2018

Relative Effectiveness of Nutritional and Physical Programs on Young, Rural, Impoverished Students

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This is to certify that the doctoral dissertation by

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Walden University
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Abstract

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MA, Walden University, 2010

BS, Marshall University, 1991

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

Health Psychology

Walden University

August 2018

Abstract

Over the past several decades, childhood obesity has continued to rank as an epidemic, particularly in rural, impoverished areas in the United States. Therefore, researchers have affirmed the necessity of exploring solutions to the epidemic, including the need to develop and implement programs that target at-risk behaviors of childhood obesity. In this quantitative, quasi-experimental study, the focus was to determine whether public school-based programs teaching nutrition, physical education, and dietary choices could increase the nutritional knowledge, physical activities, and dietary behaviors of students attending second and third grade in rural, impoverished communities of West Virginia. The theories that served as the foundation for this study were the health belief model, and the social ecological model. Archival pretest and posttest data regarding nutrition, physical activity, and dietary behavior was provided by three public schools in rural, impoverished communities that implemented the programs over a 6-week period. Data regarding students' nutritional, physical, and dietary knowledge and behaviors were collected before and after exposure to school-based exercise and nutrition programs. Results of paired samples *t* tests showed a significant increase in students' nutritional and physical education knowledge, their dietary behaviors, and improvement in 4 out of the 5 areas of physical activity that were measured. Overall, the results of this study offer insight about how school-based programs can be used to develop effective school-based nutrition, dietary, and physical activity programs for students who are at-risk for obesity, especially in rural, impoverished communities.

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Dedication

It is with a humble and thankful heart that I dedicate this page to all the students and teachers in West Virginia that helped make this research possible. I appreciate all the time and effort spent in making my dream come to fruition.

Acknowledgments

In completing this dissertation, I had the help and support of many people, and although it would probably be impossible to name them all, I wish to acknowledge as many as I can. I will forever be grateful for all the help I did received.

First, I would like to thank all the superintendents, principals, teachers, and students for volunteering to participate. During this endeavor, they were very supportive. I cannot state strongly enough how much it was appreciated.

Secondly, I wish to thank my chair and committee member, Dr. Tracy Masiello and Dr. Kizzy Dominguez, for their critical roles in this process. Their guidance, knowledge, feedback, and support were vital. I appreciate all their time and effort.

Likewise, I wish to thank my family and friends for their support, understanding, and patience. Specifically, I want to thank my Brooks-Price family: Amanda, John, and Marcia have kept me grounded. Moreover, my McClanahan family, Jerry and Cindy- you are both a tremendous blessing to me.

In addition, I wish to give a special thanks to William and Wenda Lee Duty for treating me like a daughter for many years. Because of their faith in God and respect for all people, they have been a guiding force in my life. They are special people full of love.

Finally, I wish to thank my mother, Mary Ann Sturgill and my grandparents: Lewis Hall, Dora Hall, J.B. Wright, and Ida Wright. My mother planted a seed by telling me that education was something that could not be taken away from me and that I needed a good education to have a better life. Whereas, my grandparents were able to gift me many dear memories full of love and wisdom before they were called home.

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Chapter 1: Introduction to the Study

Introduction

Currently, data suggests that childhood obesity has almost tripled since 1980 (Ogden, Carroll, Kit, & Flegal, 2012). Nearly one third of all American children include overweight or obese features because of overindulgence, insufficient PA, economic instability, and low-quality foods (Coledam, Ferraiol, Greca, Teixeira, & Oliveira, 2018; Cruz et al., 2016; Ogden et al., 2012). Overcoming the complexity of childhood weight problems begins with knowledge and behavioral changes. These changes must begin in early childhood since lifestyle habits, such as dietary selection, develop early in life (Mirtcheva & Powell, 2013) and are acquired through modeling adults and environmental factors, such as poverty and lack of resources (Grimm, Moore, Scanlon, & Centers for Disease Control and Prevention [CDC], 2013; Gundersen, Kreider, & Pepper, 2012; Mirtcheva & Powell, 2013; Shih, Dumke, Goran, & Simon, 2013).

As most children in the United States attend a public school, intervention programs in this setting have the capacity to reach most children, thus providing a target area for addressing the issue (Gundersen et al., 2012; Mirtcheva & Powell, 2013). For example, West Virginia's school system continually revises school-based wellness and dietary policies, including programs at the elementary school level, to provide children with knowledge and behaviors that promote healthier lifestyles (West Virginia Department of Health and Human Resources [WVDHHR], 2016). However, intervention approaches vary and remain inconsistently implemented throughout the schools, especially in rural, impoverished districts where resources remain limited.

Although researchers have documented the effectiveness of promoting physical education implementation programs, a dearth of research has examined contextual factors that influence school program implementation of PA programs (Brissette, Wales, & O'Connell, 2013; Carlson et al., 2013; Franks et al., 2015; Lounsbery, Holt, Monnat, McKenzie, & Funk, 2014; Lounsbery, Mackenzie, Morrow, Monnat, & Holt, 2013; Slater, Nicholson, Chriqui, Turner, & Chaloupka, 2012). These factors include socioeconomic status, gender, ethnicity, access, and disability, which influence the ability of children to engage in PA (Biddle, Braithwaite, & Pearson, 2014; Fairclough, Hilland, Stratton, & Ridgers, 2012; Garn, McCaughtry, Shen, Martin, & Fahlman, 2013; Hill, 2015; McKenzie, 2012). Moreover, there is research that supports a need to further explore factors (Cañadas, Veiga, & Martinez-Gomez, 2014; Cawley, Frisvold, & Meyerhoefer, 2013 Robinson, Wadsworth, Webster, & Bassett, 2014; Standage, Gillison, Ntoumanis, & Treasure, 2012).

One of the factors that emerged in the literature on this topic is that gender differences might exist in perceptions about PA. Indeed, Cairney et al. (2012) posited that low enjoyment of physical education might influence physical education participation in girls. Therefore, there is a need for research that examines gender inclusiveness in the promotion of PA in school programs. Another factor that I identified in the literature was that researchers have often failed to consider factors from the perspectives of the students (Cañadas, Veiga, & Martinez-Gomez, 2014; Cawley, Frisvold, & Meyerhoefer, 2013; Standage, Gillison, Ntoumanis, & Treasure, 2012). Moreover, data from rural,

impoverished districts, where access to PA is often limited, is also lacking in the literature (Robinson, Wadsworth, Webster, & Bassett, 2014).

Therefore, the purpose of this study was to examine the relative effectiveness of nutritional and physical education programs on young students in rural, impoverished areas. This study took place in rural, impoverished school communities in West Virginia. I expected the study results to provide valuable insight into ways that classroom teachers and staff can help address the widespread issue of childhood weight problems, as outlined by intervention programs such as Learntobehealthy, MyPlate Education Materials, FITNESSGRAM, and school-based dietary guidelines. This chapter will include a discussion of the background of the issue, the problem statement, the purpose of the study, the research questions, the significance of the study, and a summary of the chapter.

Background

In 2001, U.S. Surgeon General David Satcher delivered a report that highlighted overweight and obesity as issues that had reached epidemic proportions nationwide (U.S. Department of Health and Human Services, Public Health Service, Office of the Surgeon General, 2001). Furthermore, the Surgeon General stated that these statistics also included children and adolescences (U.S. Department of Health and Human Services, Public Health Service, Office of the Surgeon General, 2001). Over the years, this problem has continued to increase, and according to a recent estimate, approximately 12.5 million American children and adolescents ranging from ages 2–19 present as obese (Ogden et al., 2012).

In examining state-by-state data for citizens, West Virginia's population of overweight or obese individuals ranks significantly higher than the national average at 35% (CDC, 2013). Furthermore, a report by the WVDHHR (2016) stated that the Youth Behavioral Risk Factor Surveillance System Report of 2013 ranked West Virginia as the 7th highest state in the nation for prevalence of obesity among high school students. In this report, 15.6% of high school students were reported to be obese.

Causes of Obesity

Researchers have speculated that childhood obesity may occur because of the intake of too many calories and the lack of PA (CDC, 2013). However, these two issues arise from various factors that often intertwine. These factors include family environment (Biehl et al., 2014; Ogden, Kit, Carroll, & Flegal, 2014) and inactivity (Klakk, Chinapaw, Heidemann, Andersen, & Wedderkopp, 2013). For example, according to Rogers et al (2015) data supports that during 2003 through 2007, children of low-income, low-education, and households with higher unemployment had an obesity prevalence that increased by 23% to 33%. Moreover, regarding poverty and environment, people in lower-income neighborhoods or ethnic minorities and rural areas do not have access to quality food items, such as fresh vegetables and fruits (Grimm et al., 2013). In addition, within the physical environment, factors, such as the quality of housing, water, air, and the neighborhood, affect childhood obesity (Shih et al., 2013).

In regard to inactivity and other intertwined factors that contribute to obesity, research notes other connections. For example, activities, such as watching television,

and the sedentary lifestyle of the American society also contribute to childhood obesity (Rosiek, Frąckowiak Maciejewska, Leksowski, Rosiek-Kryszewska, & Leksowski, 2015). Whereas, other researchers have documented that gender perceptions on PA and inconsistent knowledge about female health to influence dietary and PA behaviors (Cairney et al., 2012).

Karageorgi, Alsmadi, and Behbehani (2013) listed lifestyle factors including PA, exercise, and sports participation; dietary factors such as number of meals eaten daily, degree of preference for salt in food, and dieting; and hereditary factors such as prevalence of obesity in both paternal and maternal sides as factors that contribute to childhood obesity. However, there are factors contributing to obesity that exist that involve personal choices that remain within an individual's control (Pulgarón, 2013).

For children, researchers noted healthier lifestyle choices as factors affecting weight and health outcomes. For example, by having access to healthier nutritional foods and safer environments, children receive an opportunity to choose healthier alternatives (Klakk et al., 2013). In this regard, the school leadership has an opportunity to place children in an atmosphere that remains conducive to exposing them to healthier choices and healthier alternatives (Klakk et al., 2013).

School Interventions

In 2005, West Virginia made decisive actions and passed House Bill 2816, which had a component that established more clarification in addressing the obesity epidemic (West Virginia Department of Education [WVDE], 2016a, 2016b). House Bill 2816 included how schools were to address this area further (WVDE, 2016a, 2016b). However,

even under this legislation, West Virginia's health issues continue to rank high as compared to rest of the nation (West Virginia Department of Health and Human Resources, 2016). Recently, other programs have been changed or added to the school curricula to address nutritional, dietary, and physical needs for children (WVDE, 2016a).

Mirtcheva et al. (2013) stated choices for dietary selection are established early in children's lives. Schools maintain an educational environment for at least 6 hours a day, several days a week (Gundersen et al., 2012; Mirtcheva et al., 2013). During this school time, there are opportunities for interventions that focus on nutritional knowledge and promoting dietary changes to further provide an opportunity for children to adopt healthier lifestyles (Gundersen et al., 2012; Mirtcheva et al., 2013).

To address the risk for obesity and poverty, West Virginia schools provide reduced price and free meals; in addition, food grants assist in providing vegetables and fruits to some schools (WVDE, 2016a, 2016b). West Virginia has also implemented programs into the curriculum that address nutritional, dietary, and physical needs that assist students to make healthy choices (WVDE, 2016a, 2016b). For example, the students engage daily in making their own plate at breakfast and lunch time, which consists of students having a variety of choices to build a balanced plate that they will want to eat. Likewise, leadership added the program encouraged by the former First Lady, Michelle Obama, known as Let's Move (n.d.). In this effort, students participate in movements, such as walking and dancing, for a period of 60 minutes daily at least 5 times a week for a period of 6 out of 8 weeks (Let's Move, n.d.). In other ways, schools rotate

health and physical education classes, as well as specific recess time allotments (Office of Child Nutrition, 2013).

With limited resources, high poverty rates, and statistically high obesity rates in all sectors of the state's population and prevention and intervention programs already offered in a school setting, researchers must examine these factors to further capture the impact the school environment has on overweight and obesity risk factors. Moreover, Lounsbery et al. (2014) stated that many school programs are hindered in the areas of wellness, health and physical education by limited time allocations, a lack of resources, and prioritization concerns, resulting in confusion about the numerous objectives and missions in the health-related programs. In addition, researchers have stated that more studies must investigate at the school level to capture how schools remain involved in promoting nutrition and physical health knowledge and behavior changes for those at risk due to overweight and obesity factors (Mahmood, Perveen, Dino, Ibrahim, & Mehraj, 2014; McKenzie, 2012). More specifically, researchers have suggested that physical education and health programs do not include examined and tested subjects in a manner that holds students accountable (Slater et al., 2012).

Because of changes in policies and programs and conflicting curriculum complexities, a significant need existed for a study that included an examination of how the use of nutritional, physical, and dietary programs influences the behaviors and knowledge of students in rural, impoverished districts. As confirmed by previous researchers, healthy and active children excel physically, academically, and socially during the educational process (Standage et al., 2012). Therefore, more studies must

occur at the childhood level to capture data regarding schools' involvement in promoting knowledge and behavior changes for those with factors placing them at risk for being overweight or obese factors (Mahmood et al., 2014; McKenzie, 2012).

Several researchers have indicated the prevalence of obesity in children and have demonstrated the need for collaboration between public health sectors and schools because schools play a crucial role in promoting healthy lifestyle behaviors (Brissette et al., 2013; Carlson et al., 2013; Franks et al., 2015; Lounsbery et al., 2013; Lounsbery et al., 2014; Slater et al., 2012). Furthermore, 80% of school districts in the United States require health education, yet researchers have documented less than half provide adequate resources and curriculum for educators (Franks et al., 2015). Understanding physical education implementation in schools is imperative because children and adolescents spend at least half of their time during weekdays in education settings (Carlson et al., 2013).

Despite the increase in researchers promoting wellness interventions in school settings, a significant need remains for researchers who address barriers and facilitators of school-based physical education interventions. One factor that should be addressed is the lack of alignment between school-based programs and standardized PA recommendations (Brissette et al., 2013). In this study, I will provide useful information for developing and promoting public health partnerships between schools and public health sectors by addressing the influences of contextual situations, successful physical education curricula, stakeholder participation, and information dissemination on physical education program implementation outcomes.

Problem Statement

Despite years of statistics reflecting overweight and obesity in children as an epidemic, little research exists that reveals how school-based nutrition, diet, and physical education programs implemented by classroom teachers can influence young children's knowledge and behavior (Brissette et al., 2013; Carlson et al., 2013; Franks et al., 2015; Lounsbery et al., 2013; Mahmood et al., 2014; Slater et al., 2012). According to research, only limited and insufficient data exists, especially regarding school-based and overweight prevention programs (Ickes, McMullen, Haider, & Sharms, 2016; Mahmood et al., 2014). Therefore, the need to expand research to incorporate a more holistic view of factors, including implementation barriers, PA promotion, education, and addressing behavioral responses, is imperative (Cañadas et al., 2014; Cawley et al., 2013; Gundersen et al., 2012; Standage et al., 2012).

Further research has noted that schools can play a critical role in improving nutritional knowledge as well as increasing the PA of students (Office of Child Nutrition, 2013). Moreover, it has been suggested that increasing nutrition and physical education opportunities will help strengthen children's knowledge base and involvement in committing to healthier lifestyle choices (CDC, 2014). Carlson et al. (2013) indicated that researchers have not adequately considered policy implementations concerning school meal laws, particularly in free or reduced-price lunch programs. Physical education programs at school are important because they have the potential to reach nearly all students, and they enable the least active children to experience physical activities at higher intensities (Lounsbery et al., 2014). Likewise, according to the CDC (2014),

schools can provide environments that can support healthy eating and PA, and this effort remains possible by the leadership of schools implementing policies and practices that maintain a supportive atmosphere for students to eat healthy, exercise regularly, and provide occasions to learn and practice these types of behaviors (CDC, 2014).

Purpose of the Study

The goal of this quantitative study was to compare the relative effectiveness of educational approaches designed to change the knowledge of nutrition and PA as well as to improve the dietary behaviors and PA of students in a rural, impoverished district. The dependent variables included data regarding students' nutritional, physical, and dietary knowledge and behaviors that were collected before and after exposure to school-based exercise and nutrition programs. The independent variables included the educational programs conducted regarding nutritional, physical, and dietary knowledge and behaviors.

Research Questions and Hypotheses

The central question I addressed in this study was whether or not nutritional, physical, and dietary programs influence students in a rural, impoverished district. More specifically, I sought to answer the following four research questions:

RQ1: Do school-based nutritional programs increase the nutritional knowledge of students in rural, impoverished communities?

$H_0$1: The school-based nutritional programs do not increase the nutritional knowledge of students in rural, impoverished communities.

H_A1: The school-based nutritional programs increase the nutritional knowledge of students in rural, impoverished communities.

RQ2: Do school-based physical education programs increase the physical education knowledge of students in rural, impoverished communities?

$H_0 2$: The school-based physical education programs do not increase the physical education knowledge of students in rural, impoverished communities.

$H_A 2$: The school-based physical education programs increase the physical education knowledge of students in rural, impoverished communities.

RQ3: Do dietary behavior programs increase healthy changes in the dietary behavior of students in rural, impoverished communities?

$H_0 3$: The dietary behavior programs do not increase healthy changes in the dietary behavior of students in rural, impoverished communities.

$H_A 3$: The dietary behavior programs increase healthy changes the dietary behavior of students in rural, impoverished communities.

RQ4: Do school-based physical education programs improve the physical activities of students in rural, impoverished communities?

$H_0 4$: School-based physical education programs do not improve the physical activities of students in rural, impoverished communities.

$H_A 4$: School-based physical education programs improve the physical activities of students in rural, impoverished communities.

Theoretical Framework for this Study

The primary theoretical frameworks I used for this study were the health belief model (HBM) and the social ecological model (SEM). I used the HBM because it addresses identifying starting points related to behavioral changes and highlights factors that influence the promotion or determent of change in areas such as perceived susceptibility, perceived benefits, perceived barriers, cues to taking action, self-efficacy, and modifying variables (Glanz, Rimer, & Lewis, 2002). Whereas, the SEM assists with understanding the interrelations that exist between personal and environmental conditions (McLeroy, K. R., Bibeau, D., Steckler, A., & Glanz, K. (1988).

Nature of the Study

The nature of this study was to compare the influence nutritional, physical, and dietary intervention programs have on overweight and obesity risk factor behaviors of young children in a rural, impoverished district. The independent variable was the school-based diet and exercise program. The dependent variables included students' nutritional knowledge, dietary behaviors, and PA outcomes. I examined the dependent variables through preassessments and postassessments as well a student log to self-report daily dietary behavior during breakfast and lunch. The independent variables were derived from the school-based program components of PA, nutrition, and a combination of the PA and nutrition. The target population included 6 to 11-year-old students in public schools in a West Virginia school district who receive free or reduced breakfast and lunches 50% of the time or more. The schools were located in rural areas that had high poverty rates.

Definitions

Childhood obesity: The body mass index (BMI) represents a measure used in the determination of childhood overweight and obesity measurements. This measure calculates the weight and height of a child. Although BMI does not directly account a child's body fat, it remains used as a reasonable body fat indicator (CDC, 2013). Since children's body composition varies between girls and boys and as they age, the weight status remains determined by using the age- and sex-specific percentile for the BMI, which remains different than the adult's measurement of BMI, referenced by BMI categories (CDC, 2013).

Free and reduced breakfast and lunch programs: These programs include nutrition programs that provide healthy, nutritious meals to school children whose combined family income does not exceed the eligibility scale (WVDE, 2016a).

Health belief model (HBM): This model addresses identifying starting points related to behavioral changes and highlights factors that influence the promotion or determent of change in areas such as perceived susceptibility, perceived benefits, perceived barriers, and cues to taking action as well as self-efficacy and modifying variables (Glanz et al., 2002).

MyPlate: Launched in 2011, MyPlate includes an icon released by the U.S. Department of Agriculture (USDA; 2015a) and First Lady Michelle Obama to prompt Americans to make healthier food choices. It emphasized protein, dairy groups, fruit, vegetable, and grains (U.S. Department of Health and Human Services, 2014).

Obesity: According to the CDC (2016), obesity is defined as a BMI at or above the 95th percentile for children and teens of the same age and sex based on the CDC growth charts.

Overweight: Having a BMI between the 85th and 95th percentile as established by the CDC (2016) growth charts.

Physical activity: Any bodily movement that requires energy expenditure, resulting in increased energy use and improved physical fitness. It can include both health and skill-related fitness (Alricsson, 2013).

Social ecological model (SEM): This model assists with understanding the interrelations that exist between personal and environmental conditions such as those at the micro level (McLeroy, Bibeau, Steckler, & Glanz, 1988). In learning about the complex etiology of childhood obesity, researchers often use the SEM. In this model, variables such as gender, age, and parent characteristics are used to describe factors that influence youth's weight outcomes (Ohri-Vachaspati, DeWeese, Crespo, Todd, & Yedidia, 2013).

Assumptions

Concerning this study, I made the following assumptions:

- A professional belief existed that all participants were truthful in their responses.
- All archival data would fulfill the criteria of the study.
- The schools that participated represented qualified school personnel that could implement and assess intervention and prevention programs.

- The data gathered through pretesting and posttesting reflected careful and thoughtful answers.
- The data gathered for self-reported dietary habits reflected honest accounts of items and amounts eaten during breakfast and lunch.
- Because this study represents an archival study, limitations that may compromise reliability of the findings were minimized by only accepting data that complied with the needed measurements for the study.

Scope and Delimitations

In this study, I excluded children below 7 years of age and above 11 years of age. This range targeted children in second and third grade. I extrapolated archival data from schools having 50% or higher reduced and free breakfast and lunches in West Virginia. In addition, the data were gathered from classroom teachers and state archival data, which included students' self-reported data about breakfast and lunch food consumption. This did not include data from administrators, parents, and family members. The theoretical and conceptual frameworks used in this study aligned with those used by a significant number of researchers as they pertained to childhood obesity.

Limitations

Although careful planning helped to increase the validity of this study, limitations of the study remained. These limitations occurred during execution of the designing, implementing, and evaluating components including:

1. Since confidentiality is held in high regard, the low-income data were defined by whether a school district received 50% or more free or reduced meals.

2. The data gathered relied on self-reported and self-administered information.
3. I had a short timeframe to collect data.
4. My sample selection was constructed using several factors. These were a parent's consent to allow his or her child to participate, the child's willingness to participate, and the school's willingness to participate.
5. In order to have a large effect, the sample size was from a pool of over 100 young, school-aged children.

Significance

Although obesity and obesity factors, such as poverty, continue to be prevalent with children, educational resources, interventions, and research continues to be limited for this population. In West Virginia, overweight and obesity ranks as 35.5% among children (CDC, 2013). Poverty in rural West Virginia has been an ongoing issue for decades, and statistics for the young population (ages 8–11) remains limited and seems nonexistent for the state. Therefore, exploring the relative effectiveness of programs in the areas of nutritional knowledge, dietary behaviors, and PA for young students living in a rural, impoverished district in West Virginia was an appropriate and necessary step.

Furthermore, in terms of quality of life and cost concerns, childhood obesity has significantly negative outcomes. According to research on the effects of obesity (i.e., Cawley et al., 2013; Slater et al., 2012), obese children are linked to a plethora of health issues and diseases, and they are more likely to become obese adults (Ogden et al., 2012). In the year 2008, the approximated annual nationwide productive costs of obesity and

obesity-related absenteeism ranged between $3.38 billion ($79 per obese individual) and $6.38 billion ($132 per obese individual; CDC, 2017a).

Another significant reason for this study was to establish more data on the age group of 8–10-year olds. This is necessary because most of the research on obesity in West Virginia has focused on preschoolers, fifth graders, and high school children. Furthermore, research has supported varied outcomes based on studies of school-based nutrition and PA programs (Cañadas et al., 2014; Carlson et al., 2013; Cawley et al., 2013; Gundersen et al., 2012; Standage et al., 2012).

Additionally, reviews of the literature have indicated that insufficient evidence exists regarding the benefits of school-based overweight prevention programs due to a limited number of studies published on the topic and the methodological issues present in those that were found (Mahmood et al., 2014). Researchers further supported that for positive lifestyle changes to occur, the level of awareness through knowledge-based programs and activity-based programs must be implemented (CDC, 2014; Let's Move, n.d.). Therefore, it remains important and valid to conduct research on newly-implemented programs that focus on school-based nutrition and PA.

Likewise, the results of this study captured information that other researchers may use to provide valuable insight regarding whether young students show improvement after receiving additional interventions designed to help them form healthier life choices regarding diet and PA. The findings from this research can offer insight as to whether or not there will be a significant contribution to positive social change by studying these school-based programs that promote nutritional and PA. Data

compiled from this study can contribute to promoting an understanding of how to move forward in areas of educational programs dealing with prevention and intervention that emphasis healthier lifestyles.

Summary

In Chapter 1, I provided the foundation for the study in regard to the childhood obesity crisis. Within this chapter, I highlighted research that provided support for the seriousness of this epidemic. Researchers have affirmed the need to explore further potential solutions given its threat to the health and wellbeing of children. The research questions more specifically addressed the need to explore how nutrition and PA programs affect young children in an impoverished, rural area. With this study, I sought insight into the impact of school-based nutritional programs and PA programs on increases in children's nutrition knowledge, dietary behavior changes, and increase in PA. Theories introduced in Chapter 1 included the HBM, the SEM, and the social learning theory (SLT). Whereas, the HBM highlights factors that influence the promotion or determent of change in areas such as perceived susceptibility, perceived benefits, perceived barriers, and cues to taking action as well as self-efficacy and modifying variables, the SEM includes exploring understanding the interrelations that exist between personal and environmental conditions, such as those at the micro and macro level (CITE).

The literature review in Chapter 2 includes a variety of evidence-based research presented in a comprehensive manner regarding obesity trends and statistics, obesity contributors and risk factors, and other related research conducted on obesity studies. Likewise, I will discuss the HBM and SEM as they pertain to the obesity epidemic.

Chapter 2 also includes in-depth reviews of peer-reviewed research on school-based solutions for childhood obesity. For example, specific contributors to America's obesity epidemic using a social and environmental standpoint is addressed and these including: (a) school-based nutritional programs, (b) school-based PA programs, (c) increase in nutrition knowledge, (d) dietary behavior changes, and (e) increase in PA programs.

Chapter 2: Literature Review

Introduction

According to research, obesity has reached epidemic proportions in the United States, and childhood obesity for children 6–11 years of age has increased to 18% over the last 30 years (Ogden et al., 2012). In comparison to an earlier report by the West Virginia Department of Health and Human Resources (2011), it stated that 18.5% of the kindergarten population presented as overweight or obese; 22.1% of second graders presented as overweight or obese; and 29.6% of fifth graders presented as overweight or obese. Therefore, these statistics indicated an 11.1% increase in the number of overweight and obese children from Kindergarten to fifth grade (West Virginia Department of Health and Human Resources, 2011). In 2017, a report by National Survey of Children's Health (NSCH) for 2016 stated that the combined overweight and obesity rate in West Virginia for youth ages 10 to 17 was 35.1%.

Pulgarón (2013) and Shih et al. (2013) stated that children characterize as overweight or obese due to factors that include insufficient PA, economic instability, low quality foods, and overindulgence. Moreover, overweight and obesity in children causes a variety of illnesses and disease (Hills, Dengel, & Lubans, 2015).

In addressing overweightness and obesity risk factors, children need knowledge and behavioral changes in the areas of PA, nutrition, and dietary. In this light, elementary schools have an opportunity to implement health and PA programs that target at-risk factors for overweight and obesity characteristics; however, researchers have indicated that more studies are needed in this area (Cañadas et al., 2014; Lounsbery et al., 2013).

Therefore, the purpose of this study was to compare the relative effectiveness of elementary programs targeted to increase nutritional knowledge, PA, and dietary behaviors for children living in a rural, impoverished district.

In this chapter, the major sections will include the literature search strategy, the theoretical foundation of the study, the literature review related to key variables and concepts, and the summary and conclusion. More specifically, in this section I will explore the research on school-based interventions in regard to diet, nutritional knowledge, and PA programs as related to childhood obesity factors. In addition, gaps in the literature will be presented as identified by expert researchers and reliable databases.

Literature Search Strategy

To conduct a thorough literature review, I searched eight databases, including Google Scholar, PsycINFO. Educational Resources Information Center, Walden University Data Base, PubMed, PubMed Central, and government and county-based websites (CDC, WVDHHR, and National Institute of Health). I conducted preliminary searches for peer-reviewed articles relevant to the topic by using the following keywords and/or keyword combinations: *obesity, childhood obesity, overweightness, body mass index, elementary school programs, wellness policy, physical education, nutrition, dietary, health belief theory, SEM, National School Lunch Program*, and *Breakfast Program*. Data criteria included peer-reviewed studies published primarily within the last 5 years; written in English; conducted from the United States since the population of the study was public school students in rural, impoverished districts in West Virginia; and examined intervention programs for childhood overweight and obesity risk factors. Also

included in the criteria were data regarding nutritional knowledge, PA, and dietary behavioral change. I examined both qualitative and quantitative studies as well as those focused on the School Breakfast Program and the National School Lunch Program. I also focused on exploring gaps in the research literature noted within the last 5 years.

Theoretical Foundation

Health Belief Model

The HBM served as a theoretical foundation for this study. During the 1950s, Godfrey, Rosenstock, and colleagues developed the HBM in the United States at the U.S. Public Health Service (as cited by Boslaugh, 2013). In short, the authors attempted to explain why programs established to detect and prevent disease failed on a widespread basis due to individuals not participating in them (Glanz et al., 2002). HBM included one of the first health behavior theories to explain the phenomenon, and today this model remains well established and used by professionals in the health field, including registered dietitians, dentists, physicians, and nurses (Glanz et al., 2002). Moreover, researchers have used the HBM to address questions related to public health and health behaviors, such as PA and the management of chronic diseases (Boslaugh, 2013). In the 1970s, researchers changed the HBM to include Albert Bandura's (1977) concept of self-efficacy. Self-efficacy refers to the confidence that a person feels regarding his or her ability to execute a behavior (Boslaugh, 2013). Self-efficacy includes an important component considered in this study because students have difficulties with incorporating physical activities in their lives if they feel that they are not athletically capable (Cairney et al., 2012).

Researchers have supported the notion that components of HBM, such as health behaviors and self-efficacy, can affect lifestyles. For example, King, Vidourek, English, and Merianos (2014) conducted a study using the HBM for the purpose of examining perceived benefits, cues to action, and vigorous PA barriers on college students. The results of their study revealed that with an increase in perceived benefits and cues, the students engaged more in vigorous PA (VPA). The HBM has been used to help researchers explore students' perceptions and involvement in VPA (King et al., 2014).

Janz, Champion, and Strecher (2002) defined the first four main concepts of the HBM, while the fifth one derives from Bandura (1995):

1. Perceived susceptibility: The likelihood that an individual believes he or she may seriously have a change of developing a particular health issue.
2. Perceived severity: An individual's belief regarding the seriousness of a condition and the condition's sequelae.
3. Perceived benefits: The positive results an individual believes will occur proceeding an action.
4. Perceived barriers: What an individual's belief is regarding the tangible and psychological cost regarding an advised action.
5. Self-efficacy: The course of action that an individual believes will allow himself or herself to succeed or accomplish a specific task. In an HBM study that explored how university students' nutrition and behavioral intentions were influenced by their health beliefs, Kim, Ahn, and No (2012) found the following dimensions to have construct validity: (a) susceptibility, (b) benefit,

(c) nutrition confidence, (d) severity, (e) behavioral intention to do physical activity, and (f) behavioral intention to eat health food. Moreover, behavioral intentions were predicted by the perceived benefit of eating healthy food and the perceived barrier for eating healthy food; whereas, these two dimensions had significant effects and were noted to be a valid measurement of the behavioral intention (Kim et al., 2012).

As established by researchers, the HBM has a flexible framework that allows numerous constructs and variables to be included when examining behavioral change and behavioral change intervention programs (Glanz et al., 2002; Kim, Ahn & No, 2012; King, Vidourek, English, & Merianos, 2014). Moreover, HBM has been used as a valid and reliable theory in explaining health related behaviors (Glanz et al., 2002; Kim, Ahn & No, 2012; King, Vidourek, English, & Merianos, 2014). Therefore, since it includes the purpose of this study to measure behavioral and behavioral changes as they relate to diet, nutritional knowledge, and PA in a school setting, this model was appropriate to serve as a foundation for this study.

Social Ecological Model (SEM)

Researchers may also use the SEM as a framework regarding the nutrition education interventions since this model provides a structure to understand the interrelationships that exist between personal and environmental conditions at a micro and macro level (McLeroy et al., 1988). Moreover, researchers have often used the SEM to assist in exploring the complex etiology of childhood obesity (Ohri-Vachaspati et al., 2013). For instance, variables, such as gender and age, represent a component of

describing factors that can influence the weight outcomes of youth (Ohri-Vachaspati et al., 2013).

Davison and Birch (2001) incorporated factors associated with childhood obesity using an adopted version of the SEM known as ecological systems theory (EST). Within this theory, the "ecological model of predictors of childhood overweight" (Davison & Birch, 2001, p. 161) included noting components, such as a child's activity and dietary patterns and sedentary behavior. These components are affected by factors related to the child's characteristics, community, society, demographics, parenting, and family characteristics (Davison & Birch, 2001). In this manner, the EST is useful in exploring factors influencing the weight status of a child.

In another adaption of the SEM, Blanchard et al. (2005) used the framework to demonstrate how it was useful in exploring factors regarding PA. The identified problem that Blanchard et al. solved included a way to measure the weight status of individuals working to change their weight. Blanchard et al. concluded that individuals of normal weight status engaged in PA more often than individuals who were overweight. Moreover, obese individuals participated less in PA than did the overweight individuals (Blanchard et al., 2005).

The SEM includes complex levels of influence to assess individual behavior (CITE). Because it includes supporting the idea that successful interventions remain approached from both a multimethod and multilevel position, it involves addressing health behaviors, such as PA through a multidisciplinary method (Golden & Earp, 2012). Proponents of the SEM framework have noted that behavior change can be examined

using this multilevel approach; consequently, the model was appropriate as a theoretical framework for this study because the focus includes interventions occurring within children's physical, social, and cultural environments (Golden & Earp, 2012).

Literature Review Related to Key Variables and Concepts

Social, Cultural, and Environmental Contributors to America's Obesity Epidemic

In the context of social, cultural, and environmental contributors to childhood weight problems that continue to foster unhealthy lifestyles, America's leading issues include poor eating habits and physical inactivity (CDC, 2014; Gundersen et al., 2012; Mirtcheva et al., 2013). These issues have increased obesity rates for Americans as well as for the global community (Henneberg & Grantham, 2014). Researchers have indicated that most Americans consume inadequate portions of whole grains; fruits; vegetables; and low fat or fat-free products as well as select food products that are poor in nutrients, but high in solid fats, low in dietary fiber, and high in sodium and sugars (Philips, 2014).

The Rise of Obesity to Epidemic Proportions

According to the World Health Organization (WHO; 2014), overweightness and obesity trends have moved to include not only high-income countries but also a notable increase in both low- and middle-income countries, particularly within urban communities. On the global scale, over 40 million children under 5 years of age were obese or overweight in 2012 (WHO, 2014). In the United States, statistics show that over onethird of adults are considered obese, and approximately 17% of the youth meet the criteria for being obese (Ogden et al., 2014).

Researchers have reported that nearly 13 million children and adolescents in the United States are characterized as obese, and 14% of the population of children aged 6–11 currently are characterized as obese, indicating that obesity has tripled in 40 years (Ogden et al., 2012). The last 30 years have shown demographic, environmental, and cultural changes, within which the number of underweight individuals continuously decreased; however, the number of obese individuals increased simultaneously as well as the direct and indirect costs associated with it (Bhurosy & Jeewon, 2014). Rodgers, Woodward, Swinburn, and Dietz (2018) stated that the prevalence trends of obesity show that the United States was not precipitated by age, sex, and ethnic group; rather, they posited that the obesity epidemic spread due to rapid population-wide changes, such as changes to national farm bills that led to an increase in food production, accelerated marketing and accessibility of energy-dense foods, and widespread introduction of cheap and potent sweeteners. Moreover, the mechanization of different human processes and activities within the past half-century has led to the widespread decrease of energy expenditure that is required for daily living (Wiklund, 2016). Bhurosy and Jeewon (2014) stated that the annual medical costs related to obesity have risen from $78.5 billion in 1998 to $147 billion annually in 2008. Given this trend, the researchers estimated that the national total healthcare costs that can be attributed to obesity could reach up to $861 billion by 2030.

Factors Causing the Rise in Childhood Obesity

Several complex factors influence obesity, including genetics, age and gender, birth weight, biology behavior, dietary patterns, and other social, cultural, and

environmental contributors (Mohamed, 2015; Philips, 2014). In general, researchers consider obesity and overweightness as caused by the inability to balance the energy between an individual's caloric intake and output (Rappaport, Daskalakis, & Sendecki, 2013). However, researchers have also demonstrated socioeconomic status as playing a role in obesity and activity patterns. Children and adolescents of poverty remain 1.7 times more likely to present as severely obese (Shih et al., 2013). In the United States the high rates of overweightness and obesity for both children and adults derive from environmental factors and personal behaviors regarding excess caloric intake and insufficient PA (Philips, 2014; Shih et al., 2013). Further, societal and environmental changes that influence dietary and PA patterns in sectors, including education, environment, agriculture, food processing, health, transport, marketing, and distribution, face issues with obtaining supportive policies and addressing development concerns (WHO, 2014). Regarding diet, an increase in energy-dense foods has occurred with a high fat content. In relation to PA, a decrease in PA has occurred, resulting from an increased sedentary lifestyle via technological advancements with transportation, urbanization, and the work sector (WHO, 2014). The following includes a breakdown of the caloric and PA issues that contribute to overweight and obesity:

Contributing influences to excess caloric intake include:

- An increase in beverages that are sugar-sweetened (Gundersen et al., 2012).
- An increase in snacking (Bleich, Gudzune, Bennett, & Cooper, 2013).
- Portions are a larger size (Bleich et al., 2013).
- Foods have higher caloric density (Bleich et al., 2013).

- Increase in purchasing or consuming meals away from the home (Bleich et al., 2013).
- Advertising exposure has increased in promoting foods that are unhealthy and encourage consumption (Gundersen et al., 2012).
- Buying food at outlets that have less nutritional value, such as value meals or food marketed in value-sizing packages, has increased (Gundersen et al., 2012).
- Contributing influences to insufficient amounts of PA include:
- Technological breakthroughs, such as computers, that are oriented to less physical labor (Maher, Mire, Harrington, Staiano, & Katzmarzyk, 2013). Increased activity associated with media, including as video games and television (Maher et al., 2013).
- Communities more reliant on motorized transportation (Maher et al, 2013).
- Limitations due to an inability to access walking or recreation facilities that are safe and local (Maher et al., 2013).
- Limitations to engage in activities throughout the workday (Maher et al., 2013).
    - Limitations to engage in daily physical education and recess due to time factors in a school's daily schedule (Robinson et al., 2014).

As noted earlier in this discussion, obesity prevalence for both adolescents and younger children has almost tripled since 1980. Moreover, low-income children have higher rankings of obesity than other groups (Gundersen et al., 2012; Mirtcheva et al

2013; Shih et al., 2013). Nonetheless, states with lower childhood obesity rankings have counties with higher obesity rates among low-income children (CDC, 2017b). Significant factors causing obesity remain linked to poor dietary behaviors and physical inactivity. Therefore, having access to good nutrition and areas where individuals can engage in PA can help offset the obesity. However, access to healthy and nutritional food choices is limited in less wealthy communities by as much as three times the rate impoverished communities. Likewise, regarding access to areas designed to help promote and support PA, poor communities are more limited as well. For children, however, school-based education programs can be used to intervene and promote healthier dietary choices and PA (Standage et al., 2012). In summary, the objectives for this study are to address three primary risk factors contributing to overweightness and obesity, as identified by the American Dental Association: (a) lack of nutrition knowledge, (b) lack of proper dietary intake, and (c) lack of physical activities at least 3 times a week that seem vigorous in nature.

Health Risks for Obese Children

Childhood obesity is associated with various adverse health consequences, such as intolerance for exercise, asthma, sleep disorders, chronic inflammation, hypertension, and negative sense of self (Fenget al., 2017). These consequences of obesity in childhood can also have harmful and possible long-term effects on the body. For instance, obesity can cause high cholesterol and high blood pressure, which can lead to cardiovascular disease (CVD; Philips, 2014). Obesity can increase the risk of insulin resistance, impaired glucose tolerance, and Type 2 diabetes in children (Philips, 2014). Obesity

comorbidities are often exacerbated by breathing problems and asthma, as well as the joint and musculoskeletal issues (Bleich et al., 2013). Obesity frequently produces harmful effects, such as gastro-esophageal reflux, fatty liver disease, and gallstones (Pulgarón, 2013). Moreover, psychological and social risks are greater for children and adolescents that are obese (Pulgarón, 2013). Obese children often enter and live in their adulthoods as obese and have more severe health complications via cancer, heart disease, and diabetes (Pulgarón, 2013; Sahoo et al, 2015).

Furthermore, obese children are also more developmentally vulnerable than their healthy-weight peers even in the early years of schooling. They are also less likely to have the necessary physical attributes to maximize their potential to benefit from the school environment, such as fine and gross motor skills and physical independence (Pearce, Scalzi, Lynch, & Smithers, 2016). Carey, Singh, Brown, and Wilkinson (2015) also found that the increased body mass index (BMI) status of students is associated with poorer educational outcomes and the odds of having school problems, having low school engagement, and repeating a grade is attenuated by obesity. Obesity in childhood has also been linked to physical, psychological, and social consequences like risk for noncommunicable diseases, engagement in high-risk behaviors, and social stigmatization, which can result to sadness and loneliness (Amini, Djazayery, Majdzadeh, Taghdisi, & Jazayeri, 2015).

Nutritional Knowledge and Behaviors

Nutritional knowledge and behaviors can work together to help decrease overweight and obesity; however, an understanding of nutritional principles and how to

incorporate nutritional principles into children's lifestyles is an important component. Although, it is common knowledge that eating healthy is important, most Americans struggle with sorting through information regarding food choices and nutrition (CDC, 2012). For example, dietary guidelines, as provided by the United States Department of Health and Human Services [HHS] and United States. Department of Agriculture [USDA] (2015), is based on providing good dietary habits in order to reduce the risk of major chronic diseases while promoting dietary habits that are good for individuals, starting at age 2 and older. These habits can additionally be used as intervention materials (HHS and USDA, 2015). HHS and USDA (2015) published these guidelines through the joint efforts.

Likewise, MyPlate Kids' Place (USDA, 2016) represents a component of MyPlate and has a variety of activities for children to build nutritional knowledge. This method engages students with a hands-on approach to learning through guided practice and modeling. As noted by research (Gundersen et al., 2012; Mirtcheva et al., 2013), the eating behaviors of children can occur by observing how adults model eating practices. When children observe adults consuming such foods as milk, fruits, and vegetables, their intake of these food sources also increases. Likewise, if children are in the presence of peers that consume healthy choices, their selection and consumption of healthy food choices increases. Parental nutritional knowledge have a role in the development of child obesity; parents need to have a good working knowledge of basic nutritional concepts to be able to improve the food-shopping, preparation, and food delivery processes for their children (Cluss et al., 2013). Teachers also play an important role in educating children

about nutrition and their health behaviors also have a far-reaching effect on the general health behaviors and lives of young students (Liu et al., 2018). Therefore, for children, a positive social modeling factor can be effective as an indirect way of promoting healthier diets. When children have vegetables and fruit readily available and accessible, this also can have positive results (Gundersen et al., 2012; Mirtcheva et al., 2013).

Physical Activity Needs and Behaviors

The WHO estimated that 1.9 million deaths worldwide can be attributed to physical inactivity and at least 2.6 million deaths result from being overweight or obese (Dobbins, Husson, DeCorby, & Larocca, 2013). PA is an essential step to take in in order to increase health, and research on childhood and adolescences supports the promotion of PA to help control obesity, build healthy muscles and bones, reduce stress and anxiety, increase self-esteem, improve strength and endurance, and possibly improve cholesterol and blood pressure (Cawley et al., 2013). Sufficient PA coupled with a well-balanced diet is important for the normal growth and development of children and is further crucial to the prevention of increased weight and obesity (Kobel et al., 2014). For example, the recommendations for individuals ages 6-17 state that they should engage in PA for at least 60 minutes on a daily basis (Cawley et al., 2013). Only 21.6% of 6 to 19-year old adolescents and children in the United States engage in 60 or more minutes of moderate-to-vigorous PA on at least 5 days per week; moreover, only 27.1% of surveyed high school students met this recommended guideline on all days of the week (CDC, 2018). In 2015, only 51.6% of high school students attended physical education classes in a week and only 29.8% engaged in physical education classes on a daily basis (CDC, 2018).

School-Based Interventions

Since studies have shown that the preventive and positive effects of active lifestyles during childhood carry on into adulthood, it is important to begin health promotion during an individual's early life (Kobel et al., 2014). Because schools play such important roles in children's well-being, schools have the opportunity to continue to provide school-based interventions promoting nutrition knowledge, dietary needs, and PA (Feng et al., 2017). School-based programs can improve health knowledge, attitudes, and behaviors through education on components of healthy eating, PA, and body image; sessions to develop fundamental movement skills throughout the school week; provision of food with high nutritional quality, and enhancing parent engagement in the health and activity of their children (Mohamed, 2015).

On average, children spend 5 days a week and 6 hours per day in school for approximately 175-180 days annually in the United States. Within this timeframe, children are being taught a variety of subjects that remain held to standards that reflect state and federal laws, as well as specific state and county policies. Furthermore, during the day, children (particularly of low-income status) receive at least two meals per day (Carlson et al., 2013). Carlson et al. (2013) posited much of their caloric intake occurs at school. In West Virginia, state and local efforts have been underway to implement programs and evaluate factors of the child obesity crisis. Moreover, leadership has improved laws and policies and added to address school-based interventions of obesity issues regarding nutritional knowledge, dietary intake, and PA.

The following research on systematic reviews, meta-analysis reviews, and randomized and nonrandomized control groups, regarding school-based programs, includes evaluating the effectiveness of school-based intervention programs dealing with strategies to reduce overweightness and obesity risks. Likewise, these researchers address gaps in literature, as well as the specific data regarding NSLP and SBP. In addition, data pertaining to West Virginia programs that have been implemented to address improving nutritional knowledge, dietary intake, and PA. Research strategies were used to retrieve information from the following databases: PubMed, PsycINFO, MEDLINE, ProQuest, and Google Scholar, as well as several government sites.

Systematic Reviews: School-Based Programs Nutritional and Physical Activity

Several researchers have examined school-based nutrition education and PA intervention programs focusing on childhood overweightness or obesity issues. These studies found that PA interventions were effective in promoting health-conscious behaviors. In addition, several researchers, studying physical education implementation, included using clinical controlled trials, randomized trials, and non-randomized controlled trials with appropriate control groups. The following includes a breakdown of the studies, population, finding, and other pertinent information.

Randomized School-Based Programs of Nutrition and Physical Activity

Connelly, Duaso, and Butler (2007) found randomized controlled trails in a non-clinical population of children aimed at preventing overweightness or obesity. The eligibility for the trial remained consistent with criteria including: (a) a sample of at least 30 participants, (b) intervention followed for at least a 12-week duration, and (c)

inclusion of an index of adiposity as an outcome (Connelly et al., 2007). The authors noted five studies, including an education component of nutrition, as well as a compulsory PA intervention. They identified these five studies as effective in improving weight-loss and health-conscious behaviors (Connelly et al., 2007). In addition, 13 other studies included examining nutrition skills, nutrition education, and physical education through voluntary implementation. Only one study of 12 remained identified as effective. In examining distinguishable factors, the researchers concluded that, out of the 28 trials examined, 11 were effective, and the deciding factor was based upon providing aerobic PA that was moderate to vigorous as a compulsory measure rather than a voluntary basis in obtaining an effective status (Connelly et al., 2007). Therefore, as implied by these outcomes, 39% of the interventions reported results that were effective, although authors commented that further research is necessary to identify how activity can be sustained, as well as transformed, into behaviors of personal choice (Connelly et al., 2007).

Randomized School-Based Programs of Nutrition and Physical Activity

Brown and Summerbell (2009) retrieved studies from January 2006 through September 2007 with the purpose to determine the effectiveness of interventions in school children regarding PA and their diet. Another aim of this study was to identify characteristics that affect outcomes, including setting, process indicators, gender, age, and socioeconomic status. The inclusion criteria included school-aged children who were 5 to 18 years of age, studies with a duration of at least 12 weeks, the inclusion of weight measurements, no recruitment based on weight factors, and an intervention of school-based lifestyle versus other intervention styles (Brown et al., 2009). The lifestyle

intervention types, such as reduction in sedentary behaviors, social support, healthy eating, increase PA, and education for diet and education for activity behaviors, were included (Brown et al., 2009). Of 1,553 studies identified, the number included totaled 38 of which 3 were diet studies, 15 were PA studies, and 20 were PA plus diet studies (Brown et al., 2009). The researchers stated that interventions for children, such as school-based PA interventions, may help them maintain a weight that is healthy; however, the results are short term and inconsistent (Brown et al., 2009). Overall, the suggestion of this study states that the combining of PA and diet may assist in the long-term prevention of overweightness in children (Brown et al., 2009). Other research suggestions remarked on interventions in PA that may have more success in girls and younger children. It is suggested that girls during primary school education may especially benefit on a short-term basis (Brown et al., 2009).

Randomized and Meta-Analysis: School-Based Programs of Physical Activity

In a systematic review, Harris, Kuramoto, Schulzer, and Retallack (2009) found 18 studies that met their research criteria based on determining the effect of school-based PA interventions on children's BMI. Researchers used 15 of these studies in the meta-analysis review; also, 15 of the studies incorporated school-based physical activities or school-based exercise interventions (Harris et al., 2009). Within the 18 studies, 15 included cointerventions, such as health education, classroom nutrition education, or family involvement. Other criteria factors included study duration of at least six months and the age group of 5 to 18 years of age (Harris et al., 2009). Objective weight and height data was included, and all studies were published between 1996 and 2007 (Harris

et al., 2009). In the sensitivity analyses, neither study quality, duration of the study, presences of cointerventions, nor sex of students affected the results (Harris et al., 2009). The conclusion drawn from the data showed that participation in PA programs in school-based interventions did not improve children's body composition (Harris et al., 2009). However, the researchers stated that school-based intervention programs were still important based on the significant benefits regarding bone density, aerobic capacity, lean muscle mass increase, and improved flexibility (Harris et al., 2009).

Kropski, Keckley, and Jensen (2008) located peer-reviewed studies that were published between January 1990 through December 2005 to examine the efficacy of school-based programs in decreasing overweightness and obesity in childhood. The dependent variable was childhood reduction in overweightness and obesity. The independent variables derived from the following three factors in school-based programs: PA, nutrition, and a combination of PA and nutrition (Kropski et al., 2008). In the conclusion, the authors stated that the limited number of studies published and methodological concerns resulted in a lack of sufficient evidence that could provide strong guidance regarding school-based overweightness program benefits (Kropski et al., 2008). Outcomes from the qualitative analysis revealed that, for girls, social learning used in programs may be more appropriate, whereas, for boys, interventions supporting a PA that are structural and environmental could be more effective (Kropski et al., 2008).

In one study, a program was implemented to evaluate the effects on obesity prevalence in children using university students acting as health promoting agents for the primary-school-based program (Tarro et al., 2014). The program addressed

recommendations for healthy lifestyles, which included PA and a healthy diet, over a 28-month period (Tarro et al., 2014). The method used was a random assignment based on two school clusters containing 24 schools and 1,222 students with the mean age of 8.4 ± 0.6 years and 49.9% of the students included females. The control group was from 14 schools and contained 717 students (Tarro et al., 2014). The collected data included questionnaires for parents to complete regarding lifestyles and dietary habits. In addition, the BMI was collected each year (Tarro et al., 2014). The interventions were covered over 12 activities that were set to last one hour per activity per session, while focusing on eight lifestyle topics covered over three different academic school years (Tarro et al., 2014). At the conclusion of this study, the authors noted one significant data outcome, and they stated that the obesity prevalence decreased from 9.59% to 7.23% in boys in the intervention group, which meant a -2.36% difference over the 3-year period (Tarro et al., 2014).

In a study conducted by Kandiah and Jones (2002), 187 fifth graders were part of a 3 week intervention utilizing school-based nutrition education. Lessons were taught 4 days a week for a period of 45 minutes each (Kandiah et al., 2002). The researchers designed the study to explore whether a nutrition education program would affect healthful food choices and nutritional knowledge (Kandiah et al., 2002). The intervention component addressed lessons using the following: (a) 1995 Dietary Guidelines for Americans, (b) healthful snacks, (c) Food Guide Pyramid, (d) vegetarianism, and (e) functions of energy yielding macronutrients (Kandiah et al., 2002). A pretest and posttest was given to assess the students' nutrition knowledge changes, and a 3 day food record

was used to account for dietary behaviors at the beginning and end of the study (Kandiah et al., 2002). Classroom teachers were responsible for teaching the intervention, but training was implemented via the research team. In the results, the researchers confirmed that the short 3-week intervention on nutrition education was effective with Dietary Guidelines ($p = 0.0001$) nutritional knowledge ($p = 0.001$), and guidelines of the Food Guide Pyramid ($p = 0.0001$; Kandiah et al., 2002).

Another study conducted a screening of 3 rural counties containing Appalachian third graders in order to assess dietary intake and explore whether the FoodMASTER curriculum improved this aspect (Hovland, McLeod, Duffrin, Johanson, & Berryman, 2010). In assessing the nutrition intake, the researchers' goal was to use the data as a means to improve dietary intake through future education interventions (Hovland, et al., 2010). In short, the FoodMASTER also known as Food, Math, and Science Teaching Enhancement Resource Initiative, is a curriculum of 45 hands-on lessons that are used to combine subject areas to incorporate nutritional knowledge. This program was developed by experts in the fields of teaching, dietitians, and other experts and was funded by the Education Partnership Award from the National Center for Research Resources of the National Institutes of Health. Within the study, third graders received a beginning and end-of-year test to assess their dietary intake. This was measured using the Block Food Frequency Questionnaire from 2004 (Hovland et al., 2010). The researchers' conclusions were that third graders appeared not to be meeting recommendations as specified in the MyPyramid for Kids for food groups or specific nutrient levels. Additional interventions remain warranted, and an increased effort in reducing fat and sugar remains especially

needed in low SES schools (Hovland et al., 2010). Moreover, according to the authors, the outcomes of this study only underscore how important it remains to focus on programs that address dietary behaviors for individuals and families, and these programs should be a mainstay of the classroom and continue through grade levels (Hovland et al., 2010).

Randomized School-Based Program of Nutrition

In one school-based educational program focused on preventing excessive weight gain in children, researchers aimed at reducing consumption of carbonated beverages (James, Thomas, Cavan, & Kerr, 2004). From six primary schools, a sample population of 644 students, age 7-11 years, was selected from a fourth-grade level to participate in the study (James et al., 2004). The authors conducted the study over the course of a year, and one measure of data was from self-reporting dietary logs (James et al., 2004). Interventions were conducted by trained personnel with supportive assistance from the classroom teachers. Moreover, classroom teachers were asked to reinforce the lessons during the academic year (James et al., 2004). Within the main outcome, overweight and obese children were logged, as well as the number of carbonated beverages that was consumed (James et al., 2004). The intervention groups decreased by 0.2% and the control group showed a 7.6% increase regarding the overweight and obese category. As stated, there was a decrease of 0.6 glasses in the intervention group and an increase of 0.2 glasses in the control group over a three-day sampling of carbonated liquids consumed, as based on 250 ml per glass (James et al., 2004). In the conclusion, the authors reported

that there was a modest reduction of carbonated drinks, and this was associated with the decrease in the intervention group's overweight and obese outcomes (James et al., 2004).

Randomized School-Based Program of Nutrition

Powers, Struempler, Guarion, and Parmer (2005) conducted an investigation on the effects that a school-based nutrition program would have on second and third-grade students' nutrition knowledge and dietary behavior. Using a social cognitive theory nutrition program, the researchers conducted preassessment and postassessments, as well as nutrition education classes based on the Pizza Please assessment method. A State Cooperative Extension Nutrition Education Program employed the nutrition instructors to teach the classes to 1100 participants from Alabama public schools, where at least 51% of students received free or reduced meals (Powers et al., 2005). The Pizza Please game was composed of an interactive game and a questionnaire (Powers et al., 2005). In all, the Pizza Please questionnaire included 16 nutrition knowledge and 24 dietary behavior questions that were appropriate for children of elementary school age (Powers et al., 2005). The study lasted for 8 weeks and found that children in the treatment group increased dairy, especially cheese consumption, by a significant value at lunchtime. In addition, the treatment group reported to consume as least one fruit (65%) and one vegetable (49%; Powers et al., 2005). However, in the control groups, there was a decrease in the consumption of dairy products, and one of these decreases was cheese for both lunch and snack-time, as self-reported by the students. In regard for the fruit and vegetables in the control group, the outcome was 62% and 43% (Powers et al., 2005). The authors expressed that the dietary behavior changes may have been minimized due to

the short duration of the study (Powers et al., 2005). The School Health Education states that to influence behavior, it requires a minimum of 50 hours; however, in this study, there was a minimum of 6 hours in the area of nutrition education (Powers et al., 2005). Likewise, The School Health Education Evaluation found that to produce a large effect dealing with program-specific knowledge, at least 10 to 15 hours of time is needed; however, even at 6 hours, the researcher of this study stated that there was a statistically significant increase in the treatment group (Powers et al., 2005). Programs of similar constructs, as suggested by the findings, have the potential to impact second and third grade students by improving nutrition knowledge and dietary behaviors (Powers et al., 2005).

Randomized School-Based Programs of Physical Activity

There is a need to develop physical education programs that target the underserved population of young children in an engaging and enjoyable manner (Wadsworth, Robinson, Rudisill, & Gell, 2013). Under this assumption, the authors developed a study where the sample population was from a rural southeastern Alabama elementary school and consisted of 108 students from kindergarten through second grade (Wadsworth et al., 2013). The research examined the effects of mastery climates and performance climates on PA. The study was implemented over a 10-day period, occurred during the regular physical education class time, and measured the activity by counting the steps that a child took using a pedometer (Wadsworth et al., 2013). One group was assigned to a mastery climate and the other group of students was assigned to the performance group (Wadsworth et al., 2013). In the master climate, two experts on

master motivational taught (Wadsworth et al., 2013). The mastery-oriented motivational climate was composed of 6 TARGET structures, and this was set up so that the student can direct his or her own learning experience, as well as PA goal, by developing the type of task, the level of the task, and the duration of the task (Wadsworth et al., 2013). The word TARGET is an acronym for Task, Authority, Recognition, Grouping, Evaluation, and Time (Wadsworth et al., 2013). On average, children in the mastery-oriented physical education climate produced 11 steps more each minute; likewise, this group showed that they spent significantly less in management and time sitting but they had more time walking and being active (Wadsworth et al., 2013). In summary, children had a higher step count in the mastery-oriented physical education programs, and, therefore, this method created a physical education atmosphere that was effective in a rural school with children grades K-2 (Wadsworth et al., 2013). In explaining the TARGET, the authors stated that an individual invests more effort in the physical goal during the master-oriented classes because he or she can focus more on demands and overcome challenges that are of his or her own choosing with a self-determined or an autonomous act. Moreover, this is able to build a greater effort through intrinsic motivation and perceptions of competence (Wadsworth et al., 2013).

Randomized School-Based Program of Nutrition through Adult Intervention

In a study by Cunha, Souza, Pereira, and Sichieri (2013), twenty classes comprising 559 eligible students with a mean age of 11 years old were randomly assigned into intervention and control groups to evaluate the effectiveness of school-based interventions that utilize the influence of families and teachers in promoting healthy

eating habits among adolescents. The ultimate goal of the study was to reduce the increase in the BMI of the students. The interventions provided to the chosen intervention group included nine nutritional education sessions during the 2010 academic year, wherein teachers and the parents/guardians of the students received information on the same subjects taught to the children. The primary outcome measurement was the measurable changes in BMI and percentage body fat of the students. The results of the study showed that the BMI were not significantly different between the two groups; however, there was a major reduction in the consumption of sugar-sweetened beverages and cookies among the members of the intervention group. Moreover, the students in the intervention group were also observed to consumer more fruit (Cunha et al., 2013).

National School Lunch Program (NSLP) and School Breakfast Program (SBP)

According to researchers, promoting healthier eating habits can come by changing sources of food in physical school environments, such as school cafeterias and vending machines, to offer healthier selections (Katz et al, 2011). In other ways, implementing school health programs that can be supported by researchers, policymakers, and the media can focus on promoting healthier diets and address childhood obesity in order to influence change (Ochoa-Avilés et al, 2017).

For instance, the NSLP and SBP can also be instrumental in affecting children's health outcomes through dietary methods (Gundersen et al., 2012). As based on Sudharsanan, Romano, and Cunningham's (2016) research, the SBP was introduced as a way of encouraging children to consumer breakfast, which can reduce the risk of unhealthy weight among children. Moreover, if children also participate in the SBP, they

can consume 47% of their daily calories while at school. It is estimated that, in America, approximately 19 million school age children receive a free or reduced lunch on a daily basis (Gundersen et al., 2012). With such a heavy investment in providing healthy meals for children, the financial cost of the NSLP was $10 billion in 2009 (Gundersen et al., 2012). Regarding the obesity epidemic, studies have shown that providing quality dietary meals through the SBP can be linked to better eating habits among children at disadvantaged schools (Sudharsanan et al., 2016). Further, research conducted by Nguyen, Ford, Yaroch, Shuval, and Drope (2016) held that the use of subsidized meals benefits children in day cares and school settings by helping support their weight status. Another point argued by the authors stated that subsidized meals might be an effective tool for poor children in order to fight against obesity; therefore, this program needs to be expanded (Nguyen et al., 2016). Cullen, Thompson, and Watson (2012) stated that providing school breakfast to children is a practical intervention that can help improve their energy balance, nutrient intake, as well as academic achievement (Oostindjer et al, 2016), school meals have been found to influence healthy and sustainable consumption patterns among children. Federal nutrition programs also reduce children's food insecurity by providing healthy food, which, in turns, cuts down on the amount of less nutritious meals consumed and over-eating when food remains readily available (Black et al, 2012; Gundersen et al., 2012). Other points show that school breakfasts significantly lower students' BMI (Sudharsanan et al., 2016) and have reduced obesity by at least 17% (Gundersen et al., 2012).

Resolutions for the Future

In building resolutions for the future, it is evident that school-based interventions can be an important component in encouraging a healthier lifestyle by promoting nutrition education, dietary options, and physical activities on a continuous basis. Founded on the facts provided in the previous research, children spend a significant amount of time in the school setting. Moreover, despite factors including limited budgets, policies, personal and recreational facilities, scheduling issues, and the school environment, adjustments can be made by adding or revising well-designed programs that rely on existing staff and facilities that access supportive guidance and resources. As highlighted in the preceding literature, the School Health Education recommends that 10 to 15 hours is needed to make significant knowledge changes regarding nutrition, and a minimum of 50 hours remains necessary to change behaviors. Therefore, programs need to take both of these recommendations into consideration. Likewise, it remains important to consider that some studies had fewer hours in both nutrition and PA but showed significant results. Also, taking advantage of the programs already in place and learning to maximize or add to the existing lessons can less the burden on the school budget, schedule, and staff. For example, looking at the month's breakfast and lunch menus and choosing lessons that reinforce concepts from the MyPlate and Food Pyramid with RAMP (Reading Across MyPyramid) programs will teach nutritional values. Likewise, in physical education programs, lessons can be developed by enhancing or adding to the existing content objectives. For instance, the master-oriented physical education program, that allows students to direct their own learning experiences and PA goals, can be used.

Under this program, students spent significantly less time in management and sitting, and they spent more time walking and being active. Moreover, the studies should focus on promoting nutrition knowledge, dietary behavior changes, and PA. This can remain accomplished through designing, implementing, and assessing studies that focus on the obesity epidemic and remain approached from a multi-level viewpoint. In addition, mandates, policies, and procedures must remain revisited and revised.

Summary and Conclusion

In closing, this literature review included that researchers have demonstrated that a limited number of well-designed studies existed, and most reflect changes that seem short term or too involved for a school system to place in the curriculum on a long-term basis due to financial and schedule issues. In addition, the researchers revealed concerns in methodology, such as results lacking sufficient evidence. Researchers expressed the need to continue developing and conducting studies of better design that are targeting childhood obesity, and school-based interventions need to be a part of this component.

Chapter 3 will include the research methodology used in this study. Major sections will include the research design and rationale, methodology, threats to validity, and summary. Specifically, the chapter will include the purpose of the research, time frames for data collection, baseline and demographic characteristics of the sample population, and sample proportions and validations.

Chapter 3: Research Method

Introduction

The purpose of this quantitative study was to determine whether school-based programs teaching nutritional and physical education and offering healthy dietary breakfasts and lunches can improve the nutritional knowledge, PA, and dietary behavior of students attending public schools in rural, impoverished districts. This chapter will contain a discussion and justification of the research design used in this study. Sections will also be devoted to the methodology that was used. In particular, I will present information on the study population and sampling strategy used as well as the procedures for participant recruitment, data collection, and data analysis. The chapter will also include sections on the instruments that were used to collect data and the variables of the study and how these variables were operationalized. The chapter will conclude with discussions of the validity and reliability of the study and the procedures that were implemented to ensure that this study was conducted in compliance with the standards for ethical academic research.

Research Design and Rationale

I conducted this study to examine archival data representing the relationships between the independent variable, which was the implementation of a school-based nutritional and physical knowledge program (Learntobehealthy), physical education program (FITNESSGRAM), and dietary education program (participate in school-based breakfast and lunches and MyPlate checklist), and how it affects the dependent variables of nutritional knowledge, PA, and dietary behavior among a sample of second and third

graders attending public schools in a rural, impoverished district. The nutritional and physical knowledge was obtained through the online program, Learntobehealthy, which uses 10–14 lessons to teach nutritional and physical activities for 6 weeks at approximately 30-45 minutes per lesson. Both a pretest and posttest were included in this program. In physical education, students were given a pretest and posttest of fitness performance based on the FITNESSGRAM, and the students started this activity at the same time that the nutritional and physical education lessons were taught. In addition, students were given a MyPlate checklist before starting the programs and on the last week of the programs. I used this checklist to determine if the students changed any dietary behaviors.

In line with the purpose, I conducted a quantitative study with a quasi-experimental research design. A quantitative methodology was chosen because this approach is appropriate for studies where the purpose is to determine the relationships between specific study variables, as was the case in this study (see Yoshikawa, Weisner, Kalil, & Way, 2013). The study variables were measured using numerical values and the relationships were tested using mathematical or statistical analysis procedures (see Plastow, 2016). The quantitative study was inductive in nature, derived from a general theory, and I used collected data to test that theory (Yoshikawa et al., 2013). In contrast to the quantitative methodology, the qualitative methodology is more appropriate for studies that are deductive in nature, where specific observations are used to arrive at generalizations regarding a particular area for investigation (Yilmaz, 2013). Because the

purpose of this study was to determine the relationships between the specified study variables, I determined the quantitative methodology to be more appropriate.

The purpose of this study was also a key consideration in my selection of the quasi-experimental research design. The quasi-experimental design was selected for this study because conducting a truly experimental study was not possible in this situation. In quasi-experimental studies, the independent variable is identified, but not manipulated, and there is no random assignment of participants into a control group and a treatment group for experimental comparison (Creswell, 2010). Quasi-experimental studies are conducted using data collected from preexisting groups (Creswell, 2010). However, it should be noted that a key limitation of the quasi-experimental design is the inability to make conclusions regarding causality between variables (Creswell, 2010). Because there were no control or treatment groups within the sample, the quasi-experimental design was appropriate for this study sample.

All participants underwent the same intervention programs, which included the school-based nutritional program, physical education program, and dietary education program. The use of the quasi-experimental design is recommended for studies where the focus is on determining the effectiveness of intervention programs for targeted outcomes (von der Embse, Barterian, & Segool, 2013), as was the case in this study where the purpose was to determine whether school-based nutritional program, physical education program, and dietary education program can improve nutritional knowledge, PA, and dietary behavior. In line with this purpose, I conducted a quantitative, quasi-experimental study was conducted to address the following research questions and hypotheses:

RQ1: Do school-based nutritional programs increase the nutritional knowledge of students in rural, impoverished communities?

$H_0$1: The school-based nutritional programs do not increase the nutritional knowledge of students in rural, impoverished communities.

H_A1: The school-based nutritional programs increase the nutritional knowledge of students in rural, impoverished communities.

RQ2: Do school-based physical education programs increase the physical education knowledge of students in rural, impoverished communities?

$H_0$2: The school-based physical education programs do not increase the physical education knowledge of students in rural, impoverished communities.

H_A2: The school-based physical education programs increase the physical education knowledge of students in rural, impoverished communities.

RQ3: Do dietary behavior programs increase healthy changes in the dietary behavior of students in rural, impoverished communities?

$H_0$3: The dietary behavior programs do not increase healthy changes in the dietary behavior of students in rural, impoverished communities.

H_A3: The dietary behavior programs increase healthy changes the dietary behavior of students in rural, impoverished communities.

RQ4: Do school-based physical education programs improve the physical activities of students in rural, impoverished communities?

$H_0$4: School-based physical education programs do not improve the physical activities of students in rural, impoverished communities.

H_A4: School-based physical education programs improve the physical activities of students in rural, impoverished communities.

Methodology

Population

The population for this study included students in Grades 2-3 that attended elementary or K-8 public school in rural, impoverished communities in West Virginia. In particular, I collected data from three specific schools in West Virginia, which will henceforth be referred to in this study as Public Schools (PS) A, B, and C. In addition, the schools had to have at least 50% of the students qualifying for free breakfasts and lunches, which is how the schools were classified as schools in rural, impoverished districts. However, all schools participating received 100% free breakfasts and lunches.

All three schools implement the SBP and the NSLP (see U.S. Department of Agriculture, 2015a). In addition, the three schools also implement education programs based on state goals and guidelines targeted towards increasing their students' knowledge about nutrition and diet and their engagement in physical activities. The students from the three schools comprised the sample of participants for this study.

Sampling and Sampling Procedures

I used secondary data in this study, which were collected by the schools as part of their records and were provided to me for the purpose of conducting this study. This

means that all the students in the three schools were able to participate in the program and provide data for both the pretest and the posttest. Hence, I did not conduct sampling, only collected secondary data from the schools that agreed to participate in the study.

I selected the three schools that participated in this study based on specific criteria. First, the schools had to be located in rural, impoverished districts or communities, which were determined based on whether at least 50% of the students enrolled were on the free breakfast and lunch programs. Second, the schools had to be implementing education programs on nutrition, exercise, and diet based on West Virginia state goals and guidelines. Lastly, the schools had to participate in the SBP and the NSLP (see U.S. Department of Agriculture, 2015).

I collected data collection from second and third grade students enrolled in PS-A, PS-B, and PS-C. These students had undergone the school-based nutritional and physical knowledge program as well as a physical fitness program, and they participated in choosing foods from the SBP and NSLP, which was assessed through a self-report checklist (MyPlate) for the dietary component. All students had attended the schools' physical education classes and completed the necessary program evaluations before and after the education programs. Data collection did not include the students in Grades PK-1 and 4-8 enrolled in PS-B and PS-C.

A power analysis was conducted to ensure that the number of participants for this study was adequate for data analysis procedures. Using G*Power 3.1.0, I determined that a minimum sample size of 34 participants was required to achieve 80% power. In addition, the power analysis also considered the following parameters: an alpha value of

0.05, a medium effect size of 0.5, and the planned statistical test, which was a paired samples *t* test. Increasing the desired power to 95% changed the minimum sample size to 54. However, given that data were collected for one class of second and third grade students from three schools, I determined that the sampling requirements for the analysis were met.

Procedures for Recruitment, Participation, and Data Collection

Procedures for recruitment. I focused my recruitment efforts on schools within West Virginia that were in one rural, impoverished district. This determination was based on the percentage of student population that was on the free breakfast and lunch program. For this study, a population of at least 50% on the free meal programs was required. The schools also had to implement the education programs on nutrition, exercise, and diet based on state goals and guidelines and participate in the SBP and the NSLP (see U.S. Department of Agriculture, 2015). Based on these criteria, I was able to identify several potential schools for inclusion in this study.

Prior to conducting any recruitment procedures for the study, I first contacted the district superintendents of the selected schools to request their permission to contact the principals of the selected schools and collect data from these schools. Once approval was obtained from the involved personnel, I contacted the principals of these schools to request their school's participation in the study. Among the principals contacted, three responded positively to my calls. These three schools were PS-A, PS-B, and PS-C. Because there was secondary data collected from the schools for students in second and

third grade levels, there were no procedures to obtain individual informed consent and assent from parents and students.

Participation. All three schools implement the SBP and NSLP and conduct education programs on nutrition, exercise, and diet based on state goals and guidelines and did so independently of this study. Thus, the participation of the schools was restricted to providing the data required to conduct this study. The specific data provided by the school included pretest and posttest scores of their second and third grade students for the nutrition knowledge tests, the FITNESSGRAM physical education exercises, and dietary choices checklists.

Data collection. The data used in this study were secondary data collected by schools as part of their record-keeping on the school-based educational programs on nutrition, exercise, and diet for their students. All three schools implemented these school-based programs based on Learntobehealth.org program, the Choose My Plate initiative (MyPlate Checklist) and the FITNESSGRAM. These programs provided the basis for lesson plans used during the school-based educational programs, as well as the assessment tools that were used to collect data for this study. As part of the school-based initiative, teachers administered the pretest and posttest which served as the data to measure nutritional and physical education knowledge. The teachers conducted the physical fitness tests recommended on FITNESSGRAM. These tests were conducted on the first day and 6 weeks after, and the data was used to measure PA. The data was collected to measure dietary behavior was collected using a checklist from the Choose

My Plate Initiative. Checklist results were only requested from the first day and the 6 week mark of the program.

The three schools agreed to participate in the study by providing data specified in the previous subsection. As part of the official request to participate in the study, this researcher provided a schedule for the submission of the necessary data, which only requested each student's date of birth (DOB), gender, school, grade level, pretest and posttest of Learntobehealth.org program, data showing FITNESSGRAM, which included a checklist of the first and last day of physical activities monitored, and the MyPlate checklist, which captured data twice, which was immediately before and after Learntobehealthy program. This facilitated data collection and analysis. Principals and teachers were asked to submit the pretest and posttest data within 2 weeks of collection and that the submitted data be de-identified data to protect the individual students. Once the data was collected all the data was compiled in a spreadsheet using the Statistical Packet for Social Sciences (SPSS) v. 22.0. and it was also used to conduct all data analysis procedures to address the research questions and hypotheses of the study.

Instrumentation and Operationalization of Constructs

Instrumentation

Nutritional and fitness knowledge testing. The testing instrument for the nutritional and physical knowledge component was from the Learntobehealthy.org website. This online program was structured to teach the importance of regular PA and eating healthy. Individual students logged on via a code word and password. The heading of the K-3 program was Nutrition and Fitness. In this content area, student worked

through lessons from one through fourteen. In addition, there was a pretest and posttest assessment which was designed to test student's knowledge of nutrition and PA on an independent basis. In using the program, students answered multiple-choice as well as true and false questions by maneuvering from screen to screen on the computer and responding by the use of their mouse.

FITNESSGRAM. FITNESSGRAM was a set of standards used to set individual goals for health and fitness for students based on age and gender appropriate standards. FITNESSGRAM was used to assess students in terms of their aerobic capacity, body composition, and muscular strength, endurance and flexibility. This was collected by either the physical education teacher or the classroom teacher. Because of the age of the students, the body composition test was omitted. It is an only a mandatory state requirement in grades 4-8 in West Virginia. The table shown below summarizes the test items on the FITNESSGRAM, which were used as measures in this study.

Table 1

FITNESSGRAM Test Items

Muscular Strength, Endurance, and Flexibility					
Aerobic Capacity	Body Composition	Abdominal Strength and Endurance	Trunk Extensor Strength and Flexibility	Upper Body Strength and Endurance	Flexibility
The PACER	Skinfold measurements	Curl-up	Trunk Lift	90º Push-up	Back-saver sit and reach

One-mile run	Body mass index Bioelectric impedance analyzers	Modified pull-up Flexed arm hang	Shoulder stretch

Fitness goals on FITNESSGRAM differ depending on the year level and gender of the participants, and the scoring for the PA variable in this study was standardized to facilitate data analysis. The implementation of the tests on the FITNESSGRAM was conducted based on procedures outlined in the detailed manual of the Presidential Youth Fitness Program for teachers, which helped ensure objectiveness of the test administrators.

MyPlate checklist. *The* MyPlate Daily Checklist was one of the assessment tools provided for the Choose My Plate Initiative of the U.S. Department of Agriculture (2015a). The MyPlate Checklist was constructed based on dietary guidelines published every five years by the U.S. Department of Health and Human Services (2014). These guidelines are designed to help individuals observe healthy dietary behaviors, and the MyPlate Checklist is a tool used to help make healthy eating choices. The checklist identifies the basic types of food that children need to consume daily, specifically fruits, vegetables, grains, protein, and dairy. The checklist differs between grade-levels, regarding the required number of servings or amounts per food group because the dietary needs of the students will differ with age. However, the method of scoring for dietary behavior in this study was standardized across all grade levels and will facilitate the further analysis of patterns within the data.

Operationalization of Constructs

Nutritional knowledge. Nutritional knowledge was operationalized using the educational program from LearntobeHealthy.org. This program met national and state educational standards. It also provides pretest and posttest assessments in nutritional knowledge as well as checklists that captures dietary behaviors.

Physical education knowledge. Physical education knowledge was operationalized using the educational program from LearntobeHealthy.org. This program met national and state educational standards. It provides pretest and posttest assessments in physical education knowledge.

Physical exercise. Physical exercise was operationalized based on the scores for the activities on the FITNESSGRAM program. These included activities measuring aerobic capacity (the PACER and one-mile run), muscular strength, endurance, and flexibility. Body composition, BMI, and bioelectric impedance analyzers were not attempted to obtain. Muscular strength, endurance, and flexibility was divided into four subscales, specifically abdominal strength and endurance (curl-up); trunk extensor strength and flexibility (trunk lift); upper body strength and endurance (90º push-up, modified pull-up, and flexed arm hang); and flexibility (back-saver sit and reach and shoulder stretch).

Dietary behavior. Dietary behavior was operationalized based on scores for the MyPlate Daily Checklist, which were filled out by the students at the pretest and posttest of the learntobehealth.org program. The children were asked to record what kinds of food they ate that corresponded to the five identified food groups, and whether they met the

targeted number of servings for each food group. If they met the target, they checked "Y" for that food group, and if they did not meet the target, they checked "N." Dietary behavior was operationalized by adding how many "Y" responses were obtained, and this data was operationalized as a continuous variable, with scores ranging from 0 to 5. In addition to this, each food group will correspond to a subscale for dietary behavior. The scores for these five subscales will be operationalized as categorical variables and scored as either "Y" or "N".

Data Analysis Plan

Four research questions were formulated for this study. These research questions were posed to determine whether school-based education programs on nutrition, physical exercise, and dietary behavior could improve nutritional and physical knowledge, physical exercise, and dietary behavior, respectively, among the study participants. To address these research questions, a dependent samples *t* test was conducted using the pretest and posttest data of the study. This test was used to determine whether there are any differences between independent groups and the dependent variable. The statistical analysis program SPSS v. 22.0 was used to facilitate all data analysis procedures. Based on the results of the analyses, I determined what changes occurred in the scores of the participants between the pretest and the posttest, and whether these changes were statistically significant. For all analysis procedures, statistical significance was determined at $p < .05$.

Threats to Validity

In this study, there were several concerns regarding validity. First, the threats presented by history and maturation are inherent in pretest/posttest studies, particularly when the tests used are the same. However, in this study, the concern with history only applied to the measurement for nutritional knowledge, but not for physical exercise and dietary behavior. Second, the threat of maturation was also considered, but given that the gap between the pretest and the posttest was 6 weeks, it was expected that should not greatly affect the study results. Third, experimental mortality was also an issue that could not be controlled, but occurrences of experimental mortality due to withdrawal from the school was not a factor in this study. Fourth, selection and testing threats to validity were not applicable in this study because the same set of assessments was used on all students. Fifth, the threat of instrumentation was also taken into consideration. At the time of the gathering of data, there are no available data on the psychometric properties of the instruments that was used to collect data for this study. However, this threat is mitigated by the fact that the instruments were developed by experts in their respective fields and are widely used to implement federal initiatives. Sixth, an inherent limitation of quasi-experimental studies was that the conclusions of the study do not take into account the other variables that could have affected study results. Lastly, causation cannot be established in quasi-experimental studies (Creswell, 2010). Hence, conclusions were made regarding the existing relationships between the variables; however, no assertions can be made regarding the causal relationships between the variables.

Ethical Procedures

This study was conducted in compliance with the standards for ethical academic research. First, prior to conducting any recruitment procedures, it was necessary to obtain approval from the Institutional Review Board (IRB) to ensure that the study procedures do not violate participant rights. Whereas, the IRB number provided for this study was 06-09-17-0083844. Second, secondary data was collected by the school, and this researcher did not have any contact with the students. Thus, it was not required to obtain individual informed consent and assent from the students and their parents. Likewise, all data provided by the schools was de-identified. Third, aggregate data was used, and no references to individual students was made. Fourth, to maintain the privacy of the schools that participated in the study, any identifiable data about these schools was not used. Instead, pseudonyms were used to refer to the three schools.

Summary

The purpose of this quantitative, quasi-experimental study was to determine whether a school-based nutritional program, physical education program, and dietary education program can improve nutritional knowledge, PA, and dietary behavior of public school students in a rural, impoverished school district. To achieve this purpose, only secondary data were collected from three schools that were implementing school-based educational programs on nutrition, PA, and dietary behavior based on state goals and guidelines. Pretest and posttest data were collected and used to conduct a series of paired samples *t* tests. The results of the data analysis procedures described in this chapter is discussed in Chapter 4, while the final chapter of this study will contain a

discussion of the data analysis results in line with existing literature and the recommendations and conclusions based on these results.

Chapter 4: Introduction

Purpose of the Study

Approximately 12.5 million American children and adolescents aged from 2 to 19 years old present as obese (Ogden et al., 2012). Childhood obesity may occur due to the intake of too many calories and the lack of PA (CDC, 2013). Schools can play an important role in supporting the healthy eating and PA of children. School-based nutrition, diet, and physical education programs implemented by classroom teachers can influence young children's knowledge and behavior. The goal of this research study was to examine whether school-based programs teaching nutritional and physical education and offering healthy dietary breakfasts and lunches can improve the nutritional knowledge, PA, and dietary behavior of students attending public schools in rural, impoverished districts.

In this study, I evaluated school-based education programs by focusing on whether nutritional, physical, and dietary programs influenced students in a rural, impoverished district. The research questions and hypotheses were:

RQ1: Do school-based nutritional programs increase the nutritional knowledge of students in rural, impoverished communities?

$H_0$1: The school-based nutritional programs do not increase the nutritional knowledge of students in rural, impoverished communities.

H_A1: The school-based nutritional programs increase the nutritional knowledge of students in rural, impoverished communities.

RQ2: Do school-based physical education programs increase the physical education knowledge of students in rural, impoverished communities?

$H_0$2: The school-based physical education programs do not increase the physical education knowledge of students in rural, impoverished communities.

H_A2: The school-based physical education programs increase the physical education knowledge of students in rural, impoverished communities.

RQ3: Do dietary behavior programs increase healthy changes in the dietary behavior of students in rural, impoverished communities?

$H_0$3: The dietary behavior programs do not increase healthy changes in the dietary behavior of students in rural, impoverished communities.

H_A3: The dietary behavior programs increase healthy changes the dietary behavior of students in rural, impoverished communities.

RQ4: Do school-based physical education programs improve the physical activities of students in rural, impoverished communities?

$H_0$4: School-based physical education programs do not improve the physical activities of students in rural, impoverished communities.

H_A4: School-based physical education programs improve the physical activities of students in rural, impoverished communities.

Data Collection

In this study, I used a one-group, pretest-posttest design. I focused on school-based education programs in three schools that implemented the SBP and the NSLP (see

U.S. Department of Agriculture, 2015). In addition, the three schools also implemented education programs based on state goals and guidelines targeted towards increasing their students' knowledge about nutrition and diet and their engagement in physical activities. The participants were students in Grades 2-3, who were tested before the intervention and then were again approximately 6 weeks after the intervention. I expected that if there were significant differences between the pretest and posttest scores, those differences might be attributed to the intervention.

The research population was students who were enrolled in schools in West Virginia. To be included in this study, the school had to have at least 50% of their student population on the free meal programs; have implemented the education programs on nutrition, exercise, and diet based on state goals and guidelines; and be participating in the SBP and the NSLP.

Three schools agreed to participate in the study by providing me with their archival data. During the period between March 2017 and May 2017, the program was implemented and then the data were collected. The information collected were students' date of birth, gender, school, grade level, pretest and posttest of Learntobehealth.org program, daily breakfast and lunch checklist, and FITNESSGRAM measurements. The daily breakfast and lunch checklist asked the students about what they ate, including fruit, vegetables, grains, protein, and dairy. On the days that were assessed, all students had breakfast and lunch and were in attendance. FITNESSGRAM measurements included a checklist of first and last day of physical activities monitored.

Results

Descriptive Analysis

I collected complete information from 42 students ($N = 42$). The average student age in years was 8.7 ($SD = 0.8$) with a range from 7 to 11. The median age was 9 years old. More than half of the students were female ($N = 24$, 57.1%), while 42.9% were male ($N = 18$, 42.9%). Twenty-four students were second graders ($N = 24$, 57.1%), and the remaining were in third grade ($N = 18$, 42.9%). Other demographic data such as race and ethnicity were not provided.

Prior to conducting the statistical analysis procedures, I also tested the dataset to determine whether the assumption of normality required for the paired samples *t* test was met. The results of the normality testing are shown in Table 2. Based on the Kolmogorov-Smirnov values, only the data for the 90-degree pretest ($p = .082$), sit and reach pretest ($p = .087$), and sit and reach posttest ($p = .200$) did not significantly differ from a normal distribution. Based on the Shapiro-Wilk data, only the data for the sit and reach pretest ($p = .545$) and the sit and reach posttest ($p = .181$) did not significantly differ from a normal distribution. Based on these results, the nonparametric Wilcoxon signed-rank test was conducted for all other variables, while a paired samples *t* test was conducted for the sit and reach.

Table 2

Results of Normality Testing

	Kolmogorov-Smirnov[a]	Shapiro-Wilk

	Statistic	*df*	Sig.	Statistic	*df*	Sig.
MyPlate1	.387	41	.000	.683	41	.000
MyPlate2	.293	41	.000	.846	41	.000
Know1	.226	41	.000	.932	41	.017
Know2	.298	41	.000	.740	41	.000
PACER1	.270	41	.000	.862	41	.000
PACER2	.172	41	.004	.915	41	.005
Curlups1	.187	41	.001	.911	41	.004
Curlups2	.142	41	.036	.943	41	.041
TrunkLift1	.148	41	.025	.943	41	.040
TrunkLift2	.157	41	.012	.915	41	.005
Deg1	.163	41	.008	.919	41	.006
Deg2	.129	41	.082	.930	41	.015
SR1	.128	41	.087	.976	41	.545
SR2	.107	41	.200	.962	41	.181
SSR1	.278	41	.000	.783	41	.000
SSR2	.367	41	.000	.728	41	.000
SSL1	.292	41	.000	.769	41	.000
SSL2	.259	41	.000	.792	41	.000

[a] PhysAct1 and PhysAct2 are constant. These variables have been omitted.

Main Analysis

The intervention in this study was the school-based nutrition and physical education program. The participants were tested twice, before the intervention and then 6 weeks after the intervention. I conducted statistical procedures to determine whether the differences between the pretest and posttest scores were statistically significant.

Research Question 1. I formulated the first research question to determine whether school-based nutritional programs increased the nutritional knowledge of public school students in the selected community. The data from the testing instrument for the nutritional knowledge component were collected using the Learntobehealthy.org website. This online program was structured to teach children the importance of regular PA and

eating healthy. Table 3 summarizes the results of the nonparametric Wilcoxon signed-rank test conducted to determine whether the difference between the pretest and posttest results were statistically significant. As shown in Table 3, the mean scores of the participants increased from $M = 4.45$ in the pretest to $M = 7.36$ in the posttest. Based on the Z-statistic that resulted from the Wilcoxon-signed rank test, the difference between the two scores is statistically significant. ($Z = -5.484$, $p < .001$). Based on these results, the first null hypothesis was rejected.

Table 3

Results of Wilcoxon Signed-Rank Test - Nutrition Knowledge

Nutrition Knowledge	*N*	*M*	*SD*	Z	Sig.
Pretest	42	4.45	1.55	-5.484	.000
Posttest	42	7.36	1.06		

Research Question 2. I developed the second research question to determine whether school-based nutritional programs increased the physical education knowledge of public school students in the selected community. The data from the testing instrument for the physical education knowledge component was collected using the Learntobehealthy.org website. This online program was structured to teach the importance of regular PA and eating healthy. Table 5 summarizes the results of the nonparametric Wilcoxon signed-rank test that I conducted to determine whether the difference between the pretest and posttest results were statistically significant. As shown in Table 4, the mean scores of the participants increased from $M = .83$ in the pretest to $M = 1.69$ in the posttest. Based on the Z-statistic that resulted from the Wilcoxon-signed

rank test, the difference between the two scores was statistically significant ($Z = -4.267$, $p < .001$). Based on these results, the second null hypothesis was rejected.

Table 4

Results of Wilcoxon Signed-Rank Test – Physical Education Knowledge

Phys. Ed. Knowledge	*N*	*M*	*SD*	*Z*	Sig.
Pretest	42	.83	.76	-4.267	.000
Posttest	42	1.69	.56		

Research Question 3. I formulated the third research question to determine whether school-based dietary behavior programs increased the healthy changes in the dietary behavior of public school students in the selected community. The data from the testing instrument for the dietary behavior component was collected using the MyPlate Daily Checklist. The MyPlate Daily Checklist and Activity was used to collect the data self-reported by students to the teacher about what they ate. This was based on a 1,800-calorie pattern from the MyPlate Daily Checklist. Breakfast and lunch are counted on this daily checklist, which specifies five food groups, specifically fruits, vegetables, grains, protein, and dairy. Students were asked to respond "Yes" or "No" if they reached the goal for each food or not. Each "Yes" was given a score of 1, while each "No" was given a score of 0. The scores were summed up for a highest possible score of 5 for the daily checklist.

Table 5 summarizes the results of the nonparametric Wilcoxon signed-rank test conducted to determine whether the difference between the pretest and posttest results are statistically significant. As shown in Table 5, the mean scores of the participants increased from $M = .69$ in the pretest to $M = 1.64$ in the posttest. Based on the *Z*-statistic

that resulted from the Wilcoxon-signed rank test, the difference between the two scores is statistically significant. (Z = -4.793, p < .001). Based on these results, the third null hypothesis was rejected, and the third alternate hypothesis was accepted.

Table 5

Results of Wilcoxon Signed-Rank Test - Dietary Behavior

Dietary Behavior	*N*	*M*	*SD*	Z	Sig.
Pretest	42	.69	.52	-4.793	.000
Posttest	42	1.64	.78		

Research Question 4. The fourth research question was formulated to determine whether school-based physical education programs improved the physical activities of public school students in the selected community. The testing instrument for the dietary behavior component was based on the FITNESSGRAM program, which is a set of standards used to set individual goals for health and fitness based on age and gender appropriate standards. FITNESSGRAM is applied to evaluate students in terms of their aerobic capacity, body composition, muscular strength, and endurance and flexibility. In particular, data were collected on how many minutes it took the students to complete the PACER test, the number of curl-ups completed, the distance of their trunk lift, the number of 90 degree completed, how many centimeters they reached for the sit and reach exercise, and the shoulder stretch test for both sides. The collected data were compared using the Wilcoxon signed-rank test and the results are shown below in Table 6.

As shown below in Table 6, the mean scores of the participants for all the activities increased from the pretest to the posttest. Based on the *Z*-statistics that resulted

from the Wilcoxon-signed rank test, only the results for the Shoulder Stretch – Right did not exhibit a statistically significant increase from the pretest to the posttest (Z = -1.667, p = .096). However, for all the other exercises, the difference between the pretest and the posttest was statistically significant. Based on these results, the fourth null hypothesis is rejected, and the fourth alternate hypothesis was accepted.

Table 6

Results of Wilcoxon Signed-Rank Test – Physical Activities

FITNESSGRAM	*N*	*M*	*SD*	Z	Sig.
PACER					
Pretest	42	29.19	8.85	-4.538	.000
Posttest	42	33.41	8.44		
Curl-ups					
Pretest	42	20.50	7.06	-4.260	.000
Posttest	42	22.24	7.13		
Trunk Lift					
Pretest	42	10.69	2.31	-3.901	.000
Posttest	42	11.55	2.44		
90 Degree					
Pre-test	42	7.00	4.25	-4.809	.000
Posttest	42	8.38	4.49		
Shoulder Stretch – Right					
Pretest	42	.76	.66	-1.667	.096
Posttest	42	.88	.55		
Shoulder Stretch – Left					
Pretest	42	.64	.69	-2.121	.034
Posttest	42	.79	.68		

As indicated by the results of the normality test conducted for the study variables, the data for the sit and reach test met the assumption of normality required for parametric testing. Thus, for the sit and reach data, a paired samples t test was conducted to determine whether the implementation of a school-based physical education program

resulted in statistically significant improvements in the PA of the students in the sample. As shown below in Table 7, the mean scores of the participants increased from $M = 23.17$ in the pretest to $M = 24.68$ in the posttest. Based on the t statistic that resulted from the paired samples t test, the difference between the two scores is statistically significant. ($t(40) = -4.899$, $p = .006$). These results support the rejection of the fourth null hypothesis and the acceptance of the fourth alternative hypothesis.

Table 7

Results of Paired Samples t-Test – Sit and Reach (FITNESSGRAM)

Sit and Reach	*N*	*M*	*SD*	*t*	*df*	Sig.
Pretest	42	23.17	6.76	-4.899	40	.006
Posttest	42	24.68	6.66			

Summary

The main purpose of this study was to evaluate whether nutritional, physical, and dietary programs influenced students in a rural impoverished district. Based on the results of the Wilcoxon signed-rank tests conducted, it was determined that the school-based nutrition, physical education, and fitness programs implemented resulted in statistically significant changes in the scores for nutritional and physical education knowledge, dietary behavior, and the outcomes of FITNESSGRAM test, which evaluates students' aerobic capacity, body composition, and muscular strength, endurance and flexibility. The next chapter of this study will include sections on the interpretation of the study findings, limitation of the study, recommendations, implications, and conclusions of the study.

Chapter 5: Discussion, Conclusions, and Recommendations

Introduction

There has been little research on the ways school-based nutrition, diet, and physical education programs implemented in the school environment impact young children's knowledge and behavior, despite years of statistics showing overweightness and obesity reaching epidemic levels (Brissette et al., 2013; Carlson et al., 2014; Franks et al., 2015; Lounsbery et al., 2013; Mahmood et al., 2014; Slater et al., 2012). My review of existing literature indicated that schools can play a critical role in improving nutritional knowledge, increasing student PA, and strengthening student involvement in committing to healthier lifestyle choices (CDC, 2014), thus, it is necessary to examine the extent to which school-based physical education and nutritional policy implementations and programs positively impact students (CDC, 2014; Office of Child Nutrition, 2013). Research that casts a wider net and addresses implementation barriers, PA promotion, physical and nutrition education, and behavioral responses is needed to facilitate the creation of supportive environments in which students make healthy food choices, exercise regularly, and have opportunities to learn and practice these types of behaviors (Cañadas et al., 2014; Cawley et al., 2013; CDC, 2014: Gundersen et al., 2012; Standage et al., 2012).

The goal of this quantitative study was to compare the relative effectiveness of educational approaches designed to change the knowledge of nutrition and PA and improve the dietary behaviors and PA of students in a rural, impoverished district in West Virginia. The dependent variable was data regarding students' nutritional, physical, and

dietary knowledge and behaviors that were collected before and after exposure to school-based exercise and nutrition programs. The independent variables were the educational programs conducted regarding nutritional, physical, and dietary knowledge and behaviors.

Key Findings

I developed four research questions to help me determine the influence of nutritional and physical education programs on student nutritional and physical education knowledge, the impact of dietary behavior programs on dietary behavior, and the impact of physical education programs on student activity levels. In the 6x weeks between assessments, students underwent educational interventions that significantly increased their nutritional and physical education knowledge, their dietary behaviors, and significantly improved their PA in all but one of the tested areas.

Nutritional and Physical Education Programs Increase Knowledge

In this study, I assessed students' nutritional and physical education knowledge using the Learntobehealthy.org website, where they completed a test before and after working through 14 lessons focused on nutrition and fitness. The data collected in the study showed that the increase in student test scores after they participated in the lessons on nutrition was statistically significant. This supported the conclusion that nutritional and physical education programs can increase nutritional and physical education knowledge among young students in a rural, impoverished school district.

Dietary Behavior Programs Increase Healthy Dietary Behavior

The MyPlate Daily Checklist was completed regularly by students as part of school-based educational programs and recorded the types of food students consumed based on five food groups. Students also indicated whether or not they had met the targeted number of servings for each food group. The results of this study showed that after the educational intervention, student consumption of fruit decreased, while vegetable and protein consumption remained the same. The students met targets for more food groups, and therefore, this resulted in a statistically significant change in the students' overall score for the MyPlate Daily Checklist.

Physical Education Programs Increase Physical Activity

I measured student activity levels using FITNESSGRAM, a set of cardiovascular, muscular, and body composition standards that is used to set health and fitness goals for students based on their age and gender. The results indicated that the students showed statistically significant improvements in all but one of the physical fitness tests administered. The results partially supported the hypothesis that school-based physical educational programs improve the physical activities of students. Students' cardiovascular scores, muscular endurance, and strength improved; however, while the scores for the sit and reach testing flexibility significantly increased, only the scores for one of the two shoulder stretch tests showed a statistically significant increase.

Interpretation of the Findings

The increase in student physical and nutritional knowledge as well as the improvement in PA that I found in this study supported the findings of other extant

literature that suggested school-based education programs can be used to intervene and promote healthier dietary choices and PA (Standage et al., 2012). However, it should be noted that while the dietary behavior scores in this study resulted in a statistically significant increase between the pretest and the posttest, a visual examination of the data indicated that for the pretest, most of the respondents indicated that they met targets for zero to one food group. For the posttest, most of the respondents indicated that they met targets for one to two food groups, which would result in an almost 100% increase in the scores and could therefore account for the significant Z-statistic from the Wilcoxon signed-rank test. Most of the students indicated that they had some of the food but did not reach the targeted amount per food group, so the changes in the dietary behavior were at best, limited.

The limited impact on dietary behaviors could be partially explained by interpreting the results within the context of the HBM. The results from the study indicated that students who completed short nutrition and fitness educational programs experience an increase in their perceived susceptibility to being overweight or obese, as indicated by improved test scores in the postintervention assessment. The cohort's failure to make dietary behavioral improvements could have resulted from a failure to perceive the severity of health issues resulting from poor dietary choices, a failure to experience tangible benefits and rewards from making healthy food choices, and the perception or existence of barriers to choosing target foods (see Janz et al., 2002). While there may be few benefits apparent for an 8-year-old in choosing a serving of vegetables over a serving of chips or candy, improved performance on PA assessments completed in front of an

individual's peers could be more readily perceived, and this tenet of the HBM could illustrate why behavior changes were noted for PA but not necessarily for dietary choices. Nevertheless, the significant findings from statistical analysis, in juxtaposition with the changes observed through the visual examination of the data, might require further investigation on how dietary knowledge programs in schools can affect dietary behavior in second and third graders.

The other theoretical framework applied in this study, the SEM, provided me with a framework that could explain the impact that the microsystem of the school environment has on an individual child as well as the limited effect of school-based nutrition education on dietary behaviors. Data showing an increase in the student test scores indicated that school-based interventions did impact the knowledge of the children participating in the study. However, in accordance with SEM, the impact on dietary behaviors could have been mitigated by the influence of other mesosystems, such as family and social groups, which have been shown to influence dietary choices (see Gundersen et al., 2012; Hovland, et al., 2010; Mirtcheva et al., 2013). The MyPlate Checklist data showed that students tended to make the same progress towards meeting targets as their peers; for most of the food groups studied, around 90% of students made similar choices with respect to the amount of target foods consumed, which could indicate that the influence of social group system was stronger than the influence of the school system in the school meal setting in the study.

Nutritional and Physical Education Improvements

The result of improvements in student knowledge and activity levels after 6 weeks complemented the findings of a review of randomized control trials by Connelly et al. (2007), who examined interventions of a least 12 weeks in length and found that a nutritional education component combined with a PA intervention was effective in improving health conscious behaviors. However, a review of the literature by Brown and Summerbell (2009) indicated that results from school-based intervention studies are short term and inconsistent, and the current study was not intended to extend knowledge about the long-term prevention of behaviors contributing to obesity. Despite this, the increases in knowledge about nutrition and fitness demonstrated by the study participants were consistent with existing research in the field.

Consistent Dietary Behavior

The findings from this study about student dietary behaviors supported previous research findings that Americans consume inadequate portions from whole grains, fruits, and vegetables, with only a single student reporting to have met target goals in each food category both before and after the intervention (see Philips, 2014). Improvements in nutritional knowledge did not necessarily translate to better dietary behavior, which can suggest that the struggle to apply food information to their food choices in the United States is not limited to adults but can also be found with children as well (CDC, 2012). Powers et al. (2005) also found that second and third grade students made better choices at lunchtime after completing a social cognitive theory-based nutrition education program. The difference in results could be accounted for by the characteristics in the

sample, the instruction delivery method, the study design, or the assessment instrument. Whereas, in instruction delivery, Kandiah et al. (2002) studied fifth graders receiving face-to-face instruction and used a control group in their research design. Likewise, Alabama students in the Powers et al.'s (2005) study received face-to-face instruction and were assessed using a game specially designed to collect results, and competition introduced by the game may have influenced student behavior.

Physical Activity Changes

Since body composition results were not included in the data set for this study due to the age of the study participants and availability of data, the results did not confirm, disconfirm, or extend knowledge about the obesity epidemic. It is not clear if the sample is representative of the U.S. population, which has been found to have a 14% obesity rate among youths between the ages of 6 and 11 and would likely be higher among low-income children (CDC, 2013; Gundersen et al., 2012; Mirtcheva & Powell, 2013; Ogden et al., 2012; Shih et al., 2013). Without body composition data, it was also difficult to compare these findings to another review of studies that determined the effect of school-based PA interventions on body composition, although the results of both this study and that review showed school-based interventions did yield muscular health improvements. Significant improvements in some assessment areas, but not others, could be explained by measurement, procedural, or environmental factors, such as a physical education curriculum that focused on strength-building activities and required little flexibility training during the 6 weeks between assessments.

The Findings in Context

While the sample size of 42 for this study met the criteria for inclusion in a review by Connelly et al. (2007), which required a minimum sample size of 30 participants, the duration of the intervention in this study was half of the minimum 12 weeks required for inclusion in their review. A 12-week duration was also required for inclusion in a review by Brown and Summerbell (2009), who studied children between the ages of 5 and 18 and also incorporated variables like gender, age, setting, and process. Much of the existing research used a reduction in overweightness and obesity, including the review of the literature by Mahmood et al. (2014).

The study that was most similar to this study in population group and research design was conducted by Hovland et al. (2007), where the researchers examined third-graders in rural Appalachia and the impact of lessons from a governmentally-developed nutrition education program. While Hovland et al.'s study involved assessments 9 months apart, the results were similar to the findings of this study. Another study with a similar population of second and third-grade students in rural Alabama was conducted by Powers et al. (2005) who used a social cognitive theory-based nutrition program. This study was similar in duration, and like the findings from this study, Powers et al. found that dietary choices did significantly improve. However, the disparity I found between the results of the statistical analysis and the visual inspection should still be noted. One possible explanation for the difference in results is the assessment instrument. Whereas this study used an online test and food logs, Powers et al. used an assessment instrument called Pizza Please, which is an interactive game. It is possible that social interaction or

competition related to the game introduced additional perceived benefits for the students to make healthier choices, which may account for the differences between the studies (Powers et al., 2005).

Limitations of the Study

Because this study used data collected from preexisting groups, and there was not random assignment of participants into a control group and a treatment group, a quasi-experimental design was selected. However, a key limitation of the quasi-experimental design is inability to make conclusions regarding causality between variables (Creswell, 2010). Therefore, while the results of this study confirm that there is a relationship between the implemented programs and the nutritional knowledge and PA of students, the results cannot be used to attribute causality to the study variables.

Moreover, one limitation identified prior to the beginning of the study was the size of the sample. This study had a sample size of 42, which was well above the population of 34 required for 80% statistical power; in addition, the sample included students from three different schools. However, for even stronger power, this researcher had determined that a minimum sample size of 54 was necessary to achieve 95% statistical power. This limitation did not appear to have an impact on the study results, however. Collecting data from students at three different schools also addressed another limitation that arose during the study, related to the few data collection dates of the study. Since utilizing the test results from only the first and last days of the program subjects the data to special events or unusual occurrences or conditions at school on the day when

measurements were recorded, a sample using students from three different schools mitigated this limitation.

Aspects of the school environment that could have potentially introduced limitations outside of my control included the short duration of the educational program (particularly in terms of measuring PA) and the instrumentation, which was not designed specifically for use in a formal research setting. The MyPlate Checklist may have an especially confusing data collection tool for second- and third-grade students because it requires self-reporting students to calculate the number of "cups" of food groups consumed where one cup was sometimes defined as equal to one-half of a cup or two cups, depending on the food itself. The format of data collected does not allow me to verify a student's self-assessment of whether or not they met their target goals, and it is impossible to gauge if a student understood how to correctly calculate how many "cups" they had eaten. With only one student from the sample reporting the met consumption targets in most food categories, it seems possible that the assessment instrument could have contributed to underreporting and could have affected the results of the data analysis performed. This should be taken into account when conducting studies of a similar nature in the future.

Recommendation for Future Research

Future research on the effectiveness of different types of instruction could explain why this research contradicted results with respect to the impact of nutritional education on dietary behavior that was found by Kandiah and Jones (2002) and Power et al. (2005), whose data indicated that students made better dietary choices following nutrition

education intervention. The nutritional education program in this study was computer-based, whereas the educational programs in other studies were instructor-led, either by nutrition experts or by classroom instructors. Additional study comparing the impact of instructional methods would be helpful for schools who seek to implement instructional programs focusing on nutrition. Likewise, the limitations noted above with regard to the collection of data on dietary behaviors should also be taken into consideration when planning future studies on the subject. The simplification of the data collection for second and third graders might result in more accurate results regarding the impact of educational programs on dietary behavior.

Further research could expand the applicability of the results by focusing on additional geographic areas, age groups, or income levels. One of the strengths and weaknesses of this study was its focus on a homogeneous group of students, all approximately the same age, from a similar geographic area, and of a similar income status. This consistent sample will help school administrators serving similar populations make decisions about implementing similar short-term programs at the second-and third-grade levels in their own schools. However, because these results may not be generalizable to all children, further research with varied inclusion criteria could be useful in determining the universality of education tools.

Furthermore, additional research studying the impact of nutritional education on dietary choices is needed to better understand the factors that may impact each of these variables. Qualitative research could provide insight into the dynamics of children's food selection, including familial history and habits, social pressures, and their understanding

of and feelings about food. Further research would contribute to the development of more reliable and accurate assessment instruments, as well as clarify variables whose impact could be evaluated in both nutritional education program and student dietary behaviors.

Finally, it is important that future research focus on identifying and studying programs that are easily adaptable in terms of duration, budget, and logistics. School-based interventions can only be effective if schools are able to implement them, and it is important to focus future studies on programs with low barriers to adoption so that school districts can identify the programs and interventions that will work best for their student populations. Based on the results of this and other studies, a better understanding of how to influence student dietary behavior is the most pressing and least understood issue in terms of using school-based interventions to prevent obesity.

Implications of the Findings

Better understanding how school-based nutrition and physical education intervention programs impact student knowledge and behavior can help combat obesity, a problem that is disproportionately increasing for children in low-income and low-education households (Rogers et al., 2015). Risk factors for obesity within an individual's control, such as the lack of nutrition knowledge, the lack of appropriate dietary requirements, and the lack of vigorous PA, are factors that can be addressed through school-based programs, and this study showed that there are existing curricula and resources available that effectively mitigate these risk factors. The LearntobeHealthy curriculum evaluated in this research was associated with improvements in nutritional knowledge and PA which was integrated into the classroom at minimal cost and with

minimal effort from classroom teachers. School districts wishing to implement intervention programs should consider utilizing this program or similar programs.

Another implication of this research is the possible insufficiency of school-based health education alone as an intervention tool for changing student food choices. The lack of improvement in dietary behaviors in this research, despite educational intervention, supports existing research that has shown that eating behavior of children is learned by observing how adults model eating practices (Gundersen et al., 2012; Mirtcheva et al., 2013). The intervention examined in this research did not include a modeling component, which is one possible explanation for the apparent ineffectiveness of the dietary behavioral intervention component. These findings were in line with a similar study performed by Hovland et al. (2010), which demonstrated the importance of programs focusing on dietary behaviors for both individuals and families, and the findings of this study echoed evidence that these types of programs should be a mainstay of the classroom and continue through grade levels.

One question arising from the findings centers on the foods that students did choose. If students in this study did not select foods that allow them to meet conservative target goals for fruit, vegetable, protein, grain, and dairy consumption, which food groups did they include in their diets instead? If nutritional education alone does not promote healthier dietary behaviors, future program and policy interventions designed to reduce the number of overweight and obese students should add a program component that reduces or eliminates the availability of food outside of target food groups. Gundersen et al. (2012) found that students can consume nearly half of their daily calories while at

school, and the effectiveness offering healthier selections in cafeterias and vending machines has been shown in other research (Gundersen et al., 2013; Katz et al., 2011). The results from this study demonstrated that nutrition and fitness education on their own do not improve student dietary behavior, so school districts should consider combining nutrition education with other intervention tools and strategies, such as increasing healthy food options and reducing unhealthy food options. If food offerings in this student had been limited to the food groups on the MyPlate Checklist, it is likely the limited selection would have resulted in more students meeting their target goals, albeit making their behavior more compulsory than voluntary.

Similarly, the difference in impact of compulsory behavior changes versus voluntary behavioral changes on children's health and fitness has been observed in previous research and this study doesn't contradict those findings. Connelly et al. (2007) found that when they examined 28 trials, the 11 that were effective featured compulsory rather that voluntary PA. Which adopting healthy behaviors as a matter of personal choice might be preferable, until those mechanisms are better understood and can be effectively addressed with educational programming, the improved outcomes resulting from compulsory behavioral changes may warrant overhauling of the menu and selections available to students.

Applicability of Results

The results of this study should be of keen interest to a wide spectrum of individuals, from school districts that share the study sample population characteristics to families with children at risk of obesity, to taxpayers across the country whose funds are

used to address the medical and social costs of obesity. The results are especially relevant to school districts in West Virginia, who are using these programs based on state requirements and recommendations, but also to other rural school districts where 50% or more of their students receive free or reduced-cost breakfast and lunch. It is important for school district staff to be aware of their ability to influence student knowledge and PA and understand which tools and programs are most effective for achieving their goals.

However, the importance of these findings isn't limited solely to the schools considering the implementation of school-based nutrition and fitness education programs; obesity drains the wealth of our entire society, costing approximately a minimum of 3.38 billion dollars annually in 2008 (CDC, 2017). Taxpayers who bear the cost of obesity in children, which often leads to obesity in adults, should be interested in successful interventions that can be made at the early elementary school level. If early intervention is successful, it will reduce the incidence of high cholesterol, high blood pressure, cardiovascular disease, Type 2 diabetes, and cancer caused by obesity (Philips, 2014; Pulgarón, 2013).

Finally, other researchers will be able to utilize this research to fill in the gaps in data. This study will be especially helpful for researchers focusing on West Virginia, where most of the research on obesity in West Virginia has focused on preschoolers, fifth graders, and high school children. However, this study also contributes to the under-researched topic of school-based obesity prevention programs, particularly at the elementary level. This research shows that there is a potential for a significant

contribution to positive social change by studying these school-based programs that promote nutritional and PA.

Summary and Conclusions

This quantitative, quasi-experimental study used nutrition and fitness data collected from three rural and impoverished schools to combat the overweight and obesity epidemic through a better understanding of approaches to change the nutritional knowledge and PA level of students. Based on previous research and the HBM and SEM models that framed this study, it was expected that school-based nutrition and fitness programs would increase nutritional and fitness knowledge, improve dietary behaviors, and improve the physical activities of the student sample population. The findings supported all the hypotheses except for the position that dietary behavior programs would increase healthy changes in the dietary behavior of students. While it is possible that the survey instrument failed to capture data supporting the original hypothesis, the findings indicate that adopting dietary behavior programs might not yield the same results as compared to adopting physical education programs for communities who seek reducing behaviors that contribute to overweightness and obesity through school-based programs. In conclusion, while much is still not understood about influencing the dietary behaviors of students, this research demonstrates that school-based nutritional programs, physical education programs, and dietary education programs can improve nutritional knowledge and PA of public school students in rural, impoverished school districts.

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Appendix B: Archival Data Requested

Archival Data Request

FITNESSGRAM REQUEST- 2nd and 3rd Graders

School:	DOB:	Gender:	Grade Level:

Nutritional Knowledge of Learntobehealthy Program:

Tests	Scores:
Pretest	
Posttest	

FITNESSGRAM: Muscular Strength, Endurance, and Flexibility

Aerobic Capacity	Body Composition	Abdominal Strength and Endurance	Trunk Extensor Strength and Flexibility	Upper Body Strength and Endurance	Flexibility
The Pacer:	omitted	Curl-up: Number completed:	Trunk Lift: Number completed:	90º Push-up: Number completed:	Back-saver sit and reach: Number completed:
One-mile run: Time to complete:				Modified Pull-up: Number completed:	Shoulder stretch: Number completed:
				Flexed Arm Hang: Number completed:	

1. Is this student on grade level: Yes No
2. Is this student above grade level: Yes No
3. Is this student below grade level: Yes No

Appendix C: MyPlate Daily Checklist

USDA
United States Department of Agriculture

MyPlate Daily Checklist

Find your Healthy Eating Style

Everything you eat and drink matters. Find your healthy eating style that reflects your preferences, culture, traditions, and budget—and maintain it for a lifetime! The right mix can help you be healthier now and into the future. The key is choosing a variety of foods and beverages from each food group—*and making sure that each choice is limited in saturated fat, sodium, and added sugars*. Start with small changes—**"MyWins"**—to make healthier choices you can enjoy.

Food Group Amounts for 1,800 Calories a Day

Fruits	Vegetables	Grains	Protein	Dairy
1 1/2 cups	**2 1/2 cups**	**6 ounces**	**5 ounces**	**3 cups**
Focus on whole fruits	Vary your veggies	Make half your grains whole grains	Vary your protein routine	Move to low-fat or fat-free milk or yogurt
Focus on whole fruits that are fresh, frozen, canned, or dried.	Choose a variety of colorful fresh, frozen, and canned vegetables—make sure to include dark green, red, and orange choices.	Find whole-grain foods by reading the Nutrition Facts label and ingredients list.	Mix up your protein foods to include seafood, beans and peas, unsalted nuts and seeds, soy products, eggs, and lean meats and poultry.	Choose fat-free milk, yogurt, and soy beverages (soy milk) to cut back on your saturated fat.

Limit

Drink and eat less sodium, saturated fat, and added sugars. Limit:

- Sodium to **2,200 milligrams** a day.
- Saturated fat to **20 grams** a day.
- Added sugars to **45 grams** a day.

Be active your way: Children 6 to 17 years old should move at least **60 minutes** every day.

Use SuperTracker to create a personal plan based on your age, sex, height, weight, and physical activity level.

SuperTracker.usda.gov

MyPlate Daily Checklist

Write down the foods you ate today and track your daily MyPlate, MyWins!

Food group targets for a 1,800 calorie* pattern are:		Write your food choices for each food group	Did you reach your target?
Fruits	**1 1/2 cups** 1 cup of fruits counts as • 1 cup raw or cooked fruit; or • 1/2 cup dried fruit; or • 1 cup 100% fruit juice.		Y N
Vegetables	**2 1/2 cups** 1 cup vegetables counts as • 1 cup raw or cooked vegetables; or • 2 cups leafy salad greens; or • 1 cup 100% vegetable juice.		Y N
Grains	**6 ounce equivalents** 1 ounce of grains counts as • 1 slice bread; or • 1 ounce ready-to-eat cereal; or • 1/2 cup cooked rice, pasta, or cereal.		Y N
Protein	**5 ounce equivalents** 1 ounce of protein counts as • 1 ounce lean meat, poultry, or seafood; or • 1 egg; or • 1 Tbsp peanut butter; or • 1/4 cup cocked beans or peas; or • 1/2 ounce nuts or seeds.		Y N
Dairy	**3 cups** 1 cup of dairy counts as • 1 cup milk; or • 1 cup yogurt; or • 1 cup fortified soy beverage; or • 1 1/2 ounces natural cheese or 2 ounces processed cheese.		Y N

Limit

Limit:

- Sodium to **2,200 milligrams** a day.
- Saturated fat to **20 grams** a day.
- Added sugars to **45 grams** a day.

Y N

Activity

Be active your way:

- Children 6 to 17 years old should move at least **60 minutes** every day.

Y N

* This 1,800 calorie pattern is only an estimate of your needs. Monitor your body weight and adjust your calories if needed.

MyWins

Track your MyPlate, MyWins

Center for Nutrition Policy and Promotion
January 2016
USDA is an equal opportunity provider and employer.

Appendix D: Learntobehealthy Program

Learntobehealthy Program:

Fueling My Special Body eLearning Kit©	Pretest	K-3	
Fueling My Special Body eLearning Kit©	Digestion Journey	K-3	
Fueling My Special Body eLearning Kit©	Well-Fed Wolf	K-3	
Fueling My Special Body eLearning Kit©	Body Systems Detective	K-3	
Fueling My Special Body eLearning Kit©	MyPlate: Food and Fun	K-3	
Fueling My Special Body eLearning Kit©	Susie's Café	K-3	
Fueling My Special Body eLearning Kit©	Food As Fuel Lab	K-3	
Fueling My Special Body eLearning Kit©	Nutrient Superheroes	K-3	
Fueling My Special Body eLearning Kit©	Coach Says	K-3	
Fueling My Special Body eLearning Kit©	Track That	K-3	
Fueling My Special Body eLearning Kit©	Fueling Up	K-3	
Fueling My Special Body eLearning Kit©	Premium Animated Activity - Spin the Wheel	K-3	
Fueling My Special Body eLearning Kit©	Premium Interactive Video - Grades K-1	K-3	
Fueling My Special Body eLearning Kit©	Premium Interactive Video - Grades 2-3	K-3	
Fueling My Special Body eLearning Kit©	Posttest	K-3	

www.LearntobeHealthy.org is an online health education resource created by the Byrnes Health Education Center. The site is designed to help educators and parents communicate health concepts to students by engaging them in a medium they enjoy. LearntobeHealthy.org is a portal leading to four distinct sites for: parents/teachers/community organizations & families, kids in Grades K – 6, teens in Grades 7 – 12 and an eCommerce site where educational products are sold.

The **Educator site** includes innovative health education eLearning kits targeted for students in grades K - 12. Each kit, or suite of activities, provides an educator with a series of high quality educational activities and lesson plans. The lesson plans are exciting for students and are standards-based for all 50 states for Health/PE, Science, Technology, Library and Language Arts. The eLearning kits enable educators the flexibility to choose activities that are done in a large group, small group or pairs, independently or educator-led. Each kit employs a variety of media and educational modalities, such as downloadable PDFs, animation, vivid graphics and sound effects to make learning fun while meeting the diverse learning styles of all students.

The **Kid site** is an interactive environment where students in Grades K-6 can navigate the halls of the online *Susan Byrnes School*, stop by their locker where they can store information and search for health facts, and enter classrooms to play the dynamic, interactive health games.

The **Teen site** is high-tech and more mature than the kids' site for students in Grades 7-12, with a homepage featuring a combination of photos, video imagery, and sketchy illustrations. Interior pages include educational activity areas related to fitness and nutrition, mental health, bullying/cyber bullying, stress management and much more! Students have access to an individualized health log where students can express their view on health and track nutrition and fitness goals.

The site has received several awards since its launch in early 2006, including the Horizon Interactive Award in the Education/Training website category, "Educator's Best Bet" Award from *USA Today Education*, three "World Wide Web Health Awards" and an award from Dentsply for the site's dental health content. In addition, the site won the bronze medal for Health and Wellness for online video at the 32nd Annual Telly Award for 2011.

LearntobeHealthy.org currently covers six specific health topics:

- Nutrition & Fitness
- Mental Health (Bullying Prevention)
- The Five Senses
- Tobacco and Inhalants
- Adolescence
- Dental Health

LearntobeHealthy.org provides:

- Comprehensive lesson plans and supplemental materials on health topics for Grades K-12.
- Approximately 9 – 18 activities per topic
- Meet State and National Health and Technology Education Standards (for all 50 states)
- Group and self-directed activities
- Pre and post assessment tests
- Cross curricular activities meeting Science, Reading, Language Arts and Math Standards
- Individualized Health Log
- Documents available in Spanish

LearntobeHealthy.org was developed by:

- The Byrnes Health Education Center, in York, PA, a recognized leader in the development of innovative, high-quality health education programs for students of all ages.

LearntobeHealthy.org was made possible by:

- A grant from Highmark Healthy High 5, a children's health promotion initiative of the Highmark Foundation

LearntobeHealthy.org meets and incorporates:

- Health and Technology Standards (with many cross curricular activities)
- Madeline Hunter Theory of Effective Instruction

LearntobeHealthy.org adheres to the following national standards:

- Children's Online Privacy Protection Act
- Center for Media Education
- Children's Advertising Review Unit of the Better Business Bureau

Appendix E: Testing: Nutrition and Fitness Knowledge

Testing: Nutrition and Fitness Knowledge

Experience the importance of regular physical activity and eating healthy. The cross-curricular activities below follow educational standards and are sure to keep your students engaged. Detailed lesson plans make implementation a snap. Become a member to get started today!

Fueling My Special Body eLearning Kit©

Ready for lunch and recess? This kit contains 14 activities for students in grades K-3 that demonstrate the connection between the digestive system, nutrition and the benefits of regular physical activity. With the help of friends like the Amazing Herman, Simon, the Nutrient Superheroes, Red Riding Hood and the "Well-Fed Wolf", students will explore and discover the importance of eating healthy and getting regular exercise.

 **Activity 1** Pretest

This is an independent student activity testing students' knowledge of nutrition and physical activity. Students will maneuver through the screens to answer multiple-choice and true/false questions.

Delivery Method:

Instructor-led

Individual

Learning Objectives:

The students will be able to:

1. Complete the Pretest.

Educational Standards:

Click here to view how this activity aligns with your state's standards: www.learntobehealthy.org/parents-teachers/educational-materials/state-standards/

Activity 2 Digestion Journey

Get ready for a journey into the digestive system to investigate how food travels through our body, giving us the nutrients and energy our body needs. So what really happens to the slice of pizza once it is swallowed anyway? In this activity, Simon and Sarah engage students as they explore the digestion process in Simon's digestive system. Students will then put the pieces of the digestive system together in an online interactive activity.

Delivery Method:

Individual

Pairs

Learning Objectives:

Students will be able to:

1. State the importance of food as fuel for the body.

2. Identify organs of the digestive system and their function.

Educational Standards:

Click here to view how this activity aligns with your state's standards:

www.learntobehealthy.org/parents-teachers/educational-materials/state-standards/

Activity 3 Well-Fed Wolf

Are your students ready to help Red Riding Hood feed a well-balanced meal to the hungry Wolf? In this interactive activity, students will learn all about the five food groups and the importance of eating a variety of foods every day. Students will view six video segments featuring Red Riding Hood and the Well-Fed Wolf. They will then select foods from each of the food groups to help Red before preparing Wolf's meal.

Delivery Method:

Instructor-led

Learning Objectives:

Students will be able to:

1. Identify the five food groups on MyPlate.

2. Place foods and beverages in their correct food group on MyPlate.

Educational Standards:

Click here to view how this activity aligns with your state's standards:

www.learntobehealthy.org/parents-teachers/educational-materials/state-standards/

Activity 4 Body Systems Detective

Welcome to ***Body Systems Detective***! Students are lead by Hailey (Herman's sister) the amazing body systems detective in an investigation on how their body works with all five systems to keep us healthy and give us motion. The animated five-part activity focuses on the skeletal, muscular, circulatory, digestive and respiratory systems. Once they complete all five body systems, they continue onto a bonus round called ***Get FITT*** which focuses on the benefits of regular physical activity.

Delivery Method:

Individual

Large groups

Small groups

Lesson Objectives:

The students will be able to:

1. Identify and know the location of the circulatory, respiratory, skeletal, digestive and muscular systems.
2. Describe the benefits of regular physical activity.
3. List four types of physical activity.
4. Define the FITT principle.

Educational Standards:

Click here to view how this activity aligns with your state's standards: www.learntobehealthy.org/parents-teachers/educational-materials/state-standards/

Activity 5 MyPlate: Food and Fun

Why not a little food and fun to teach students about staying healthy? In this MyPlate activity, students will find out why it is important to eat a variety of foods from all of the food groups and get at least one hour of physical activity every day to stay healthy.

Delivery Method:

Small groups

Individual

Learning Objectives:

Students will be able to:

1. Identify and label the five food groups on MyPlate.
2. Draw foods from each of the five food groups.
3. List five examples of physical activity.

Educational Standards:

Click here to view how this activity aligns with your state's standards:

www.learntobehealthy.org/parents-teachers/educational-materials/state-standards/

Activity 6 Susie's Café

It's time for lunch! Are your students hungry? Let's find out what they would like to eat by heading to Susie's Café. In this interactive activity, students with hear about GO, SLOW and WHOA foods from Simon and Herman the Food Analyzer. Students are challenged to select the healthiest lunch choices from ***Susie's Café***. Once they make their lunch selections, Herman will use his analyzer skills and analyze their food/drink choice as a GO, SLOW or WHOA selection.

Delivery Method:

Individual

Pairs

Learning Objectives:

Students will be able to:

1. State the importance of eating a variety of healthy foods.

2. Define fat, sugar and calories.

3. Identify GO, SLOW and WHOA foods based on fat, sugar and calories.

Educational Standards:

Click here to view how this activity aligns with your state's standards:

www.learntobehealthy.org/parents-teachers/educational-materials/state-standards/

Activity 7 Food As Fuel Lab

Food is the fuel that makes our body go go go! Students will discover just that in this classroom experiment designed to demonstrate how food provides nutrients and energy that our body needs – similar to the way batteries supply power to a flashlight. When discussing nutrition as a source of energy, use this visual demonstration to explain the need to eat healthy foods on a daily basis.

Delivery Method:

Small groups

Learning Objectives:

Students will be able to:

1. State the importance of food as fuel for the body.

Educational Standards:

Click here to view how this activity aligns with your state's standards:

www.learntobehealthy.org/parents-teachers/educational-materials/state-standards/

Activity 8 Nutrient Superheroes

Welcome to Nutrient Control. In this animated activity, students will join Simon as he explores several exciting missions with the Nutrient Superheroes. Simon will guide the students in this exploration and introduce them to the Nutrient Superheroes as he reveals each of their super powers. Students will then identify the correct Nutrient Superhero needed to solve the nutrient mysteries.

Delivery Method:

Instructor-led

Learning Objectives:

Students will be able to:

1. Identify and state the role of six nutrients in the body.
2. Determine which nutrients play a role in the scenarios provided.
3. Verbalize sources of nutrients.

Educational Standards:

Click here to view how this activity aligns with your state's standards:

www.learntobehealthy.org/parents-teachers/educational-materials/state-standards/

Activity 9 Coach Says

Coach Craley is recruiting for his team and wants your students to join him in a game of ***Coach Says*** (his version of “Simon Says”). In this game, Coach will challenge students to get physically active indoors – but only if Coach Says so. Play for as long as you’d like, but remember the goal is for the students to get up and get active. And don’t forget to have fun doing it!

Delivery Method:

Instructor-led

Learning Objectives:

Students will be able to:

1. List benefits of regular physical activity, including how it keeps the body healthy.
2. Demonstrate ways to get active indoors through a game of Simon Says.
3. Recall ways to stay safe when exercising.

Educational Standards:

Click here to view how this activity aligns with your state’s standards:

www.learntobehealthy.org/parents-teachers/educational-materials/state-standards/

Activity 10 Track That

Are your students ready to get on track to a healthy lifestyle? In this interactive activity, students will keep track of their daily nutrition, physical activity and overall mood in their very own Health Log.

Delivery Method:

Individual

Learning Objectives:

Students will be able to:

1. Track their diet, exercise and overall mood.

2. Identify how many daily servings they should be getting from each of the food groups.

3. View their diet, exercise and mood results over a determined period of time.

Educational Standards:

Click here to view how this activity aligns with your state's standards:

www.learntobehealthy.org/parents-teachers/educational-materials/state-standards/

Activity 11 Fueling Up

Get ready to fuel up with some food, fitness and fun during this interactive board game called ***Fueling Up***. Students will take their favorite character around the game board to answer questions and keep their body moving with lots of activity.

Delivery Method:

Individual

Instructor-led

Learning Objectives:

Students will be able to:

1. Recall information related to nutrition, physical activity and the five food groups by playing the review game ***Fueling Up***.

Educational Standards:

Click here to view how this activity aligns with your state's standards:

www.learntobehealthy.org/parents-teachers/educational-materials/state-standards/

 **Activity 12** Premium Animated Activity - Spin the Wheel

In this interactive activity, Simon engages students to get up and to be active. Simon will have students hopping like frogs, pedaling as if they are in a bike race, running as if they are in a marathon and much more! Students will spin the wheel, land on a physical activity and get a brief explanation and demonstration of the exercise. Students will do the exercise they landed on while Simon times them. Join Simon and get ready to Spin the Wheel! To learn more about the benefits of exercise, check out the ***Fueling Your Special Body eLearning Kit©*** on Learntobehealthy.org.

Delivery Method:

Instructor-led

Small groups

Individual

Learning Objectives:

Students will be able to:

1. List benefits of regular physical activity, including how it keeps the body healthy.

2. Demonstrate five different physical activities.

Educational Standards:

Click here to view how this activity aligns with your state's standards:

www.learntobehealthy.org/parents-teachers/educational-materials/state-standards/

 **Activity 13** Premium Interactive Video - Grades K-1

Simon and our health educator Clarence will guide students as they learn about nutrition and keeping the body healthy at the Susan P. Byrnes Health Education Center! Using engaging activities and critical-thinking questions, this video along with the accompanying lesson plan will encourage Kindergarten and 1st graders to make healthy choices. To learn more about the benefits of making healthy food choices and keeping the body healthy, try our other activities in the ***Fueling My Special Body eLearning Kit©*** on LearntobeHealthy.org. (Video running time 12:29)

Delivery Method:

Instructor-led

Small groups

Learning Objectives:

Students will be able to:

1. State the function of heart, lungs and stomach.

2. Identify the importance of physical activity.

3. State the importance of eating healthy foods.

Educational Standards:

Click here to view how this activity aligns with your state's standards:

www.learntobehealthy.org/parents-teachers/educational-materials/state-standards/

Activity 14 Premium Interactive Video - Grades 2-3

Simon and our health educator Vicki will guide students as they learn about nutrition at the Susan P. Byrnes Health Education Center! Using engaging activities and critical-thinking questions, this video along with the accompanying lesson plan will encourage 2nd and 3rd graders to make healthy food choices. To learn more about nutrition and keeping the body healthy, try our other activities in the ***Fueling My Special Body eLearning Kit©*** on LearntobeHealthy.org. (Video running time 16:56)

Delivery Method:

Instructor-led

Small groups

Learning Objectives:

Students will be able to:

1. Recognize the function of the digestive system.
2. Identify nutrients found in foods.
3. Place foods in the correct food groups.
4. Explain the importance of eating a variety of healthy foods.

Educational Standards:

Click here to view how this activity aligns with your state's standards:

www.learntobehealthy.org/parents-teachers/educational-materials/state-standards/

Activity 15 Posttest

This is an independent student activity testing students' knowledge of nutrition and physical activity.

Students will maneuver through the screens to answer multiple-choice and true/false questions.

Delivery Method:

Instructor-led

Individual

Learning Objectives:

Students will be able to:

1. Complete the ***Posttest***.

Educational Standards:

Click here to view how this activity aligns with your state's standards:

www.learntobehealthy.org/parents-teachers/educational-materials/state-standards/

Appendix F: Permission Request for Learntobehealthy

Anne Bahn <abahn@byrneshec.org>
To:aarroodd2121@yahoo.com
Cc: Humera Proctor
Aug 6 at 5:08 PM

Hello Dora,

I am confirming that you have our permission to use archival data from March – June 2017 regarding Nutrition and Fitness health education curriculum accessed by students on www.LearntobeHealthy.org.

Good luck with your dissertation and please stay in touch with us.

Anne

Anne E. Bahn

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Educating and inspiring people of all ages to make healthy choices.

Appendix G: Permission Status for MyPlate Materials

The following statement was taking from the website:

The ChooseMyPlate.gov website includes a number of print materials which are available as downloadable PDFs. These materials are in the public domain and therefore **no permission** is needed to print, reproduce, or use them. For more information, read our MyPlate Graphics Standards.

Printable Materials
https://www.choosemyplate.gov/printable-materials