ACCESS VERSUS ATTITUDE: DETERMINING INFLUENCES ON FRUIT AND VEGETABLE INTAKE OF FIFTH GRADE STUDENTS

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DEDICATION

This dissertation is dedicated to my family and friends who were my supporters, motivators, and cheerleaders throughout this journey.

First and foremost, to my daughters, Kinsey and Kinlee. Thank you for not only supporting me and encouraging me, but for allowing me to take time away from you and your activities to pursue this degree. Thank you for always reminding me that I need to stay focused and finish this degree! You are the reason I have followed my dream of a PhD. I want you to know and believe that you can do ANYTHING you put your mind to. Learning is a lifelong process that offers opportunities that you may never have imagined being possible!

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ABSTRACT

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ACCESS VERSUS ATTITUDE: DETERMINING INFLUENCES ON FRUIT AND VEGETABLE INTAKE OF FIFTH GRADE STUDENTS

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Obesity rates are at the highest ever with 39.8% of American adults and 18.5% of Americans aged 6 to 19 years considered obese (Centers for Disease Control and Prevention [CDC], 2018a; CDC, 2018c; Hales, Carroll, Fryar, & Ogden, 2017). Obesity is a serious health concern that increases the risk for chronic disease as well as psychological issues (CDC, 2018c; Dauchet, Amouyel, Hercberg, & Dallongville, 2006; Litwin, 2014). Improved fruit and vegetable intake reduces risk for weight gain; however, many Americans fail to get the recommended daily intake (World Health Organization [WHO], 2014). Additionally, a person's positive attitude toward consumption, as well as access to healthy foods impacts eating habits and patterns.

This study examined the school-based intervention Grow into Health (GIH) and its attempt to improve fruit and vegetable (FV) intake. The study examined how attitude and perceptions of access to healthy foods may affect FV intake. Over 700 students participated in the intervention. This study utilized pre- and post-survey data to analyze the intervention, attitude, and perceptions of access as predictors of improved FV intake. Although, the program was designed to improve knowledge and behavior related to fruit and vegetable consumption, analysis of the data found no statistically significant impact that provides opportunity for future researchers to learn.

School-based interventions should include a comprehensive approach that should be long term and involve educational, environmental, and physical strategies (Brown et al., 2016). The strategies must include input from a comprehensive personnel team including classroom teachers, family members, and student support systems (Brown et al., 2016; Mahmood, Perveen, Dino, & Mehraj, 2014; Mei et al., 2016; Mukamana & Johri, 2016). The GIH intervention was restricted by internal and external limitations that contributed to the absence of statistical significance. Researchers should invest time in survey design and intervention planning to better understand content, evaluation, and data analysis to improve program efficiency and outcomes

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CHAPTER I

INTRODUCTION

The United States continues to face an obesity epidemic among youth and adults. It is currently estimated that obesity rates are at the highest ever with 39.8% of American adults and 18.5% of American children aged 6 to 19 years considered obese (Centers for Disease Control and Prevention [CDC], 2018a; CDC, 2018c; Hales, Carroll, Fryar, & Ogden, 2017). Not only does the obesity epidemic increase the risk of health conditions such as heart disease, high blood pressure, and stroke, it also increases health care costs for all Americans (CDC, 2018c). The estimated cost for obesity in the United States was $147 billion in 2008 (CDC, 2018c). When comparing youth affected by obesity rates in various socioeconomic communities, young people living in lower socioeconomic communities were at greater risk for obesity than young people living in higher socioeconomic conditions (CDC, 2018b). In fact, 18.9% of children and adolescents living in the lowest income group are considered obese as compared to 10.9% in the highest income group according to the CDC (2018b).

Although obesity may be a gateway for chronic disease such as heart disease, stroke, and diabetes, obesity may also result in psychological issues such as depression, anxiety, and social rejection (Dauchet, Amouyel, Hercberg, & Dallongville, 2006; Dye, Boyle, Champ, & Lawton, 2017; Litwin, 2014; Morrison, Shin, Tarnopolsky, & Taylor, 2015; Russell-Mayhew, McVey, Bardick, & Ireland, 2012). Obese children may also experience lower academic achievement, higher rates of school absenteeism, and diminished social support systems (Asirvatham, Thomsen, & Nayga, 2019; Florence, Asbridge, & Veugelers, 2008; Glewwe, Jacoby, & King, 2001; Wu, Chen, Yang, & Li, 2017).

For children, unhealthy weight status is determined using the Body Mass Index (BMI)-for-age percentile growth charts. Using these charts, obesity is defined by the CDC as "a BMI at or above the 9fifth percentile by age and sex; an overweight child has a BMI at or above the 8fifth percentile but less than the 9fifth percentile by age and sex" (CDC, 2018a, "Childhood Obesity Facts," para. 3; CDC, 2018b, "Prevalence of Childhood Obesity," para. 2). Although BMI charts help quantify obesity, the charts cannot determine the specific factors contributing to the obesity of a child.

Factors contributing to obesity vary across individuals and include environmental factors, individual health behaviors, medical conditions and medications, genetic factors, and sociodemographic factors. Children within a healthy weight range often practice certain dietary behaviors which include improved consumption rates of whole grains, low-fat dairy, lean protein, fruits, and vegetables (Radcliff, Kash, Ferdinance, & Schulze, 2015; Reed, Patterson, & Wassermon, 2011). Of these dietary behaviors, improving daily consumption of fruits and vegetables (FV) may be one of the most beneficial dietary behaviors to prevent obesity and chronic disease (Harvard School of Public Health [HSPH], n.d.).

Although increased FV intake may be beneficial, since 2009, there has been a decrease in overall consumption rates of FV by 7% for youth and adults (Produce for Better Health Foundation [PBH], 2015). These decreasing consumption rates include FV intake at home and away from home (PBH, 2015). Researchers estimate that 60% of children do not meet the recommended daily intake levels of 1-2 cups for fruits and 93% fail to eat the recommended 1-3 cups of vegetables (PBH, 2015). Improved FV intake reduces the risk for heart disease, stroke, certain types of cancer, and unhealthy weight gain (American Heart Association, 2015; HSPH, n.d.; World Health Organization [WHO], 2014).

One factor contributing to poor FV intake is limited access to healthy foods (Brehm & D'Alessio, 2014; Gustafson et al., 2012; Krolner et al., 2011; Mayer et al., 2014; Rose, 2010; Wieting, 2008). Limited access to healthy foods occurs as a result of family financial limitations and/or geographic location (Brehm & D'Alessio, 2014; Gustafson et al., 2012; Krolner et al., 2011; Mayer et al., 2014; Rose, 2010; Wieting, 2008). Family financial limitations inhibit consumption since healthy foods can be higher in price than convenience or fast foods (Brehm & D'Alessio, 2014; Krolner et al., 2011; Mayer et al., 2014). Low-income families have difficulty affording these foods; therefore, consumption of healthier foods is limited among all family members which increases the risk of chronic disease (Bella, Mora, Hagan, Rubin, & Karpyn, 2013).

Financial limitations may limit access to healthy foods, but often this limited access occurs due to the geographic area in which a person resides. Many people with limited access to healthy foods reside in areas considered food deserts. Food deserts are defined as geographical areas or regions where access to healthy food outlets such as a grocery stores or supermarkets is limited or non-existent (United States Department of Agriculture [USDA], 2017; USDA, n.d.). More specifically, the USDA defines a food desert as “limited access in a one-mile radius in urban areas and 10-mile radius in rural areas” (USDA, 2017, “Definitions,” para. 9). Few researchers have measured whether living in a food desert versus non-food desert area can impact behaviors such as intake of healthy foods such as fruits and vegetables.

A person’s attitude toward a behavior including food consumption behavior, may affect behavior. Specific attitudes for or against healthy eating behaviors are often due to lack of education regarding the beneficial effects of healthy foods, lack of family support for intake, and/or peer acceptance towards the behavior. Attitude can be related to specific constructs of the theory of planned behavior (TPB) including attitude toward behavior, subjective norms, and perceived behavioral control (PBC). Given that limited studies have been conducted comparing perceptions of access and attitudes towards fruits and vegetables in food desert and non-food desert locations, this study fills an important gap.

Statement of Purpose

The purpose of this study was to examine secondary data to determine the effects of perceptions of access to healthy foods and attitudes towards healthy foods on FV intake of fifth grade students participating in an eight-week school-based intervention. In addition, this study compared the relationship of FV intake between students who attended schools located in food deserts versus students attending schools in non-food deserts.

Research Questions

1. Is there a significant difference in FV intake from pre-test to post-test between fifth grade students enrolled in the eight-week school-based intervention?
2. Is there a significant difference in perceptions of access to healthy foods and FV intake rates between fifth grade students enrolled in the eight-week school-based intervention?
3. Is there a significant difference in FV intake rates between fifth grade students enrolled in the eight-week school-based intervention at a food desert versus non-food desert campus?
4. Is there a significant difference in perceptions of access to healthy foods and FV intake rates between fifth grade students enrolled in the eight-week school-based intervention at a food desert versus non-food desert campus?
5. Is there a significant difference in attitude towards healthy eating and FV intake rates between fifth grade students enrolled in the eight-week school-based intervention at a food desert versus non-food desert campus?

Null Hypotheses

The following null hypotheses were tested at the 0.01% level of significance:

1. There will be no significant change in FV intake from pre-test to post-test between fifth grade students enrolled in the eight-week school-based intervention.
2. There will be no significant relationship between perceptions of access of healthy foods and FV intake between fifth grade students enrolled in the eight-week school-based intervention.

3. There will be no significant change in FV intake rates between fifth grade students enrolled in the eight-week school-based intervention at a food desert versus non-food desert campus.
4. There will be no significant relationship between perceptions of access to healthy foods and FV intake between fifth grade students enrolled in eight-week school-based intervention at a food desert versus non-food desert campus.
5. There will be no significant relationship between attitudes toward healthy eating and FV intake between fifth grade students enrolled in the eight-week school-based intervention at a food desert versus non-food desert campus.

Delimitations

Delimitations for this study were as follows:

1. Participants were fifth grade students living within one of the following Texas counties: Bosque, Coryell, Hamilton, Hill, Falls, Limestone, and McLennan.
2. Participants were enrolled in the GIH program of Texas A&M AgriLife Extension Service conducted by health educators in Physical Education (PE) classrooms.
3. Participants attended schools where 50% or more of the student population was considered economically disadvantaged with locations mapped as food desert or non-food deserts.
4. Secondary data were used for analysis.

Limitations

The limitations for this study are as follows:

1. The time period for this study was October 2016 through May 2017.

2. The study only examined correlation between perceptions of access, attitude, and FV intake and not causal effects.
3. Survey data were self-reported by minors and subject to error and reporting bias.
4. The study lacked the use of fidelity monitoring to determine consistent implementation practices.
5. Implementation differences (regarding teaching styles and methodologies) used by educators implementing program may have occurred.

Assumptions

The assumptions for this study are as follows:

1. Participants were attending school in their properly assigned campus.
2. Participants provided honest responses to assessment instrument items.
3. Participants' primary language was English; therefore, participants could read and comprehend survey instrument instructions and questions.
4. Participants had similar socioeconomic statuses and attitudes towards healthy foods that allow results to be generalizable to other fifth grade students within Texas.

Definitions of Terms

1. **Access** – The ability for a person to gain access to healthy foods without barriers (The Food Trust [TFT], 2013).
2. **Attitude** – The mindset that healthy foods are acceptable or non-acceptable in regards to intake (TFT, 2013).

3. **Economically Disadvantaged** – According to the Texas Education Agency (TEA)Public Education Information Management System, 50% or more of student enrollment is considered economically disadvantaged (TEA, 2017).
4. **Food desert** – Geographical area where access to healthy food (including fruits and vegetables) is limited. Food deserts are defined by USDA as "one-mile radius in urban areas and ten-mile radius in rural areas" (USDA, 2017, "Definitions," para. 9).
5. **Grow into Health (GIH)** – An eight-week school-based nutrition and physical activity intervention developed by Texas A&M AgriLife Extension.

Importance of Study

This study compares FV intake between fifth grade students living within food deserts and fifth grade students living in non-food desert areas. FV intake has the potential to reduce the risk of chronic disease and obesity; therefore, understanding the influences of access and attitude on FV intake is critical (Fulton, Cardwell, McKinley, & Woodside, 2011; HSPH, n.d.; Slavin & Lloyd, 2012). Additionally, this study provides insight on school-based interventions, especially for health educators

CHAPTER II

LITERATURE REVIEW

The United States is one of the most developed countries in the world and produces a safe and abundant food supply, yet American children still suffer from chronic diseases linked to poor dietary habits (Office of Disease Prevention and Health Promotion, 2015; CDC, 2017a; USDA, 2018c). These chronic diseases which include heart disease, diabetes, chronic obstructive pulmonary disease (COPD), and cancer, are often linked directly to the obesity epidemic effecting the United States for decades. Thus, this literature review will provide a foundation for understanding the obesity epidemic, causes of obesity, and why future research is critical to determine the underlying factors of poor FV intake.

The Obesity Epidemic

Experts and researchers agree that the number of overweight and obese children is greater than ever before. The National Health and Nutrition Examination Survey (NHANES), which is the leading survey used for obesity data and trends, indicated that during 2015-2016 the United States reflected the highest rates of obesity ever (CDC, 2017a; Robert Wood Johnson Foundation [RWJ], n.d.a; Trust for America's Health [TAH], 2018). In 2018, 18.5% of children (13.7 million children or 1 in 5) and 39.8% of adults are considered obese (CDC, 2018a; CDC, 2018b; TAH, 2018). Moreover, CDC researchers indicated that obesity rates in the United States have tripled since the 1970s (CDC, 2017b; CDC, 2018a; CDC, 2018b; RWJ, n.d.a). The specific rate of obesity for children ages 2-5 is 13.9%, however, that rate increases to 18.9% for 6-11-year-olds, and 20.6% for 12 to 19-year olds (CDC, 2017a; CDC, 2018a; CDC, 2018b; RWJ, n.d.a).

NHANES researchers also indicated childhood obesity has similar trends to adult obesity when aggregated by race. Like adults, youth in certain groups are at greater risk for obesity (CDC, 2017a; CDC, 2018b). Data from the 2015-2016 NHANES report indicated differences in the prevalence of obesity among youth aged 2 to 19 years old by race (CDC, 2017a). As compared to non-Hispanic white youth (14.1%) and non-Hispanic Asian youth (11.0%), the obesity rates for non-Hispanic black youth was 22% and 25.8% among Hispanic youth (CDC, 2017a; TAH, 2017). NHANES researchers also indicated differences between male and female students. Non-Hispanic black females had the highest rates (25.1%), followed by Hispanic females at 13.5% as compared to 13.5% in non-Hispanic white females and 10.1% in non-Hispanic Asian females (CDC, 2017a). The variances in prevalence rates among race and gender indicate that certain areas of the United States may have greater risk of obesity (CDC, 2017b). This increased obesity risk is associated with higher rates of chronic disease and higher health care costs in these areas (Biener, Cawley, & Meyerhoefer, 2017; TAH, 2018).

Causes of Obesity

Researchers have identified common factors that increase a person's obesity risk. Genetics is often identified as a risk factor of obesity (CDC, 2018a; Sahoo et al., 2015). Studies investigating the relationship between BMI and genetics have suggested that BMI is 25-40% inherited (CDC, 2018a; Nemours Foundation, 2018; RWJ, n.d.a; Sahoo et al., 2015). In contrast, other researchers have shown that genetic factors account for less than

5% of childhood obesity cases (CDC, 2018a; Nemours Foundation, 2018; Sahoo et al., 2015). With these findings, researchers have shifted their focus to lifestyle choices as culprits of obesity.

Nutrition and Physical Activity

Poor nutrition and physical inactivity are the most common lifestyle behavior causes of obesity (Mayo Clinic, 2015; National Heart, Lung, and Blood Institute, 2018). During recent decades, food intake has shifted away from foods high in vitamins, minerals, and nutrients to foods that are energy dense (CDC, 2014; WHO, n.d.). Energy dense foods are high in fat and sugars and provide little nutritional or no nutritional value (WHO, n.d.; Mayo Clinic, 2015; Mayo Clinic, n.d.; Sahoo et al., 2015; CDC, 2018a; Nemours Foundation, 2018). In addition, an increase in sugary beverage consumption and fast food meals have contributed to the obesity epidemic (CDC, 2018a; Mayo Clinic, n.d.; Nemours Foundation, 2018; Sahoo et al., 2015; WHO, n.d.). For people living in lower socioeconomic areas, access to healthy foods may be limited so they instead choose what is convenient and less expensive which may be high fat, high sodium fast food options (Mayo Clinic, n.d.). Habitual family eating behaviors or cultural norms may contribute to consumption of high fat, high sugar, and high sodium foods; if families have historically not eaten healthy foods due to culture, economic, or just habitual factors, it may be difficult for future generations to change eating patterns (Mayo Clinic, n.d.; Sahoo et al., 2015).

In addition to the widespread shift in food choices, decreased physical activity is also an obesity risk factor for youth (CDC, 2018a; Mayo Clinic, n.d.; Nemours

Foundation, 2018; Sahoo et al., 2015; WHO, n.d.). Campbell (2016) indicated that environmental factors, including family and physical environment factors, have a direct influence on a child's nutritional intake behaviors and activity behaviors. Moreover, these environmental factors are also be associated with increased stress, which has been correlated with obesity (Campbell, 2016).

Technology, automation, and use of motorized vehicles for transportation contributes to an increasingly sedentary lifestyle for Americans (Brehm & D'Alessio, 2014; Campbell, 2016). Although some youth fail to participate in daily physical activity due to lack of safe walking and/or play areas use of technology may exert the greatest impact on decreased physical activity (CDC, 2018a; Mayo Clinic, n.d.; Sahoo et al., 2015). Many children also fail to achieve their recommended 60 minutes per day of aerobic activity as well as recommended muscle and bone strengthening activities throughout the week (United States Department of Health and Human Services, 2018).

Screen-Time and Obesity

Longitudinal studies have identified a relationship between the number of hours per day a child spends on a screen and the prevalence of obesity (Robinson et al., 2017). Furthermore, other researchers indicate that children spend an average of 5.5 hours per day on a screen of some type including television, computer, phone, or other electronic devices (Kenney & Gortmaker, 2017; Wieting, 2008). The 2016 recommendations of the American Academy of Pediatrics (AAP) suggest that children ages 2-5 spend no more than one hour per day on any form of screen; however, over half of children who are age three have access to an electronic device such as a tablet (AAP, 2016; Kenney &

Gortmaker, 2017). For adolescents, AAP encourages parents to set a personalized limit but notes that studies have shown that adolescents who watch more than five hours of television a day have a five times greater risk of obesity as compared to adolescents who limit television to two or fewer hours (AAP, 2016; Moreno, Chassiakos, & Cross, 2016).

Research indicates that higher consumption of FV is associated with decrease likelihood of overweight or obesity; however, increased screen time results in decreased FV intake (Robinson et al., 2017). Instead, children who spend more time on a screen consume fewer healthy foods and more unhealthy foods (Kenney & Gortmaker, 2017; Robinson et al., 2017; Sahoo et al., 2015). Sahoo et al. (2015) determined that the number of hours a child spent on a screen, specifically television, was directly correlated with an increased intake of junk food; for each additional hour of television watched per day there was a 2% higher prevalence rate of obesity. Another research team estimated that one-third of a child's daily energy intake occurs in front of some type of screen; this is mainly due to "mindless" eating that may occur when a child is engrossed in what is occurring on the screen and unconscious of the amount of food being consumed (Moren et al., 2016; Robinson et al., 2017). Caloric intake may not be the only concern of increased screen time; adverse sleep behaviors may also occur. Increased screen time has been indicative of fewer hours of sleep and/or less restful sleep for adolescents (Kenney & Gortmaker, 2017). In a review of studies, Robinson et al. (2017) suggested a positive relationship between screen time and adverse sleep habits. Furthermore, Robinson et al. (2017) also suggested that adolescents using a screen in excess of five hours per day have an 80% greater odd of poor sleep behaviors as compared to youth who use a screen less than five hours per day.

Social and Emotional Health

Social and emotional health can have a profound effect on childhood obesity as well (Campbell, 2016; Sahoo et al., 2015). Although the question remains if obesity precedes psychosocial issues or vice versa, psychosocial issues are elevated when youth are obese (Mayo Clinic, n.d.; Nemours Foundation, n.d.; Rankin et al., 2016; Sahoo et al., 2015). Common psychosocial issues often seen with obese youth include depression, poor self-esteem, and loneliness (Campbell, 2016; Mayo Clinic, n.d.; Nemours Foundation, 2018; Rankin et al., 2016; Sahoo et al., 2015). Stress factors such as parental, personal, or family stress may also result in unhealthy lifestyle behaviors such as poor eating habits and lack of physical activity due to depression, poor self-esteem or lack of motivation from these factors to improve one's self (Mayo Clinic, n.d.; Sahoo et al., 2015).

Children who are considered overweight or obese are often subject to bullying and teasing from others (AAP, 2017; Sahoo et al., 2015). Researchers have found persistent stressors such as bullying, teasing, and name calling influence psychosocial complications (AAP, 2017; Bacchini et al., 2015). These complications may include a greater tendency to overeat and/or retreat to environment with limited physical activity (Sahoo et al., 2015). When bullied and teased, researchers also suggest that overweight youth may suffer decreased academic achievement, increased school tardy and absenteeism rates, decreased cognitive performance and decreased social engagement as compared to normal weight peers (Rankin et al., 2016; TAH, 2017). These issues, especially low self-esteem, may be caused from increased dissatisfaction with one's body shape and size; not only is self-esteem affected, but self-worth and self-competence as well (Rankin et al., 2016). The depressive state resulting from bullying may manifest itself in anger, aggression, defiance, and reverse bullying in which the obese child becomes the bully instead of being bullied (Kalra, Sousa, Sonavane, & Shah, 2012; Mayo Clinic, n.d.; Nemours Foundation, 2018; Rankin et al., 2016; Sahoo et al., 2015). All of these physical, environmental, and social factors contribute directly to the burden of obesity and the development of chronic diseases comorbid with obesity. Physicians are addressing chronic health issues with adolescent and teen patients more than ever before, and these adolescent and teen patients do not understand what a chronic disease is or the long-term effects of chronic disease (Dauchet et al., 2006; Litwin, 2014).

Defining Chronic Disease

A disease which last more than one year has been traditionally defined as a chronic disease; however, some researchers have shortened that timeframe to more than three months for diseases which have more devastating effects on a person's health (Anderson & Horvath, 2004; National Health Council [NHC], 2014). Chronic diseases include heart disease, cancer, diabetes, asthma, COPD, and obesity (Bernell & Howard, 2016; NHC, 2014). For many Americans, the term is misunderstood or remains undefined; however, a chronic disease, either diagnosed or not, may be affecting them personally or people within their family structure to an extent that decreased life expectancy or decreased quality of life may occur.

Researchers estimate that 133 million Americans are affected by at least one chronic disease; it is further estimated that over 40 million Americans are burdened with more than one chronic disease (NHC, 2014). Some experts estimate 157 million Americans will be diagnosed with at least one chronic disease and 81 million Americans will be affected by multiple chronic diseases by the year 2020 and beyond (NHC, 2014). In 2014, seven of 10 deaths were due to chronic disease with heart disease and cancer accounting for over 46% of these deaths (CDC, 2017b). One in five teens has high cholesterol, which increases the risk for cardiovascular heart disease (CHD), stroke, cancer, diabetes, arthritis, asthma, sleep apnea, and psychological disorders, all of which are classified as comorbid with obesity (WHO, n.d.). Other complications include development of metabolic syndrome, which is defined as a collection of chronic diseases and conditions such as high blood pressure, high blood sugar, lower HDL cholesterol levels, and excess abdominal fat (Mayo Clinic, n.d.).

Chronic diseases may often be prevented or better managed with lifestyle choices and behaviors such as improved nutrition (Fulton et al., 2011; Slavin & Lloyd, 2012). Specifically, improved FV intake may be directly related to reduction of chronic disease risks and improved management (Fulton et al., 2011; Slavin & Lloyd, 2012; Wieting, 2008). Unfortunately, an estimated 90% of American youth have poor diets, which include limited FV intake thus putting them at greater risks for developing chronic disease at a younger age (TAH, 2017). It is important that positive lifestyle choices, and behaviors related to healthy eating, and physical activity be adopted at an early age to reduce risk of obesity and chronic disease.

Many researchers suggest improving nutrition and increasing physical activity to decrease obesity and chronic disease risk (Rose, 2010; Sahoo et al., 2015; Wedick et al., 2015). More specifically, improving fruit and vegetable consumption has been shown to potentially have the most beneficial effects on reducing obesity and chronic disease risk (Fulton et al., 2011; HSPH, n.d.; Sahoo et al., 2015; USDA, 2019). Improved fruit and vegetable consumption help decrease BMI especially when paired with an overall improved diet and increased physical activity (Fulton et al., 2011; HSPH, n.d.).

Impact of Healthy Foods

In 2019, the WHO, estimated that 3.9 million deaths throughout the world resulted from inadequate FV intake. Furthermore, the WHO (2014) examined the specific risks associated with limited FV intake and found that inadequate FV intake results in increased risk for heart disease, stroke, cancer, and unhealthy weight gain, among other risks. Although organizations such as the WHO recognize, report, and promote the health benefits of higher rates of FV intake, Americans still do not achieve the recommended daily intake rates. Fewer than 33% of adults and 20% of children achieve the national recommendation of daily FV intake according to a study by Dave, Evans, Condrasky, and Williams (2012).

Should Americans improve their FV intake rates, a direct impact on health can be observed (Bhupathiraju et al., 2013). Not only could an individual's health improve, but their overall diet and quality of life would improve as well (Dairy Council of California, n.d.; Fulton et al., 2011; Slavin & Lloyd, 2012; USDA, 2016; WHO, 2014). Reducing risks for chronic disease and/or managing chronic disease via nutrition reduces visits to healthcare professionals, thus reducing healthcare costs. Various experts, agencies, and researchers have found specific benefits of increasing the number of fruits and vegetables eaten daily (WHO, 2019). These include improved heart health, reduced risk for certain cancers, lower blood glucose levels, and reduced risk for weight gain (American Heart Association, 2015; Fulton et al., 2011; HSPH, n.d.; USDA, 2016). Fruits and vegetables promote health benefits and reduced risk of chronic disease because fruits and vegetables contain little or no fat, have few calories, are low in sodium, and are cholesterol free (Dairy Council of California, n.d.; USDA, 2016). Additionally, fruits and vegetables provide important vitamins and minerals such as potassium, fiber, folate, and vitamins including A and C which further reduce the risk for chronic disease (USDA, 2016).

Multiple researchers have reported higher levels of FV intake increases daily dietary fiber, which may lower blood pressure and control cholesterol, thus decreasing the risk of atherosclerosis (WHO, 2014; HSPH, n.d.; USDA, 2016; Slavin & Lloyd, 2012). Furthermore, improved intake of fruits and vegetables high in potassium such as bananas, sweet potatoes, and cantaloupe may not only lower blood pressure, but also improve bone density as a person ages (Dairy Council of California, n.d.; WHO, 2014). In addition, improved intake of non-starchy vegetables and green leafy vegetables have also been demonstrated to promote higher fiber intake resulting in insulin regulation and a promotion of satiety to decrease caloric intake (HSPH, n.d.; USDA, 2016; WHO, 2014).

Improved fruit and vegetable intake may not only affect a person's physical health but could be beneficial in improving student academic performance within young people

(Florence et al., 2008). Although there are limited studies related to diet and academic performance, Florence et al. (2008) study examined the diet quality and academic performance of over 5,000 fifth graders in Canada. The research team concluded that healthy eating habits adopted in childhood are likely to continue to adulthood. In addition, children who have high levels of FV intake and moderate fat intake have fewer absences and greater academic success compared with children with poor dietary intake (Dye et al., 2017; Florence et al., 2008). Furthermore, children with improved FV intake performed better on standardized testing used to rate the association of FV intake and academics (Florence et al., 2008).

Impact of Limited Access to Healthy Foods on Overall Health

A healthy diet consists of not only fruits and vegetables, but low-fat, lean protein, and whole grain foods as well. Although these recommendations are promoted via the USDA MyPlate and Dietary Recommendations; many Americans simply cannot practice these recommendations for various reasons, including limited access to healthy foods. Environment directly impacts food choices and food intake behaviors (Prevention Institute, 2009).

Food insecurity.

Food insecurity is defined as “a lack of consistent access to enough food for an active, healthy lifestyle” (Feeding America, n.d.a.; Feeding Texas, n.d.b.; Healthy People 2020, n.d.; Office of Disease Prevention and Health Promotion, n.d.; USDA, 2018a). This limited access may be a result of financial burdens or limited geographical access to food retail sites (TFT, 2010; Texas Health and Human Services [THHS], 2010; USDA, 2018b). In 2017, approximately 40 million Americans were considered food insecure; of these, more than 12 million were children (Feeding America, n.d.a.). Texas is rated among the top states in terms of food insecurity in the United States (Food Research and Action Center [FRAC], 2017; USDA, 2018b). It is estimated that one-fourth of Texas children live in food insecure homes, resulting in hungry children throughout the state (THHS, 2010). The excess number of hungry children is consequential because of the physical, psychological, and academic developmental delays that may occur as a result of under- or malnourishment (THHS, 2010).

Access.

Researchers have shown that people living in limited access areas often suffer from higher obesity rates and higher BMI than people living in high access areas where healthy foods can be easily accessed (FRAC, n.d.; Larson, Story & Nelson, 2009; ODPAC, n.d.; Prevention Institute, 2009; Rundle et al., 2009; White House Task Force on Childhood Obesity, 2010). Limited access most often occurs due to geographical proximity to healthy foods, transportation limitations, and socioeconomic limitations of a neighborhood and affects people living in both urban and rural settings (Vargas, Stines, & Granado, 2017; Gustat, O'Malley, Luckett, & Johnson, 2015).

For many Americans, the zip code in which they reside is classified as a food desert area. Across the United States, approximately 23 to 25 million people live in urban areas where a large supermarket is more than one mile away; more than seven million of the people affected by limited access are children (American Heart Association, 2014; RWJ, n.d.b.; WHTF, 2010). In comparison, 2.3 million people living in rural areas live more than 10 miles from a fully stocked supermarket or grocery store (WHTF, 2010). In both instances, just under half of people residing in these food deserts are at or below 200% of the poverty level while almost one million of these people do not have a car which further complicates access to FV and other healthy foods (WHTF, 2010).

Food deserts are defined by not only the miles from a supermarket or major food retailer, but also the types of food retailers available in the area. Food deserts are often limited to convenience stores or small retail food stores that carry foods lower in nutritional value than foods in large supermarkets (ODPHP, n.d.).These convenience and small food stores are also limited on fresh produce, low-fat foods, and whole grain products that have proven beneficial to a healthy diet and often charge higher prices for healthier foods (Gustafson et al., 2012; Rose, 2010; THHS, 2010). Researchers indicate higher FV intake occurs in areas with lower FV prices and higher fast food prices; additionally, teens living in these areas have lower BMI and obesity rates (Bella et al., 2013).

In the United States, approximately 75% of groceries are purchased in large supermarkets; however, a current trend is to centralize supermarkets, which means closing many supermarket locations located in low-income areas (THHS, 2010). Data from 2012-13 further supports this finding as the average distance from a person's home to a supermarket in an urban area was shown to be more than 2.19 miles (ODPHP, n.d.). Researchers have correlated the decreasing numbers of grocery stores with decreased consumption of fruits and vegetables (Prevention Institute, 2009). Specific studies conducted within African American communities demonstrated that African Americans living in neighborhoods supported by a supermarket were more likely to consume the recommend amounts of fruits and vegetables than African Americans living in a food desert; a 32% increase in produce consumption was shown for each additional supermarket within the neighborhood (CDC, 2018d; Larson et al., 2009; TFT, 2010; THHS, 2010). In comparison, people who lacked access to FV not only consumed less of these healthy foods but were more likely to be overweight (WHTF, 2010). The same conclusion was found in a study conducted within metropolitan Massachusetts where residents with a supermarket in their zip code were 11% less likely to suffer from overweight and obesity than residents without a supermarket in their zip code (Bodor, Rice, Farley, Swalm, & Rose, 2010). Bodor, Rice, Farley, Swalm, and Rose (2010) also found decreased risk of obesity when a supermarket was present. Vargas, Stines and Granado (2017) suggested that a natural and built environment that limits access to healthy foods and physical activity resources increases the risk of childhood obesity.

Although many researchers and practitioners posit that people with lower socioeconomic status are unable to fulfill the daily recommended intake due to lack of FV access, some researchers have found the opposite. Ghosh-Dastidar et al. (2014) found that distance to a supermarket might not be the determining factor of healthy food purchases. Ghosh-Dastidar et al. (2014) revealed study participants would travel further distances to purchase food at lower-priced supermarkets instead of purchasing food at the higher priced supermarkets in their own neighborhood. These findings indicate that access and availability may not be the only two variables influencing increased or decreased FV intake.

Impact of Attitude on Healthy Food Intake

Although access may be a primary barrier to FV intake, attitude, and social norms regarding FV intake may also affect dietary choices. Dietary researchers documented positive attitudes towards eating FV increases the likelihood of and actual measured FV intake (FRAC, n.d.; Rundle et al., 2009; WHTF, 2010). Pearson, Russell, Campbell, and Barker (2005) found that when examining for relationship between access, affordability, income, and FV intake, none of these factors were statistically significantly associated with rates of FV intake. The same study found that attitudes and intentions had the most significant effect on FV intake (Pearson et al., 2005). Among a sample of adolescents, the constructs of attitude, subjective norms, and perceived behavioral control accounted for a 55% variance in FV intake among 9th graders (Pawlak & Malinauskas, 2008). Specifically, attitude towards a behavior is often directly or indirectly explanatory for predicted and actual behaviors (Pawlak & Malinauskas, 2008; Pearson, Russell, Campbell & Barker, 2005).

Within a meta-analysis, Riebl et al. (2015) identified that attitude can become the strongest predictor of behavioral intention as observed in 13 of the studies reviewed. Intention was identified as a common predictor of behavior and could positively impact health outcomes when included in FV intake interventions (Riebl et al., 2015). In another example, a focus group study of 13-15-year olds was used to determine if teens identified food choices with a socially desirable image and/or used food choices to judge others (Stead et al., 2011). Within the study, participants indicated that bringing healthy foods to school was socially unacceptable; the participants would laugh at kids who had a banana or yogurt for lunch (Stead et al., 2011). Stead, McDermott, Mackintosh, and Adamson (2011) concluded that attitudes and behaviors are influenced by peers; furthermore, emotional and social risks are related to food choice among teens.

Pelletier, Graham, and Laska (2014) found in a survey of 1,000 college students that young adults were more likely to consume fast-food and sugar sweetened beverages if the young adults perceived their friends and family doing so. In contrast, increased FV intake was higher only when the sample of college students perceived their friends, not family consuming these healthy foods (Pelletier, Graham, & Laska, 2014). Krolner et al. (2011) identified similar results in a systematic review of qualitative studies to determine influences of children's FV intake. Analysis showed food as symbolic for social image among young people and peer influences were not perceived as supporting FV intake, but instead found a strong presence of peer pressure towards eating unhealthy foods such as sweets, sugary beverages, and fast-food (Krolner et al., 2011). Five of the studies reviewed within the systematic literature review identified a direct influence of peers among FV intake behavior as children reported negative comments regarding their lunchbox choices or consumption of FV from the cafeteria line (Krolner et al., 2011).

Although similar results regarding peer influence and social norms have influenced FV intake, Pedersen, Gronhoj, and Thogersen (2015) indicated different results in their study involving both youth and their parents. Over 700 adolescent-parent paired groups were given questionnaires to measure dietary behaviors, self-efficacy, and consumption outcomes related to FV intake. This study confirmed that parents, not friends, were the main influencers of healthy eating over young people (Pedersen, Gronhog, & Thogersen, 2015). Dave, Evans, Condrasky, and Williams (2012) found children whose parents encouraged FV intake and kept FV accessible in the home had a higher FV intake as compared to other children. Furthermore, a parent's ability to provide social support, such as encouraging a child to try new foods and purchasing new types of foods, was associated with increased intake. Within the same study, the research team found that parents who modeled healthy FV intake practices had a greater impact on their children's FV intake than parents who did not. These practices may also attribute to healthier weights and decreased risk of obesity and chronic disease among the parents as well (Dave, Evans, Condrasky, & Williams, 2012).

To further support the need for parental influence on FV intake, researchers Evans, Christian, Cleghorn, Greenwood, and Cade (2012) examined parental attitudes and behaviors as a potential impact. Their study of 2,389 students and parents measured the participants' attitudes and behaviors through a randomized control study that included a questionnaire and 24-hour food intake journal. In order to validate the food intake journal, breakfast and lunch intake was guided by a trained field worker to leave only one meal self-reported via the parent. This practice is essential as youth often underestimate their own FV intake and may overestimate that of others (Di Noia & Cullen, 2015). Lally, Bartle, and Wardle (2011) reinforced this underestimation finding as their study saw a 22% variance reported in fruit and vegetable consumption; this variance was a result of descriptive norms among teens. Teens participating in the survey ate more FV if they perceived their peers doing so; however, more of them ate less FV because their perceptions were that their peers had a negative attitude and consumption regarding FV

(Lally, Bartle, & Wardle, 2011). In another study, it was found that children who ate more meals at home consumed 130g more FV than children that did not; furthermore, a parent's behavior regarding precutting the child's FV saw consumption improve by one-half of a FV portion more than children whose parents did not (Evans et al., 2012). Parents who make consumption easier by pre-cutting FV have a direct impact on their child's healthy eating patterns (Evans et al., 2012). Zarnowiecki, Parletta, and Dollman (2014) in their social-ecological study of 525 youth and parents, identified predictors of FV intake; although self-efficacy for healthy eating and attitudes towards fruits and vegetables were among the predictors, supportive family environment explained most of the variances observed in the study.

Since researchers seem to be conflicted regarding the key influencers of healthy eating patterns and behaviors, more studies are necessary to gain a greater, more comprehensive understanding of what or who influences healthy eating behaviors among children and adolescents. More research is also necessary to determine if social norms and/or attitudes are exclusive in determining FV intake patterns or if other factors such as access are contributors.

Theory of Planned Behavior

The theory of planned behavior (TPB) is designed to predict and/or explain an individual's intention to change behavior (Boston University, 2013). TPB evolved from theory of reasoned action (TRA), which suggests that a person's actions or behaviors are dependent upon his/her intent to change behavior (Boston University School of Public Health [Boston University], 2013). TPB differs from TRA as the theory attempts to explain all behaviors over which a person can exert self-control using the construct of perceived behavioral control (PBC). Behavioral intent is based on the model's premise that attitude regarding the behavior will determine if change occurs (Boston University, 2013).

TPB is comprised of six constructs that may help explain individual behavior changes or intent to change behavior based on their actual control over the behavior, as well as attitude towards the behavior (Ajzen, 1985; Ajzen, 1991; Boston University, 2013; Montano & Kasprzyk, 2015; Fila & Smith, 2006). The six constructs of TPB include:

- Attitude: Attitude determines the effects of the other constructs in that it can directly affect whether a behavior change is sustained or changed and is the intrinsic motivator for doing so (Ajzen, 1985; Emanuel, McCully, Gallagher, & Updegraff, 2012; Montano & Kasprzyk, 2015).
- Behavioral Intention: This refers to factors that will influence a behavior change to more likely occur; the stronger the motivational factors are, the more likely a new behavior will be performed. (Ajzen, 1985; Montano & Kasprzyk, 2015):
- Subjective Norm: Individuals often value and respect the opinion of others, especially that of peers or important others; allowing this opinion to determine if behavior change occurs (Ajzen, 1985; Emanuel et al., 2012; Montano & Kasprzyk, 2015).
- Social norms: Social norms refer to standard and acceptable conduct among a group of people or culture (Ajzen, 1985; Montano & Kasprzyk, 2015).

- Perceived power: Perceived presence of factors that will either facilitate or hamper behavior change often occurs. Perceived power is a person's perceived control over such factors. (Ajzen, 1985; Fila & Smith, 2006; Montano & Kasprzyk, 2015).
- Perceived Behavioral Control: A person must believe that they have control over their behavior. If a person believes no barriers or negative impact exists with a behavior change, they can not only change behavior but also sustain it as well (Ajzen, 1985; Ajzen, 1991; Montano & Kasprzyk, 2015).

TPB has shown to be effective when determining factors affecting FV intake. Specifically, the TPB constructs of subjective norm, PBC, and attitude have been studied to determine positive and negative effects of FV intake rates. Fila and Smith (2006) found that subjective norm was indicative of eating habits of Native American males who were less likely to consume greater amounts of FV because they did not perceive their peers as approving of the behavior (Fila & Smith, 2006). Blanchard et al. (2009) also found subjective norm to be indicative of poor FV intake in teens. These studies provide a basis for investigation of how peers and others influence dietary behaviors. PBC is another TPB construct that can influence FV intake. A person must believe he/she is in control of his/her behavior (Montano & Kasprzyk, 2015). Studies have shown that PBC can impact sustained FV intake, which provides support including this construct within health interventions (Blanchard et al., 2009; Staunton, Louis, Smith, Terry, & McDonald, 2014).

Of all TPB constructs, attitude may have the greatest impact on FV intake. TPB posits that positive attitude toward a behavior enables a person to change behavior (Emmanuel et al., 2012; Montano & Kasprzyk, 2015). When evaluating for FV intake with a youth gardening intervention, Lautenschlager and Smith (2007) found attitude to be a stronger predictor than PBC or subjective norm for not only FV intake but increased physical activity as well. Similarly, in a meta-analysis of 13 studies, Riebl et al. (2015) found that attitude could become the strongest predictor of FV intake and healthy eating behavior intention. Determining if TPB constructs are most applicable to study FV intake may enable researchers to better design health interventions and research studies related to improving FV intake among young people.

Although TPB may have been successful in certain studies, there are limitations to TPB that restrict its utility in health education research. As an individual level theory, TPB assumes the individual has access to all resources to be successful in behavior change (Ajzen, 1985; Boston University, 2013). Furthermore, the TPB creator omitted environment, economic, or other factors, which may influence behavior or a person's intention to change a specific health behavior (Ajzen, 1985; Boston University, 2013). Additionally, TPB does not address the time frame between a person's intention to change a health behavior and the actual time a person changes (and sustains) the health behavior (Ajzen, 1985; Boston University, 2013).

Social Cognitive Theory

The social learning theory (SLT), created by Albert Bandura (1986), argued that behaviors of children are shaped by environmental factors, including peers and family.

Furthermore, Bandura suggested that a person's behavior both influences and is influenced by social environment and personal factors. This two-way influence is known as reciprocal determinism, which serves as the central concept of SLT and its successor the social cognitive theory (SCT). Key elements of behavior included in SCT include (Bandura, 1986; Boston University, 2013):

1. Reciprocal Determinism – The central premise of SCT, reciprocal determinism refers to the influence of environment on a person and vice versa.
2. Behavioral Capability - A person's ability to perform a behavior based on learned knowledge and skills.
3. Observational Learning - Refers to a person's ability to visually witness and observe a behavior, establishing the belief that they can also perform the behavior.
4. Reinforcements – Responses to a person's behavior, internal or external, that encourage continuation or discontinuance of a behavior.
5. Outcome Expectations – Anticipated consequences of a person's behavior either positive of negative.
6. Self-Efficacy – "A person's confidence in his or her ability to successfully perform a behavior." (Boston University, 2013, "The social cognitive theory," para. 3) Self-efficacy was added when SCT evolved from SLT. Within this theoretical framework, a person's self-efficacy is influenced by personal abilities, environmental factors, and social factors.

Baxter (1998) suggested that childhood eating patterns are shaped from the reinforcements and incentives that occur from their family and larger environment, especially during routine mealtime experiences. Furthermore, exposure to nutritious foods on a continual basis can create healthier eating patterns within children. Parents must be conscious that rewarding behaviors with sugary foods such as candy may reinforce negative perceptions towards healthy foods (Baxter, 1998). A more recent study by Knol et al., (2016) similarly suggested that healthy eating must be a multifactorial approach including parents, peers, and school environments since SLT suggests an individual's behavior is shaped by the ability to regulate behavior and shape environment around them. Three domains shape healthy eating habits (Knol et al., 2016):

- *Political and economic environments* including socioeconomic status of the family, food security status, and participation in subsidy programs.
- *Sociocultural environments* of the family include parent/guardian structure, stress, parenting styles, parental ability related to food preparation, and parental role modeling of healthy eating.
- *Built and natural environments* include access to and availability of healthy foods in the home, which may reinforce healthy eating as they are readily available and replace unhealthy options such as high fat, high sugar foods (Bodor, Rice, Farley, Swalm, & Rose, 2010).

These environments reinforce Bandura's reciprocal determinism construct and may suggest why some studies fail to find the reasoning behind behavior change, or lack of, related to improved FV intake (Bandura, 1986).

CHAPTER III

METHODOLOGY

For this study, a quasi-experimental design was utilized to encompass both convenience and random sampling techniques (Behi & Nolan, 1996). School districts were categorized by the primary researcher as either food desert or non-food desert using the USDA food desert mapping system. Within the geographic region where the GIH intervention was conducted, nine school campuses were randomly selected from eight school districts. All available data from October 1, 2016 to May 31, 2017 for selected school districts was collected and utilized for analysis that allowed for sufficient results to be measured (Jack et al., 2010).

Intervention

The GIH intervention was implemented in the fifth-grade PE classroom setting on the middle school campus in the following independent school districts located in Central Texas: Waco, Clifton, Groesbeck, Gatesville, Copperas Cove, Marlin, LaVega, and Connally. The intervention consisted of eight weeks of content related to healthy eating and physical activity. Each week, health educators from Texas A&M AgriLife Extension delivered the educational lessons within a 45 minute to one-hour timeframe. These educators held a minimum of a bachelor's degree in health, education, or related field. The educational sessions included nutrition, health, and physical activity messages and activities from the GIH curriculum guide. The curriculum guide included lesson plans focused on healthy eating and physical activity. These lessons were: Smart Fitness, Make My Plate, Get in the Zone, Label Lingo, Fit versus Fat, H2O…the Way to Go, Make Half Your Plate Fruits and Vegetables; The Balancing Act.

The weekly lessons aligned with the TEA required Texas Essential Knowledge and Skills (TEKS) for fifth grade PE classrooms. Additional components included in the weekly lesson plan included student learning and outcome objectives, materials needed list, background information for the educator, and lesson outlines. To reinforce lesson content, a review and reflect activity was included in classroom activity. Furthermore, a take home sheet and family fact sheet were sent home to encourage students to share content with family members.

GIH is designed to create an awareness of the benefit of healthy eating and improved physical activity while addressing the needs of the PE teachers regarding state curriculum mandates. The overarching goal of the intervention is to increase knowledge and change behaviors related to healthy eating and physical activity. GIH is modeled after other Texas A&M AgriLife Extension Service programs, some of which are delivered in the school.

Population and Sample

The population included fifth grade students enrolled in Central Texas school districts that participated in the GIH school-based intervention implemented in the PE class setting. The GIH school-based intervention was conducted by Texas A&M AgriLife Extension Service in school districts within seven counties: Bosque, Coryell, Falls, Hamilton, Hill, Limestone, and McLennan. Within these counties, 17 school districts qualified and received the intervention; nine of the districts were randomly selected for inclusion in the primary study. Five of the selected school districts were identified by the USDA food desert mapping system as being located in a food desert with the remaining four not located in a food desert.

To qualify for participation in the intervention, campuses within school districts were required to have 50% or more of their student population defined as economically disadvantaged according to Public Education Information Management System (PEIMS) reports published by the TEA. Total participation from October 1, 2016 to May 31, 2017 consisted of 1,983 students with 1,421 parental consents given for participation in program activities and surveys. From the school districts chosen for this study, 1,466 students participated with 938 parental consents provided. Data from 725 students enrolled in the randomly selected sites for this study were analyzed for this study. School districts and the campuses within school districts selected for this study, school student data, and geographic location status are shown in Table 1.

Table 1

School Information

District	Campus	Participants	Food Desert
Clifton	Clifton Middle School	61	No
Connally	Connally Middle School	107	Yes
Copperas Cove	Hattie Halstead Elementary	26	Yes
Gatesville	Gatesville Intermediate	162	No
Groesbeck	Groesbeck Middle School	136	No
LaVega	LaVega Middle School	84	Yes
Marlin	Marlin Middle School	36	Yes
Waco	Kendrick Elementary	62	Yes
Waco	Mountain View Elementary	51	No

Protection of Human Participants

Parental consent forms, in both English and Spanish language, were distributed by homeroom teachers to students for parental completion at least two weeks prior to the implementation of the intervention. Consent forms were returned to the homeroom teacher and then forwarded to Texas A&M AgriLife Extension Assistants to determine eligible participation based on parental consent. Teachers were notified of eligible students so only those students would be allowed to participate in the intervention. Students who were not eligible to participate in the intervention were offered alternative activities in the school library or another classroom. To facilitate confidentiality, students were asked to use their student identification numbers issued by the school on pre- and post-survey instruments as their unique identifier.

Approval of all study related processes, procedures, and materials was granted from the Texas A&M University and Texas Woman's University Institutional Review Boards. Furthermore, permission to use the data was granted by the Deputy Vice Chancellor of Texas A&M AgriLife system.

Data Collection Procedures

Secondary data were obtained and analyzed from the GIH pre- and post-intervention surveys. GIH was a school-based intervention targeting fifth grade students in Central Texas school districts. The intervention focused on nutrition, physical activity, and general health lessons to improve overall health practices including improved FV intake. Health educators from Texas A&M AgriLife Extension Service delivered the weekly program within PE classrooms. Once participants completed survey instruments, data were submitted to Texas A&M AgriLife Extension's Organizational Development Unit. This Unit is where the dataset for this study was obtained. The primary researcher obtained a comma-separated values (CSV) spreadsheet with coded responses from the Organizational Development Unit for use in study analysis.

The primary data collection processes consisted of parental consent forms secured for each student's pre-test and post-test evaluation participation. Once parental consent was obtained, health educators administered a pre-intervention assessment to obtain baseline data related to healthy eating practices, attitudes towards healthy eating, and perceptions of access to healthy foods. After the eight-week intervention, a post-intervention assessment was administered using the same assessment instrument. In the 2016-2017 school year, 1,983 students participated in the intervention with 1,421 having parental consent (a return rate of 72%); therefore, an appropriate sample size was established.

A priori power analysis was conducted using G*Power 3.1.7 to determine the minimum sample size required to find significance with a desired level of power set at .80, an alpha (α) level at .05, and a moderate effect size of .10 (f) (Erdfelder, Faul & Buchner, 1996; Faul, Erdfelder, Lang, & Buchner, 2007). Based on the power analysis, the present author determined that a minimum of 151 participants were required to ensure adequate power for the group x time repeated measures ANOVA. However, with utilization of all available data for the 2016-2107 school year, the sample size would be a minimum of 600 participants to ensure more than adequate power for the group x time repeated measures ANOVA. A final sample size of 725 was used for this study.

Instrumentation.

Secondary data were analyzed using the pre- and post-intervention survey data from the GIH intervention. Validity of the assessment was measured using content validity approach; Texas A&M AgriLife Extension educators reviewed intervention lessons and assessment tools to measure if concepts taught were consistent with the assessment tools. The 14-question assessment measured physical activity, FV intake, perceptions of access to FV, and attitudes of student, family, and friends regarding healthy eating. Demographic data including gender, school location, and ethnicity were collected on the pre-intervention instrument. The unique identification number assigned to each student allowed for paired data of pre- and post-intervention surveys.

Variables.

Dependent Variable.

The dependent variable (DV) for this study was FV intake. The dependent variable of FV intake was measured pre- and post-intervention. The DV was measured with two items, one item measuring fruit intake and one item measuring vegetable intake. In the two items, the student indicated the amount of times fruit or vegetables were consumed the previous day (see Table 2). Response options for both items were "0, 1-2, 3-4, 5-6, 7 or more times."

Independent Variables.

The independent variables for this study included gender, ethnicity, school location, attitude of the student, family, and peers, and Perceptions of access to FV (see Table 2). Gender and ethnicity were measured at pre-intervention only since student data were paired. Gender was measured with one item with response options including “male” and “female.” Ethnicity was also measured with one item with response options including “black,” “white,” “Hispanic,” or “multi-racial.”

School locations (food desert or non-food desert) were determined by the primary researcher using the USDA food desert zip code system. Zip codes included for selected schools included 76634 (Clifton), 76705 (Connally), 76522 (Hattie Halstead), 76528 (Gatesville) 76642 (Groesbeck), 76705 (LaVega), 76661 (Marlin), 76711 (Kendrick), 76710 (Mountain View).

Attitudes of student, family, and peers towards FV intake were included in the pre- and post-intervention instruments. Student attitudes were measured with two items including (1) “Eating healthy foods is…” and (2) “I think eating fruits and vegetables is…”. Students’ perceptions of their family’s attitudes were measured with one item, “My family thinks eating fruits and vegetables is…” and students’ perceptions of their friends’ attitudes were measured with one similar item, “My friends think eating fruits and vegetables is…” Response options for all items measuring student, family, and friends attitude towards FV intake included “very unimportant,” “fairly unimportant,” “neither unimportant nor important,” “fairly important,” and “very important.”

Perceptions of access to healthy foods were measured with five items that measured perceived access at home, school, neighborhood, and overall perception of access. Response options were “very difficult,” “fairly difficult,” “neither difficult nor easy,” “fairly easy,” and “very easy.”

Table 2

Overview of Survey Questions and Responses

Variable	Survey questions	Response options
Gender	What is your gender?	Male Female
Ethnicity	What is your ethnicity?	Black White Hispanic Multi-racial
FV intake	Yesterday, how many times did you eat fruit? Yesterday, how many times did you eat vegetables?	0 1-2 3-4 5-6 7 or more times
Student attitude towards eating FV	Eating healthy food is… I think eating fruits and vegetables is…	Very unimportant Fairly unimportant Neither unimportant nor important Fairly important Very important
Family attitude towards eating FV	My family thinks eating fruits and vegetables is…	Very unimportant Fairly unimportant Neither unimportant nor important Fairly important Very important
Peer attitude towards eating FV	My friends think eating fruits and vegetables is…	Very unimportant Fairly unimportant Neither unimportant nor important Fairly important Very important
Perceptions of access	How easy is it for you to find fruits and vegetables at your house? How easy is it for you to find fruits and vegetables at your school? How easy is it for you to find fruits and vegetables in your neighborhood?	Very difficult Fairly difficult Neither difficult nor easy Fairly easy Very easy

Data Analysis.

SPSS statistical software was used to test the research hypotheses and questions. Data analyses included descriptive and inferential statistics; descriptive statistics were used to identify basic study data such as FV intake and gender while inferential statistical analyses examined conclusions associated with access and attitude to generalize findings (Jack et al., 2010; Hoe & Hoare, 2012). Repeated measures ANOVA was conducted to measure effect of the intervention on FV intake change; additionally, a linear regression was used to measure relationship of the dependent variable (FV intake) to the independent variables of access to healthy foods, attitudes toward FV intake, gender, ethnicity, and school location.

Summary

A quasi-experimental approach was used to collect data for this study of fifth grade students enrolled in the GIH school-based intervention. This eight-week intervention focused on healthy eating and physical activity was conducted by health educators employed by Texas A&M AgriLife Extension. Specifically, the present author examined the impact of the attitude constructs of TPB and perceptions of access to healthy foods on FV intake. The sample size of 723 students was representative and appropriate for the study. Finally, the chosen analyses of repeated measures ANOVA and linear regression insured proper analysis to answer the research questions and test the hypotheses.

CHAPTER IV

RESULTS

This chapter presents results and data interpretation related to each research question for this study. Data analysis was conducted for overall program participants and then examined for differences in FV intake related to each research question.

Difference in FV Intake as a Result of the Intervention for Entire Sample: GIH was an eight-week school-based intervention in which health educators delivered lessons related to nutrition and physical activity. Lessons focused on healthy eating and increased physical activity to reduce the risk for chronic disease. Data analysis identified whether the intervention impacted students' FV intake rates. Specifically, the data analysis determined if FV intake rates increased as a result of the intervention.

Difference in Perceptions of Access to Healthy Foods and FV Intake: Fifth grade students may have perceptions of access to healthy foods that may influence FV intake. Actual access may vary from perceived access. Therefore, analyses examined students' perceptions of FV access for their home, school, and neighborhood.

Difference in FV Intake as a Result of the Intervention Based on Geographic Location: The GIH intervention was implemented in school districts identified as either food desert or non-food desert location using the USDA zip code mapping system. Data analyses identified the differences in FV intakes as a result of the intervention in campuses located in food deserts compared to campuses in non-food deserts.

Difference in Perceptions of Access to Healthy Foods and FV Intake: Researchers have shown that perceptions of access to healthy food may determine intake rates. Moreover, if healthy foods are readily accessible, consumers are more apt to prepare and consume these foods. Furthermore, within specific geographic areas such as food deserts and non-food deserts areas, consumption patterns differ. The data analysis for this study examined the fifth grade students' self-reported data related to perceptions of FV access within their home, their school, and their neighborhood to determine if perceptions of access were predictive of improved FV intake.

Difference in Attitude Towards Healthy Foods and FV Intake: The data analysis examined if differences in attitudes towards healthy foods affects FV intake. This included the examination of fifth grade students' personal attitudes as well as the attitude of students' friends and family.

Description of the Sample

This secondary dataset of 724 students who were enrolled in the GIH intervention; however, only 723 completed surveys; resulting in a response rate of 99.86%. All students were in fifth grade; therefore, age frequency and percentage were not collected nor tabulated for the study. Most participants identified as female (51.9%) and either white (31.8%) or multi-racial (31.9%). Most participants resided in a non-food desert zip code (56.5%) with most students attending school in McLennan County or Coryell County, Texas (67.9%). Demographic characteristics of students are shown in Table 3.

Table 3

Demographic Characteristics of Study Participants

Variable	*n*	%
Gender		
Male	347	47.9
Female	376	51.9
Missing	1	.1
Ethnicity		
Multiracial	231	31.9
Black	94	13.0
White	230	31.8
Hispanic	167	23.1
Missing	2	.3
Geographical Location		
Non-food Desert	410	56.5
Food Desert	314	43.4
County		
Bosque	61	8.4
Coryell	188	26.0
Falls	36	5.0
Limestone	136	18.8
McLennan	303	41.9

Note. Frequencies not summing to n = 723 and percentages not summing to 100 reflect missing data.

Data Analysis for Research Question One

Intervention changes: fruit and vegetable intake pre-intervention versus post-intervention for total study population.

A repeated measure ANOVA was used to measure changes in daily fruit and vegetable intake from pre-intervention to post-intervention. The main effect for time which examined fruit intake changes from pre-intervention to post-intervention, was not statistically significant, $F(1, 701)= 5.98$, $p = .015$ ($\eta^2 = .008$). This finding indicated there was not an increase of fruit consumption observed from pre-test to post-test across participants. Similarly, the model examining vegetable intake changes from pre to post intervention indicated non-statistically significant differences from pre to post intervention, $F(1, 701)= 3.05$, $p = .081$ ($\eta^2 = .004$).

Data Analysis for Research Question Two

Perceptions of access to healthy foods and FV intake: total study population.

A paired t-test was utilized to determine access at pre-intervention and post-intervention to determine if student perceptions of access to healthy foods impacted FV intake. This test was utilized for the entire study population. Significant change from pre- to post-test was observed perceptions of access increased (t (704) = 3.62, $p < .01$, Cohen's d = .14); however, effect size was small [(d = 704); see Table 4].

Table 4

Paired t-test Analysis - Perceptions of access to FV

Outcome	*M*	*SD*	*n*	95% CI for Mean Difference	*t*	df	*p*
Access pre score-Access post score	*-.117*	*.860*	*705*	*-.181, -.054*	*-3.62*	*704*	*.000*

Data Analysis for Research Question Three

Intervention changes: FV intake pre-intervention versus post-intervention for geographic location.

A 2(time) x 2(school type) repeated measures ANOVA was used to measured differences in both fruit and vegetable intake between the pre- and post-test for schools located in food deserts and schools located in non-food deserts. When examining differences between school type (food desert versus non-food desert), food desert schools did not statistically significantly differ from non-food desert schools regarding fruit intake from pre-test to post-test, [$p = .015$ ($\eta^2 = .001$); see Figure 1]. When examining between school type for vegetable intake, results were again found to be non-statistically significant [p = .490 (η^2 = .001); see Figure 2].

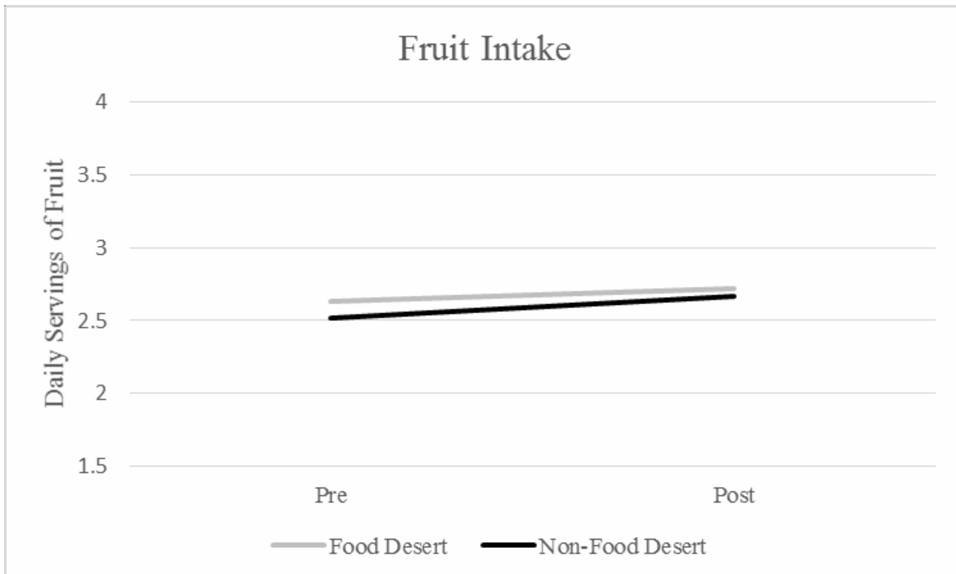

Figure 1. Fruit intake of students attending school in food deserts versus students attending school non-food deserts

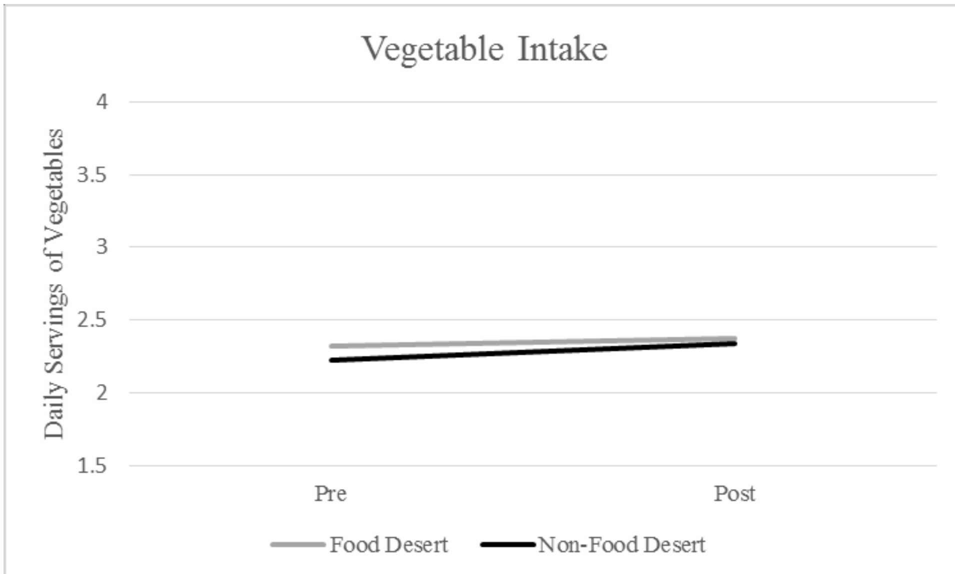

Figure 2. Vegetable intake of students attending school in food deserts versus students attending school in non-food deserts.

Data Analysis for Research Question Four

Perceptions of access to healthy food and FV intake rates.

Two separate linear regressions were conducted for pre-intervention and post-intervention to predict fruit and vegetable consumption rates. These linear regressions were conducted to predict FV intake from perceptions of access to fruits and vegetables at home, school, and in neighborhoods. Due to substantial sample size (*n* = 724), the primary researcher for this study intentionally selected $p < .01$ for this and all other regressions in this study.

Perceptions of access to healthy food and FV intake rates: total study population.

A multiple regression was conducted to predict FV intake from perceptions of access to fruits and vegetables at the home, school, and neighborhood levels. The regression model did not statistically significantly predict FV intake $F(3, 690) = 3.42$, $p > .01$, adj. $R^2 = .02$. Results indicated that access did not affect fruit intake at pre-intervention. No statistical significance was identified for any of the independent variables of perceptions of home, school, or neighborhood FV access at pre-intervention, and accounted for less than 2% of the variance. Table 5 includes regression coefficients and standard errors.

Table 5

Multiple Regression Analysis – Perceptions of FV Access on Fruit Consumption (Pre-Intervention)

	Unstandardized Coefficients		Standardized Coefficients		
Predictor	B	SE	β	*t*	*p*
Ease of finding fruits and vegetables in the home	.097	.043	.089	2.260	.024
Ease of finding fruits and vegetables in school	-.025	.040	-.024	-.616	.538
Ease of finding fruits and vegetables in the neighborhood	.063	.038	.066	1.668	.096

Note. $F(3, 690) = 3.42$, $p > .01$, $R^2 = .02$, adjusted $R^2 = .01$.

Another multiple regression was conducted to predict FV intake from perceptions of access to fruits and vegetables at the home, school, and neighborhood levels post-intervention. The regression model did not statistically significantly predict FV intake

F(3, 700), $p > .01$, adj. R^2=.01. As shown in Table 6, no statistical significance was identified related to perceptions of home, school, or neighborhood FV access as a predictor of FV intake, which only accounted for 1.2% of variance. Table 6 includes regression coefficients and standard errors.

Table 6

Multiple Regression Analysis - Perceptions of FV Access on Fruit Consumption (Post-intervention)

	Unstandardized Coefficients			Standardized Coefficients		
Predictor	B	SE		β	*t*	*p*
Ease of finding fruits and vegetables in the home	.116	.045		.106	2.564	.011
Ease of finding fruits and vegetables in school	-.014	.041		-.014	-.351	.726
Ease of finding fruits and vegetables in the neighborhood	.014	.038		.015	.358	.720

Note. $F(3, 700) = 2.86$, $p >.01$, $R^2 = .012$, adjusted $R^2 = .01$.

Regarding vegetable consumption, overall results indicated a slight statistical significance related to perceptions of FV access to vegetable consumption at pre-intervention ($R^2 = .03$, $p = .000$) and post-intervention ($R^2 = .01$, $p = .01$). Although overall results indicated a slight statistical significance at pre- and post-intervention, specific data related to access variables were not significant enough to conclude perceptions of FV access is a predictor of FV intake (see Table 7). This slight significance was observed at pre-test for the independent variables of home, school, and neighborhood FV access, $F(3, 683) = 6.01$, $p < .01$, as well as post-intervention as a potential predictor of vegetable consumption, $F(3, 698) = 4.25$, $p < .01$ (see Table 8).

Table 7

Multiple Regression Analysis - Perceptions of FV Access on Vegetable Consumption (Pre-intervention)

	Unstandardized Coefficients		Standardized Coefficients		
Predictor	B	SE	β	*t*	*p*
Ease of finding fruits and vegetables in the home	.106	.043	.097	2.471	.014
Ease of finding fruits and vegetables in school	-.029	.040	-.028	-.727	.468
Ease of finding fruits and vegetables in the neighborhood	.105	.038	.109	2.756	.006

Note. $F(3, 683) = 6.01$, $p < .01$, $R^2 = .03$, adjusted $R^2 = .02$

Table 8

Multiple Regression Analysis - Perceptions of FV Access on Vegetable Consumption (Post-intervention)

	Unstandardized Coefficients		Standardized Coefficients		
Predictor	B	SE	β	*t*	*p*
Ease of finding fruits and vegetables in the home	.109	.046	.098	2.365	.018
Ease of finding fruits and vegetables in school	.002	.042	.002	.051	.959
Ease of finding fruits and vegetables in the neighborhood	.057	.039	.060	1.453	.147

Note. $F(3, 698) = 4.25$, $p = .01$, $R^2 = .02$, adjusted $R^2 = .01$

Difference in access to healthy food and FV intake rates: geographic location.

Analysis for differences between schools located in food desert versus non-food deserts was conducted to also determine differences at pre- and post-intervention. Specific results for fruit consumption at pre-intervention tests indicated non-significance for students in both food deserts ($R^2 = .02$, $F(3, 296) = 1.45$, $p = .23$) and non-food deserts

(R^2= .02, F(3, 390) = 2.08, p = .10) with less than 2 percent variance for both fruit and vegetables. The results remained non-significant at post-intervention for both geographic locations as well [food desert (R^2 = .03, F(3, 300) = 2.63, p = .05)]; non-food desert (R^2 = .01, F(3, 396) = .94, p = .42).

When examining if access indicated a difference in vegetable consumption among school campuses, analysis for schools in food deserts showed non-significance (R^2 = .04, F(3, 293) = 3.59, p = .03). Non-food desert schools showed the same non-significance at pre-intervention (R^2 = .03, F(3, 386) = 3.17, p = .02). Final examination for geographic location at post-intervention once again found no significant effect between differences in access and vegetable consumption for either food desert (R^2 = .02, F(3, 299) = 3.00, p = .03) or non-food desert (R^2 = .02, F(3, 395) = 3.26, p = .02) campuses.

Differences in access and FV intake: gender.

Two separate regressions were conducted for pre-intervention and post-intervention to identify differences of fruit and vegetable consumption rates among gender. These linear regressions measured students' perceptions of access to fruits and vegetables using three independent variables of home access, school access, and neighborhood access to predict the dependent variable which was daily intake of fruits and vegetables with $p < .01$.

Results for pre-intervention tests to determine if difference in access affected fruit consumption showed no significance for this prediction among males (R^2 = .03, F(3, 326) = 3.17, p = .03) or females (R^2 = .02, F(3, 359) = 1.86, p = .14). Among males, no statistical significance was shown for any of the independent variables of home, school, or neighborhood at pre-intervention, $F(3, 329) = 3.17$, $p > .01$, and accounted for less than 2% of the variance. Similarly, among females, no significance was shown for independent variables at pre-intervention, $F(3, 362) = 1.86$, $p > .01$.

Regarding post-intervention, no significance was shown for improved fruit consumption among males ($R^2 = .02$, $F(3, 331) = 2.50$, $p = .06$) or females ($R^2 = .01$, F(3, 362) = 1.21, $p = .31$). Furthermore, no statistical significance was observed for either gender for independent variables of access at home, school, or neighborhood among males $F(3, 334) = 2.49$, $p > .01$) or females $F(3, 367) = 1.21$, $p > .01$.

Tests were also conducted to look at the effect of differences in access on vegetable consumption among gender. Slight significance was potentially shown among males in the pre-intervention survey stage ($R^2 = .04$, $F(3, 323) = 3.95$, $p = .01$) for independent variables of access at home, school and neighborhood, $F(3, 326) =3.95$, $p = .01$. Post-intervention analysis showed slight, but improved significance for differences of access and vegetable consumption among males ($R^2 = .04$, $F(3, 331) = 4.62$, $p < .01$). Results for differences of access for females was not significant at pre-intervention ($R^2 = .02$, $F(3, 355) = 2.43$, $p = .07$) which remained the case at post-intervention ($R^2 = .02$, $F(3,362) = 2.63$, $p = .09$).

Differences in access and FV intake: ethnicity.

Linear regression analysis was conducted to determine if differences in access among various ethnic groups affected fruit and vegetable consumption included. Since the surveys were paired, ethnicity was not asked in the post-intervention survey instrument. No statistical significance was identified among the ethnic groups at the pre-intervention phase (see Table 9).

Table 9

Multiple Regression Analysis – Differences in Perceptions of access on FV intake

Group	Pre-Fruit		Pre-Vegetable	
	R^2	p	R^2	p
Multiracial	.003	.88	.017	.31
Black	.088	.05	.088	.05
White	.027	.12	.050	.01
Hispanic	.074	.01	.073	.01

At post-intervention, ethnic groups showed similar results with no statistical significance observed at this period either for fruit consumption among multiracial students ($R^2 = .02$, $p = .27$), black ($R^2 = .06$, $p = .16$), white ($R^2 = .05$, $p = .02$), and Hispanic ($R^2 = .05$, $p = .04$).

When viewing pre-intervention results for vegetables, there was a slight significance among white students ($R^2 = .05$, $p = .01$) and Hispanic students ($R^2 = .07$, $p = .01$); however, no significance was identified among multiracial students ($R^2 = .02$, $p = .31$) or black ($R^2 = .09$, $p = .05$). Post-intervention results for perceptions of access as a predictor of vegetable intake indicated no statistical significance for multiracial students ($R^2 = .012$, $p = .435$), black students ($R^2 = .067$, $p = .109$), white students ($R^2 = .029$, $p = .091$), or Hispanic students ($R^2 = .057$, $p = .029$).

Data Analysis for Research Question Five

Differences in attitude toward healthy eating and FV intake: total study population.

Using the linear regression model, the relationship between attitude towards fruits and vegetables and daily intake was measured for population variables. Personal attitude was measured in regards to how important students perceived eating healthy foods and importance of eating fruits and vegetables. Additionally, social norms were measured related to students' perceptions of how their friends and family viewed importance of eating fruits and vegetables.

For analysis purposes, two separate regressions were conducted for pre-intervention and post-intervention consumption rates of fruits and vegetables to determine if differences in attitude resulted in change in FV intake. Results for impact of attitude on fruit intake at pre-intervention predicted a slight statistical significance as shown in Table 9 ($R^2 = .04$, $p < .01$). Post-intervention results also indicated slight statistical significance ($R^2 = .02$, $p < .01$) (see Table 10).

Table 10

Multiple Regression Analysis - Differences of Attitude on Fruit Consumption (pre- and post-intervention)

	Unstandardized Coefficients		Standardized Coefficients		
Predictor	B	SE	β	*t*	*p*
Personal Thoughts on fruit intake (pre)	.293	.053	.204	5.480	.000
Personal Thoughts on fruit (post)	.168	.051	.125	3.33	.001

Note. Pre-intervention: $F(1, 692) = 29.98$, p = .00, $R^2 = .04$, adjusted $R^2 = .04$; Post-intervention: $F(1, 695) = 11.10$, $p = .00$, $R^2 = .02$, adjusted $R^2 = .02$

Results indicated that differences in attitude did not affect vegetable intake at pre-intervention ($R^2 = .10, p < .01$). Results indicated a slight statistical significance of differences of attitude and vegetable consumption at post-intervention [($R^2 = .03, p < .01$); see Table 11].

Table 11

Multiple Regression Analysis - Differences of Attitude on Vegetable Consumption (pre- and post-intervention)

	Unstandardized Coefficients		Standardized Coefficients		
Predictor	B	SE	β	*t*	*p*
Personal Thoughts on vegetable intake (pre)	.445	.053	.308	8.46	.000
Personal Thoughts on vegetable intake (post)	.185	.041	.167	4.48	.000

Note. Pre-intervention: $F(1, 685) = 71.57, p < .01, R^2 = .10$, adjusted $R^2 = .09$; Post-intervention: $F(1, 702) = 20.08, p < .01, R^2 = .03$, adjusted $R^2 = .03$

Differences in attitude toward healthy eating and FV intake: geographic location.

Linear regression analysis for differences in attitude for schools located in food desert versus non-food deserts was conducted. Specific results for fruit consumption at pre-intervention tests indicated slight significance for students in both food deserts ($R^2 = .03, p < .01$) and non-food deserts ($R^2 = .05, p < .01$); however, variances were less than 3% and 5% percent respectively for both locations. The results remained significant at post-intervention for students in food deserts ($R^2 = .04, p < .01$) as compared to non-food desert ($R^2 = .01, p = .16$).

When examining if attitude indicated a difference in vegetable consumption among school campuses, slight significance was shown at both pre- and post-intervention for both types of locations. Specifically, food desert school showed slight significance at pre-intervention of (R^2 = .12, p < .01) and post-intervention (R^2 = .02, p < .01). Non-food desert schools had very similar results at pre (R^2 = .08, p < .01) and post-intervention (R^2 = .03, p = .01).

Differences in attitudes toward healthy eating and FV intake: gender.

Linear regression was also used to determine effects of differences of attitude on fruit and vegetable consumption among gender. Regarding fruit intake at pre-intervention, there was slight significance for both gender groups: male (R^2 = .03, p < .01), female (R^2 = .06, p < .01). Post-intervention analysis showed only slight significance among females (R^2 = .03, p < .01) as compared to males (R^2 = .01, p = .11). When determining effects of attitude among gender for vegetable consumption, pre-intervention analysis showed slight significance again for both male (R^2 = .09, p < .01) and females (R^2 = .11, p < .01). This slight statistical significance was again shown at post-intervention among males (R^2 = .04, p < .01) and females (R^2 = .02, p = .01).

Differences in attitude toward healthy eating and FV intake: ethnicity.

To determine statistically significant differences among ethnicities, linear regression was used. Regarding fruit consumption at pre- and post-intervention, overall results indicated a slight significant effect of attitude on fruit consumption at pre-intervention for the multiracial students (R^2 = .06, p < .01); however, at post-intervention this same group showed no significance for attitude to determine their fruit consumption

($R^2 = .00$, $p = .37$). Pre- and post-intervention time periods both showed no significance among black students (pre: $R^2 = .05$, $p = .03$; post: $R^2 = .03$, $p = .14$); white students (pre: $R^2 = .03$, $p = .02$; post: $R^2 = .03$, $p = .01$); and Hispanic students (pre: $R^2 = .03$, $p = .02$; post: $R^2 = .02$, $p = .09$).

Pre-intervention results for effects of attitude on vegetable consumption among ethnicities showed slight significance for all groups including multiracial students ($R^2 = .09$, $p < .01$); black students ($R^2 = .11$, $p = .01$); white students ($R^2 = .08$, $p < .01$); and Hispanic students ($R^2 = .12$, $p < .01$). However, these same results only held true at post-intervention for white students ($R^2 =.02$, $p = .01$) and black students ($R^2 = .08$, $p = .01$). In contrast, no statistically significant difference was observed for multiracial students ($R^2 = .02$, $p = .07$) or Hispanic students ($R^2 = .02$, $p = .05$).

Summary

Although researchers often maintain that statistically significant change must occur for a study to be successful, this study provided evidence otherwise. Only slight statistical significance was observed regarding this study's research questions; in some instances, no statistically significant change was observed. This lack of statistically significant change possibly indicates possible flaws in intervention design, intervention delivery, survey instrument, and/or the self-reported data. Possible limitations are further discussed in Chapter 5 of this dissertation.

CHAPTER V

DISCUSSION, SUMMARY, AND RECOMMENDATIONS

This study involved secondary data analysis to determine whether attitude towards consumption of healthy foods or perceptions of access to fruits and vegetables would predict FV intake of fifth grade students enrolled in the GIH program of Texas A&M AgriLife Extension. This study was designed to provide a comparison of results between school districts in food deserts and non-food deserts. A total of 724 students were enrolled in the school-based intervention; only completed and paired surveys were utilized for this study. All students were in fifth grade, had parental consent on file, completed both the pre- and post-test instruments, and lived within one of the following counties in Central Texas: Bosque, Coryell, Falls, Limestone, or McLennan.

Students enrolled in the GIH program participated in the eight-week school-based intervention during their regularly schedule PE class time. The lesson was provided one-time per week for a total of eight lessons. The intervention was conducted by health educators of Texas A&M AgriLife Extension to improve FV intake and potentially decrease the risk of chronic disease. All students received the same curriculum; there was no control and experimental group format used for the intervention. The curriculum was designed with course objectives to meet the Texas Essential Knowledge and Skills for fifth grade PE as outlined by the Texas Education Agency, however, no further enrichment or expansion activities were conducted outside of the classroom except for a parent newsletter provided to students to take home.

Summary of Findings

Although studies have been implemented on the effect of school-based interventions and student health, limited research exists related to the effects of TPB constructs on student FV intake, specifically the constructs of attitude and social norms. Moreover, limited research exists related to access of healthy foods as a predictor of FV intake among middle school students. This study is unique in that it investigates TPB constructs of attitude and social norm on FV intake while comparing students' geographical locations defined as food deserts where access to healthy foods is limited and non-food desert areas where there is easier access to healthy foods.

School-based intervention effect on FV intake.

Some school-based interventions have improved consumption rates of healthy foods and improved physical activity (Buchan, Ollis, Thomas, Malina, & Baker, 2012; Drapeau et al., 2016; Vander Ploeg et al., 2014). However, of the relationships studied within the present study, the primary author of this study did not identify a statistically significant predictor or correlation between the eight-week GIH intervention and improved FV intake.

Experts agree that for a school-based intervention to be successful, a multi-faceted approach must be utilized (Budd & Volpe, 2006; Fung et al., 2012; Kropski, Keckley, & Jensen, 2008; Shaya, Flores, Gbarayor, & Wang, 2008). Moreover, this intervention approach must be long-term and involve educational, environmental, and physical strategies (Brown et al., 2016). Such intervention strategies must include teachers, other family members, and student support systems for behavioral changes to occur and be sustained (Brown et al., 2016; Buchan et al., 2012; Mahmood et al., 2014; Mei et al., 2016; Mukamana & Johri, 2016)

The GIH school-based intervention lacked many key components that may have impacted study results. For example, the intervention was only eight weeks in length and delivered only in the PE classroom. There was no other school personnel involvement; therefore, the messages and behaviors were isolated to single sessions and not reinforced throughout the school day. In addition, family involvement was limited to a parent newsletter that may or may not have been delivered to or read by the parents, and the school environment did not reinforce the GIH messaging via signage, school nutrition services, or supplemental initiatives to increase FV intake.

Access and Perceived Access on FV intake.

A healthy diet is a critical component to good health for people of all ages. However, a person's environment may influence perceptions of access and limit or complicate actual access to healthy foods (Prevention Institute, 2009; Rose, 2010; Wedick et al., 2015). This lack of perceived and actual access to healthy foods may inhibit FV intake, thus, increasing the risk for chronic disease, obesity, and higher BMI (FRAC, n.d.; Larson et al., 2009; ODPAC, n.d.; Prevention Institute, 2009; Rundle et al., 2009; WHTF, 2010). Actual and perceived access to healthy foods within the home, school, and neighborhood setting may influence why students enrolled in the GIH program did or did not consume FV daily.

This study measured if perceptions of access to healthy foods predicted improved FV intake among the fifth-grade students enrolled in the intervention. Specifically, the primary researcher examined students' perceptions of FV access at home, school, and neighborhood. Data were also aggregated based on the location of the school regarding food desert or non-food desert. Schools were geographically identified as being in a food desert area or a non-food desert area using the USDA definition and comparing the school's zip code with the USDA food desert mapping system.

Linear regression analysis showed this research variable to be non-significant, thereby leaving questions as to why access did not predict FV intake. In addition, when perceptions of access were measured, it was not statistically significant as a predictor of FV intake.

Students' perceptions of their food environment at home, school, and in their neighborhood and perceptions of the concept of "access" by fifth grade students may be limited. Because fifth grade students are not the purchasing agents for their families, students may not directly understand the ramifications of food resources (of the lack of resources) reasonably accessible to them and their families. Researchers such as Wedick et al. (2015) suggested that residing in geographic areas with closer proximity to healthy foods was an independent predictor of improved healthy food consumption; however, healthy foods are primarily available in well-stocked grocery stores, which are limited in numbers within food deserts (Rose, 2010; Wedick et al., 2015). This is especially true for low-socioeconomic neighborhoods defined as food deserts. Research indicates that low-socioeconomic areas with higher proportions of minorities have a greater number of convenience stores, fast-food restaurants, and most "dollar stores" (Hilmer et al., 2012). Each type of store offers limited if any, offering of healthy foods such as fruits and vegetables (Hilmer et al., 2012). Students may interpret these convenience stores or "dollar stores" in their neighborhood as "grocery" stores and fail to understand the limited amount of healthy foods these stores offer since their exposure a grocery store or supermarket may be limited due to proximity and transportation (Hilmer et al., 2012). Additionally, students may see the healthy food offerings at school and interpret this level of access as universal access. This perspective may be especially true if the school is the only exposure to a food environment other than their home or the neighborhood convenience stores. Students' mindset may be artificially skewed with the relative abundance of healthy food easily accessible through school breakfast, lunch, afterschool, or summer meal programs.

Another factor may be the interpretation of healthy foods by family members. If limited knowledge is present in terms of healthy food preparation, a person may deem fried vegetables or fruits that have had added sugar to them as healthy simply because a fruit or vegetable serves as base. However, evidence suggests otherwise since preparation such as frying or adding sugar increases caloric, fat, and sugar content which increases likelihood of overweight or obesity (Sacks et al., 2009; Studies from University of Glasgow, 2017). Together, it is plausible that such individual and environmental contributed to the non-statistical significance of access as a predictor of improved FV intake.

Attitude regarding FV intake.

Various researchers have identified that positive attitudes toward FV and social norms encouraging FV intake can impact healthy eating behaviors, especially FV intake rates (FRAC, n.d.; Rundle et al., 2009; WHTF, 2010). Although intention to change behavior may often be a predictor of actual health behavior change, a person's attitude toward a specific behavior is often the strongest predictor of behavioral change (Riebl et al., 2015). Therefore, it seems reasonable to expect that a positive attitude of the individual and/or friends and family toward FV intake would provide an accepted social norm of healthy eating and would be a predictor of FV intake in this study.

Although Riebl et al. (2015) identified attitude as a primary predictor of FV intake, the present study failed to reiterate the same results. In fact, the analysis of students' attitudes toward healthy eating as a predictor of FV intake was found to be non-significant in the present study. Many factors likely influenced this non-statistical significance including substandard questionnaire design and not completely intertwining Central Texas students' social norms in GIH intervention design (Pelletier et al.,2014). Additionally, the constructs of TPB may not have been clearly conceptualized when designing the evaluation plan and instruments and creating the framework to understand adolescent dietary behaviors (Riebl et al., 2015).

One limitation may have been questionnaire design flaw in regards to measuring attitude of student, family, and friends. Di Noia and Cullen (2015) suggested that youth often misperceive their own and their peers FV intake which results in misperceptions of their peers' attitude toward healthy eating as well. Furthermore, Di Noia and Cullen (2015) suggested that attitude might only predict perceived behavior change and not actual behavior change regarding adolescent eating behaviors. Limited understanding or misunderstanding of attitude and social norms as predictors of healthy food intake among adolescents may have resulted in intervention design flaws. Researchers have suggested that to better understand the impact of attitude and social norms, the intervention designers must not only understand these constructs, but apply them appropriately (Di Noia & Cullen, 2015; Pelletier et al., 2014).

Limitations

The non-statistical significance findings may be due to various limitations of the study. Limitations are discussed below and include limitations related to the data, survey instruments, participants, educators, and theory.

Data limitations.

The dataset utilized may have resulted in limitations related to socioeconomic differences, cultural differences, and social experience differences among students. Although the sample size was large, the campuses utilized had varying social and academic climates that resulted in lack of understanding regarding the intervention itself and the evaluation instrument. Furthermore, this dataset only contained students in Central Texas area school campuses, which limits generalizability to other areas of the state or nation.

The time period of collection creates a limitation of data collection. The data were collected during October 2016 through May 2017. During this time period, the intervention was not conducted simultaneously. This variance could affect data reporting due to social, academic, and life experiences occurring for youth. It is unknown by the primary researcher if the intervention was conducted without interruption due to holiday schedules, testing schedules, and other school related activities which may have forced the intervention to not occur weekly at the regularly and originally scheduled time. Furthermore, the program development team did not document if students who were absent during the intervention were provided makeup lessons.

Survey limitations.

This intervention included a pre- and post-test instrument administered in-person, thus providing for a high response rate among participations. This high response rate is a benefit of in-person surveys (Jones, Baxter, & Khanduja, 2013) however, specific limitations of the survey included survey design and the lack of data regarding pilot testing.

The design of the survey instrument is critical to the clarity and understanding among participants. Survey designers must consider wording choice for questions, order of questions, and response format that is understood and acceptable for participants, especially for surveys involving children (Chaudhary & Israel, 2017; Colosi, 2006; Delnevo, Gunderson, Manderski, Giovenco, & Giovina, 2017). As a specific example of survey instrument flaws, gender was incorporated in place of biological sex and response options were not exhaustive. Another example was use of subjective response options such as "fairly unimportant" and "neither difficult nor easy." If students did not fully understand the wording or meaning of a question, their ability to answer was limited (Jedinger, Watteler, & Forster, 2018; Jones et al., 2013). This limitation is often due to cognitive and social development still occurring in middle school aged children (de Leeuw, 2011). Although children in middle school may be able to answer well-designed questions, their reading and language skills are still developing which means that wording for both survey questions and survey instructions must be simple and unambiguous (de Leeuw, 2011). The GIH program survey instruments were administered in a pre- and post-test format; however, students were asked to recall FV intake which may have posed problems for this age group since memory capacity is still developing (Colosi, 2006; de Leeuw, 2011). Furthermore, the tendency to want to please others at this age and within the school setting may have resulted in responses to satisfy social desirability (de Leeuw, 2011).

Both pretesting and pilot testing are critical to insuring survey instruments include age appropriate construction, wording, and readability (Chaudhary & Israel, 2017; de Leeuw, 2011; Jedinger et al., 2018). In the pretesting phase, researchers evaluate the survey instrument and survey protocols to identify issues, which might exist, related to four cognitive steps of response. These four cognition steps include comprehension, recall, judgment, and reporting (Chaudhary & Israel, 2017). The pretesting phase includes questionnaire development, question critique, informal testing, and systematic review of the survey instrument (Chaudhary & Israel, 2017); pretesting allows researchers and practitioners to examine and revise the instrument in stages.

In comparison, pilot testing provides an opportunity for researchers and practitioners to evaluate survey instruments within an actual administration setting. Pilot testing identifies problems within a small representative sample of the survey population prior to implementation of the full survey. Pilot testing allows the researcher to assess the participants understanding of question wording, flow, response rates, and instances of confusion (Chaudhary & Israel, 2017). Pilot testing is the ultimate method to determining if a survey questionnaire is going to be an effective way to collect desired data.

It is unknown whether the GIH survey was pretested or pilot tested using student focus groups or cognitive interviews (de Leeuw, 2011; Jedinger et al., 2018). It is also unknown as to how educators provided survey instruction and if students understood that instruction. The survey instruments included written instructions and verbal instruction should have been provided. It is unknown whether educators administering the instrument answered specific survey-related questions related at the time of administration.

There is specific concern related to the understanding of the survey questions that captured data related to healthy food access. Fifth grade students' personal experience with access was most likely limited to knowing if healthy food is in their immediate home or school. These students largely are not shopping for healthy foods; therefore, their actual perceptions of food access within neighborhood stores, food pantries, or other neighborhood sources is limited. Moreover, students' definition and understanding of healthy food may be limited.

Reliability and validity.

It is unknown if instrument reliability was tested prior to pre- and/or post-test administration. Specifically, it is unknown if reliability was established using any of the reliability best practices such as test/retest, internal consistency, or interrater reliability (Kimberlin & Winterstein, 2008). These methods evaluate whether the instruments can consistently and uniformly measure what is intended to be measured each time the instrument is used with the study population (Kimberlin & Winterstein, 2008).

Although Texas A&M AgriLife Extension personnel expressed that the pre-test and post-test instruments were tested for validity, the extent or process of validity testing is unknown. Specifically, content validity should have been established prior to administration to determine if the delivered content of GIH being accurately measured; again, it is unknown if this was established for the GIH intervention. Again, no evidence of pre-testing or pilot testing was documented which would enable researchers to also identify reliability and validity concerns related to consistent measurement, survey design, and participant understanding of instrument components (Jones et al., 2013).

Self-reported data.

Nutrition and physical activity studies often rely on self-reported data in regarding food intake and rates of exercise (Archer, Marlow, & Lavie, 2018). Although this type of data collection has proven successful in efforts such as determining the causation of neural tube defects due to limited dietary folic acid intake, experts still argue this type of reporting may result in bias and skewed results (Archer et al., 2018; Subar et al., 2015). Subar et al. (2015) argued that self-reported data related to food intake are often inaccurate due to the extent of error in reporting accurate list of foods, amounts, and consumption rates; therefore, measurement error must be considered in this study. In addition, Gupta et al. (2018) evaluated self-reported data related to food allergies and found that reliability of self-reported data may differ based on race, education level, and socioeconomic status.

Self-reported data may result in reporting bias due to the misunderstanding of the survey instrument items; however, bias may also occur due to social-desirability bias (Rosenman, Tennekoon, & Hill, 2011). When social-desirability bias is present, respondents want to appear in a positive light among researchers and/or their peers (Rosenman et al., 2011). Additional concern with self-reported data among youth is their experiences and home background, which may create bias (United States Department of Education, 2001). The GIH program depended on self-reported data for the analyses, which is a limitation of the study design. Specifically, the fact that the data were self-reported by fifth grade students potentially indicates that their limited education level and understanding of food recall may have resulted in reporting bias.

Educator limitations.

Researchers suggest that school-based interventions targeting improving dietary intake and increasing physical activity must include a multi-faceted approach (Budd & Volpe, 2006; Fung et al., 2012; Kropski et al., 2008; Shaya et al., 2008). Furthermore, classroom teachers, food service personnel, and administrative leaders must support and assist with program delivery (Budd & Volpe, 2006; Jain & Langwith, 2013). Interventions which failed to have total campus support have resulted in limited impact (Jain & Langwith, 2013).

The school nurse is one staff member who is critical to success of a school-based health intervention. Today's school nurse responsibilities include coordinated school health programming which makes school nurses a natural fit for inclusion into classroom health interventions (Johnson, Weed, Touger-Decker, 2012); however, most studies indicate the use of classroom teachers as the sole source of curriculum delivery (Baxter, 1998; Cole, Waldrop, D'Auria, & Garner, 2006; Johnson et al., 2012). Expanding the intervention to include the school nurse as a school health champion and potential program coordinator could expand not only outreach but results as well.

The GIH program was delivered by Texas A&M AgriLife Extension educators. These health educators were the sole instructors for the program. Not only could their varied academic backgrounds, experiences, and delivery methods provided limitations to the study, but the failure to include the school nurse, classroom teacher, food service, administration, and even students in the planning, implementation and evaluation phases may have reduced the efficiency and effectiveness of this intervention.

Study design limitations.

A primary study design limitation is the fact that only correlation is measured without causal effects related to FV intake, attitude, and access to healthy foods measured as well. This makes it difficult for a researcher to understand what might be causing FV intake limitations or understanding of intervention lesson objectives. Socioeconomic status, language, culture, and academic performance variables were not assessed on the evaluation instrument, making it impossible for the researcher to analyze these areas.

TPB limitations.

The TPB has long been accepted as a model to study prediction of behavior; however, no model is perfect. La Morte (2018) suggested TPB limitations associated with (1) whether a person has had previous experiences and opportunities needed to make behavior change, (2) psychosocial variables such as fear, mood, or anxiety, (3) environmental factors which may impact attitude and behavior, (4) and the lack of representation of the time frame between intent and actual behavior change. There are additional arguments that TPB constructs should be expanded to identify additional external factors that may contribute to behavior change (Hasbullah, Mahajar, & Salleh, 2014).

For instance, Hasbullah, Mahjar, and Salleh (2014) identified and reviewed studies that added the additional predictors of moral norms, social support, past behavior, self-identity, personality traits, anticipated regret, and moral obligation; these studies were more successful at predicting behavior change in relationship with attitude, subjective norms, and PBC. The original founder of TPB, Ajzen, acknowledged that

> "…..the theory of planned behavior is, in principle, open to the inclusion of additional predictors if it can be shown that they capture a significant proportion of the variance in intention or behavior after the theory's current variable have been taken into account" (Ajzen, 1991, p.199).

This lack of inclusion of external predictors, along with the TPB assumption that individuals have all resources to change behavior, and the fact that environmental, economic and other factors were not considered by the original intervention developers may have contributed to the lack of statistical significance within this study. Inclusion of past behavior, social support, and environmental factors of the fifth-grade students could have been critical in increasing FV intake rates for students in the program.

Implications and Recommendations

Study implications and recommendations are discussed in the following section.

Implications for practice.

With non-statistically significant change occurring related to all variables including intervention, attitude, access, and perceived access within this study, there are several recommendations that could strengthen the intervention and data collection processes in future intervention iterations. Recommendations relate to educator training, program length, and a multi-faceted intervention approach.

Future educators of Texas A&M AgriLife who are implementing the same and similar programs must be knowledgeable in content and delivery. Best practice for future iterations of GIH include in-depth training on nutrition, physical activity, and youth development subject matter so educators have a complete understanding of the content taught and the development of fifth grade students. Furthermore, training needs include pedagogies, learning styles, and delivery methodologies of delivery to address the learning needs of all students participating in the intervention. Additional recommendations related to best practice include taking a multi-faceted approach to designing the intervention. This multi-faceted approach would provide for inclusion of the students' regular classroom teacher, school nurse, nutrition staff, and school administration. These facets would also be trained on the intervention, but more importantly on their role in creating a community of health through behavior modeling and health messaging.

Health educators fill a critical role in school-based interventions. Classroom teachers often lack the time or expertise to deliver such interventions and health educators may fill this gap in school districts. However, to effectively fill this gap, health educators must understand effective delivery systems and determinants related to FV intake in young people (Di Noi & Cullen, 2015). Furthermore, identifying factors affecting FV intake among children, can enable health educators to be pro-active when developing youth focused interventions. Early identification of these factors affecting FV intake can enable intervention processes such as subject matter, delivery method, attitude, and social determinants to be addressed within initial design of the intervention. When these processes are identified and addressed, changes can result in a more in-depth intervention targeting behavior change related to TPB constructs.

Implications for theory.

Reducing chronic disease is critical to improve the overall health of adults and children in the US; it is also critical to reducing the healthcare cost burden for future generations. The rise of obesity and significant increase of health care costs related to obesity where shown in the Global Burden of Disease 2015 Obesity Collaborators report, indicating the need for early preventative based interventions. It is logical for these interventions to occur within schools throughout the United States as this is where American youth spend most of their time. Vander Ploeg, Maximova, Mcgavock, Davis, and Veugelers (2014) identified the success of school-based interventions to improve nutrition and increase physical activity; however, researchers should examine previous interventions and theoretical best practices when designing school-based interventions.

Recommendations for Future Research

This primary author recommends that future studies be conducted to investigate the success of school-based nutrition and physical activity programs, as well as to investigate if predictors of attitude and access to healthy foods have an impact on FV intake. Best practice recommendations below are suggested to strengthen this research:

Evaluation instrument: The program's existing pre-test and post-test instruments should undergo reliability testing, validity testing, and pilot testing. A pilot test should be conducted to identify potential issues related to language, readability, and format of the instructions and the instruments.

Training of educators: An in-depth training of educators should occur with specific protocols identified for delivery of survey instruments, as well as standardized training regarding intervention delivery. This protocol should set forth standards of delivery, course of action for schedule adjustment, and the specific processes and procedures for data collection.

Theory: More research is necessary to identify similar studies using TPB; this inquiry will aid researchers in developing the intervention and evaluation instrument to increase successful data collection. Although previous studies have demonstrated success of school-based nutrition and physical activity interventions, few researchers have examined TPB constructs of attitude and social norm. Specifically, evaluation instruments should be designed to collect attitude and social norm data from participants in a way that is clear, understandable, and lessens social-desirability bias.

Recommendations for Researchers

Studies that result in non-statistically significant findings such as this study, may reflect practical or clinical significance. Furthermore, non-statically significant findings still answer important research questions and strengthen the message to researchers regarding the importance of planning prior to intervention. Specifically, these studies offer an opportunity for researchers to understand the need to invest more time in all intervention phases. Researchers should start with the end in mind and have a clear understanding of what data are to be collected and how the evaluation instrument will be formatted. Furthermore, non-significant findings in a study may also allow for stronger research questions and methods, but only if these non-significant findings can be shared and published for others to view and learn from. This allowance may not only provide a better foundation for researchers, but a foundation for interventions to increase knowledge and change health behavior related to health. These changed behaviors could impact a person's overall health as well the health of communities throughout Texas and the United States.

Summary

School-based interventions have the great potential to result in behavior changes related to healthy eating and physical activity. Additionally, with these changes, the reduction of chronic disease in young people will likely occur. The GIH program goal was to increase FV intake of fifth grade students throughout Central Texas to reduce the risk of obesity and chronic disease. This study examined the intervention's overall effectiveness toward that goal as well as whether or not attitude and perceptions of access towards FV were predictors of improved FV intake. Finding slight or non-statistically significant results for all selected study variables indicates a need for systematically examining all components of this intervention.

Specific limitations for this study included survey design flaws, educator expertise uncertainties, and theoretical framework misapplication. Future recommendations for this and other school-based interventions are to address survey instrument design, question wording, readability, and accuracy. Specific to survey design is the need for pretesting and pilot testing to ascertain understanding and effectiveness of measuring desired variables. Health educators implementing the program must be astute in intervention design and evaluation, content delivery and student learning style in order to increase impact, knowledge change, and behavior modification related to lessons within GIH. Finally, more research and review of literature is necessary to determine if TPB is appropriate for nutrition related interventions with adolescence.

Overall, health educators should continue to facilitate learning in the classroom and school setting since most youth spend most of their day in school. However, future interventions must be designed with a strong program development process model for planning, implementation, and evaluation phases to be successful. School-based interventions must also utilize a holistic approach to learning; involving not only the student in isolated lessons, but classroom teachers, nutrition staff, administration, and parents as partners in learning throughout and beyond the entire school day. This approach enables health messages and behaviors to be reinforced throughout the day at school and within the home, thus resulting in healthier young people who become healthier adults.

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APPENDIX A

Grow into Health Student Assent Form – Pre-Intervention

Grow into Health

Student Assent Form Pre-Survey

This is a research project. It is about food and activity. We want to know what you eat and how active you are. This is not a test. There is no right or wrong answer.

- You will be asked to answer questions about what you eat and how active you are.
- No one at school or at home will see your answers.
- If you do not want to answer a question, you can skip it.
- You will be asked to answer these questions before the lessons begin and again after they are completed.
- You may stop being in this project at any time.
- Being in this project is up to YOU. If you say no, it will not hurt your grades or your participation in other school activities.
- You can ask your parents or teachers if you have any questions about this project.
- The person who takes care of you gave their permission for you to do this.
- After you finish the questions, your last name will be removed from this survey.
- By writing your name below, you agree to be in this project.

Date:____

School:____

County:____

Last Name:_______________________________________

Student ID Number:________________________________

IRB NUMBER: IRB2014-0324D
IRB APPROVAL DATE: 12/20/2017
IRB EXPIRATION DATE: 12/19/2018

Pre Assessment Survey

Welcome to Grow into Health!
Before we begin we would like to ask you a few questions about yourself, what you eat, and how active you are.
Please bubble in your answers.

Marking Instructions:
CORRECT: ● INCORRECT: ⊘ ⊗ ◒ ◓

Last Name: ______________________________

What is your gender?

- O male
- O female

What is your ethnicity?

- O American Indian or Alaskan Native
- O Asian
- O Black or African American
- O Native Hawaiian or other Pacific Islander
- O White
- O Hispanic/Latino
- O Multi-racial

1. Yesterday, how many minutes…	0 minutes	15-30 minutes	30-45 minutes	45-60 minutes	60 or more minutes
were you physically active?	O	O	O	O	O
did you spend on an electronic device? (phone, computer, tablet…)	O	O	O	O	O
2. Yesterday, how many times did you…	**0 times**	**1-2 times**	**3-4 times**	**5-6 times**	**7 or more times**
eat fruit?	O	O	O	O	O
eat vegetables?	O	O	O	O	O
drink soda, sweet tea, sports or energy drinks?	O	O	O	O	O
drink water?	O	O	O	O	O

IRB NUMBER: IRB2014-0324D
IRB APPROVAL DATE: 12/20/2017
IRB EXPIRATION DATE: 12/19/2018

Marking Instructions:
CORRECT: ● INCORRECT: ⊘ ⊗ ◒ ◓

3. The taste of most...	very bad	fairly bad	neither bad nor good	fairly good	very good
fruit is	O	O	O	O	O
vegetables is	O	O	O	O	O

4. Fruits and vegetables are	very cheap to buy	fairly cheap to buy	neither cheap nor expensive	fairly expensive to buy	very expensive to buy
	O	O	O	O	O

5. Thoughts about food...	very unimportant	fairly unimportant	neither unimportant nor important	fairly important	very important
Eating healthy food is	O	O	O	O	O
I think eating fruits and vegetables is	O	O	O	O	O
Making half my plate fruits and vegetables is	O	O	O	O	O
Drinking water is	O	O	O	O	O
Reading the nutrition facts label is	O	O	O	O	O
My *friends think eating fruits and vegetables is*	O	O	O	O	O
My *family thinks eating fruits and vegetables is*	O	O	O	O	O

6. How easy is it for you to find fruits and vegetables...	very difficult	fairly difficult	neither difficult nor easy	fairly easy	very easy
at your house?	O	O	O	O	O
at your school?	O	O	O	O	O
in your neighborhood? (stores, gardens, farmers markets...)	O	O	O	O	O

7. Overall, how easy is it for you to eat...	very difficult	fairly difficult	neither difficult nor easy	fairly easy	very easy
fruits each day?	O	O	O	O	O
vegetables each day?	O	O	O	O	O

Thank You!

IRB NUMBER: IRB2014-0324D
IRB APPROVAL DATE: 12/20/2017
IRB EXPIRATION DATE: 12/19/2018

APPENDIX B

Grow into Health Student Assent Form – Post-Intervention

Grow into Health

Student Assent Form Post-Survey

This is a research project. It is about food and activity. We want to know what you eat and how active you are. This is not a test. There is no right or wrong answer.

- You will be asked to answer questions about what you eat and how active you are.
- No one at school or at home will see your answers.
- If you do not want to answer a question, you can skip it.
- You will be asked to answer these questions before the lessons begin and again after they are completed.
- You may stop being in this project at any time.
- Being in this project is up to YOU. If you say no, it will not hurt your grades or your participation in other school activities.
- You can ask your parents or teachers if you have any questions about this project.
- The person who takes care of you gave their permission for you to do this.
- After you finish the questions, your last name will be removed from this survey.
- By writing your name below, you agree to be in this project.

Date:____

School:____

County:____

Last Name:______________________________________

Student ID Number:________________________________

IRB NUMBER: IRB2014-0324D
IRB APPROVAL DATE: 12/20/2017
IRB EXPIRATION DATE: 12/19/2018

Grow into Health

Post Assessment Survey

TEXAS A&M AGRILIFE EXTENSION

Thank you for participating in Grow into Health!
Now that you have completed the program we would like to ask you a few questions about yourself, what you eat, and how active you are.
Please bubble in your answers.

Marking Instructions:
CORRECT: ● INCORRECT: ⊘ ⊗ ⊖ ⊙

Last Name: ______________________________

1. Yesterday, how many minutes...	**0 minutes**	**15-30 minutes**	**30-45 minutes**	**45-60 minutes**	**60 or more minutes**
were you physically active?	O	O	O	O	O
did you spend on an electronic device? (phone, computer, tablet...)	O	O	O	O	O

2. Yesterday, how many times did you...	**0 times**	**1-2 times**	**3-4 times**	**5-6 times**	**7 or more times**
eat fruit?	O	O	O	O	O
eat vegetables?	O	O	O	O	O
drink soda, sweet tea, sports or energy drinks?	O	O	O	O	O
drink water?	O	O	O	O	O

3. The taste of most...	**very bad**	**fairly bad**	**neither bad nor good**	**fairly good**	**very good**
fruit is	O	O	O	O	O
vegetables is	O	O	O	O	O

4. Fruits and vegetables are	**very cheap to buy**	**fairly cheap to buy**	**neither cheap nor expensive**	**fairly expensive to buy**	**very expensive to buy**
	O	O	O	O	O

ATM
IRB NUMBER: IRB2014-0324D
IRB APPROVAL DATE: 12/20/2017
IRB EXPIRATION DATE: 12/19/2018

Marking Instructions:

CORRECT: ● INCORRECT: ⊘ ⊗ ◒ ◓

5. Thoughts about food...	**very unimportant**	**fairly unimportant**	**neither unimportant nor important**	**fairly important**	**very important**
Eating healthy food is	O	O	O	O	O
I think eating fruits and vegetables is	O	O	O	O	O
Making half my plate fruits and vegetables is	O	O	O	O	O
Drinking water is	O	O	O	O	O
Reading the nutrition facts label is	O	O	O	O	O
My *friends think eating fruits and vegetables is*	O	O	O	O	O
My *family thinks eating fruits and vegetables is*	O	O	O	O	O

6. How easy is it for you to find fruits and vegetables...	**very difficult**	**fairly difficult**	**neither difficult nor easy**	**fairly easy**	**very easy**
at your house?	O	O	O	O	O
at your school?	O	O	O	O	O
in your neighborhood? (stores, gardens, farmers markets...)	O	O	O	O	O

7. Overall, how easy is it for you to eat...	**very difficult**	**fairly difficult**	**neither difficult nor easy**	**fairly easy**	**very easy**
fruits each day?	O	O	O	O	O
vegetables each day?	O	O	O	O	O

What is the most important thing you learned in Grow Into Health?

____

____

____

____

Thank You!

IRB NUMBER: IRB2014-0324D
IRB APPROVAL DATE: 12/20/2017
IRB EXPIRATION DATE: 12/19/2018

APPENDIX C

IRB Approval Letter

TWU
TEXAS WOMAN'S UNIVERSITY
DENTON DALLAS HOUSTON

Institutional Review Board
Office of Research and Sponsored Programs
P.O. Box 425619, Denton, TX 76204-5619
940-898-3378
email: IRB@twu.edu
http://www.twu.edu/irb.html

DATE: April 6, 2018

TO: Ms. Julie Gardner
Health Studies

FROM: Institutional Review Board (IRB) - Denton

Re: Exemption for Access versus Attitude: Determining Influences on Fruit and Vegetable Intake of Fifth Grade Students (Protocol #: 20075)

The above referenced study has been reviewed by the TWU IRB (operating under FWA00000178) and was determined to be exempt from further review.

If applicable, agency approval letters must be submitted to the IRB upon receipt PRIOR to any data collection at that agency. Because a signed consent form is not required for exempt studies, the filing of signatures of participants with the TWU IRB is not necessary.

Although your protocol has been exempted from further IRB review and your protocol file has been closed, any modifications to this study must be submitted for review to the IRB using the Modification Request Form. Additionally, the IRB must be notified immediately of any adverse events or unanticipated problems. All forms are located on the IRB website. If you have any questions, please contact the TWU IRB.

cc. Dr. Kimberly Miloch, Health Studies
Dr. Mandy Golman, Health Studies
Graduate School