & Begley, 2013; Freedman & Nickell, 2010; Somerville et al., 2012). Walker et al. (2008) used the FBC, whereas Branscum et al. (2013) and Somerville et al. (2012) used the FBC-MC. Although these studies used multiple instruments, Branscum and Somerville suggested that validated instruments are needed in the future. Another weakness noted was that while theory enhances the strength of the intervention, it was not frequently used; when a

theory was used, SCT was most often selected (Branscum et al., 2013; Freedman & Nickell, 2010; Somerville et al., 2012). While interventions that focused on nutrition had some positive effects, a review of the literature also suggests that positive behavioral changes are associated with programs that focus on physical activity exclusively.

Physical Activity Guidelines and Fitness Interventions

Physical Activity Guidelines

Physical activity is defined as "any bodily movement produced by the contraction of skeletal muscles that increases energy expenditure above a basal level" (ODPHP, 2015, p. 2). Bodily movement is narrowly defined as baseline activity or health-enhancing activity. Baseline activities are generally of a short duration, light intensity, and do not meet 2008 Physical Activity Guidelines (PAG), and individuals who do not engage in any physical activity are regarded as "inactive" rather than at baseline (ODPHP, 2015). Health-enhancing activities are considered to be those activities of moderate to vigorous intensity with health-enhancing benefits (ODPHP, 2015).

The PAG, developed by the ODPHP, promote evidence-based guidelines for the nation on the frequency, duration, and benefit of physical activity on health (ODPHP, 2015). ODPHP also implements and monitors compliance to Healthy People 2020. The PAG are conveyed to other governmental agencies and departments and are included in the Dietary Guidelines for America 2010. The PAG also identify age-appropriate structured (e.g., school team sports) or unstructured exercise for adolescents with regular physical exercise identified as an activity of moderate to vigorous intensity, 30–60 minutes, three to five times per week.

Physical activity is associated with reducing obesity, increasing mental alertness, and improving academic success (Diamont, Babey, & Wolstein, 2011; ODPHP, 2015). Adolescents spend more time in sedentary behaviors such as watching television and playing video or computer games and are increasingly at risk to become overweight and obese (CDC, 2015a; Grow et al., 2010; Kann et al., 2014). In the school district, 51% of high school students did not play on at least one sports team run by their school or a community group during the 12 months before the survey, 56% did not exercise 60 minutes a day on 5 or more days before the survey, and 56% did not attend physical education class all 5 days before the survey (CDC, 2014; Kann et al., 2014).

Research has suggested that student participation in physical activity outside the school may be hampered by neighborhood safety concerns, which leaves participation at school as an option (Goh et al., 2009; Levine, 2011; Rahman et al., 2011). However, the low level of participation in team sports at school is suggestive of other factors. Goh et al. (2009) pointed to the quality and quantity of physical education classes at school, lack of parental support, and lack of motivation as impediments to physical activity. While the ABC program does not address the quality of class instruction and is more student focused, it does increase motivation by increasing self-efficacy through interactive lessons, mentoring opportunities, and participation in physical activities.

Physical Activity Interventions

Similar to nutrition and dietary interventions, a similar pattern of strengths and weaknesses was noted relative to physical activity interventions. Physical activity programs are diverse, using activities such as partnering with a professional sports

organization, dance, aerobics, and strengthening to reduce overweight and obesity (Belansky et al., 2006; Irwin et al., 2009; Wang, Beydoun, Liang, Caballero, & Kumanyika, 2008). Dobbins, Husson, DeCorby, and LaRocca (2013) noted a significant effect in long-term interventions lasting from 52 to 156 weeks with a reduction in BMI and a reduction in television time for adolescents. Conversely, Lubans, Morgan, and Callister (2012) found no increase in physical activity but noted significant changes related to self-efficacy.

Neumark-Sztainer et al. (2003) focused on nutrition literacy and physical activity for girls. The outcome was statistically significant relative to increasing physical activity for participants in the intervention group at the 8-month follow-up. Furthermore, Belansky et al. (2006) noted a significant improvement related to increased knowledge, self-efficacy, and attitudes related to eating fruits and vegetables, eating lower fat foods, and being physically active. While these outcomes were found in a younger population, they may be generalized to an adolescent population.

Combined Nutrition and Fitness Interventions

Interventions that combine diet or nutrition literacy and physical activity have been suggested as a more successful strategy for addressing adolescent overweight and obesity (Office of the Surgeon General, 2010; Sharma, 2011). While Dobbins et al. (2013), Dishman et al. (2004), Ho et al. (2013), Lubans et al. (2012), and Neumark-Sztainer et al. (2003) noted positive outcomes in physical activity interventions, Brooks and Begley (2013) also reported positive but not significant changes in food literacy

interventions. However, balancing energy intake with expenditure must include both nutrition and physical activity to increase intervention effectiveness.

Extreme Interventions

Alternative methods to address extreme overweight and obesity in adolescents include bariatric surgery and pharmaceutical solutions. Both alternatives are reserved for obese conditions that co-occur with fatty liver disease, cardiovascular disease, diabetes, chronic sleep apnea syndrome, and other diseases (Chuang et al., 2013; Kelly et al., 2013; Matsuo et al., 2013). Kelly et al. (2013) suggested that surgical and pharmaceutical alternatives have demonstrated limited effectiveness without individual lifestyle changes. The successes noted in nonsurgical intervention programs (i.e., fitness, nutrition, gardening-focused programs) are likely attributable to behavioral changes that address nutrition and physical activity, an element generally missing in both pharmaceutical and surgically based solutions (Barr-Anderson et al., 2013; Jain & Langwith, 2013; Kong et al., 2013; Van Ryzin & Nowicka, 2013).

Literature Review Related to Key Intervention Variables

Independent and Dependent Intervention Variables

Studies to reduce and prevent overweight and obesity implicitly use the intervention as the key independent variable (Branscum et al., 2013; Freedman & Nickell, 2010; Irwin et al., 2009; Somerville et al., 2012). The characteristics of each intervention program are unique, with some using gardening, cooking, and snack tasting (Brooks & Begley, 2013; Howerton et al., 2007). The key dependent variables fruit and vegetable consumption, diet quality, and physical activity are prominently used in

research to prevent and reduce obesity and were used in this study (Branscum et al., 2013; Somerville et al., 2012).

Diet quality and fruit and vegetable variables. The effect of the intervention on fruit and vegetable intake and diet quality is usually measured by questionnaire, survey, and 24-hour diet recalls, and in one study, the use of questionnaires was enhanced by observation of snacking behavior and quantitative measurements of discarded food (Branscum et al., 2013; Freedman & Nickell, 2010; Somerville et al., 2012). The archived participant responses to three questionnaires to assess dietary behaviors, nutrition and fitness knowledge, and fitness behaviors were used in this study.

Physical fitness variables. Measuring the effect of the intervention on physical activity in other studies has included obtaining physical measurements of the participants; other methods (e.g., self-reported values, pretest–posttest questionnaires) have been used with mixed results (Lubans et al., 2012; Walker et al., 2008). Researchers concur that physical measurements should be obtained to prevent underreporting of weight and to obtain accurate information on the effect on the dependent variable (Goh et al., 2009).

Use of unpublished instruments. The use of unpublished instruments (questionnaires and surveys) appears to be common in interventions. There is agreement among researchers that using validated instruments is preferable, but the value of using an instrument customized to obtain needed data is also recognized (Branscum et al., 2013; Freedman & Nickell, 2010).

Similarities Between ABC and Other Interventions

Branscum et al. (2013) evaluated an extended version of the Food Fit program, an after-school program for children aged 8–13 years from low-income communities. The Food Fit program curriculum was developed to target dietary behaviors, and the program was specifically designed for an after-school environment. The program focused on eating fruits and vegetables, consuming low-sugar beverages and treats, and eating low-calorie snacks. The program was implemented and assessed by interns in a dietetic internship at the Ohio State University. The lessons were given once a week for 14 weeks at six YMCA locations. The study measured BMI, dietary behaviors, and constructs of SCT in a pretest–posttest design with an additional follow-up 3 months after the intervention. Height and weight measurements were taken for BMI; the FBC-MC was used to measure dietary behaviors; and behavioral capabilities, self-efficacy, and outcome expectancy were measured by a survey that was developed and given to participants before and after every lesson. BMI measurements were taken and participants completed FBC-MC at the beginning and end of the study. A significant improvement in overall dietary behaviors and behavioral capabilities (a construct of SCT) was found in 11 of 14 lessons, along with an increase in BMI. At pretest follow-up, changes in dietary behaviors remained, and some participants did not report a change in confidence and desire to use the information learned.

An initial cursory review of the ABC program held at one site used the FBC, the NKC, and an undisclosed BMI measurement tool with 16 participants and netted mixed findings: There was a slight increase in BMI; half of the participants demonstrated

increased health and fitness knowledge; and the remaining 50% of the participants had the same or less knowledge, increased fruit intake, and a decrease in soda consumption (Walker et al., 2008). The study cited participant difficulties related to nutritional concepts, use of testing instruments with English language learners, and mentoring procedures (Walker et al., 2008). The study by Branscum et al.(2013) was similar to the ABC program in design, instrumentation, and goals, with the following exceptions: A self-reporting questionnaire was used relative to BMI and nutrition knowledge; the FBC used by ABC currently had 16 questions instead of 19; the ABC program is a 12-week program with 5 weeks of combined physical activity and nutrition lessons, 5 weeks of mentoring younger children, and an orientation and culmination meeting for high school students; ABC used a mentoring model with its participants; and ABC was conducted after school on the school campus. Although the participants in Branscum et al.'s (2013) programs were aged 8–14 years, it was reasonable to assume that positive outcomes would also exist with high school adolescents as they are more apt to understand environmental influences on behavior and individual behavior.

The pretest–posttest design used with ABC is not unusual for intervention designs, and unvalidated instruments are often used to evaluate aspects of programs that are unique or without an existing measurement tool (Branscum et al., 2013; Brooks & Begley, 2013; Freedman & Nickell, 2010; Somerville et al., 2012). Also key variables in this study are the same as or similar to other independent variables in intervention programs (the intervention), and the dependent variables fruit and vegetable intake,

dietary quality, and physical activity have also been used in part or in whole in other interventions.

Summary

The major themes in the literature were reducing and preventing overweight and obesity by eating a healthy diet; reducing foods high in sugar, salt, and fats; and increasing physical activity. Although not explicitly articulated within the literature, quality of diet appears to be closely aligned with the recommended food and serving sizes contained in the Dietary Guidelines for Americans 2010. The body of clinical and nonclinical programs to prevent and reduce obesity and overweight in adolescents includes mixed strategies, such as gardening, cooking and tasting, and affiliation with professional sports teams (Belansky et al., 2006; Branscum et al., 2013; Huang et al., 2007; Irwin et al., 2009). However, research on adolescent obesity remains scarce as compared with research on early adolescents, younger children, and adults. Moreover, even within existing research, a "gold standard" or best practices to address adolescent obesity remain elusive and continue to drive more research, while the level of adolescent obesity languishes.

The question of what is the most effective program to change eating behaviors and increase physical activity remains unanswered largely because of the small population of programs targeting adolescent obesity (Brooks & Begley, 2013). Furthermore, small sample sizes, study biases, heterogeneity of the programs, nonsignificant findings, and the lack of statistically significant differences prevent generalized outcomes and identification of key characteristics in programs (Kropski et

al., 2008). While some similarities were noted when comparing ABC to other programs, what is dissimilar is the participation by adolescents as mentors to younger students, which serves to reinforce classroom learning that combines didactic and interactive teaching. Finally, Freedman and Nickell (2010) and Branscum et al. (2013) agreed that holding interventions after school on the school campus might be more promising for future interventions, as there would be more time for exposure to the intervention and participant attrition may be reduced.

What is known from research is that both physical activity and nutrition programs can have an effect on preventing and reducing obesity by changing eating behaviors and increasing physical activity. However, what is not known is if after-school fitness and nutrition intervention programs are effective with high school students. What is known about the effect of physical activity and diet literacy intervention programs is extrapolated from studies that do not always include high school students. Therefore this study on the ABC program filled the gap in knowledge by determining the effect that the program had on changing dietary behaviors and physical activity, perceived general fitness, and self-body perception. This study added to what is known about successful and unsuccessful elements of programs and identified program concepts that are useful in identifying best practices. The outcome from this study added to the knowledge of successful and unsuccessful elements of intervention programs and best practices. The intervention, the instrumentation, and the proposed statistical analysis to answer the research hypotheses regarding physical activity, diet quality, fruit and vegetable intake, general fitness, and body self-perception are more fully described in the next chapter.

Chapter 3: Research Method

This quantitative research study provided a thorough evaluation of the ABC Program, a 12-week intervention that promotes health behavior changes for high school students in a large metropolitan school district in California (Parent Company, n.d.; Walker et al., 2008). The ABC program curriculum was developed by the Parent Company, a nonprofit organization, along with registered dietitians, consultants, and other professionals, in response to the increasing rates of obesity, overweight, and sedentary behavior among high school students in the school district. The theoretical foundation for the ABC program was SCT (Walker et al., 2008). The program utilized a mentorship model by providing professionals as mentors to the participants and by having the participants act as peer mentors to younger children. The mentorship model is in keeping with the SCT premise that children learn from observing other people's behaviors and that children's learning is likely to be more pronounced when the model they are observing is comparable in some way to them (Bandura, 1986; Walker et al., 2008).

The program was open to high school students in the school district, where most students are primarily Hispanic and African American and typify the demographics of the neighborhood and schools. The goals of this intervention program are to

> address the childhood obesity epidemic that disproportionately affects families in a large metropolitan city area; teach high school students the importance of making healthy food choices and exercising regularly; reduce the rate of childhood obesity and related illnesses among youth in a large metropolitan city;

> increase youth participation in regular physical activity; improve students' overall health and fitness levels; and to empower students to become advocates for healthy eating and increased physical activity. (Parent Company, n.d.)

An adolescent population was selected for this study given the scarcity of research on interventions to prevent and reduce obesity in adolescents and the potential to contribute to the body of existing research in this area (Branscum et al., 2013; Brooks & Begley, 2013).

Archival data containing the participant responses to the FBC, the NKC, and the PSDQ obtained before and after the interventions were used. In this chapter, I discuss the quantitative research design and rationale based on the research hypotheses, the selection of participants, use of archival data, the instrumentation, a description of the intervention, and the research methodology. Additional discourse in the research methodology section includes the sampling and archival data procedures, power analysis, data analysis plan, threats to validity, and ethical procedures. The conclusion of this chapter includes a brief summary of the chapter and a preview of Chapter 4.

Research Design and Rationale

The first four research hypotheses entailed the use of the single-group pretest–posttest design to determine the effect of the intervention on participants. A single-group pretest–posttest research design is an appropriate design for an evaluation study when there is no control group (Creswell, 2009). For the first four research hypotheses, the independent variable was the intervention. There were five dependent variables (measuring change): (a) amount of fruit and vegetables consumed, (b) quality of diet, (c)

perception of general fitness, (d) nutrition knowledge, and (e) level of physical activity. An example of the single-group pretest–posttest design is represented as O1 X O2, where O1 denotes the pretest assessment, X was the ABC intervention, and O2 symbolizes the posttest assessment (Creswell, 2009).

A mediational analysis was performed for Hypothesis 5 to determine if the intervention led to improvements in one area that influenced improvements in other areas. For this hypothesis, the independent variable was quality of diet (at posttest), the mediating variable was level of general fitness (at posttest), and the dependent variable was body self-perception (at posttest).

A pretest–posttest design is often used in interventions without a control group (Creswell, 2009). While this research design was not considered to be a strong research design, this evaluative study increases the body of knowledge where there was a paucity of fitness and nutrition interventions for the high school adolescent population (Brooks & Begley, 2013; Kropski et al., 2008; Lyness & Sprenkle, 1996; Waters et al., 2011). Pretest–posttest design outcomes contribute to identifying best practices in designing interventions that address nutrition and fitness for adolescents (Brooks & Begley, 2013; Somerville et al., 2012).

Methodology

Sample Population

The participants in this study were 9th- through 12th-grade high school students in a large school district who attended ABC in 2010 to 2012. According to internal data from the school district, in 2012, there were 94 high schools with approximately 153,000

9th- through 12th-grade students enrolled in the school district. The largest ethnic populations of students enrolled in the school district are Latino (73.4%), African American (10%), White (8.8%), and Asian American (6.2%). A high school adolescent population was selected for this study considering the shortage of research on interventions to prevent and reduce overweight and obesity in high school adolescents.

Sampling Strategy

The sampling strategy used was related to the archival data for this study as the ABC program has been implemented since 2006. A sample size was derived from the power analysis, which is discussed more fully in the following section. However, in this study, I used the entire population of students who participated in ABC in 2010 through 2012. The participants were not contacted, and any personally identifying data were deleted by the Parent Company before I received them. There were 544 applications to participate in ABC from 2010 to 2012, with 532 applicants attending ABC at least once. This study generated 95 participants who completed all three assessments.

Power analysis. G*Power 3.1.9.2 was used to determine the number of participants needed to achieve a statistical power of .80, given a one-tailed alpha of .05 (Faul, Erdfelder, Buchner, & Lang, 2009). Three effect sizes were chosen: a small effect size of d = .20, a medium effect size of d = .50, and a large effect size of d = .80 (Cohen, 1977, 1988). The findings in Table 1 reveal that, assuming a small effect size, a minimum of 156 participants was needed to achieve a statistical power of .80. However, assuming a large effect size, a minimum of 12 participants was needed to reach a statistical power of .80.

Table 1

Power Analysis to Assess Change in Behavior From Pretest to Posttest

Effect size	*N*
.20	156
.50	27
.80	12

Note. Power = .80. Calculations are based on a one-tailed alpha of .05.

G*Power 3.1.9.2 was used to determine the number of subjects required to attain a statistical power of .80, given the four predictors in the equation (i.e., the four posttest knowledge measures; Faul et al., 2009). Three effect sizes were chosen: a small effect size of $f^2 = .02$, a medium effect size of $f^2 = .15$, and a large effect size of $f^2 = .35$ (Cohen, 1988). The findings in Table 2 reveal that, assuming a small effect size, a minimum of 602 participants was needed to attain a statistical power of .80. However, assuming a large effect size, a minimum of 40 participants was needed to reach a statistical power of .80.

Table 2

Power Analysis to Assess Mediating Effect of Quality of Diet on the Relationship Between Nutrition Knowledge and General Fitness and Body Perception

Effect size	*N*
.02	602
.15	85
.35	40

Note. Power = .80. Effect size is f^2.

Intervention

The program was a 12-week program that included 5 weeks of nutrition and fitness classes, 5 weeks of learning reinforcement through mentoring at an elementary or middle school, an orientation meeting, and a culmination event (Parent Company, n.d.; Walker et al., 2008). The ABC program information was distributed on the school campus and in classrooms by classroom teachers. Participants self-opted into attending the program. Training and training materials were provided by the Parent Company to instructors and volunteers ("mentors"; Parent Company, 2015). The adult mentors were business professionals, graduate students, and certificated teachers. The mentors agreed to a background check and attended an orientation class to review the goals of the program and the training materials (Parent Company, 2015; Walker et al., 2008).

The nutrition classes were conducted once a week after school on the school campus in an empty classroom, cafeteria, or other designated room from approximately 3:30 to 5:00 P.M. The class agenda was divided into five sessions that covered the following topics: pyramid power and healthy steps for you, fantastic fruits, vibrant veggies and power play, magnificent meat and beans, great grains, and marvelous milk. Each session had stated objectives, standards, activities to reinforce learning, identified key points, and homework assignments, which included a daily food intake journal (Parent Company, n.d.). Participants took the NKC, PSDQ, and FBC before receiving a participant notebook containing material for class participation and reinforcement of principles for healthy eating based on MyPyramid (KNA My Plate). After completing the 5-week classes, participants completed the NKC, PSDQ, and FBC again. The

assessments were collected by ABC personnel and maintained in the administrative offices of the Parent Company. The participants served as peer instructors or mentors in nutrition classes at a local elementary or middle school after completing the 5-week classes (Walker et al., 2008). Program participants were provided with incentives for attending the intervention in the form of raffle prizes. Upon completion of the intervention, they were given 20 hours of community service credit to apply to the service learning requirement for high school (Parent Company, n.d.).

Archival Data

The archival data consisted of participant responses to the FBC, PSDQ, and NKC obtained during ABC program classes held at the high schools in 2010 through 2012. The Parent Company, the parent organization of ABC, owns the archival data and deleted all personally identifying information before the data were provided to me. The Parent Company signed a Data Release Agreement and provided the data via Google Drive after approval was received from the Institutional Review Board (Walden IRB approval no. 03-14-16-0114136).

Instrumentation

Published Instrument

Food Behavior Checklist. The FBC was developed by the California Nutrition Network, University of California (UC) Cooperative Extension, the UC Davis Nutrition Department, and the UC Davis Design Program, jointly with Marilyn Townsend and other professionals (Murphy et al., 2001; Townsend et al., 2003). The original FBC contained 39 questions and was developed for use with Food Stamp Nutrition Education

Program and Expanded Food and Nutrition Stamp Program participants (Townsend, 2006; Townsend & Kaiser, 2005, 2007). The FBC was subsequently revised into a 16-question FBC and a 14-question FBC-MC, the latter of which has been used with children and an early adolescent population (Blackburn et al., 2006; Townsend et al., 2008). The FBC and the FBC-MC have construct validity but have not been completely validated for use with children and the adolescent population (Branscum et al., 2013; Branscum et al., 2010; Somerville et al., 2012).

The FBC has been used with diverse multiethnic and socioeconomic groups. Criterion validity was established by correlating fruit and vegetable intake with total serum carotenoids (biomarker). The content validity was established by conducting a validation study using a 24-hour dietary recall and the FBC, $p < .01$ (Kristal et al., 1990). Convergent validity was established for the Fruit and Vegetable, Milk, and Diet Quality subscales by comparing the nutrient intake in the FBC to three separate dietary recalls. Criterion validity was established for the Fruit and Vegetable subscale, $r = .44$, $p < .001$, and Diet Quality subscale, $r = .32$, $p < .05$ (Murphy et al., 2001; Townsend et al., 2003). The Fruit and Vegetable subscale of the FBC was used for the dependent variable of fruit and vegetable consumption for the first hypothesis. A single-item measure of quality of diet was used from the FBC for the dependent variable of the second hypothesis.

Unpublished Instruments

Perceived Self-Descriptive Questionnaire. The PSDQ comprises 18 questions requiring a Likert-type scale response ranging from 1 (*false*) to 6 (*true*) to assess self-perception of body fat, physical activity, and general fitness. The three subscales use six

questions to assess perceived physical fitness, perceived physical activity, and perceived body fat. The questions on this instrument are identical to those contained in a published instrument (Physical Self-Description Questionnaire) developed by Marsh for use with an adolescent population (Moore, 2003). However, there are no other similarities between the unpublished instrument developed by the Parent Company and its consultants and the published instrument. The instrument by Marsh contains 70 questions and 11 subscales: Strength, Endurance, Sport Competence, Attractiveness, Flexibility, Coordination, Body Fat, Health, Physical Activity, Global Self-Esteem, and Physical Self-Concept (Moore, 2003). The reliability of the 11 scales ranges from .87 to .96, and the instrument has demonstrated construct validity.

The Perceived General Fitness subscale of the PSDQ was used for the dependent variable of perceived level of general fitness for the third hypothesis; the Perceived Physical Activity subscale was used for the dependent variable perceived level of physical activity for the fourth hypothesis. The Perceived Body Fat (body self-perception) subscale was used in the mediation as a dependent variable for the fifth hypothesis.

Nutrition Knowledge Pretest–Posttest Checklist. The NKC was developed by the Parent Company and its consultants to measure nutrition knowledge of the participants (Parent Company, n.d.). The NKC has 12 multiple-choice questions, with each question requiring a selection of one out of four possible answers; it is used to determine the participant's knowledge of healthy foods, exercise, nutrition, and dietary guidelines. While not validated, this instrument is basically sufficient to provide an

indication of perceived nutrition and fitness knowledge before and after the intervention. The NKC was used as a dependent variable in Hypotheses 1–5.

Operationalizing Variables

Dependent and Mediation Variables

The dependent variables of fruit and vegetable consumption, quality of diet, perceived general fitness, perceived activity level, and nutrition knowledge were operationalized in Hypotheses 1–5 as follows. The operationalization of the mediating variables follows the dependent variables.

Dependent Variable 1: Fruit and vegetable consumption. The dependent variable of fruit and vegetable consumption was determined by using the seven-item Fruit and Vegetable subscale of the FBC. The total Fruit and Vegetable subscale score was computed by summing the seven items. In this study, the Fruit and Vegetable subscale scores ranged from 8 to 25, with a higher score indicating higher levels of fruit and vegetable intake. Several psychometric reviews of the FBC and its subscales have supported the validity and reliability of the Fruit and Vegetable subscale in adult samples (Blackburn et al., 2006; Murphy et al., 2001; Townsend, 2006; Townsend & Kaiser, 2005; Townsend et al., 2003) and, with limits, with children (Branscum et al., 2010). Exploratory factor analyses (EFA) and confirmatory factor analyses (CFA) of the FBC with adults demonstrated the FV as being the strongest of the four factors or subscales of the FBC (Townsend & Kaiser, 2005; Townsend et al., 2003).

A study of an after-school health promotion program used a modified 14-question version of the FBC with 97 low-income middle school students. The CFA indicated that a

three-subscale FBC was a better fit to the data than the original four-subscale FBC, with the FV subscale emerging as the strongest and with the subscale loads ranging from .47 to .83 (Branscum et al., 2010).

Criterion-related validity of the FV subscale has been established in studies, showing significant associations between the FV subscale and total serum carotenoids, $r = .44$, $p < .001$ (Townsend et al., 2003), milk intake, $r = .38$, $p < .001$ (Branscum et al., 2010), and food insecurity, $r = -.44$, $p < .001$ (Dave, Evans, Saunders, Watkins, & Pfeiffer, 2009).

Discriminant validity of the FV subscale has been confirmed by results showing higher levels of fruit and vegetable intake among low-income mothers participating in a farmer's market nutrition program as compared to mothers participating in WIC (Kropf, Holben, Holcomb, & Anderson, 2007) as well as a community-based nutrition course with middle school students who did and did not attend a community nutrition course (Branscum & Kaye, 2009).

The FV subscale has acceptable to very good inter-item reliability in studies with children, with Cronbach's alpha ranging from .67 to .80 (Blackburn et al., 2006; Branscum & Kaye, 2009; Branscum et al., 2010; Dave et al., 2009).

Dependent Variable 2: Quality of diet. A single-item measure of quality of diet was used from the FBC for the dependent variable of the second hypothesis. The question is "How would you rate your eating habits?" (Murphy et al., 2001; Townsend et al., 2003). The response format for this question was coded from 1 (*poor*) to 10 (*excellent*), thus a higher score indicates a higher degree of quality of diet (Murphy et al., 2001;

Townsend et al., 2003). In this study, the Quality of Diet subscale scores ranged from 1 to 9. Using a single-item measure for quality of diet was based on the poor interitem reliability of the two-item Quality of Diet subscale of the FBC, which has ranged between .32 and .56 in studies with adults and children (Branscum et al., 2010; Murphy et al., 2001; Townsend et al., 2003). The quality of diet single item has demonstrated criterion-related validity correlated with serum carotenoid levels, $r = .45$, $p < .001$, and vitamin C levels, $r = .24$, $p < .05$ (Murphy et al., 2001), and face validity (Banna, Becerra, Kaiser, & Townsend, 2010).

Dependent Variable 3: Perception of general fitness. The dependent variable, perception of general fitness, was measured by the General Fitness subscale of the PSDQ, which was created by the Parent Company jointly with other professionals. The General Fitness subscale has six items; an example of an item is "I feel good about who I am physically." The six items are scored from 1 (*false*) to 6 (*true*). The total subscale score was computed by summing the six items. In this study, the General Fitness subscale scores ranged from 1 to 36, with a higher score denoting higher levels of perceived general fitness. The items on this instrument originate from a published instrument, but as related to this study, the PSDQ is not a validated instrument.

Dependent Variable 4: Physical activity. The dependent variable, physical activity levels, was measured by the Physical Activity subscale of the PSDQ. The Physical Activity subscale has six items; an example of an item is "I do sports, exercise, dance, or other physical activities almost every day." The six items are scored from 1 (*false*) to 6 (*true*). The total subscale score was computed by summing the six items. In

this study, the Physical Activity subscale scores ranged from 2 to 36, with a higher score denoting a higher level of perceived physical activity.

Dependent Variable 5: Nutrition knowledge. The dependent variable, nutrition knowledge (NK), was measured by assigning 1 point to each of the 12 multiple-choice questions. The total NK score was computed by summing the 12 items. In this study, the NK scores ranged from 1 to 12, with a higher score indicating a higher level of nutrition knowledge.

The fifth and last research hypothesis was guided by regression procedures and utilized mediation. The independent, mediating, and dependent variables are discussed in the following sections. The posttest variables were used in this analysis.

Mediating variable: Perception of general fitness. The mediating variable, perception of general fitness, was measured by the General Fitness subscale of the PSDQ. The General Fitness subscale has six items; an example of an item is "I feel good about who I am physically" (Parent Company, n.d.). The six items are scored from 1 (*false*) to 6 (*true*).

The total subscale score was computed by summing the six items. In this study, the General Fitness subscale scores ranged from 1 to 36, with a higher score denoting a greater level of perceived general fitness. The items on this instrument originate from a published instrument, but as related to this study, the PSDQ is not a validated instrument.

Independent variable: Quality of diet. A single-item measure of quality of diet was used from the FBC for the independent variable of the fifth hypothesis. The question is "How would you rate your eating habits?" (Murphy et al., 2001; Townsend et al.,

2003). The response format for this question was coded as 1 (*poor*) to 10 (*excellent*); thus a higher score indicates a higher degree of quality of diet (Murphy et al., 2001; Townsend et al., 2003).

Dependent variable: Body self-perception. The dependent variable, body self-perception (body fat), was measured by the Perceived Body Fat subscale of the PSDQ. The Perceived Body Fat subscale has six items; an example of an item is "I am too fat" (Parent Company, n.d.). The six items are scored from 1 (*false*) to 6 (*true*). The total subscale score was computed by summing the six items. In this study, the Body Fat subscale scores ranged from 0 to 3.6, with lower scores indicating perceived decrease in body fat.

Data Analysis Plan

The overarching research inquiry to determine if the ABC program promotes health behavior change through its goal of improving healthy food choices and regular exercise in adolescents attending high school in the school district was undertaken in the following five hypotheses and data analysis plan:

$H1_0$: As students' knowledge about nutrition and fitness increases from pretest to posttest, there will be no change in the amount of fruits and vegetables they consume.

$H1_1$: As students' knowledge about nutrition and fitness increases from pretest to posttest, they will consume more fruits and vegetables.

$H2_0$: As students' knowledge about nutrition and fitness increases from pretest to posttest, there will be no change in the quality of their diet.

$H2_1$: As students' knowledge about nutrition and fitness increases from pretest to posttest, the quality of their diet will increase.

$H3_0$: As students' knowledge about nutrition and fitness increases from pretest to posttest, there will be no change in their perception of general fitness.

$H3_1$: As students' knowledge about nutrition and fitness increases from pretest to posttest, their perception of general fitness will increase.

$H4_0$: As students' knowledge about nutrition and fitness increases from pretest to posttest, there will be no change in their level of physical activity.

$H4_1$: As students' knowledge about nutrition and fitness increases from pretest to posttest, their level of physical activity will increase.

$H5_0$: As students' knowledge of nutrition and fitness increases from pretest to posttest, there will be no effect on their quality of diet, level of general fitness, and body self-perception.

$H5_1$: As students' knowledge of nutrition and fitness increases from pretest to posttest, their quality of diet will improve, leading to increased levels of general fitness and body self-perception.

Preliminary Screening Procedures

The data were first examined for missing values. A missing value analysis (MVA) was conducted using the MVA module of the SPSS 22 program. The pattern of missing values was examined by using Little's missing completely at random (MCAR) test. If the pattern of missing values was MCAR, missing values were imputed using the expectation-maximization (EM) method (Tabachnick & Fidell, 2007). Using EM does

not affect the variability of the distribution, unlike the mean substitution method. If the pattern of missing values was not MCAR, the multiple imputation method was used to impute missing values (Tabachnick & Fidell, 2007).

Univariate normality was assessed by the histograms and appropriate statistical tests for normality and skewness. If the histograms yielded a bell-shaped curve, the distribution of the variable under study was deemed as normal. If the histograms were skewed, the variables were transformed (Tabachnick & Fidell, 2007).

Univariate outliers were detected by first standardizing the variables. Cases whose standardized values fell above the absolute value of 3.29 were considered as univariate outliers and were deleted from the analysis (Tabachnick & Fidell, 2007). SPSS was used for the regression diagnostics, including outliers, influential cases, multicollinearity, homoscedasticity, and the normal distribution of error. If any of these assumptions were violated, appropriate corrections were made.

Reliability of the Measures

Internal consistency of the measures was assessed by using Cronbach's alpha. A measure is determined to be reliable if the alpha is .70 or higher (Nunnally & Bernstein, 1994). If the measures had low alphas, the item-total correlations were examined; theory and statistical results were used and items with low correlations were dropped.

Descriptive and Inferential Statistics

The frequencies and percentages for the demographic variables were provided. The ranges, means, and standard deviations of the study variables were presented. The variables for the first four hypotheses were measured using an interval scale; the

variables were checked for normality, and if they were not normally distributed, they were transformed using a natural log function (Tabachnick & Fidell, 2007).

First through fourth hypotheses. As there was only one group measured from pretest to posttest and four dependent variables, the four hypotheses were tested using dependent-sample *t*-test procedures. Since the four dependent-sample *t*-test procedures were conducted, the *t*-statistic was assessed at an alpha of .0125 to address Type I error. The first hypothesis testing, increased fruit and vegetable consumption from pretest to posttest, was performed using a dependent-sample *t*-test procedure; a one-tailed value of .05 was used to evaluate the *t*-value, as this hypothesis is directional. The second hypothesis, improvement in quality of diet from pretest to posttest, was tested by using a dependent-sample *t*-test procedure; a one-tailed value of .05 was used to evaluate the *t*-values, as this hypothesis is directional. The third hypothesis, increase in perceived general fitness level from pretest to posttest, was tested using a dependent-sample *t*-test procedure; since the hypothesis is directional, the *t*-value was evaluated using a one-tailed value of .05. The fourth hypothesis, assessing increase in physical activity level from pretest to posttest, was tested using a dependent-sample *t*-test procedure; given that the hypothesis specifies the direction of change, the *t*-value was evaluated using a one-tailed value of .05.

Fifth hypothesis. The fifth hypothesis tested for mediation. All variables were measured using an interval scale; they were tested for normality and were transformed if nonnormal. Because regression procedures were conducted, the assumptions of multivariate normality, linearity, and homoscedasticity were assessed. The normal

probability plot was examined to check for normality; if the plots fell close to the diagonal, multivariate normality was assumed (Norusis, 1991).To examine for linearity and homoscedasticity, the scatterplot of the standardized residuals by the standardized predicted values was assessed. If the scatterplot yielded a random scatter, then linearity and homoscedasticity were fulfilled (Norusis, 1991).

Hayes's (2013) mediation macro for SPSS was used to test for mediation. Mediation is confirmed when the following criteria are met: The independent variables predict the mediator; the independent variables predict the dependent variable; and the indirect effects of the independent variables on the dependent variable are statistically significant (Hayes, 2013). Testing for this third criterion was performed by bootstrapping procedures (Hayes, 2013). Based on the bootstrap samples, the mediation macro generated 90% confidence intervals to test the indirect effects.

Threats to Validity

There are several types of validity and associated threats to validity. Threats to validity are methodological issues, participant, experimenter, and setting. Methodological issues can diminish the ability to make correct conclusions about research outcomes; threats can affect the quality of the study (Creswell, 2009; Thomas & Rothman, 1994/2013). Quantitative research studies are subject to four types of validity: (a) *construct validity*, how well the instrument expresses the theoretical construct being reviewed; (b) *external validity*, the ability to generalize the research results to the same population (or other samples), situations, and time; (c) *internal validity*, the extent to which an assumption can be made that the research findings were the result of the

intervention and not an unmeasured issue; and (d) *statistical conclusion validity*, the ability to make accurate conclusions about the relationship between the independent and dependent variables from statistical analyses (Creswell, 2009; García-Pérez, 2012; Thomas & Rothman, 1994/2013). The four types of validity and their threats related to this study are discussed in the following section.

Threats to Construct Validity

Construct validity refers to the sufficiency of the measurement of the theoretical construct and the extent to which the study outcomes can be generalized to other studies that have reviewed the same constructs. The treatment integrity is important to any intervention; as such, it was important to determine that the treatment was delivered as it was intended. There was an assumption in this study that the ABC program had treatment integrity. Also essential to any intervention is the need for replication studies that prove hypothesized and consistent results establishing the construct validity of the intervention (Constantine, 2013). Although the ABC program had been operational in the school district since 2006, the program had not been comprehensively evaluated. This study addressed this gap in adolescent health intervention research.

A concern in this study was also the threat to construct validity due to incorrect or inexact operationalization of study constructs (Hoyt, Warbasse, & Chu, 2006). A critical evaluative problem of the ABC program was the use of psychometrically sound instruments. As an example, the construct validity of replication studies could be hindered as the open-ended questions on the FBC disallow the subscale from having a consistent range of scores (Hoyt et al., 2006). An exploratory factor analysis was

performed on the Fruit and Vegetable scale of the FBC and is more fully detailed in Chapter 4. Another threat to construct validity was the use of a single measure of a construct in a study or mono-method bias (Constantine, 2013; Hoyt et al., 2006). This study used a single measure of a construct regarding quality of diet and was limited by mono-method bias.

Threats to External Validity

External validity refers to the ability to generalize research results beyond the study sample to the same population (or other samples), to other times, and to other situations (Thomas & Rothman, 1994/2013). Results from this study cannot be generalized to other adolescent populations dissimilar to the school district's high school adolescent population. Also, it is possible that the data were influenced by participants' social desirability; as an example, when answering sensitive questions about eating and exercise habits and personal perceptions of weight and body image, the participant may provide perceived socially acceptable responses, thereby introducing social desirability bias, which is also a threat to external validity. This was addressed by procedures such as deleting extreme outliers (Thomas & Rothman, 1994/2013).

Other threats to external validity. Other threats to external validity that were relevant to this study were the Hawthorne effect and multiple treatment interference (Thomas & Rothman, 1994/2013). A threat of the Hawthorne effect may become apparent when participant data show abnormally positive health behaviors in consistently high or low scores on the self-report instruments. Identifying and addressing outliers helped to reduce this threat (Thomas & Rothman, 1994/2013). A last threat to external

validity was multiple treatment interference (Thomas & Rothman, 1994/2013). Participants were not questioned about other programs and may have participated in other health intervention programs concurrently with ABC. Nothing could be done to address this threat, and as such, major changes in behaviors were not entirely attributed to participation in the ABC program.

Threats to Internal Validity

The internal validity of a quantitative research study concerns the extent to which an assumption can be made that research outcomes from the statistical analysis were the result of the intervention and not from another variable (Thomas & Rothman, 1994/2013). Types of single-group study internal validity threats are attrition, history, maturation, testing, regression to the mean, and instrumentation (Creswell, 2009; Thomas & Rothman, 1994/2013). A history threat refers to a national event that occurred between testing periods that influenced participant responses on the pretest (Creswell, 2009; Thomas & Rothman, 1994/2013). While a possibility existed that a historic event influenced participants' pretest responses during the 2010–2012 school years, the shortness of the intervention (e.g., 12 weeks) made a historical threat unlikely. Single-group designs are also subject to the threat of maturation and attrition; however, the shortness of this study excluded maturation influences, and the data collection was from a large sample size to facilitate the identification of significant effects. There was a possibility that pretest contamination with the testing instruments would introduce posttest response effects (Thomas & Rothman, 1994/2013). However, the contamination with the testing instruments was minimal, as there was a sufficient length of time in

between the pretest and posttest. The posttest reduction of extreme scores seen at pretest, or regression to the mean, was a concern in this study (Creswell, 2009; Thomas & Rothman, 1994/2013). This concern was addressed by examining outliers at pretest and posttest.

Threats to Statistical Conclusion Validity

Statistical conclusion validity (SCV) refers to the degree of sufficiency in allowing for correct conclusions relative to statistical analyses used for hypothesis testing related to the relationship between variables (Creswell, 2009; García-Pérez, 2012). SCV is key to the Type I error, or reporting that results were significant when in fact they were not, and to the Type II error, or reporting that the results were not significant when in fact they were (García-Pérez, 2012). Statistical tests were performed to reduce or eliminate a majority of the critical threats to SCV. Low statistical power, another major threat, was attended to by using a sufficient sample size (García-Pérez, 2012). Another major threat, violations of assumptions of statistical tests, was eliminated by testing for and attending to violations of statistical assumptions (García-Pérez, 2012). The lack of randomization and the inclusion of all participants in the study could present a threat of extraneous variance. Another significant threat to this study was unreliability of measures (García-Pérez, 2012). Cronbach's alpha was calculated to determine the interitem reliability of study measures. A Cronbach's alpha of less than .70 could indicate poor interitem reliability (García-Pérez, 2012).

Ethical Issues

The use of archival data eliminated the ethical issues that emerged in the collection of data. The researcher did not have access to student names or any other personally identifying data, as the Parent Company scrubbed participant information prior to releasing the data. The Parent Company owns the data and obtains participant assent and parental consent from the participants. The data files are kept on a jump-drive, which is kept in a locked file cabinet in the researcher's home office. The jump-drive will be destroyed and any study-related documents shredded 5 years after the conclusion of the study.

Dissemination of Findings

The overall intent of this research was to determine the efficacy of the ABC program in meeting its goals; to identify positive and negative effects associated with the program, if any; and contribute to the improvement of ABC and other nutrition and fitness programs (DHHS, 2012). The results of this research were presented in a debriefing session with handouts to key stakeholders of the Parent Company, the parent of the ABC program.

Summary and Transition

In summation, the purpose of this study was to provide a thorough evaluation of the ABC program, an intervention that promotes healthy behaviors for adolescents attending high school in a large county in California. A quantitative method of inquiry using a single-group pretest–posttest research design was used to address five research hypotheses, including a mediational hypothesis. Archival data containing participant

responses to three instruments but devoid of personal identifiers were used in the statistical analyses. A power analysis was performed to determine the number of participants needed to achieve a statistical power of .80 with a large effect size to assess changes in behavior from pretest to posttest and the mediating effects of quality of diet on general fitness and body perception. The data analyses included a preliminary prescreening of the data, determination of the reliability of measures, and other statistical tests using SPSS and the Hayes 2013 Mediation Macro for SPSS. Threats to internal, external, construct, and statistical conclusion validity were addressed and considered in the data analyses, and ethical concerns were considered. The findings from the statistical analysis are discussed in the following chapter.

Chapter 4 discusses the purpose of the study and the use of the archival data, followed by details of the data analyses, including the descriptive statistics, exploratory factor analysis, and statistical assumptions. The chapter provides details of the statistical findings for each hypothesis, including probability values, confidence intervals, effect sizes, results of any post hoc analyses, and any charts or tables that provide further clarification of the findings.

Chapter 4: Results

In this chapter, I briefly highlight the background and purpose of the study; discuss the data collection, treatment fidelity, and the results of the data analysis; and provide a summary transition to Chapter 5. The section on data collection includes the response rates, discrepancies in collecting the data, external validity, and results of basic univariate analyses. The section regarding treatment fidelity includes treatment administration and adverse events, if any. The results section includes the descriptive and demographic characteristics of the data, the statistical analysis findings and assumptions, and the report of any post hoc tests or additional tests performed. Finally, the transitional summary addresses the answers to the hypotheses and provides an introduction to Chapter 5.

Background and Purpose of the Study

The increase in adolescent obesity and overweight to the current rate of 21% is associated with poor dietary behaviors, physical inactivity, low self-esteem, and poor body image (Babey et al., 2012; NCHS, 2015; Ogden et al., 2015; Spruijt-Metz, 2011). Preventive efforts to reduce adolescent obesity have been scarce (Kropski et al., 2008; Summerbell et al., 2009; Waters et al., 2011). The scarcity of research to reduce adolescent obesity hampers a mutual effort to extend the body of knowledge and develop best practices to reduce obesity for the adolescent population.

The purpose of this research study was to evaluate the ABC program, a 12-week intervention program that promotes health behavior changes for high school students in a large metropolitan school district (Parent Company, n.d.; Walker et al., 2008). The ABC

program curricula was developed by the Parent Company, a nonprofit organization, along with registered dietitians, consultants, and other professionals to address the increasing rates of obesity, overweight, and sedentary behavior among high school students in the school district. The program used professionals as mentors to the participants, and the participants act as peer mentors to younger children. SCT was used in the development of the ABC program (Walker et al., 2008) and in conceptualizing this research study. Mentorship modeling is in keeping with the SCT premise that children learn from observing the behavior of other people and that individual learning is likely to be more positive when the model they observe is comparable in some way to them (Bandura, 1986; Walker et al., 2008).

Data Collection

Participant responses to the FBC, PSDQ, and NKC were obtained by the Parent Company from participants before and after attending the ABC program. The archival data of participant responses to the FBC, PSDQ, and NKC for the years 2011 and 2012 were obtained as described in Chapter 3. The participant responses for 2010 were also received from the Parent Company and included to provide a more robust study. All participants who attended the intervention and completed the FBC, PSDQ, and NKC for the years 2010 through 2012 were included in the study. The participants were not contacted, and all personally identifying data were deleted by the parent organization before it provided the data to the researcher via Google Drive.

Treatment Fidelity

In this study, I used archival data, and there was no interaction with participants. Treatment integrity is important to any intervention (DHHS, 2012), and it was assumed that the ABC program had treatment integrity during the intervention. Additionally, no adverse events occurred during this study. However, there were problems with fidelity of the program process, as discussed in Chapter 5.

Data Analysis

The central research inquiry was to determine if the ABC program accomplished its goal of changing adolescent health behavior by promoting healthy food choices and regular exercise in adolescents attending high school in a large metropolitan school district in California. This inquiry was reviewed in five hypotheses. Before I analyzed the data, the data were subjected to preliminary screening procedures.

Preliminary Screening Procedures

Assessment of missing values. The FBC, PSDQ, and KNC were completed by 95 participants. Missing values were assessed using the MCAR procedure to determine the pattern of missing values (see Appendix A for univariate statistics). The results indicated that the pattern of missing values was MCAR, $\chi^2(69) = 78.88$, $p = .195$. Therefore missing values were assigned using the EM method (Tabachnick & Fidell, 2007).

Assessment for normality

***Univariate normality*.** The histograms of the variables were assessed and the Shapiro–Wilk procedures were performed to measure the normality of the variables. All variables except the food and vegetable consumption posttest measure were not normally

distributed (see Appendixes B–D). Therefore bootstrapping for paired-sample *t*-test procedures (*N* = 5,000) was performed to test differences across time (Tabachnick & Fidell, 2007). Bootstrapping for regression procedures (*N* = 5,000) was also conducted to test for mediation effects.

Multivariate normality. Multivariate normality was assessed by using the normal probability plot produced by the SPSS regression procedure. Multivariate normality is achieved when the points are clustered toward the diagonal (Norusis, 1991). However, multivariate normality was not achieved (see Appendix E).

Screening for outliers.

Univariate outliers. The variables were standardized to detect univariate outliers. Standardized values that exceeded the absolute value of 3.29 were deemed to be outliers (Tabachnick & Fidell, 2007). None of the items met this criterion; therefore there were no univariate outliers.

Multivariate outliers. Cooks's distance values were used to determine the items that were multivariate outliers. Items for which the Cooks's *D* value was 2 standard deviations above the Cooks's *D* mean can be considered multivariate outliers (Norusis, 1991). Two items met this criterion and were deemed to be multivariate outliers. These items were deleted from the data set.

Descriptive Statistics

Demographic variables. The schools with the highest percentage of participants as presented in Table 3 were Usity S2012 (19.4%) and Hwd F2010 (18.3%; pseudonyms

are used here and throughout for the schools). The schools with the smallest percentage of participants were Mnro F2012 (2.2%) and UC F2012 (3.2%).

Table 3

Frequencies and Percentages for the Demographic Variables

School	Frequency	Percentage
Cnoga F2010	5	5.4
Hwd F2010	17	18.3
Hwd F2012	11	11.8
Mnro F2010	11	11.8
Mnro F2011	7	7.5
Mnro F2012	2	2.2
Stee F2010	14	15.1
UC F2012	3	3.2
Usity S2012	18	19.4
Wlsn F2012	5	5.4

Note. $N = 532$. F = fall. S = spring.

Research variables. The descriptive statistics for the research variables are recapped in Table 4. According to Nunnally and Bernstein (1994), a measure is considered reliable if its Cronbach's alpha is .70 or greater. The fruit and vegetable consumption pretest and posttest measures were reliable, as their respective alphas were .80 and .82. The mean NK score increased significantly from pretest to posttest, $p < .001$. Therefore it appears that the intervention was successful in this area. Also, as indicated in Table 4, the fruit and vegetable consumption, quality of diet, and PSDQ physical activity mean scores appeared to increase across time.

Table 4

Descriptive Statistics for the Study Variables

Measure	Pretest		Posttest	
	M	*SD*	*M*	*SD*
Nutrition knowledge	6.52	2.37	8.90	3.31
Fruit and vegetable consumption	14.61	3.39	16.85	3.62
Quality of diet	5.48	1.72	6.65	1.70
PSDQ				
Physical activity	22.33	9.82	25.48	9.00
General physical fitness	23.69	8.89	23.34	10.78
Perceived body fat	2.43	0.75	2.37	0.81

Note. $N = 93$. Cronbach's alpha for fruit and vegetable consumption pretest was .80 and posttest was .82. PSDQ = Perceived Self-Descriptive Questionnaire.

Additional Testing: Exploratory Factor Analysis

The Parent Company maintained sufficient data to perform an analysis on the FBC but not on the PSDQ and NKC. Therefore, an EFA procedure was performed to determine the number of factors that lie beneath the FBC measure. Principal axis factoring was used to remove the factors. The scree plot was used to ascertain the number of factors to keep, and a nonorthogonal Oblimin procedure was used to rotate the factors.

The bend took place after the second factor, as indicated in Figure 2; therefore two factors were retained. The first factor was responsible for 39.79% of the variance. The pattern matrix shown in Table 5 discloses that the items that loaded onto this factor were items measuring vegetable consumption. Therefore this factor could be labeled the vegetable consumption measure. The second factor accounted for 10.85% of the variance. Only two items measuring fruit consumption loaded onto this factor; this factor could thus be labeled the fruit consumption measure. The second item (e.g., item FBC8) cross-loaded onto both the first and second factors. The 16-question FBC has not been

validated with a California high school adolescent population similar to those in this study, so comparable data are not available. Data using a modified version of the FBC with a younger population from other researchers were unavailable.

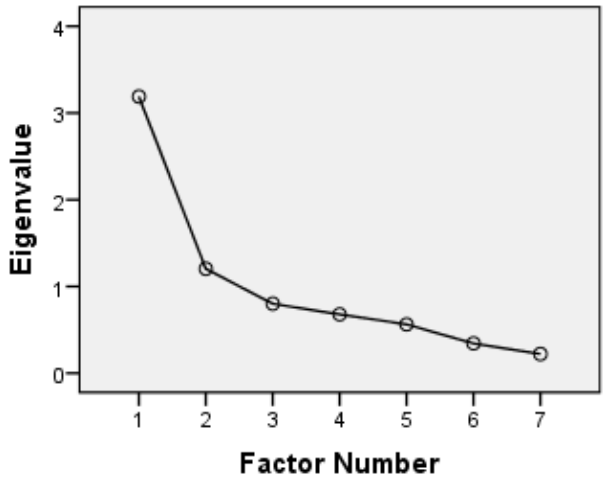

Figure 2. Scree plot from the exploratory factor analysis.

Table 5

Pattern Matrix for the Pretest Food Behavior Checklist Measure

	Item	1	2
FBC1	Eat fruits or vegetables as snacks	**.45**	.26
FBC3	Had citrus fruit or juice during the past week	−.05	.28
FBC6	How much vegetables eaten per day	**.56**	.13
FBC7	How much fruits eaten per day	.12	**.80**
FBC8	Eat more than one kind of fruit per day	.44	**.49**
FBC9	Eat more than one kind of vegetable per day	**.92**	−.05
FBC13	Eat two or more vegetables during main meal	**.84**	−.19

Note. The first factor accounted for 39.79% of the variance, while the second factor accounted for 10.85% of the variance. Boldface identifies the prevalent item on each factor.

Findings Related to Hypotheses 1–5

Hypothesis 1: Fruit and Vegetable Consumption

It was hypothesized that as participant knowledge about nutrition and fitness increased due to the ABC program, participants would consume more fruits and vegetables. The paired-sample *t*-test results summarized in Table 6 indicate that participants report consuming a greater amount of fruits and vegetables, $t(92) = -7.05$, $p < .001$. At pretest administration, the mean consumption score was 14.61 ($SD = 3.39$); at posttest administration, the mean consumption increased significantly to 16.85 ($SD = 3.62$). Accordingly, the first hypothesis was supported.

Table 6

Bootstrap Paired-Sample t-Test Results for Fruit and Vegetable Consumption, Quality of Diet, General Fitness, and Level of Physical Activity Across Time

Pair	*M*	95% CI		*df*	*t*	
		Lower	Upper			
Consumption pretest and posttest	−2.24	−2.84	−1.62	92	−7.05	***
Diet quality pretest and posttest	−1.17	−1.49	−0.81	92	−6.55	***
Physical activity pretest and posttest	−3.15	−5.42	−0.86	92	−2.68	**
General fitness pretest and posttest	0.34	−1.75	2.46	92	0.32	

Note. $N = 93$. CI = confidence interval.
*$p < .05$. **$p < .01$. ***$p < .001$.

Hypothesis 2*:* Quality of Diet

It was hypothesized that as participant knowledge about nutrition and fitness increased due to the ABC program, the quality of participants' diets would improve. The paired-sample *t*-test results summarized in Table 6 indicate that participants' diet quality

did improve, $t(92) = -6.55$, $p < .001$. At pretest administration, the mean diet quality score was 5.48 ($SD = 1.72$); at posttest administration, the mean diet quality score significantly increased to 6.65 ($SD = 1.70$). Therefore the second hypothesis was supported.

Hypothesis 3*:* Perception of General Fitness

It was hypothesized that as participant knowledge about nutrition and fitness increased due to the ABC program, their perception of general fitness would improve. The results as noted in Table 6 indicate that the participants' perception of general fitness did not improve significantly from pretest to posttest, $t(92) = .32$, $p = .759$. Therefore the third hypothesis was not supported.

Hypothesis 4: Level of Physical Activity

It was hypothesized that as participants' knowledge about nutrition and fitness increased due to the ABC program, there would be an increase in their level of physical activity. There was an increase in the level of physical activity by participants, as indicated in Table 6. The improvement was significant from pretest to posttest, $t(92) = -2.68$, $p < .01$. At pretest administration, the participants' mean physical activity score was 22.33 ($SD = 9.82$); at posttest administration, the mean activity score increased to 25.48 ($SD = 9.00$). As such, the fourth hypothesis was supported.

Hypothesis 5: Diet Quality, Perception of General Fitness, and Body Self-Perception

It was hypothesized that perception of general fitness would mediate the relationship between diet quality and body self-perception. Prior to testing this hypothesis, the assumptions of regression were evaluated. As noted earlier, multivariate

normality was not satisfied, but bootstrapping procedures were used to make the correction. The plot of the standardized predicted values by the studentized deleted residuals was used to assess linearity and homoscedasticity (Norusis, 1991). According to Norusis, if the plot yields a random scatter, then these two assumptions are fulfilled. This assumption was fulfilled, as shown in Appendix E.

Hayes's (2013) mediation macro for SPSS was used to test for mediation. Mediation is confirmed when the following criteria are met: the independent variable predicts the mediator, the independent variable predicts the dependent variable, and the indirect effect of the independent variable on the dependent variable is statistically significant. Testing for this third criterion was performed by bootstrapping procedures; based on the bootstrap samples, the mediation macro generated 95% confidence intervals to test the indirect effects.

As shown in Table 7, quality of diet significantly predicted perception of general fitness; thus the first criterion for mediation was met. But the quality of diet did not significantly predict body self-perception; therefore the second criterion for mediation was not met. The indirect effect of quality of diet on body self-perception was significant, $B = -.05$, 95% CI [−.10, −.01]; thus the third criterion for mediation was met. Because only two out of the three criteria for mediation were met, perception of general fitness did not significantly mediate the relationship between quality of diet and body self-perception. Therefore the fifth hypothesis was not supported.

Table 7

Results Testing the Mediating Effect of Perception of General Fitness on Quality of Diet and Body Self-Perception

Variable	General fitness[a]		Body self-perception[b]	
	B	*SE*	*B*	*SE*
Quality of diet	1.62 *	.64	.01	.05
General fitness	–	–	−.05 ***	.01

Note. $N = 93$.
[a]$R^2 = .065$; $F(1, 91) = 6.39$, $p < .01$. [b]$R^2 = .141$; $F(2, 90) = 7.38$, $p < .01$.
*$p < .05$. **$p < .01$. ***$p < .001$.

Summary and Transition

The purpose of this study was to evaluate the effectiveness of the ABC program in promoting healthy behaviors for adolescents attending high school in a large school district in California. A single-group pretest–posttest research design using archival data was used to focus on five research hypotheses. The data analysis yielded three hypotheses that were supported and two that were not supported.

It was hypothesized that as participants' knowledge about nutrition increased from attending the ABC program, they would consume more fruits and vegetables. As shown in Table 8, this first hypothesis was supported. The second hypothesis, that as participants' knowledge about nutrition increased from attending the ABC program, the quality of participants' diets would improve, was also supported. Similarly, the fourth hypothesis that participants' physical activity would increase by attending the ABC program was also supported. However, the third hypothesis, that participants' perception of general fitness would improve from pretest to posttest, was not supported. Finally, the

fifth hypothesis, that perception of general fitness would mediate the relationship between quality of diet and body self-perception, was also not supported.

Table 8

Summary of Results

	Hypothesis	Result
1	Increased fruit and vegetable consumption	Supported
2	Improved diet quality	Supported
3	Increased perception of general fitness	Not supported
4	Increased level of physical activity	Supported
5	General fitness mediating diet quality and body self-perceptions	Not supported

Three of the five hypotheses are supportive of the improvements in nutrition and fitness behaviors that may be attributable to attending the ABC program. What is known from research is that both physical activity and nutrition programs can have an effect on preventing and reducing obesity by changing eating behaviors and increasing physical activity.

In Chapter 5 I will briefly discuss the purpose of the study, summarize and interpret the key findings, and compare these findings to outcomes described in the literature review of Chapter 2. This comparison will confirm, disconfirm, or extend knowledge regarding after-school nutrition and fitness programs for adolescents who attended the high schools in the study. Furthermore, the findings will be analyzed and interpreted in the context of the theoretical and conceptual framework discussed in Chapter 2. In addition, I will also explain any limitations regarding generalization, trustworthiness, validity, and reliability that were noted during the analysis. Finally,

recommendations will be provided regarding future research. The findings from this study will add to the body of knowledge regarding successful and unsuccessful elements of fitness and nutrition programs for high school adolescents.

Chapter 5: Discussion, Conclusions, and Recommendations

The purpose of this study was to determine if ABC, an after-school health education intervention, was effective in promoting healthy food choices and regular exercise to adolescents attending high schools in a large California school district. The desired outcome for the program was to reduce the rate of childhood obesity and obesity-related illness among youths in a large metropolitan city by changing health behaviors. In the past, the ABC program had only received a cursory review as an intervention promoting healthy lifestyle choices.

The effectiveness of the ABC program as an intervention to teach healthy food choices and regular exercise was examined in five research hypotheses, resulting in the following key findings: (a) An increase in the consumption of fruit and vegetables was associated with an increase in nutrition and fitness knowledge, (b) an increase in diet quality was associated with an increase in nutrition and fitness knowledge, (c) an increase in nutrition and fitness knowledge was not associated with perceived general fitness, (d) an increase in the level of physical activity was associated with an increase in nutrition and fitness knowledge, and (e) quality of diet was associated with perception of general fitness but not with body self-perception (body fat), and there was a significant indirect effect of quality of diet on body self-perception.

Interpretation of Findings

The analysis of the data supports that participants who attended the ABC intervention learned about the importance of nutrition, fitness, and selecting a healthy lifestyle, which led to behavioral changes. These behavioral changes resulted in positive

change in the quality of diet and an increase in the level of physical activity and fruit and vegetable consumption. However, participants did not associate increased nutrition and fitness knowledge with perceived general fitness (as an example of a question on the PSDQ subscale, "I feel good about who I am physically"). Perhaps the reason that there was no perception of improved general fitness is that the questions on the PSDQ subscale appear to be worded to solicit self-esteem-type responses (the validated PSDQ has a global self-esteem scale) and the NKC questions focus on nutrition and fitness. Lastly, the analysis of the data did not support all three mediation criteria. The quality of diet predicted participant perception of general fitness but not body self-perception (as an example of a question on the PSDQ subscale, "I am too fat"). One possible reason that diet quality was not a predictor of body self-perception could be negative connotations associated with the word "fat."

Similarities to Other Interventions

In this study, I found that as participants increased their nutrition and fitness knowledge, they consumed more fruits and vegetables. These results are consistent with the results noted by Branscum and Kaye (2009) and Somerville et al. (2012). Similarly, Branscum et al. (2013) noted an overall improvement in dietary behaviors, while Walker et al. (2008) found that half of the students who attended the ABC program reported an increase in nutrition awareness. Findings by Walker et al. did not extend to specific areas of nutrition improvement.

Participants reported an increase in the quality of their diet as a result of acquiring nutrition and fitness knowledge. This finding is also consistent with findings of

improvement in overall dietary behaviors noted by Irwin et al. (2009) and Branscum et al. (2013). Freedman and Nickell (2010) also noted meaningful increases in the consumption of milk, vegetables, and water.

In this study, I did not find that increased nutrition knowledge was associated with a perception of general fitness. This finding could be attributable to a difference in the types of responses solicited on each questionnaire, which are seemingly unrelated. Questions associated with perceived general fitness were worded in a manner that may have elicited self-esteem types of responses, whereas nutrition knowledge elicited responses that were more factual regarding nutrition and fitness. Irwin et al. (2009) noted somewhat similar results in that students did not associate daily physical activity requirements with the intervention, which included nutrition knowledge and behaviors.

The results also point to increased levels of physical activity associated with increased knowledge of nutrition and fitness. This differs from Lubans et al. (2012), who found that the effect of the intervention was not significantly related to physical activity. One reason for the difference could be that Lubans et al. had a nutrition component, but the intervention focused more on physical activity, and the effects of the nutrition component were not assessed.

Lastly, participant perception of general fitness did not mediate the relationship between diet quality and body self-perception (body fat). The quality of diet significantly predicted perception of general fitness but did not significantly predict body self-perception (body fat); as such, the second criterion for mediation was not met. The third criterion was, however, met: The indirect effect of quality of diet on body self-perception

was significant. Similarly, Lubans et al. (2012) had explored potential mediators and moderators of a physical activity intervention for boys. They did not identify changes in physical activity, and while nutrition mediators were not included, none of the four variables in the study met the criteria for mediation.

Self-Efficacy, Outcome Expectancy, and Advocacy Evaluation

Self-efficacy. In this study, I explored SCT concepts of self-efficacy related to changes in dietary behavior. Self-efficacy as related to this study was an individual belief that increased health dietary knowledge would lead to behaviors supportive of a healthy lifestyle. This concept was evaluated through Hypothesis 1, which concerned the ability to change eating behaviors related to fruit and vegetables after obtaining nutrition knowledge. The concept of self-efficacy was supported, as participants demonstrated an ability to change eating behaviors by eating more servings of fruits and vegetables after gaining nutrition knowledge. The results were statistically significant, as the participants created a self-suited environment that facilitated increased consumption of fruits and vegetables based on incentive motivation and resource access. Branscum and Kaye (2009) and Somerville et al. (2012) noted similar results regarding self-efficacy in their studies.

Outcome expectancy. Outcome expectancy as viewed in this study was an individual belief that attending ABC may influence eating behaviors that are currently desirable and beneficial for the future. Outcome expectancy was evaluated in Hypothesis 5 as determining if there was an association between nutrition knowledge and dietary behaviors (as measured by quality of diet) and if the dietary behaviors were associated

with increased levels of general fitness and body self-perception (body fat). Outcome expectancy was not supported, as participants demonstrated that the quality of diet significantly predicted their perception of general fitness (e.g., "I feel good about who I am physically") but did not significantly predict body self-perception (e.g., "I am too fat").

Advocacy construct: Let's Move! The TFCO recommended 73 action items to reduce childhood obesity that resulted in an executive mandate to all government departments to employ programs focused on reducing childhood obesity. Recommendation 3.16 underscores the need to promote good nutrition through after-school programs. The construct of promoting good nutrition was supported (Hypothesis 2), as participants demonstrated a significant change in the quality of their diet from pretest to posttest as their knowledge of nutrition and fitness improved. As such, ABC appears to be an after-school intervention recognizable as an effective program to reduce childhood obesity in a school environment and to be promotable as such under TFCO Recommendation 3.16.

Limitations

Limitations to external validity. Results from this study cannot be generalized to adolescent populations dissimilar to the school district's student population and demographics and intervention locations. The matched pretest sampling (N = 93) was more than sufficient to achieve a statistical power of .80 with a large effect size of .80 for Hypotheses 1–4 and an effect size of .35 for Hypothesis 5. I did not use randomization and variables such as social economic status, gender, attendance, and household

resources. I also did not measure the association between actual weight loss and participant nutrition knowledge. Participants were not screened for potential effects by other outside influences, such as participating in other intervention programs.

Limitations to internal validity. Limitations relative to attrition, history, and maturation did not occur due to the short time frame of the intervention; the sample size was sufficient to identify significant effects. I did not use a control group or comparison groups in this study. Single-group pretest contamination with the testing instruments was minimized, as the program design provided for sufficient length of time in between testing, and extreme scores were minimal. I relied on archival data; as such, no plan was implemented to control for spontaneous changes in intervention delivery, the timing of the posttest assessments, and disruptive participants. It is assumed that the intervention had treatment integrity and controlled for these matters.

Limitations to construct validity. It is assumed that the ABC program had treatment integrity. The instrumentation used to collect data for this study were two unpublished instruments and one published instrument. The PSDQ and the KNC have not been validated with this population. The results of an exploratory factor analysis performed on the fruit and vegetable consumption scale of the FBC was more fully discussed in Chapter 4; nevertheless, the FBC has not been validated with the population in this study. The interpretation of the results of theoretical constructs examined in this study is limited by the study population and instrumentation. The effect of mentoring on participants conducting the mentoring and receiving the mentoring was not evaluated. The influence of incentives, such as the receipt of community service hours and small

incentives from the program sponsors, was not evaluated. The program is one of several nutrition and fitness programs sponsored by the parent organization. The effectiveness of this program is limited to the specific goals, requirements, and operations of the ABC program and cannot be generalized to other intervention programs or other programs administered by the parent organization.

Recommendations

Recommendations for Action

Findings from this study support the effectiveness of the ABC program in changing nutrition and fitness behaviors in adolescents notwithstanding the use of nonvalidated instruments. In the future, consideration should be given to using validated instruments or to validating the FBC and PSDQ. An abridged version of the PSDQ containing less than the 70 questions on the original instrument has been validated. Regarding intervention fidelity, the on-site intervention process should be reviewed as it relates to obtaining pretest and posttest instruments from participants, as only 95 of approximately 532 participants completed all three assessments. These recommendations were included in a debriefing meeting with the executive officers of the parent organization.

The ABC program changed its name to DEF (pseudonym) in 2014 and combined the ABC nutrition and fitness program with guided imagery and stress reduction as part of a partnership with a prominent California university.

Recommendations for Further Study

A recommendation for future research is to implement a follow-up assessment with participants 3–6 months postcompletion of the ABC program to evaluate enduring behavioral changes (Somerville et al., 2012). Additionally the effect of peer mentoring of younger children by participants has not been evaluated. The effects of the mentoring by adolescents for the youths and their families should also be evaluated, as such an evaluation would present another opportunity to understand the effects of the intervention on elementary and middle school populations through mentoring.

Implications for Social Change

This study was conducted with a goal of determining if the ABC program met its goals of teaching nutrition and fitness to adolescents, and if so, if the results were quantifiable. Furthermore, an adolescent population was selected due to the scarcity of preventive programs for this population. The findings from this study support a foundation for social change related to obesity reduction and prevention. Adolescents attending the ABC program reported significant dietary changes, increased consumption of fruits and vegetables, and increased levels of physical activity, all key to preventing and reducing obesity. Moreover, the changes occurred as the participants learned new behaviors related to making healthy nutrition choices and increasing physical activity notwithstanding environmental factors. These changes provide an opportunity to teach and model healthy behaviors to peers, family, and communities with the hope of reducing early-age mortality and the economic impact of increased health care costs.

The rate of adolescent obesity is currently 21%, and there is a scarcity of intervention research for the adolescent population (Ogden et al., 2015). This study contributes to the existing body of knowledge on effective interventions and practices for increasing adolescent knowledge of healthy lifestyle choices.

Concluding Statement

The purpose of this study was to evaluate the effectiveness of the ABC program in achieving its goal of promoting healthy lifestyle choices through nutrition and fitness education. The results of this study support that ABC is an effective after-school program for adolescents, that the program is a valuable resource in delivering health-related information, and that the program is an effective change agent in influencing dietary and fitness changes. As findings from the study supported an increase in the quality of diet reported by the participants from pretest to posttest, Whitmee et al. (2015) noted that "dietary risk factors are among the most important contributors to the global burden of disease, with large numbers of premature deaths in particular being due to inadequate consumption of vegetables, fruit, and nuts" (p. 35). The results support that adolescents who attend ABC acquire life-sustaining knowledge that translates into healthy lifestyle choices.

References

After School Alliance. (n.d.). *Issue briefs*. Retrieved from http://www.afterschoolalliance.org/issue_24_obesity.cfm

Babey, S. H., Wolstein, J., & Diamant, A. L. (2011). *Food environments near home and school related to consumption of soda and fast food*. Retrieved from http://healthpolicy.ucla.edu/publications/Documents/PDF/Food%20Environments%20Near%20Home%20and%20School%20Related%20to%20Consumption%20of%20Soda%20and%20Fast%20Food.pdf

Babey, S. H., Wolstein, J., Diamant, A. L., Bloom, A., & Goldstein, H. (2012). *Overweight and obesity among children by California cities*. Retrieved from http://www.publichealthadvocacy.org /research/overweightdocs2012/Overweight-2010_CCPHA%20Study_FINAL.PDF

Bandura, A. (1971). Vicarious and self-reinforcement processes. In *The nature of reinforcement.* Retrieved from http://web.stanford.edu/dept /psychology/bandura /pajares/Bandura1971.pdf

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review, 84*, 191–215. doi:10.1.1.315.4567

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Englewood Cliffs, NJ: Prentice Hall.

Banna, J. C., Becerra, L., Kaiser, L. L., & Townsend, M. S. (2010). Using qualitative methods to improve questionnaires for Spanish speakers: Assessing face validity

of a food behavior checklist. *Journal of the American Dietetic Association, 110*, 80–90. doi:10.1016/j.jada.2009.10.002

Barr-Anderson, D. J., Adams-Wynn, A. W., DiSantis, K. I., & Kumanyika, S. (2013). Family-focused physical activity, diet, and obesity interventions in African American girls: A systematic review. *Obesity Review, 14*(1), 29–51. doi:10.1111/j.1467-789X.2012.01043.x

Belansky, E. S., Romaniello, C., Morin, C., Uyeki, T., Sawyer, R. L., Scarbro, S., . . . Marshall, J. A. (2006). Adapting and implementing a long-term nutrition and physical activity curriculum to a rural, low-income, biethnic community. *Journal of Nutrition Education, 38,* 106–113. doi:10.1016/j.jneb.2005.11.011

Blackburn, M. L., Townsend, M. S., Kaiser, L. L., Martin, A. C., West, E. A., Turner, B., & Joy, A. B. (2006). Food behavior checklist effectively evaluates nutrition education. *California Agriculture, 60*(1), 20–24. doi:10.3733/ca.v060n01p20

Branscum, P., & Kaye, G. (2009). An evaluation of a theory based childhood overweight prevention curriculum. *California Journal of Health Promotion, 7*, 33–38. Retrieved from http://www.cjhp.org/Volume7_2009/IssueSE/branscum.pdf

Branscum, P., Kaye, G., & Warner, J. (2013). Impacting dietary behaviors of children from low income communities: An evaluation of a theory-based nutrition education program. *California Journal of Health Promotion, 11*(2), 43–52. Retrieved from http://cjhp.fullerton.edu/Volume11Issue2_2013/documents/43-52_BranscumP.pdf

Branscum, P., Sharma, M., Kaye, G., & Succop, P. (2010). An evaluation of the validity and reliability of a food behavior checklist modified for children. *Journal of Nutrition Education Behavior, 42*, 349–352. doi:10.1016 /j.jneb.2009.12.005

Braveman, P. A., Cubbin, C., Egerter, S., Williams, D. R., & Pamuk, E. (2010). Socioeconomic disparities in health in the United States: What the patterns tell us. *American Journal of Public Health, 100*, S186–S196. doi:10.2105/AJPH.2009.166082

Brooks, N., & Begley, A. (2013). Adolescent food literacy programmes: A review of the literature. *Nutrition & Dietetics, 71*, 158–171. doi:10.1111/1747-0080.12096

Cawley, J. (2009). The economics of childhood obesity. *Health Affairs, 29*, 364–371. doi:10.1377/hlthaff.2009.0721

Cawley, J., & Liu, F. (2012). Maternal employment and childhood obesity: A search for mechanisms in time use data. *Economics and Human Biology, 10*, 352–364. doi:10.1016/j.ehb.2012.04.00

Centers for Disease Control and Prevention. (2012). *Multiple causes of death 1999–2010.* Retrieved from http://wonder.cdc.gov/mcd- icd10.html

Centers for Disease Control and Prevention. (2014). Youth risk behavior surveillance—United States, 2013. *Morbidity and Mortality Weekly Report Surveillance Summaries, 63*(4). Retrieved from http://www.cdc.gov/mmwr/pdf/ss/ss6304.pdf

Centers for Disease Control and Prevention. (2015a). *Defining childhood obesity*. Retrieved from http://www.cdc.gov/obesity/childhood/defining.html

Centers for Disease Control and Prevention. (2015b). *Obesity causes and consequences*. Retrieved from http://www.cdc.gov/obesity/childhood/causes.html

Chuang, J., Zeller, M. H., Inge, T., & Crimmins, N. (2013). Bariatric surgery for severe obesity in two adolescents with type 1 diabetes. *Pediatrics, 132*, 1031–1034. doi:1542/peds.2012-3640

Cohen, J. (1977). *Statistical power analysis for the behavioral sciences* (Rev.ed.). Hillsdale, NJ: Lawrence Erlbaum Associates.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Lawrence Erlbaum Associates.

Constantine, N. A. (2013). Intervention effectiveness research in adolescent health psychology: Methodological issues and strategies. In W. T. O'Donohue, L. T. Benuto, & L. Woodward (Eds.), *Handbook of adolescent health psychology* (pp. 295–317). New York, NY: Springer. doi:10.1007/978-1-4614-6633-8

Creswell, J. W. (2009). *Research design: Qualitative, quantitative, and mixed methods approaches*. Thousand Oaks, CA: Sage.

Dave, J. M., Evans, A. E., Saunders, R. P., Watkins, K. W., & Pfeiffer, K. A. (2009). Associations among food insecurity, acculturation, demographic factors, and fruit and vegetable intake at home in Hispanic children. *Journal of the American Dietetic Association, 109,* 697–701. doi.10.1016/j.jada.2008.12.017

Diamont, A. L., Babey, S. H., & Wolstein, J. (2011). *Adolescent physical education and physical activity in California* (Health Policy Brief). Retrieved from http://escholarship.org/uc/item/8hn72960

Dishman, R. K., Motl, R. W., Saunders, R., Felton, G., Ward, D. S., Dowda, M., & Pate, R. R. (2004). Self-efficacy partially mediates the effect of a school-based physical activity intervention among adolescent girls. *Preventive Medicine, 38*, 628–636. doi:10.1016/j.ypmed.2003.12.007

Dobbins, M., Husson, H., DeCorby, K., & LaRocca, R. L. (2013). School-based physical activity programs for promoting physical activity and fitness in children and adolescents aged 6 to 18. *Cochrane Database of Systematic Reviews, 2*, CD007651. doi:10.1002/14651858.CD007651.pub2

Durlak, J. A., Weissberg, R. P., & Pachan, M. (2010). A meta-analysis of after-school programs that seek to promote personal and social skills in children and adolescents. *American Journal of Community Psychology, 45*, 294–309. doi:10.1007/s10464-010-9300-6

Ervin, R. B., & Ogden, C. L. (2013, May). *Consumption of added sugars among U.S. adults, 2005–2010* (NCHS Data Brief No. 122). Hyattsville, MD: National Center for Health Statistics.

Faul, F., Erdfelder, E., Buchner, A., & Lang, A. G. (2009). Statistical power analyses using G*Power 3.1: Tests for correlation and regression analyses. *Behavior Research Methods, 41*, 1149–1160. doi:10.3758/BRM.41.4.1149

Flegal, K. M., Carroll, M. D., Kit, B. K., & Ogden, C. L. (2012). Prevalence of obesity and trends in the distribution of body mass index among U.S. adults 1999–2010. *Journal of the American Medical Association, 307*, 491–497. doi:10.1001/jama.2012.39

Flegal, K. M., Carroll, M. D., Ogden, C. L., & Johnson, C. L. (2002). Prevalence and trends in obesity among U.S. adults 1999–2000. *Journal of the American Medical Association, 288,* 1723–1727. doi:10.1001/jama.288.14.1723

Freedman, D. S., Khan, L. K., Dietz, W. H., & Srinivasan, S. A. (2001). Relationship of childhood obesity to coronary heart disease risk factors in adulthood: The Bogalusa Heart Study. *Pediatrics, 108,* 712–718. doi:10.1542/peds.108.3.712

Freedman, M. R., & Nickell, A. (2010). Impact of after-school nutrition workshops in a public library setting. *Journal of Nutrition Education and Behavior, 42,* 192–197. doi:10.1016/j.jncb.2009.07.003

Fryar, C. D., Carroll, M. D., & Ogden, C. L. (2012, September). *Prevalence of obesity among children and adolescents: United States, trends 1963–1965 through 2009–2010* (NCHS Health E-Stat). Hyattsville, MD: National Center for Health Statistics.

Gale, E. (2002). The rise of childhood type 1 diabetes in the 20th century. *Diabetes, 51*, 3353–3361. doi:10.2337/diabetes.51.12.3353

García-Pérez, M. A. (2012). Statistical conclusion validity: Some common threats and simple remedies. *Frontiers in Psychology, 3*. doi:10.3389/fpsyg.2012.00325

Gebauer, H., & Laska, M. N. (2011). Convenience stores surrounding urban schools: An assessment of healthy food availability, advertising, and product placement. *Journal of Urban Health, 88,* 616–622. doi:10.1007/s11524-011-9576-3

Glanz, K., & Bishop, D. B. (2010). The role of behavioral science theory in development and implementation of public health interventions. *Annual Review of Public Health, 31*, 399–418. doi:10.1146/annurev.publhealth.012809.103604

Goh, Y., Bogart, L. M., Sipple-Asher, B. K., Uyda, K., Hawes-Dawson, J., Olarita-Dhungana, J., . . . Schuster, M. A. (2009). Using community-based participatory research to identify potential interventions to overcome barriers to adolescents' healthy eating and physical activity. *Journal of Behavioral Medicine, 32*, 491–502. doi:10.1007/s10865-009-9220-9

Grow, H. M., Cook, A. J., Arterburn, D. E., Saelens, B. E., Drewnowski, A., & Lozano, P. (2010). Child obesity associated with social disadvantage of children's neighborhoods. *Social Science Medicine, 71*, 584–591. doi:10.1016/j.socscimed.2010.04.018

Grusec, J. (1992). Social learning theory and developmental psychology: The legacies of Robert Sears and Albert Bandura. *Developmental Psychology, 28*, 776–786. doi:10.1037/0012-1649.28.5.776

Hattori, A., An, R., & Sturm, R. (2013). Neighborhood food outlets, diet, and obesity among California adults, 2007–2009. *Preventing Chronic Disease, 10*. doi:10.5888/pcd10.120123

Haycraft, E., Goodwin, H., & Meyer, C. (2013). Adolescents' level of eating psychopathology is related to perceptions of their parents' current feeding practices. *Journal of Adolescent Health, 54*, 204–208. doi:10.1016/j.jadohealth.2013.08.007

Hayes, A. F. (2013). *Introduction to mediation, moderation, and conditional process analysis*. New York, NY: Guilford Press.

Hendrie, G. A., Brindal, E., Corsini, N., Gardner, C., Baird, D., & Golley, R. K. (2012). Combined home and school obesity prevention interventions for children: What behavior change strategies and intervention characteristics are associated with effectiveness? *Health Education & Behavior, 39*, 159–171. doi:10.1177/1090198111420286

Hillier, A., Cannuscio, C. C., Karpyn, A., McLaughlin, J., Chilton, M., & Glanz, K. (2011). How far do low-income parents travel to shop for food? Empirical evidence from two urban neighborhoods. *Urban Geography, 32*, 712–729. doi:10.2747/0272-3638.32.5.712

Ho, M., Garnett, S. P., Baur, L. A., Burrows, T., Stewart, L., Neve, M., & Collins, C. (2013). Impact of dietary and exercise interventions on weight change and metabolic outcomes in obese children and adolescents: A systematic review and meta-analysis of randomized trials. *Journal of the American Medical Association Pediatrics, 167,* 759–768. doi:10.1001/jamapediatrics.2013.1453

Hokayem, C., & Heggeness, M. L. (2014). *Living in near poverty in the United States 1966–2012.* Retrieved from http://www.census.gov/content/dam/Census/library/publications/2014/demo/p60-248.pdf

Hosper, K., Nicolau, M., van Valkengoed, I., Nierkens, V., & Stronks, K. (2011). Social and cultural factors underlying generational differences in overweight: A cross-

sectional study among ethnic minorities in the Netherlands. *BMC Public Health, 11,* 105. doi:10.1186/1471-2458-11-105

Howerton, M. W., Bell, S. B., Dodd, K. W., Berrigan, D., Stolzenberg-Solomon, R., & Nebeling, L. (2007). School-based nutrition programs produced a moderate increase in fruit and vegetable consumption: Meta and pooling analyses from 7 studies. *Journal of Nutrition Education and Behavior, 39,* 186–196. doi:10.1016/j.jneb.2007.01.010

Hoyt, W. T., Warbasse, R. E., & Chu, E. Y. (2006). Construct validation in counseling psychology research. *Counseling Psychologist, 34,* 769–805. doi:10.1177/0011000006287389

Huang, J. S., Norman, G. J., Zabinski, M. F., Calfas, K., & Patrick, K. (2007). Body image and self-esteem among adolescents undergoing an intervention targeting dietary and physical activity behaviors. *Journal of Adolescent Health, 40,* 245–251. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/17321425

Irwin, C. C., Irwin, R. L., Miller, M. E., Somes, G. W., & Richey, P. A. (2009). Get fit with the Grizzlies: A community-school-home initiative to fight childhood obesity. *Journal of School Health, 80,* 333–339. doi:10.1111/j.1746-1561.2010.00510.x

Jain, A., & Langwith, C. (2013). Collaborative school-based obesity interventions: Lessons learned from 6 southern districts. *Journal of School Health, 83,* 213–222. doi:10.111/josh.12017

Jomaa, L. H., McDonnell, E., Weirich, E., Hartman, T., Jensen, L., & Probart, C. (2010). Student involvement in wellness policies: A study of Pennsylvania local education agencies. *Journal of Nutrition Education and Behavior, 42*, 372–379. doi:10.1016/j.jneb.2009.07.012

Kann, L., Kinchen, S., Shanklin, S. L., Flint, K. H., Hawkins, J., Harris, W. A., . . . Zaza, X. (2014). *Youth risk behavior surveillance—United States 2013*. Retrieved from http://www.cdc.gov /mmwr/pdf/ss/ss6304.pdf

Kelly, A. S., Barlow, S. E., Rao, G., Inge, T. H., Hayman, L. L., Steinberger, J., . . . Daniels, S. R. (2013). Severe obesity in children and adolescents: Identification, associated health risks, and treatment approaches. *Journal of the American Heart Association, 128*, 1689–1712. Retrieved from http://circ.ahajournals.org/

Kong, A. S., Sussman, A. L., Yahne, C., Skipper, B. J., Burge, M. R., & Davis, S. M. (2013). School-based health center intervention improves body mass index in overweight and obese adolescents. *Journal of Obesity, 2013*, Article 575016. doi:10.1155/2013/575016

Kristal, A. R., Abrams, B. F., Thornquist, M. D., Disogra, L., Croyle, R. T., Shattuck, A. L., & Henry, H. J. (1990). Development and validation of a food use checklist for evaluation of community nutrition interventions. *American Journal of Public Health, 80*, 1318–1322. doi:10.2105/AJPH.80.11.1318

Kropf, M. L., Holben, D. H., Holcomb, J. P., & Anderson, H. (2007). Food security status and produce intake and behaviors of special supplemental nutrition program for women, infants, and children and farmer's market nutrition program participants.

Journal of the American Dietetic Association, 107, 1903–1908. doi:10.1016/j.jada.2007.08.014

Kropski, J. A., Keckley, P. H., & Jensen, G. L. (2008). School-based obesity prevention programs: An evidence-based review. *Obesity, 16*, 1009–1018. doi:10.1038/oby.2008.29

Kumanyika, S. K., Obarzanek, E., Stettler, N., Bell, R., Field, A. E., Fortmann, S. P., . . . Hong, Y. (2008). Population-based prevention of obesity: The need for comprehensive promotion of healthful eating, physical activity, and energy balance—a scientific statement from American Heart Association Council on Epidemiology and Prevention, Interdisciplinary Committee for Prevention (formerly the expert panel on population and prevention science). *Circulation, 118*, 428–464. doi:10.1161/CIRCULATIONAHA.108.189702

Langellier, B. A. (2012). The food environment and student weight status, Los Angeles County, 2008–2009. *Preventing Chronic Disease, 9*. doi:10.5888/pcd9.110191

Learn The Facts. (n.d.). Retrieved from http://www.letsmove.gov/learn-facts/epidemic-childhood-obesity

Levine, J. A. (2011). Poverty and obesity in the U.S. *Diabetes, 60*, 2667–2668. doi:10.2337/db11-1118

Lubans, D. R., Morgan, P. J., & Callister, R. (2012). Potential moderators and mediators of intervention effects in an obesity prevention program for adolescent boys from disadvantaged schools. *Journal of Science and Medicine in Sport, 15*, 519–525. doi:10.1016/j.jsams.2012.03.011

Lyness, K. P., & Sprenkle, D. H. (1996). Experimental research. In D. H. Sprenkle & S. M. Moon (Eds.), *Research methods in family therapy* (pp. 191–215). New York, NY: Guilford Press.

Madsen, K. A., Weedn, A. E., & Crawford, P. B. (2010). Disparities in plateaus, and declines in prevalence of high BMI among adolescents. *Pediatrics, 126*, 434–442. Retrieved from http://pediatrics.aappublications.org/content/126/3/434.full.html

Matsuo, Y., Oberbach, A., Till, H., Inge, T. H., Wabitsch, M., Moss, A., . . . Adams, V. (2013). Impaired HDL function in obese adolescents: Impact of lifestyle intervention and bariatric surgery. *Obesity, 21*, E687–E695. doi:10.1002/oby.20538

McAlister, A. L., Perry, C. L., & Parcel, G. S. (2008). How individuals, environments, and health behaviors interact: Social cognitive theory. In K. Glanz, B. K. Rimer, & K. Viswanath (Eds.), *Health behavior and health education: Theory, research, and practice* (4th ed., pp. 169–178). San Francisco, CA: Jossey-Bass.

McClure, A. C., Tanski, S. E., Kingsbury, J., Gerrard, M., & Sargent, J. D. (2010). Characteristics associated with low self-esteem among U.S. adolescents. *Academic Pediatrics, 10*, 238–244. doi:10.1016/j.acap.2010.03.007

Moore, J. A. (2003). *Cognitive indices of physical self-perception: Relationships with physical activity* (Unpublished doctoral dissertation). University of Texas, Austin. Retrieved from https://www.lib.utexas.edu/etd/d/2003 /moorejb032 /moorejb032.pdf

Murphy, S., Kaiser, L. L., Townsend, M. S., & Allen, L. (2001). Evaluation of validity of items in a food behavior checklist. *Journal of the American Dietetic Association, 101*, 751–756, 761. Retrieved from http://fsnep.ucdavis.edu/publications/research-articles%20/research-articles/EvaluationOfValidityOfItemsForAFoodBehaviorChecklist.pdf

National Center for Health Statistics. (2015). *Health, United States 2014: With special feature on adults aged 55–64. Obesity among children and adolescents aged 2–19 years, by selected characteristics. United States selected years 1988–1994 through 2009–2012*. Retrieved from http://www.cdc.gov/nchs/data/hus/hus15.pdf

Neumark-Sztainer, D., Story, M., Hannan, P. J., Stat, M., & Rex, J. (2003). New moves: A school-based obesity prevention program for adolescent girls. *Preventive Medicine, 37*(1), 41–51; doi:10.1016/S0091-7435(03)00057-4

Norusis, M. J. (1991). *SPSS base systems user's guide*. Chicago, IL: SPSS Inc.

Nunnally, J. C., & Bernstein, I. H. (1994). *Psychometric theory*. New York, NY: McGraw-Hill.

Office of Disease Prevention and Health Promotion. (2015, August). *2008 physical activity guidelines for Americans* (ODPHP Publication No. U0036). Retrieved from http://health.gov/paguidelines/

Office of the Surgeon General. (2010). *The Surgeon General's Vision for a Healthy and Fit Nation 2010.* Rockville, MD: U.S. Department of Health and Human Services.

Ogden, C. L., & Carroll, M. D. (2010). *Prevalence of obesity among children and adolescents: United States, trends 1963–1965 through 2007–2008*. Retrieved

from http://www.cdc.gov/nchs/data/hestat /obesity_child_0708 /obesitychild0708.htm

Ogden, C. L., & Carroll, M. D. (2011, June). *Prevalence of overweight, obesity, and extreme obesity among adults: United States, trends 1960–1962 through 2007–2008* (NCHS Health E-Stat). Hyattsville, MD: National Center for Health Statistics.

Ogden, C. L., Carroll, M. D., Curtin, L. R., Lamb, M. M., & Flegal, K. M. (2010). Prevalence of high body mass index in U.S. children and adolescents, 2007–2008. *Journal of the American Medical Association, 303,* 242–249. doi:10.1001/jama.2009.2012

Ogden, C. L., Carroll, M. D., Fryar, C. D., & Flegal, K. M. (2015). *Prevalence of obesity among adults: United States, 2011–2014* (NCHS Data Brief No. 219). Hyattsville, MD: National Center for Health Statistics. Retrieved from http://www.cdc.gov/ nchs/data/databriefs/db219.htm

Ogden, C. L., Carroll, M. D., Kit, B. K., & Flegal, K. M. (2013). *Prevalence of obesity among adults: United States, 2011–2012* (NCHS Data Brief No. 131). Hyattsville, MD: National Center for Health Statistics. Retrieved from http://www.cdc.gov/nchs/data/databriefs/db131.htm

Ogden, C. L., Carroll, M. D., Kit, B. K., & Flegal, K. M. (2014). Prevalence of obesity among adults: United States, 2011–2012. *Journal of the American Medical Association, 311,* 806–814. doi:10.1001/jama.2014.732

Oka, M., Link, C. L., & Kawachi, I. (2012). Area-based variations in obesity are more than a function of the food and physical activity environment. *Journal of Urban Health, 90*, 442–463. doi:10.1007/s11524-012-9715-5

Pajares, F. (2002). *Overview of social cognitive theory and of self-efficacy*. Retrieved from http://www.emory.edu/EDUCATION /mfp/eff.html

Parent Company. (2015, September 20). *ABC training video.* Retrieved from http://www.The Parent.org/videos-ABC/training-videos/ABC-program-training-videos.html

Parent Company. (n.d.). *The ABC program*. Retrieved from http://www.TheParent.org/ABC-program.html

Rahman, T., Cushing, R. A., & Jackson, R. J. (2011). Contributions of built environment to childhood obesity. *Mount Sinai Journal of Medicine, 78*, 49–57. doi:10.1002/msj.20235

Rayner, G., Gracia, M., Young, E., Mauelon, J. R., Luque, E., & Rivera-Ferre, M. G. (2010). Why are we fat? Discussions on the socioeconomic dimensions and responses to obesity. *Globalization and Health, 6*(7). doi:10.1186/1744-8603-6-7

Sallis, J. F., Floyd, M. F., Rodriguez, D. A., & Saelens, B. E. (2012). Recent advances in preventive cardiology and lifestyle medicine: Role of built environments in physical activity, obesity, and cardiovascular disease. *Circulation, 125*, 729–737. doi:10.1161/CIRCULATIONAHA.110.969022

Schaefer, S. E., Salazar, M., Bruhn, C., Saviano, D., Boushey, C., & Van Loan, M. D. (2008). Influence of race, acculturation, and socioeconomic status on tendency

toward overweight in Asian-American and Mexican-American early adolescent females. *Journal of Immigrant Minority Health, 11*, 188–197. doi:10.1007/s10903-008-9150-6

Schulberg, H. C., & Baker, F. (1968). Program evaluation models and the implementation of research findings. *American Journal of Public Health, 58*, 1248–1255. Retrieved from http://ajph.aphapublications.org/doi/pdfplus/10.2105/AJPH.58.7.1248

Schwarz, S. M. (2013). *Obesity in children: Drugs, diseases, and procedures*. Retrieved from http://medscape.com/article/985333-over#showall

Sharma, M. (2011). Dietary education in school-based childhood obesity prevention programs. *Advances in Nutrition, 2*, 207S–216S. doi:10.3945an.111.000315

Shuttleworth, M. (2008, March). *Quantitative research design*. Retrieved from https://explorable.com/quantitative-research-design

Somerville, M., Kessler, L. A., Wallace, S. P., & Burns-Whitmore, B. (2012). The effect of a garden-based nutrition education program on the consumption of fruits and vegetables by Hispanic children. *California Journal of Health Promotion, 10*(Suppl.), 20–25. Retrieved from http://www.cjhp.org /SpecialIssue1_2012/documents/20-25kessler.pdf

Spahn, J. M., Reeves, R. S., Keim, D. S., Laqua, I., Kellogg, M. J., Ortberg, B., & Clark, N. A. (2010). State of the evidence regarding behavior change theories and strategies in nutrition counseling to facilitate health and food behavior change.

Journal of the American Dietetic Association, 110, 879–891. doi:10.1016/j.jada.2010.03.021

Spruijt-Metz, D. (2011). Etiology, treatment and prevention of obesity in childhood and adolescence: A decade in review. *Journal of Research on Adolescents, 21*, 129–152. doi:10.1111/j.1532-7795.2010.00719x

Stice, E., Shaw, H., & Marti, C. N. (2006). A meta-analytic review of obesity prevention programs for children and adolescents: The skinny on interventions that work. *Psychological Bulletin, 132*, 667–691. doi:10.1037/0033-2909.132.5.667

Summerbell, C. D., Waters, E., Edmunds, L., Kelly, S., Brown, T., & Campbell, K. J. (2009). Interventions for preventing obesity in children (Review). *The Cochrane Collaboration*. Retrieved from http://www.thecochranelibrary.com

Swinburn, B. A., Sacks, G., Hall, K. D., McPherson, K., Finegood, D. T., Moodie, M. L., & Gortmaker, S. L. (2011). The global obesity pandemic: Shaped by global drivers and local environments. *The Lancet, 378*, 804–814. doi:10.1016/S0140-6736(11)60813-1

Tabachnick, B. G., & Fidell, L. S. (2007). *Using multivariate statistics* (5th ed.). San Francisco, CA: Pearson.

Tandon, P. S., Zhou, C., Sallis, J. F., Cain, K. L., Frank, L. D., & Saelens, B. E. (2012). Home environment relationships with children's physical activity, sedentary time, and screen time by socioeconomic status. *International Journal of Behavioral Nutrition and Physical Activity, 9*. doi:10.1186/1479-5868-9-88

Thomas, E. J., & Rothman, J. (2013). *Intervention research: Design and development for human service* (Kindle ed.). New York, NY: Routledge. (Original work published 1994)

Townsend, M. S. (2006). Evaluating food stamp nutrition education: Process for development and validation of evaluation. *Journal of Nutrition Education and Behavior, 38*(1), 18–24. doi:10.1016/j.jneb.2005.11.008

Townsend, M. S., & Kaiser, L. L. (2005). Development of an evaluation tool to assess psychosocial indicators of fruit and vegetable intake for two federal programs. *Journal of Nutrition, Education & Behavior, 37,* 170–184. Retrieved from http://www.jneb.org/article /PIIS1499404606602431/abstract

Townsend, M. S., & Kaiser, L. L. (2007). Brief psychosocial fruit and vegetable tool is sensitive for United States Department of Agriculture's nutrition education programs. *Journal of the American Dietetic Association, 107,* 2120–2124. doi:10.1016/j.jada.2007.09.015

Townsend, M. S., Kaiser, L. L., Allen, L. H., Joy, A. B., & Murphy, S. P. (2003). Selecting items for a food behavior checklist for a limited resource audience. *Journal of Nutrition Education and Behavior, 35,* 69–82. doi:10.1016/s1499-406(06)60043-2

Townsend, M. S., Sylva, K., Martin, A., Metz, D., & Wooten-Swanson, P. (2008). Improving readability of an evaluation tool for low-income clients using visual information processing theories. *Journal of Nutrition Education Behavior, 40,* 181–186. doi:10.1016/j.jneb.2007.06.011

Trasande, L., & Chatterjee, S. (2009). The impact of obesity on health service utilization and costs in childhood. *Obesity, 17,* 1749–1754. doi:0.1038/oby.009.67

U.S. Census Bureau. (2014, January). *U.S. and world population clock*. Retrieved from http://www.census.gov/popclock/

U.S. Department of Agriculture. (2010). *Dietary guidelines for Americans 2010*. Retrieved from http://www.health.gov/dietaryguidelines/2010.asp

Van Hook, J., & Baker, E. (2010). Big boys and little girls: Gender, acculturation, and weight among young children of immigrants. *Journal of Health and Social Behavior, 51,* 200–214. doi:10.1177/0022146510372347

Van Ryzin, M., & Nowicka, P. (2013). Direct and indirect effects of a family-based intervention in early adolescence on parent–youth relationship quality, late adolescent health, and early adult obesity. *Journal of Family Psychology, 27,* 106–116. doi:10.1037/a0031428

Volken, T., Schaffert, R., & Ruesch, P. (2011). Need for weight management in Switzerland: Findings from National Blood Pressure Week 2009. *BMC Public Health.* Retrieved from http://www.biomedcentral.com/1471-2458/11/473

Walker, M. A., Graves, M., Montoya-Sotos, L., & Rios, G. (2008). *Innovative approach in addressing childhood obesity using mentors as part of an after-school nutrition and physical activity program* [PowerPoint slides]. Retrieved from http://www.slideserve.com/eden-faulkner/m-a-walker-m-graves-l-montoya-g-rios

Wang, Y., Beydoun, M. A., Liang, L., Caballero, B., & Kumanyika, S. K. (2008). Will all Americans become overweight or obese? Estimating the progression and cost of the U.S. obesity epidemic. *Obesity, 16*, 2323–2330. doi:10.1038/oby.2008.351

Waters, E., Silva-Sanigorski, A., Burford, B. J., Brown, T., Campbell, K. J., Gao, Y., . . . Summerbell, C. D. (2011, December 7). *Interventions for preventing obesity in children*. Retrieved from Cochrane Database. doi:10.1002/14651858.CD001871.pub3

Webb, T. L., Joseph, J., Yardley, L., & Michie, S. (2010). Using the Internet to promote health behavior change: A systematic review and meta-analysis of the impact of theoretical basis, using behavior change techniques and mode of delivery of efficacy. *Journal of Medical Internet Research, 12*(1). doi:10.2196/jmir.1376

White House Task Force on Childhood Obesity. (2010). *Solving the problem of childhood obesity within a generation.* Retrieved from http://www.letsmove.gov/sites/letsmove.gov/files/TaskForce_on_Childhood_Obesity_May2010_FullReport.pdf

Whitmee, S., Haines, A., Beyrer, C., Boltz, F., Capon, A. G., Ferreira de Souza Dias, B., . . . Yach, D. (2015, July). Safeguarding human health in the Anthropocene epoch: Report of The Rockefeller Foundation–Lancet Commission on planetary health. *The Lancet, 386*, 1–62. doi:10.1016/S0140-6736(15)60901-1

Williams, J., Scarborough, P., Matthews, A., Cowburn, G., Foster, C., Roberts, N., & Rayner, M. (2014). A systematic review of the influence of the retail food

environment around schools on obesity-related outcomes. *Obesity Reviews, 15,* 359–374. doi:10.111/obr.12142

Williams, S. L., & Mummery, K. W. (2011). Links between adolescent physical activity, body mass index, and adolescent and parent characteristics. *Health Education Behavior, 38,* 510–520. doi:10.1177/1090198110385772

Wilson, D. (2009). New perspectives on health disparities and obesity interventions in youth. *Journal of Pediatric Psychology, 34,* 231–244. doi:10.1093/jpepsy/jsn137

Wojcicki, J. M., & Heyman, M. B. (2010). Let's Move—childhood obesity prevention from pregnancy and infancy onward. *New England Journal of Medicine, 362,* 1457–1459. doi:10.1056/NEJMp1001857

World Health Organization. (2015a, January). *Obesity and overweight fact sheet 311*. Retrieved from http://www.who.int/mediacentre /factsheets /fs311/en/index.html#

World Health Organization. (2015b). *Demographic and socioeconomic statistics.* Retrieved from http://www.who.int /gho/publications / world_health_statistics/en/

Appendix A: Univariate Statistics for the Checklists

				Missing	
	N	*M*	*SD*	*n*	%
T1FBC1	93	2.47	.80	2	2.1
T2FBC1	94	2.97	.78	1	1.1
T1FBC3	93	1.84	.35	2	2.1
T2FBC3	94	1.88	.32	1	1.1
T1FBC6	93	1.50	.63	2	2.1
T2FBC6	94	1.83	.74	1	1.1
T1FBC7	92	2.03	.73	3	3.2
T2FBC7	93	2.38	.73	2	2.1
T1FBC8	93	2.37	.83	2	2.1
T2FBC8	94	2.70	.75	1	1.1
T1FBC9	93	2.17	.86	2	2.1
T2FBC9	94	2.60	.89	1	1.1
T1FBC13	93	2.31	.80	2	2.1
T2FBC13	94	2.52	.82	1	1.1
T1FBC16	93	5.47	1.82	2	2.1
T2FBC16	94	6.63	1.79	1	1.1
T1PSDQPA	95	22.30	9.89	0	.0
T2PSDQPA	95	27.67	22.23	0	.0
T1PSDQGP	95	23.90	8.91	0	.0
T2PSDQGP	95	23.48	10.70	0	.0
T1PSDQBF	95	14.26	9.18	0	.0
T2PSDQBF	94	13.50	8.95	1	1.1
T1KNC	95	6.45	2.41	0	.0
T2KNC	95	8.73	3.46	0	.0

Appendix B: Shapiro–Wilk Results for the Study Variables

Measure	Pretest		Posttest	
	Statistic	Sig.	Statistic	Sig.
Fruit and vegetable consumption (FBC subscale)	.97	.016	.98	.234
Quality of diet (FBC item 16)	.95	.002	.83	.000
PSDQ				
Physical activity	.95	.001	.89	.000
General physical fitness	.94	.000	.89	.000
Perceived body fat	.91	.000	.93	.000
Nutrition knowledge (KNC)	.91	.000	.83	.000

Appendix C: Histograms for the Pretest Measures

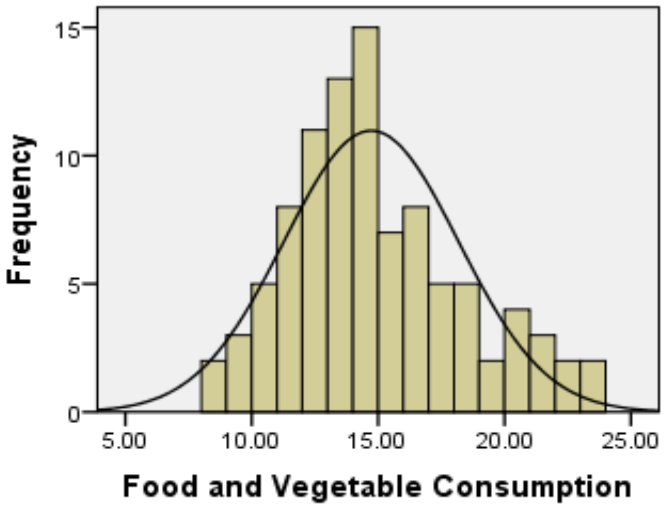

Figure C1. Histogram of food and vegetable consumption: Pretest measure.

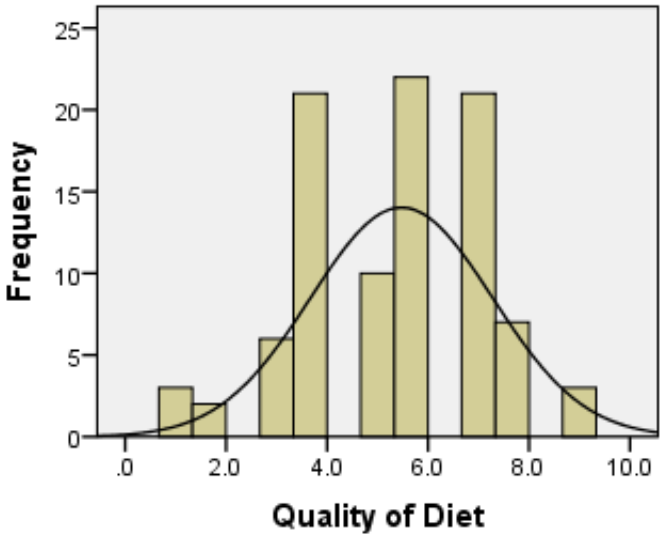

Figure C2. Histogram of quality of diet: Pretest measure.

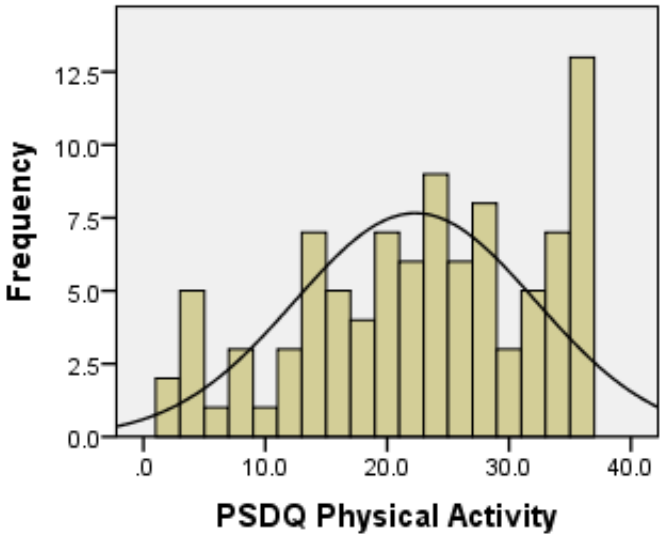

Figure C3. Histogram of physical activity: Pretest measure.

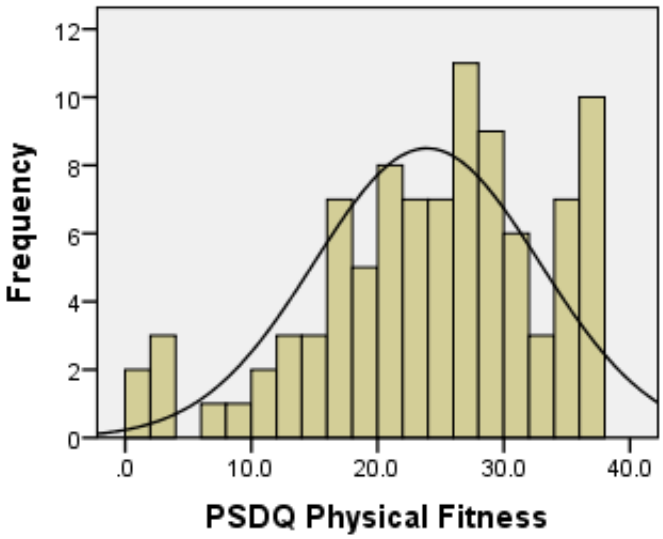

Figure C4. Histogram of physical (general)fitness: Pretest measure.

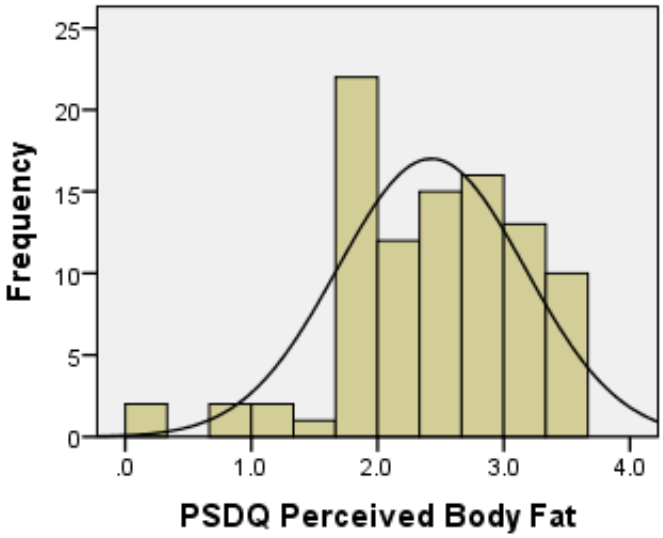

Figure C5. Histogram of perceived body fat (body self-perception): Pretest measure.

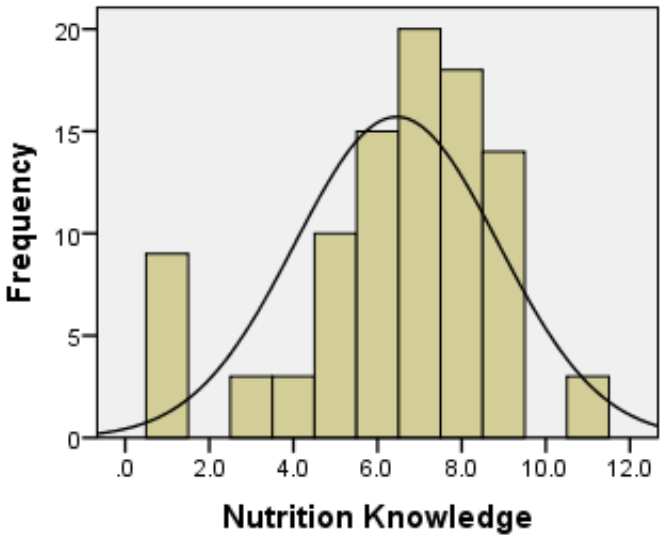

Figure C6. Histogram of nutrition knowledge: Pretest measure.

Appendix D: Histograms for the Posttest Measures

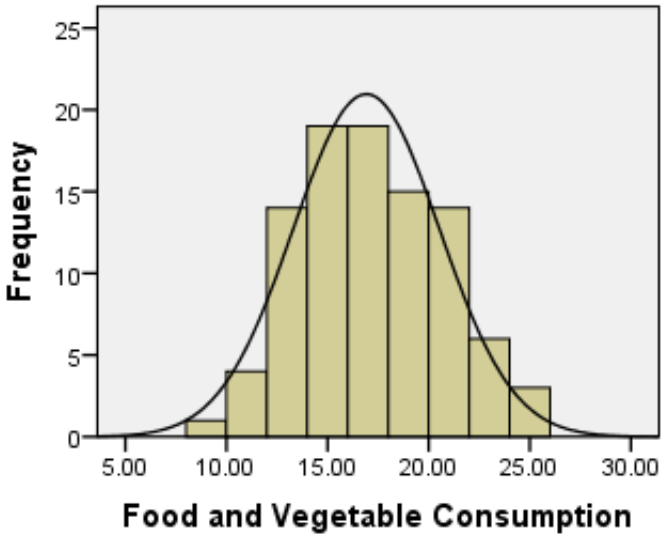

Figure D1. Histogram of food and vegetable consumption: Posttest measure.

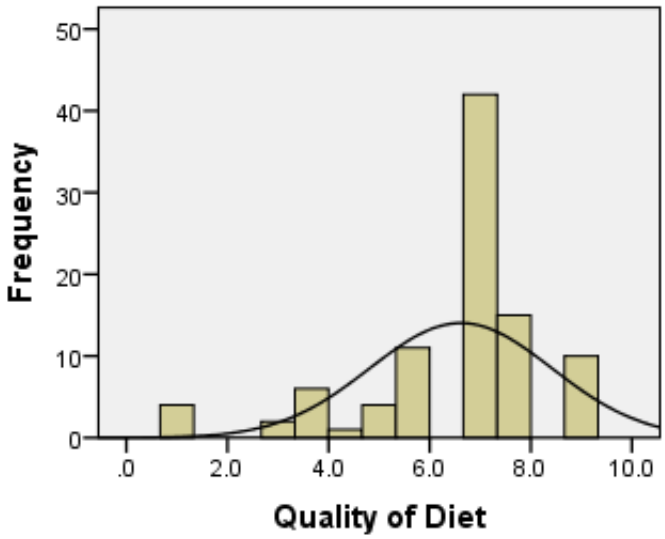

Figure D2. Histogram of quality of diet: Posttest measure.

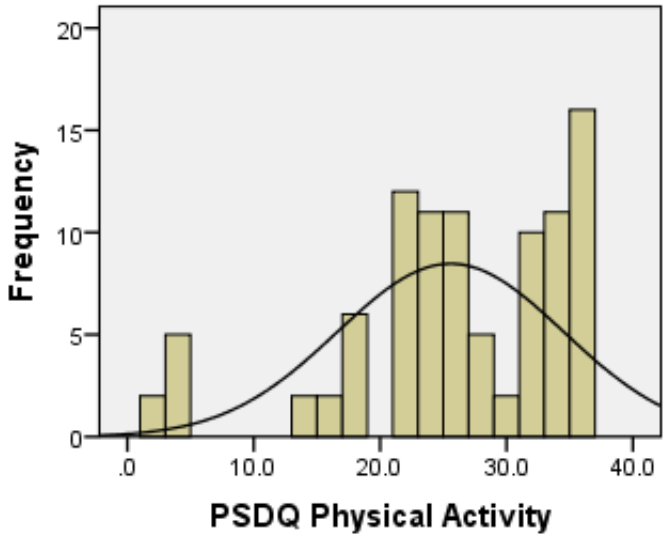

Figure D3. Histogram of physical activity: Posttest measure.

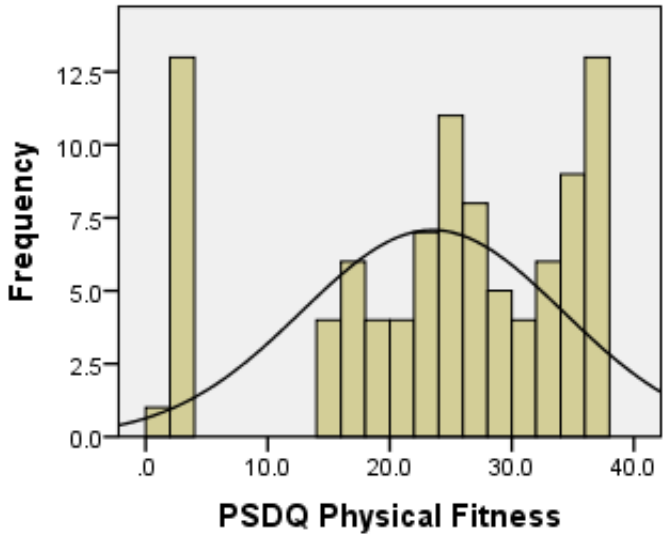

Figure D4. Histogram of physical (general) fitness: Posttest measure.

Figure D5. Histogram of perceived body fat (body self-perception): Posttest measure.

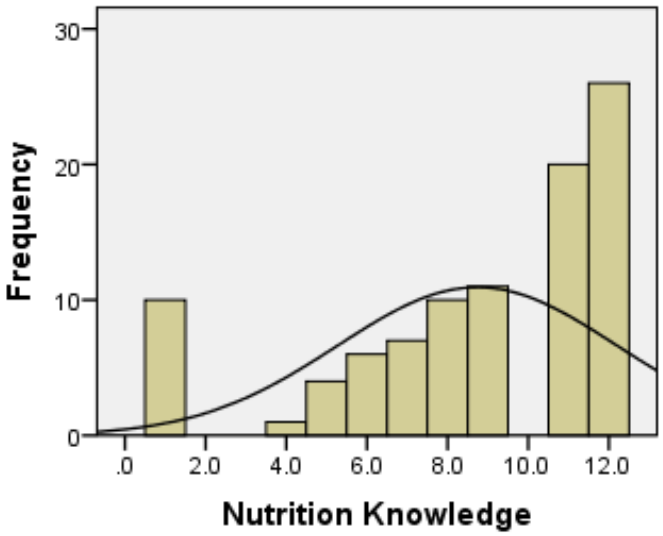

Figure D6. Histogram of nutrition knowledge: Posttest measure.

Appendix E: Plots Testing the Regression Assumptions