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Impact of Nutrition Education in High School Students

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IMPACT OF NUTRITION EDUCATION IN HIGH SCHOOL STUDENTS

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By

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2012

Dedication

To begin, I want to thank God for guiding me and helping me achieve my goals. I now want to take this opportunity to dedicate my thesis project to my wonderful family. To my parents, Jose and Leticia Cortez, thank you very much for always being the best parents. Thank you mom and dad for always guiding me and for being there for me all throughout these years. Both of you have always set an extraordinary example to my sisters and I and have instilled in us the will to succeed and be the professional women we are. To my sisters, Celeste and Polette, thank you for always listening to me and providing me with support. And now, to my nephew Richard III, you have become a very important part of my life. I want all of you to know that none of what I have done would be possible if it weren't because I have you in my life. Thank you so much and I want you to know that I love you all very much.

IMPACT OF NUTRITION EDUCATION IN HIGH SCHOOL STUDENTS

By

LETICIA CORTEZ, BS

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Abstract

The diet of adolescents is typically high in calories, fat, and saturated fat and often fails to meet the daily recommended amounts of fruits, vegetables, and calcium-rich foods. The frequent consumption of unhealthy diets in combination with the lack of physical activity has resulted in a high prevalence of obesity worldwide. Approximately 17% of adolescents in the United States are obese. Obesity is a common risk factor for the development of chronic disease such as heart disease and diabetes. In the last few decades and along with a high prevalence of obesity there has also been an increased prevalence of chronic diseases such as diabetes and heart diseases among adolescents. Nutrition education can play an important role in the adoption of healthy eating habits and in the prevention of chronic diseases by increasing nutrition knowledge of participants. The objective of this study was to assess the impact of a classroom-based, interactive nutrition education program with emphasis on the prevention of chronic diseases in the nutrition knowledge of high school students enrolled in a science course.

A prospective nutrition education intervention, using pretest-posttest quasi-experimental design with control group was conducted. A total of 88 participants ages 17.5 ± 0.8 years were assigned to the control ($n = 39$) and intervention ($n = 49$) groups. A 35-item nutrition knowledge test and 3-day dietary records were completed at baseline and posttest. Students in the intervention group received three nutrition lessons. A post-intervention survey that assessed behavior change was completed by participants after being exposed to the intervention. Statistical analyses were conducted to determine impact on nutrition knowledge and dietary intake of selected nutrients at two time points (pre versus post).

Means and Standard Errors for correct responses on the nutrition knowledge test controlling for prior nutrition knowledge of participants was significantly different ($p < .001$) for

participants in the intervention group. Dietary Reference Intake (DRI) for fiber, calcium, iron, magnesium, and folate were not met at either baseline or posttest for females and males in both groups. Ninety four percent of participants in the intervention group appeared to have formed positive behavior intentions towards adoption of healthy eating habits.

An interactive nutrition program taught to high school students enrolled in a science class increased their nutrition knowledge and also appeared to positively impact students' behaviors. Nutrition education could be incorporated in the high school science curriculum to help students make informed decisions about their dietary intake.

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Chapter 1

Background and Significance

Introduction

Good nutrition is vital to good health, disease prevention, and essential for healthy growth of children and adolescents (CDC, 2011). Research has shown that good nutrition or healthy eating practices are often sub-optimal among adolescents, thus placing this group at future risk for developing chronic diseases. It has been documented that adolescents frequently consume foods and beverages of low nutritional value and that their intake of high nutrient dense foods such as fruits, vegetables, and dairy products are far from the daily recommendations for their age (Velazquez, Pasch, Ranjit, Mirchandani, & Hoelscher, 2011; Boumtje, Huang, Lee, & Lin, 2005).

Chronic diseases, such as heart disease, stroke, cancer, diabetes, and arthritis are among the most common, costly, and preventable of all health problems in the United States. According to Center for Disease Control and Prevention (CDC), 7 out of every 10 deaths among Americans each year are from chronic diseases (CDC, 2010). Heart disease, cancer and stroke account for more than 50% of these annual deaths. The most common causes of death reported in 2007 among Hispanics, the fastest growing ethnic minority group in U.S., were heart disease, cancer, stroke, and diabetes (CDC, 2011). Chronic diseases such as heart disease, cancer, and some of its predisposing factors such as overweight and obesity have been linked to poor nutrition (World Health Organization, 2011). The findings from recent studies have revealed an increasing prevalence of chronic diseases caused by poor nutrition among adolescents. In the past, the onset of heart disease and diabetes typically occurred during middle age (Hoelscher, Evans, Parcel, & Kelder, 2002). Due to the recent increase in the prevalence of chronic diseases in adolescents and

its association with unhealthy dietary patterns, several studies recommend conducting nutrition interventions aimed at adolescents so they can obtain the necessary nutrition information that will help them develop appropriate nutritional patterns (Prell, M.S., Berg, Jonsson, & Lissner, 2005; Velazquez, Pasch, Ranjit, Mirchandani, & Hoelscher, 2011).

Influential Determinants of Adolescent Nutrition

The definition of adolescence emerges from the Latin word *adolescere*, which signifies “to grow” or “to develop towards maturity” (Feixa, 2011). Adolescence is denoted by the period of life between 10-19 years of age (Brenhouse & Andersen, 2011). Biological, psychological, and social changes along with cognitive, emotional changes and a need for independence happen synchronously during this period of life (Somerville, Jones, & Casey, 2010). All of these changes have been reported to have a correlation with the rapid growth characteristic of this life stage. Due to all of these transitions, adolescence is seen as a nutritional vulnerable time that requires special nutritional needs including higher amounts of protein, vitamin A, folate, and iron among other nutrients (Mesias, Seiquer, & Navarro, 2011; Stang & Story, 2005).

Because adolescence is a critical stage in life, youth is viewed as an important group to address the importance of good nutrition and child health in general (Erturgut & Erturgut, 2010). There are several reasons why this age group is considered to be at nutritional risk and therefore in need of nutrition education that will help them make better nutritional choices. Altogether, lifestyle changes and food habits, cognitive and psychosocial development, peer influence, the ability to make decisions, and physical growth influence the nutritional patterns that are common to adolescents. Typical nutritional habits among adolescents include irregular meal patterns such as skipping breakfast (Lubans, Plotnikoff, Morgan, Dewar, Costigan, & Collins, 2012). It has been reported that during the past 40 years, youth have lowered the frequency of breakfast

consumption, thus reducing the intake of many nutrients and not meeting the daily recommendation for certain foods like fruits and vegetables (Bruening, Larson, Story, Neumark-Sztainer, & Hannan, 2011; Deshmukh-Taskar, Nicklas, O'neil, Keast, Radcliffe, & Cho, 2010). As part of the irregular meals followed by adolescents, it has also become common for youth to eat away from their homes. The consumption of away-from-home foods among adolescents, specifically fast food sources has increased as shown by a survey whose results demonstrated that approximately 75% of adolescents within the ages of 11-18 ate at a fast food restaurant during the week prior to the survey being conducted (Powell & Han, 2011).

Cognitive development that happens during adolescence may also play a role in terms of risk taking behaviors such as disordered nutritional habits. Research has found that even though most adolescents are aware of and understand the risks created by their actions, they still involve themselves in risky behaviors (Steinberg, 2005). As youth search for independence, they have more liberty to make decisions that affect their eating patterns, such as what and when to eat (Videon & Manning, 2003). Parent authority may also find opposition from the adolescent, thus creating a separation from their family (Ertugut & Ertugut, 2010). By eating fewer healthy foods or by skipping meals, adolescents are expressing independence and disobedience to their parents (Stevenson, Doherty, Barnett, Muldoon, & Trew, 2007).

Dietary Habits among Adolescents

Dietary patterns of adolescents frequently include higher than recommended intakes of total fat, saturated fat, sodium, cholesterol, and refined carbohydrates (Lubans, Plotnikoff, Morgan, Dewar, Costigan, & Collins, 2012; Stang & Story, 2005). Many also have sub-optimal intake of dairy products, fruits and vegetables (Velazquez, Pasch, Ranjit, Mirchandani, & Hoelscher, 2011). According to the CDC, in the United States fewer than 40% of children and

adolescents meet the dietary guidelines for saturated fat as the majority exceeds their intake of saturated fat (CDC, 2008). Reports indicate that among adolescents aged 12-19 years of age, 70% of boys and 65% of girls surpass dietary recommendations for fat intake (Lytle & Kubik, 2003).

The elevated consumption of refined carbohydrates such as sugar-sweetened soft drinks is also reported as having increased among youth. As children approach the adolescent years, milk and fruit juice is often replaced by soft drinks (Frary, Johnson, & Wang, 2004). Most adolescents in the United States consume sugar sweetened beverages on a daily basis (Johnson, Bruemmer, Lund, Evens, & Mar, 2009). Teenagers have been found to consume more added sugars as their total energy percentage compared to other age groups (Frary, Johnson, & Wang, 2004). The intake of soft drinks has almost doubled within the adolescent female group, and almost tripled among adolescent males (Centers for Disease Control and Prevention, 2008). Non-diet soft drinks, fruit drinks, sugars, sweets, sweetened grains, sweetened dairy products, and cereals that already contain sweets, are also high contributors to the increase in the consumption of added sugars (Frary, Johnson, & Wang, 2004).

The lack of fruit and vegetable intake has also been found to frequently happen among adolescents, as they have the lowest intakes of fruit and vegetables among the overall population (Granner, Sargent, Calderon, Hussey, Evans, & Watkins, 2004). Most youth in the U.S. do not meet the minimum recommendations for fruit and vegetable intake (i.e. 2½ cups to 6½ cups/day) (CDC, 2012). Fewer than 22% of high school students reported eating 5 or more servings of fruits and vegetables per day in 2007 (CDC, 2008). To concur with this data, a study of 3957 adolescents from 31 public middle and high schools in Minnesota participating in the Eating Among Teens (EAT) project found that fewer than one-third of participating adolescents

consumed at least five daily servings of fruit or vegetables (Neumark-Sztainer, Wall, Perry, & Story, 2003).

Among youth, the intake of dairy products, which are the primary source of dietary calcium for many, is also inadequate. Among adolescents in the United States, approximately 70% of boys and 88% of girls have a dairy product intake that does not meet the daily recommendation of 1300 mg per day. According to Lytle & Kubik, 2003, boys seem to have the highest intake of calcium during adolescence while calcium intake among girls seems to reach its highest point during childhood and appears to decline during the adolescence period. Data reported by the CDC also indicates that over the course of the last 25 years, milk was only consumed by 36% of adolescent females alone (CDC, 2008).

Obesity in Adolescents

Obesity and overweight have also become important health conditions to monitor among children and adolescents. Overweight and obesity are determined using body mass index (BMI). This type of weight/height ratio (i.e. kg/m^2) is compared to a reference population. The classification of “at risk for overweight” is given to adolescents who are above the 85th percentile and “overweight” to those that are above the 95th percentile. In the United States more than 20% of children and adolescents are considered to be overweight and obese (Acosta, Manubay, & Levin, 2008).

Children and adolescents who are overweight and obese are at risk for developing chronic diseases such as Type 2 diabetes, heart diseases, several types of cancer, osteoarthritis, sleep apnea, hypercholesterolemia, and gallstones (Wang, Chyen, Lee, & Lowry, 2008; Monheit, Vistnes, & Rogowski, 2009). Most of these chronic conditions were formerly observed among mostly adults different from now where and increasing proportion of children and adolescents

are suffering from such conditions (Salvy, de la Haye, Bowker, & Hermans, 2012). Other common consequences associated with child and adolescent overweight and obesity includes psychosocial problems (e.g. low self-esteem, negative body image, depression, stigma, discrimination, and teasing and bullying) (Monheit, Vistnes, & Rogowski, 2009). This is important since in recent times, and estimated 365,000 premature deaths per year in the United States were caused by overweight and obesity (Crossman, Sullivan, & Benin, 2006).

In excess of one third of teenagers are overweight or obese (Caccavale, Farhat, & Iannotti, 2012). According to the National Health and Nutrition Examination Survey (NHANES), 17.9 percent of adolescents aged 12 – 19 years in the United States are considered obese.

Table 1. Obesity in adolescents aged 12 – 19 years (percent) by Gender and Ethnicity

	2005-2008
By Total	
Total	17.9
By Sex	
Male	18.7
Female	17
By Race Ethnicity	
Hispanic or Latino	
Mexican	23.8
Not Hispanic or Latino	
White only non-Hispanic	15.1
Black or African American only non-Hispanic	24.2

Source: National Health and Nutrition Examination Survey (NHANES), 2008

It has been shown that the obesity epidemic that is affecting adults originates during childhood (Crossman, Sullivan, & Benin, 2006). In the past twenty years, the prevalence of overweight and obesity among adolescents between the ages of 12-19 has more than tripled (Centers for Disease Control and Prevention, 2008).

Many environmental factors appear to contribute to adolescent obesity (Center for Adolescent Health, 2010). The school environment plays an important role in the dietary patterns of students as they have a broad variety of eating options (Rovner, Nansel, Wang, & Iannotti, 2011). Schools sell more high-fat, high-calorie foods and sugary drinks than nutritious, lower-calorie choices (Center for Adolescent Health, 2010). Food-insecurity is another environmental factor that also plays a role in the type of food eaten by individuals. It is attributed to the lack of home availability of nutritious; low-energy dense types of foods in adolescents and adults (Parker, Widome, Nettleton, & Pereira, 2010). Low-income communities tend to have more limited access to healthy food than those that are more affluent. For example, calculations made in 2004 by the United States Department of Agriculture (USDA) indicate that approximately 20% of all low income households do not buy fruits and vegetables during the week compared to approximately 9% of high income households (Webber, Sobal, & Dollahite, 2010). One reason for this is because many poor neighborhood residents are forced to shop at local convenience stores which often stock fewer fresh foods (Center for Adolescent Health, 2010).

Many adolescents also live sedentary lives as measured by the amount of physical activity (Pearson & Biddle, 2011). As described in Center for Adolescent Health, 2010, adolescents tend to spend the school day mostly sitting, and then go on to spend an average of three more hours sitting in front of a TV or computer screen. School physical education programs have also been slashed, therefore contributing to a sedentary lifestyle. In 1991, 42 per-

cent of high school students participated in daily phys. ed. classes. By 2007, that number was 25 percent or lower. TV commercials are saturated with food-product advertisements. Adolescents watch on average, 17 advertisements a day for candy and snack foods, or more than 6,000 of these advertisements a year.

Obesity Related Chronic Conditions

One of the three leading causes of preventable deaths within the United States is poor nutrition, and is related to chronic conditions such as diabetes and obesity (Nichols, Ussery-Hall, Griffin-Blake, & Easton, 2012). Chronic diseases such as heart disease and cancer have also been found in many instances to be diet-related (Verhagen, Vos, Franc, Heinone, & Henk, 2010). It has been documented that in order to prevent diseases in adulthood, it is vital that healthy habits initiate at an early stage in life and are continuously present (Irazusta, Hoyos, Irazuta, Ruiz, Diaz, & Gil, 2007). In recent times several studies have reported that adolescents exhibit poor eating habits, consequently placing youth at a higher risk of developing chronic conditions (de Moraes, Adami, & Falcao, 2012; Lytle, Nutritional Issues for adolescents, 2002).

Heart disease is well documented the leading cause of death in the United States (Bellow, Epstein, & Parikh-Patel, 2011). The American Heart Association (AHA) has recommended that individuals reduce their high intake of total fat, *trans* and saturated fat, dietary cholesterol, and sodium as they increase the risk of developing heart disease (Eilat-Adar & Goldbourt, 2010). The National Health and Nutrition Examination Survey (NHANES) is a series of studies designed to assess the health and nutritional status of adults and children in the United States. The survey reports that boys within the ages of 16 – 19 years consume an excess of dietary cholesterol (Lytle, Nutritional Issues for adolescents, 2002).

Atherosclerosis, the buildup of fats in and on the artery walls (plaques), which can restrict blood flow, initiates during childhood or adolescence and progresses to the young adult years (Homma, Troxclair, Zieske, Malcolm, & Strong, 2011). In the United States, more than 60% of children and adolescents consume more saturated fat than the recommended amount in the *Dietary Guidelines for Americans* consequently placing this group at risk of developing heart disease (National Center for Chronic Disease Prevention and Health Promotion, 2009). Because adolescents are prone to acquire habits that will remain through the rest of their lives (Monge-Rojas, 2001), it is essential that more adolescents translate nutrition knowledge into eating behavior modification aimed at preventing the development of heart disease.

The chronic condition diabetes mellitus has affected children and adolescents in recent years (Craig & Chi-Yu, 2009). Diabetes mellitus is a metabolic condition that emerges from a failure in insulin secretion and/or insulin action. This creates hyperglycemia with the disordered metabolism of carbohydrates (Heydari, Radi, Razmjou, & Amiri, 2010). Diabetes is considered to be a global problem, which is anticipated to reach pandemic proportions by the year 2030 (Scollan- Koliopoulos & David, 2011). Throughout many years, Type 2 diabetes was appraised as a condition of people in middle age (Perez Gomez & Huffman, 2008). Less than 3% of all cases of new-onset diabetes in children and adolescents were deemed to be occurring 15 years ago, whereas in present times, new-onset cases among adolescents has risen up to 45% (Pinhas-Hamiel & Zeitler, 2005). According to CDC, approximately one in three American children born in the year 2000 will develop diabetes in their lifetime (Centers for Disease Control and Prevention, 2008; National Center for Chronic Disease Prevention and Health Promotion, 2009). Some of the risk factors associated with the onset of diabetes have been linked to environmental factors such as lifestyle changes and the lack of physical activity leading to excess body weight

especially around the waist. Other risk factors include being from an ethnic group of high prevalence such as Hispanics, family history of diabetes, blood lipid abnormalities, among other factors (Craig & Chi-Yu, 2009).

Osteoporosis a chronic condition in which bones become frail and break easily is highly prevalent in United States. The heightened level of people suffering from osteoporotic bone disease within the past decades has risen to epidemic proportions (Rafferty, Watson, & Lappe, 2011). According to data from the National Osteoporosis Foundation (NOF), 2011, about 10 million adults are currently suffering from osteoporosis of which eight million are women and two million are men. Even though it is adults who suffer from osteoporosis, this disease has its foundation during adolescence (Novotny, Daida, Grove, Acharya, Vogt, & Paperny, 2004). The importance given to the appropriate amount of nutrient consumption during adolescence, specifically the required amount of calcium, is due to this nutrient being identified as an essential factor in the development of and maintenance of a healthy skeleton. Approximately 45% of the achievement of total skeletal maturity occurs during adolescence (Rafferty, Watson, & Lappe, 2011; Lytle, Nutritional Issues for adolescents, 2002). This increases the importance of effective nutrition education programs that are targeting adolescents.

Cancer, a chronic disease of more than 100 types is a leading cause of death worldwide, accounting for 7.6 million deaths (around 13% of all deaths) in 2008 (American Cancer Society, 2011; World Health Organization, 2011). According to World Health Organization it is contemplated that by the year 2030, deaths caused by cancer will increase to over 11 million. In 2011, the WHO indicated that cancer could be prevented by more than 30% by adjusting or diverting from certain risk factors such as low fruit and vegetable intake. As children get older there is a noticeable decrease in their consumption of fruits and vegetables therefore losing

important micronutrients with cancer protecting activity (Striegel-Moore, et al., 2006). With the existent data that reflects the link between a plant based diet and the prevention of cancer, it is necessary to target vulnerable populations such as the adolescent group with effective interventions in order to convey these messages.

Existent Need for a Nutrition Education Intervention

According to Cardamone Cusastis, and Shannon, (1996), nutrition interventions and education strategies are needed to advocate for the modification of adolescent's deficient dietary intakes towards the adoption of healthier ones. A study by Prell, M. S., Berg, Jonsson, & Lissner, 2005, states that the introduction of health promotion and the prevention of disease through interventions show to be more effective when began early in life. Because of the existent data reflecting the need to improve the dietary patterns of adolescents, this study aims at increasing their nutrition knowledge and their awareness of the association of unhealthy dietary practices and its adverse health effects.

In an attempt to enhance health and hinder the development of chronic diseases, the adoption of healthy eating practices is imperative (Lytle & Kubik, Nutritional issues for adolescents, 2003). Eating patterns of adolescents in the U.S. have shown they consume an excess of fat, sugar, soft drinks, and salty snacks and have too low an intake of fruits and vegetables and micronutrients according to dietary recommendations (Powell & Han, 2011). This creates a complication because of the link between dietary habits and the development of chronic disease later in life (Neumark-Sztainer, Story, Hannan, MStat, & Croll, 2002). Due to these findings, the need for nutrition education has risen (Contento, 2008).

Studies have provided information on how nutrition education focusing on youth may be most efficacious in advocating for the creation of healthy dietary patterns that will be followed

throughout the life of a person (Robinson-O'Brien, Larson, Neumark-Sztainer, Hannan, MStat, & Story, 2009). Because schools have access to a large number of students, schools can be seen as a suitable setting for the implementation of nutrition education and health promotion programs needed in order to promote health in general and specifically for the prevention of chronic diseases (Cohen, et al., 2012; Briggs, Safaii, & Beall, 2003). Schools are a fundamental part of the social environment that helps construct eating and physical activity patterns of children (Zenzen & Kridli, 2009). The Academy of Nutrition and Dietetics previously known as the American Dietetic Association (ADA), the Society for Nutrition Education (SNE), and the American School Food Service Association (ASFSA) state that extensive coverage of nutrition services such as nutrition education must be supplied to all the preschool through grade 12 students in the nation (Briggs, Safaii, & Beall, 2003).

Nutrition education can be defined in different ways. Poppell, Stanberry, Blackwell, & Davidson, (2001) defined nutrition education as “means by which functional and scientific nutrition science is transmitted to the American public in a manner which leads to reasonable nutrition behavior.” In a report by the ADA, nutrition education is defined as “any set of learning experiences designed to facilitate the voluntary adoption of eating and other nutrition- related behaviors conducive to health and wellbeing (American Dietetic Association Reports, 1995). In a paper by Casazza & Ciccazzo (2007), it is stated that there is a need for compelling programs/interventions that center on revising lifestyle behaviors that are unhealthy, if health of adolescents is to be amended.

Research performed on school-based interventions, have shown that an increase in knowledge, intentions, and self-efficacy maintained an impact on healthy choices for food (Abood, Black, & Coster, 2008). An article by Sharma, Gernand, & Day (2008), defines

knowledge as “factual and interpretive information leading to understanding or useful for taking informed action.” Because knowledge is one of several factors that can assist in the formation of better nutritional habits by adolescents, this topic is worthy of more study. Other studies have demonstrated that although adolescents have a significant amount of knowledge regarding healthy eating practices, they find it difficult to follow healthy eating recommendations and frequently consume foods that they perceive as unhealthy. Barriers to healthy eating include lack of time, limited availability of healthy foods in schools, and a general lack of concern regarding following healthy eating recommendations (Croll, Neumark-Sztainer, & Story, 2001).

A considerable number of studies have found that there is an existent correlation between eating behavior and knowledge about nutrition (Sharma, Gernand, & Day, 2008). Rankins, et al, 2000, mention that even though some studies demonstrate that adolescents seem to comprehend the significance of lowering fat intake, cholesterol and sodium, they frequently do not know which foods have an excessive amount of these nutrients. Misinterpretations and the deficient knowledge processed by adolescents on nutritional topics, create plausible public health concerns (Brook & Tepper, 1997).

The awareness of health as a precedence for academic importance has been insufficient in the educational system of the United States. In order to receive assistance and resources for health-based policies and interventions, such as health education, the effects of health need to be part of the educational agenda (Esposito, Fisher, Mennella, Hoelscher, & Huang, 2009). The need for programs/interventions that target the adolescent group is of great importance because of the implications that choices made during adolescence have on long term health.

The study by Croll, J. K., Neumark-Sztainer, D., & Story, M. (2001) concludes that there is a need for interventions that assist adolescents with the translation of nutritional knowledge

into healthy behaviors. Interventions should help youth to easily follow healthy eating and explain the consequences of unhealthy eating in terms that they value, stressing meaningful short-term benefits. In setting out ways by which to decrease the burden of chronic diseases such as obesity, type 2 diabetes, cardiovascular diseases, cancer, osteoporosis, the Food and Agricultural Organization (FAO) proposes that nutrition should be placed at the forefront of public health policies and programs.

Adequate nutrition during adolescence is particularly important because of the rapid growth that teenagers experience. Dietary choices and habits established during adolescence greatly influence future health. Yet many studies report that adolescents consume few fruits and vegetables and are not receiving the calcium, iron, vitamins, or minerals necessary for healthy development. Low-income youth are more susceptible to nutritional deficiencies, and since their diets tend to be made up of high-calorie and high-fat foods, they are also at greater risk for overweight or obesity. Currently adolescents have access to inexpensive and unhealthy foods such as those available at fast foods restaurants. In addition, many high school cafeterias sell more high-fat, high-calorie foods and sugary drinks than nutritious, lower-calorie choices.

Because adolescence is a time of developments and many decisions they make about food intake can have a long lasting effect, the current nutrition education intervention was designed to provide key nutrition information in an interactive format while addressing the benefits of healthy eating and the consequences of unhealthy dietary practices. In order to prevent diet-related chronic conditions it is essential that adolescents are exposed to effective interventions where they are able to translate nutrition knowledge into healthy eating behaviors. To our knowledge no nutrition education programs aimed at high school students have included Hispanics. Hispanics are the fastest growing minority group in the United States. According to

the U.S Census Bureau, Hispanics comprise the 15% of the total population, with a projected increase to 24.4% by 2050 (U.S. Census Bureau, 2004). This is one of the reasons Hispanic groups deserve particular attention especially in terms of nutrition education during their high school years. The study was conducted at one of the high schools located in El Paso, Texas. El Paso, Texas is located in the US-Mexico border, the largest bi-national border in the world. According to the US Census Bureau, El Paso, Texas is considered to have approximately twice the national percentage of families living under federal poverty levels (21.4% vs. 9.9%) (U.S. Census Bureau, 2011). The poverty level in El Paso is twice compared to the one reported nationwide (26.6% vs 13.5%). The median household income nationwide in El Paso, Texas is \$51,914 vs. \$37,428. Therefore the region of El Paso is considered low income, which is a factor associated with increased consumption of inexpensive foods of low nutrient density.

The high school student population in El Paso, Texas is comprised of approximately more than 151,000 students according to information obtained from the district websites from the 3 most important school districts in El Paso, Texas. According to the Texas Education agency Hispanic students for the first time make up slightly more than half of Texas public school children. Enrollment data from this agency show that this school year Hispanic students reached 50.2 percent of Texas' 4.9 million public school children, compared with nearly 49 percent last year. Hispanic students in prekindergarten through high school now total 2,480,000 in Texas.

The goal of this study was to investigate the impact of a nutrition education intervention in high school with a predominately Hispanic population. The results of this study are expected to help advance policy to incorporate nutrition education in a science high school curriculum.

Chapter 2

Hypotheses and Objectives

The main objective of the quasi-experimental study was to investigate the effect of a specific interactive nutrition education on the nutritional knowledge of a group of predominantly Hispanic high school students living in the U.S.-Mexico border area.

Hypotheses and Specific Objectives

Hypothesis # 1. There will be a significant increase in nutrition knowledge expressed as the change in score from pretest to posttest in students who will be part of the nutrition education intervention due to the exposure to nutrition content. No significant difference in nutrition knowledge will be detected in participants in the control group.

Objective # 1. To measure the effectiveness of the nutrition intervention by testing the nutrition knowledge of participants at baseline and after the intervention.

Hypothesis # 2. There will be a significant increase in nutrient intake between baseline and post-intervention reported by participants in the study group as a result of information regarding nutrients of concern during adolescence covered throughout the intervention. No significant difference will be detected between baseline and posttest in participants in the control group.

Hypothesis 2.a. There will be a significant increase in the number of participants in the study group who meet the Dietary References Intakes of selected nutrients for their age and sex when presented with information about nutrients of concern during adolescence during the intervention.

Objective # 2. To compare dietary intake at baseline and after the intervention of participants in the control and study groups.

Hypothesis # 3. Students in the intervention group will demonstrate positive attitudes towards modifying eating patterns after been exposed to a nutrition education intervention.

Objective # 3. To record intentions of behavior change of participants in the study group.

Theoretical Framework

The Theoretical Framework used for this nutrition education is related to the Behavioral Change Model. It is a very basic model which initiated with the literature review from where the problem of increased obesity rates and the obesity related chronic conditions in adolescents was identified. Previous school-based interventions have shown that an increase in knowledge, intentions, and self-efficacy maintained an impact on healthy choices for food (Abood, Black, & Coster, 2008). Others have shown that although adolescents have a significant amount of knowledge regarding healthy eating practices, they find it difficult to follow healthy eating recommendations and frequently consume foods that they perceive as unhealthy. Rankins et al., (2000), mentioned that even though some studies demonstrate that adolescents seem to comprehend the significance of lowering fat intake, cholesterol and sodium, they frequently do not know which foods have an excessive amount of these nutrients. Therefore it was expected that participants exposed to the intervention acquire nutrition knowledge that may have an impact in their dietary intake and in their intentions to adopt healthy eating behaviors. As a result of the behavioral changes, the long term goal of this study was to decrease obesity rates and obesity related chronic disease conditions.

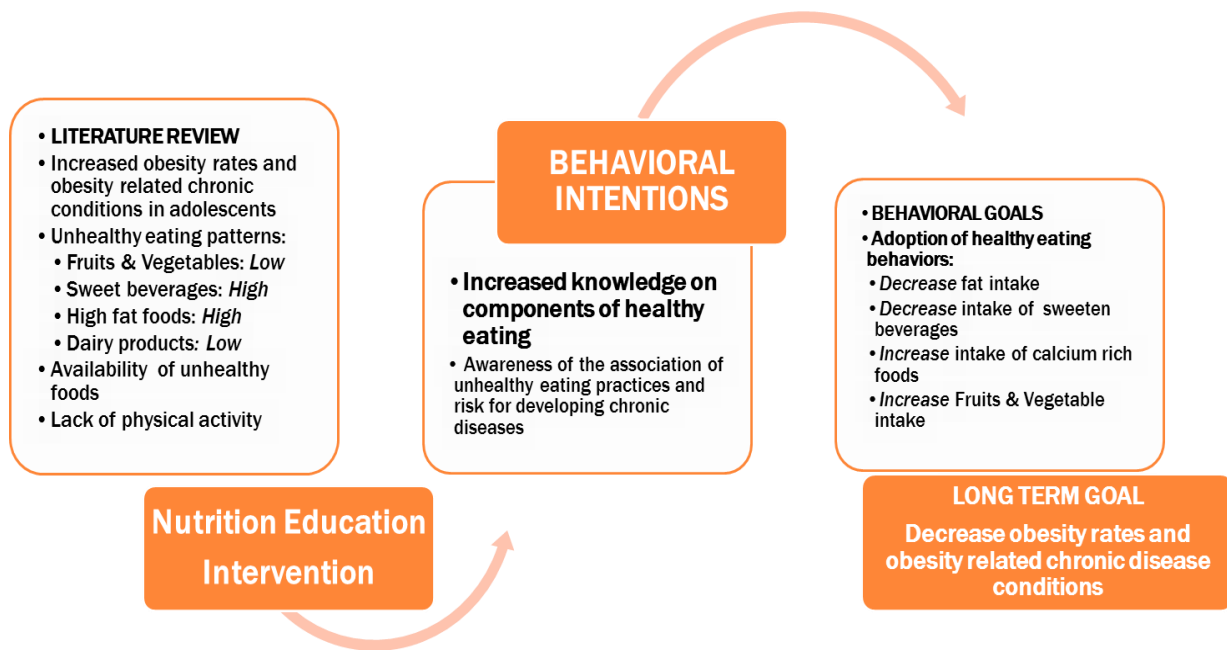


Figure 1. Theoretical Framework

To our knowledge no nutrition education interventions have addressed the importance of healthy eating practices in the prevention of obesity related chronic diseases and the health risks associated with unhealthy eating practices. In addition none of the studies of this nature has been conducted with high school students of Hispanic origin.

Chapter 3

Methods

Setting

The study was conducted at one of the high schools belonging to one of the three major independent school districts in El Paso Texas.

Sample

The research protocol was approved by The University of Texas at El Paso Institutional Review Board (IRB) and by the Research and Evaluation Department of one of the major school districts in El Paso, Texas. Approval from the high school principal where the study was conducted was also obtained.

Participants in the study were high school students enrolled in two science courses during the academic year of 2010 and were recruited to take part in the nutrition education intervention. A total of 88 eligible participants were assigned to the control group (n=39) and intervention group (n=49) after signing a consent form (Appendix A). The sample sizes achieved 63% power to detect 5.6 mean difference in nutrition knowledge at post-test among groups (equivalent to a medium effect size of 0.5), at a significance alpha level equal to 0.05 (Poppell, Stanberry, Blackwell, & Davidson, 2001).

Two thirds of participants in each group were females and more than 85% self-reported as being Mexicans, Mexican-Americans, and Hispanic/Latino (Table 2). Two science teachers had previously agreed to support participation of students in their classes and assist with data collection. Both teachers signed a consent form (Appendix B). To protect the privacy and identity of all participants in the study, all data collected for the purpose of the study was given a

unique code. All data collected were stored in a locked cabinet of a faculty member at The University of Texas at El Paso, College of Health Sciences.

Participant Recruitment

Students enrolled in high school science courses offered at the high school where the study was conducted were invited to participate in the study during a regular class session. Permission from science teachers was obtained in advance to explain the study to potential participants. Six science classes were visited to explain the study to approximately one hundred and seventy potential participants. All potential participants were presented with an oral and written explanation of the purpose of the study as well as all the steps involved in the study. The potential participants were also informed of several incentives that they would be eligible to receive based upon completion of all parts of the study. These included gaining earning extra credit points from their science teachers, a fifteen dollar gift card to a local supermarket, and earning community service hours through their participation and completion of all parts of the study. After all the information pertaining to the study was presented there was an opportunity to answer any questions the students had.

After all the necessary information was presented to the potential participants, a cover letter and consent forms both in English and in Spanish (Appendix A) was distributed among the students. The cover letter provided potential participants and their parents with information about the researcher and the purpose of the study. Both the English and Spanish versions of the consent forms for the control and intervention groups provided the potential participants and their parents with detailed information about the purpose of the study, the procedures to be followed throughout the investigation, as well as any risks and benefits the participants could encounter, as well as information regarding the confidentiality of the participants throughout the investigation.

Assent to participate in the study was obtained from all participants who were younger than 17 years of age and had returned consent forms with all required signatures. All other participants who were 18 years of age or older were allowed to participate in the study once they returned their consent forms with all the required signatures.

Inclusion and Exclusion Criteria

Participants were senior high school students aged 17.5 ± 0.8 , enrolled in a high school science course. The response rate for this study was 58.6% (34 males and 54 females). Students who had previously enrolled in a nutrition course were excluded from participation.

Study Design

A quasi-experimental design study was conducted among high school students enrolled in two science courses using a pre- and post-test controls. The students were divided into an intervention group and a control group. The intervention group ($n=42$), was exposed to three nutrition lessons. The control group ($n=36$), was not exposed to guided nutrition lessons and continued with the normal course work given to them by their science teachers.

Control Group

Control group participants were not exposed to the nutrition intervention, but also met with the researcher after 10 weeks for completion of the nutrition knowledge test and the three-day dietary records.

Survey

The investigation began with the participants taking a survey (Appendix C). The survey was developed by the student researcher and was approved by a thesis committee member for flow, clarity, and relevance of questions prior to its administration. Both the researcher and the

science teacher were present during the time the survey was administered to students. Any questions that students had about the survey were answered by the researcher.

The survey given to students was comprised of nineteen questions which collected information on the demographic and other characteristics of the participants. The first nine questions asked participants for their age, gender, ethnicity, if they worked, and if so, how many hours, how many people lived in their household, as well as father and mother's education level and occupation.

Questions ten through thirteen asked participants to self-report if they had previously taken a nutrition course (in order to meet inclusion criteria), where and whom they get most of their nutrition and health information from, if they were involved in extracurricular activities, if so, which ones, and whether they participated in the free lunch or breakfast program at school. Questions fourteen through seventeen dealt with questions about factors that influenced their nutritional patterns. They were asked what nutrition meant to them, if they believe they ate healthy, if peers influenced their eating habits, and whether or not they skipped any meals. The last two questions within this survey asked if anyone at their home was overweight, or obese, and which meals they sat down to eat with their family.

Anthropometric Measurements

The school nurse was also notified about the research study and was asked to support the investigation by collecting clinical measurements from the participants. Once the school nurse agreed to participate in the collection of clinical measurements, a consent form was completed (Appendix D). After the students completed the survey, the researcher took groups of approximately 5-8 students at a time to the school nurse's office in order to collect their anthropometric measurements (height, weight, waist circumference). Height and weight

measurements were taken following standard procedures. Participants removed their shoes in order for the school nurse to measure their height and weight. The measurement of the participant's height and weight was performed in order to calculate BMI.

BMI is commonly used as means to determine generalized body adiposity for the purpose of the overweight and obesity status of children and adults (Messiah, Arheart, Lipshultz, & Miller, 2008) however it can have limitations as an indicator for adiposity in youth, due to the changes in growth rates and maturity levels of an individual (Lee, Bacha, Gungor, & Arslanian, 2006). For this reason, waist circumference (WC), which has been shown to be associated with metabolic syndrome in children, adolescents, and adults (Messiah, Arheart, Lipshultz, & Miller, 2008) was also measured in participants by the school nurse. The WC of participants was measured over their clothing.

Because the concurrent use of BMI and WC has been acknowledged as a more appropriate predictor of metabolic risks than when they are used alone (Lee, Bacha, Gungor, & Arslanian, 2006), the researcher made the decision of using both measurements to describe the anthropometric measurements of the participants. The measurements collected by the school nurse were recorded in a section located at the end of the survey. After all participants attended the school nurse's office to have their height, weight, and waist circumference measured, they moved on to the next part of the study.

Three-day Dietary Records

All participants filled out a three-day dietary record at baseline and post-intervention as a means to compare current dietary intake of participants to Dietary Reference Intakes (DRIs). Participants were provided with the handouts on which they would record their dietary patterns (Appendix E). The three-day dietary record handout given to the participants provided

instructions on how to fill out a dietary record for one day through the use of an example record. The researcher also met with the students in order to train them on how to fill out the three-day dietary record and to answer any questions. Participants were instructed to record dietary intake for two weekdays and a one weekend. Once participants were instructed on how to complete their 3-day dietary records, participants were ready to move on to the next section of the study.

Nutrition Knowledge Test

The purpose of the nutrition knowledge test (Appendix F) was to analyze the impact in reported nutrition knowledge of students at baseline and at post-intervention after being exposed to three guided lessons. The nutrition knowledge test was revised and approved by all thesis committee members before its administration among the participants.

The nutrition knowledge test consisted of 35 questions. It was conducted within the participant's science classes and both the teacher and researcher were present during the testing sessions.

Nutrition Lessons

Each nutrition lesson presented to participants focused on US Dietary Guidelines for Americans (USDA and USDHHS, 2010), including nutritional value of whole versus processed foods and the types of nutrients and food sources including carbohydrates, protein, and fats & cholesterol. These topics were taught in the context of healthy eating practices and the prevention of chronic diseases and overconsumption of nutrients and its association with the risk of developing chronic diseases by using several sources. A textbook, as well as web-based lesson plans which were modified to concur with the information presented to participants were used to prepare the lessons (Insel, Ross, McMahon, & Bernstein, 2011; Polisky, 2009). The lessons were developed by the researcher and were reviewed by the thesis supervisor before being presented

to the participants. Lessons were designed to be age appropriate by using several research articles, and sources that were focused on nutrition and adolescents (Casazza & Ciccazzo, 2007; Poppell, Stanberry, Blackwell, & Davidson, 2001; Abood, Black, & Coster, 2008; Contento, 2008)

Lesson structure delivered to participants followed the same format in all three lessons.

The following is the format used:

- Materials: Lesson plans, fact sheets, food models, and visuals (fat, sugar and salt).
- Expository content: Health effects of low nutrient density foods; simple vs complex carbohydrates; saturated vs unsaturated fats; importance of eating fruits and vegetables
- Activities: Hands-on activities and demonstrations
- Reinforcement: Learning by working on activities:
 - Observe and compare visuals for content of fats, sugar, and salt.
 - Fix plates with food models to compare healthy vs unhealthy options.

The lessons were delivered by the researcher using Power Point Presentations. Every participant received a folder with handouts that provided the participants with the goals of the particular lesson and an outline of every lesson. As the lessons were presented, participants had to fill in information or answer questions on these handouts, regarding the material. Other handouts that were used throughout the lessons in order to supplement the information being presented were also placed in these folders. At the end of the first two lessons, participants returned their folders to the researcher to minimize the chances of the folders being lost. When the third and final lesson was presented, participants were allowed to take their folders with them in order to review the material they had learned.

In addition to the folders, hands-on activities and demonstrations of certain food items were also used as a means to reinforce the information being presented. Discussions were also held at certain key areas throughout the presentations, and at the end of each presentation in order to address any comments or questions the participants had.

Intervention

Lesson 1

Upon completion of the nutrition knowledge test at baseline, students in the intervention group began attending one of three one-and-a-half hour nutrition guided lessons. The first lesson given to the participants began with the researcher giving the participants a brief overview about the topics that would be addressed throughout the lessons they would be exposed to during the next 3 class periods. The actual lesson began with an introduction that defined nutrition in order to have the participants acquire a better understanding of what nutrition is and why it is important to become familiar with this topic. Within this first lesson, statistics were also presented to the participants to provide them with information on common nutritional habits among adolescents and with this set the grounds for a need to modify eating patterns among youth.

After the introduction to the lesson, the researcher began with the presentation of the main topic for lesson one, which was information about carbohydrates. In order to open up the discussion about carbohydrates, different food items were placed at the different lab tables within the classroom. Participants were then asked to look at the different food items and identify which food products contained carbohydrates. This was done in order to ascertain reported participant knowledge regarding which food items contained carbohydrates. It also exposed them to other food items which they may have not recognized as containing carbohydrates. Participants were

then presented with detailed information on what carbohydrates are and how they are broken down in our body.

Different types of carbohydrates and their health effects were also addressed in this lesson. Information about simple and complex carbohydrates, refined versus unrefined complex carbohydrates were presented to the participants. Participants were given lists of different food items that contain the different types of carbohydrates in order to help participants make better choices when deciding what food items to consume. Visual aids to display the amount of sugar contained in several popular food items such as vanilla ice cream, brownies, soft drinks, chocolate bars, and other food products were used. As the participants were examining the visual aids, discussions were being held with the participants regarding the impact this demonstration had on them.

Participants were also informed on how to examine food labels for carbohydrate information. A sample food label of a well-known food product was used to discuss carbohydrate content. Because these nutrition classes were being held in a high school setting, carbohydrate intake for athletes before, during, and after exercise was also addressed. After the information was presented students were given the opportunity to ask any questions they had over any of the material and were given the opportunity to look at a handout with common beverages in order to check for calorie, grams of sugar, and teaspoons of sugar content. When the first lesson ended, students gave their folder containing the information presented to the researcher.

Lesson 2

The second lesson focused on the topic of fruits and vegetables. Participants were presented with information on the importance of consuming fruits and vegetables in order to

receive the more than 100 potential beneficial substances that are found within fruits and vegetables. The beneficial substances that the lesson focused on were vitamins, minerals, fiber, and antioxidants. Information regarding the impact such substances have on health and the importance of why people should consume these was also presented to the participants.

The possibility of reducing the risk of suffering from heart disease and stroke, controlling blood pressure, preventing some types of cancers, avoiding intestinal problems and the prevention of obesity was addressed by providing participants with examples of some of the fruits and vegetables that can help with the prevention of such chronic conditions. In an effort to help participants increase their consumption of fruits and vegetables, tips that could help the participants consume more fruits and vegetables such as keeping fruits and vegetables out where they can be easily seen, were also given to the participants.

As part of the lesson, participants created a foldable that would help them remember other specific information that was presented during this lesson. On this foldable, the participants included information about the reasons why Vitamin D, Vitamin A, Iron (Fe), and Calcium (Ca) are considered to be nutrients of concern during adolescence. Participants also included information on their foldable regarding how to build better salads, and the nutrients and benefits that are provided by some of the fruits and vegetables that make up their salads.

After the presentation on why adolescents should add more fruits and vegetables to their diets, participants had the opportunity to find out how much fruits and vegetables they needed to consume depending on their age, sex, and level of physical activity. This was done by having the participants access the following website: <http://www.fruitsandveggiesmatter.gov/> from the CDC. The Fruits and Veggies Matter website was used to help students understand whether or not they were meeting the recommendations for the consumption of fruit and vegetables and with

this modify their eating patterns if needed, towards an increase in the consumption of fruits and vegetables.

During the last part of the lesson, students were introduced to the “Plate Concept.” Participants were given the opportunity to build their own plates using what they had learned during the first two lessons which covered carbohydrates and fruits and vegetables. The building of their plates was also used to briefly introduce the participants to topics of proteins, fats and cholesterol, which was covered during the third and final lesson. As the participants created their plates, the researcher walked around the classroom and helped the participants analyze their plates in order to see if they were adding the healthy foods, and the right portions for each of the food items selected.

Lesson 3

The third and final lesson of this intervention was divided into two sections. The first section focused on information regarding proteins in our diets. Participants were informed of what proteins are and how they are formed in our bodies. The nine essential amino acids were also included in this lesson and different food items containing these amino acids were covered as well. The differences between complete and incomplete proteins were addressed and different examples of food products containing each of the different proteins were presented to the participants. Sample meals such as wheat tortillas with beans, rice and soybeans, and rice and lentils were used reinforce the concept of how incomplete proteins can come together to supply adequate amounts of amino acids.

Protein and its link to health conditions was also an important part of this lesson. Positive impacts of protein consumption in areas such as blood clotting and the formation of muscle tissues stressed the need for protein in our diets. The negative impact on health due to the

consumption of protein was also addressed by informing participants that certain conditions such as kidney problems, heart disease, some types of cancers have been attributed to the excess consumption of protein. To end the section covering protein, participants were given information that provided the recommended dietary allowances for protein by gender and age group.

The second part of the third lesson was dedicated to fats and cholesterol. This section began with detailed information on some of the ways in which our body uses fats. Information dealing with the differences between good and bad fats in terms of which food products contain these fats and the impact the different fats have on a person's health was also addressed. Visual aids displaying amounts of fat in different food items were passed around the classroom and a class discussion was held right after in order to answer any questions participants had and to address any comments or concerns. Cardiovascular disease, obesity, and some types of cancers were some of the conditions that were acknowledged as having strong links with the consumption of bad fats.

The last part of this lesson focused on cholesterol which is a fat-like substance. Participants were told what cholesterol is, how our body makes cholesterol, as well as which food products normally contain cholesterol. The different types of cholesterol being high density lipoproteins (HDL) cholesterol and low density lipoproteins (LDL) cholesterol were also covered in this section. Participants were informed of the role these two types of cholesterol play in terms of a person's health.

In order to reinforce all the information that was presented during the third and final lesson, participants watched a video that focused on food and fat content that are commonly seen in the American diets. This video specifically focused on food products that were consumed while eating out at restaurants. After the video students were issued a handout that provided a list

of several popular food products that are consumed by the population, and were given the opportunity to determine the amount of calories, total fat, saturated fat, and sodium these products had. Finally, to end the lesson, participants were given time to ask any questions they had and comment on the information they had learned.

Post-Intervention Survey

The purpose of the post-intervention survey was to record reported attitudes of participants after being exposed to nutrition lessons. The post-intervention survey was designed by the researcher and was reviewed and approved by the thesis committee members prior to administration (Appendix G). The post-intervention survey consisted of eight questions, in which the first four questions focused on the participant's reported attitudes towards their nutritional habits. Question number one asked participants if they were willing to modify their eating patterns after taking part in the nutrition education program, question number two asked participants if the information they learned provided them with valuable and interesting information, questions number three and four asked the participants if they were going to share any of the information they learned throughout the 3 guided nutrition lessons with their peers and household members respectively.

The last four questions provided the participants the opportunity to express their feelings or thoughts about the nutrition classes. Question number five asked the participants if there was anything they would have liked to learn about that was not covered in the lessons. Question six asked participants to write down anything they liked or disliked about the way the lessons were taught. Questions seven and eight asked participants for any suggestions they had in order to improve the lessons, and any other comments they wanted to share with the researcher.

Incentives

During the tenth and final week of communication with the students, the researcher issued a fifteen dollar gift card to all participants who completed all sections of the investigation. All students signed a form in which they acknowledged they received their gift card. Participants who asked for a letter from the researcher stating the number of community service hours they completed received their community service letters, and science teachers provided the participants with extra credit points on their average.

Nutrient Analysis

Data obtained from the three-day dietary records was entered and analyzed using a Nutrient Analysis Software ESHA. Nutrient analysis for each of the three days was then entered in an Excel sheet for further analysis.

Statistical Analysis

For all variables of the study, descriptive statistics such as the mean and standard deviation, frequency tables and graphs are presented.

Distribution of demographic variables such as gender and ethnic group across the two Groups (Control versus Intervention) are tested using the Chi-Square test for contingency tables. The two-sample t-tests are used to compare means for variables such as age and BMI across the two Groups.

For the continuous response variables (such as reported knowledge score and dietary nutrients) and 2 time points (Pre versus Post), the Group effect, Time effect and Group by Time Interaction are tested using the General Linear Mixed Model Analysis for repeated measures. If there was significant Group by Time Interaction, the Tukey-Kramer post-hoc procedure and F-test for simple effects are used to test where the differences lie. Variables such as age, BMI,

gender are also included in the model as covariates. All tests are conducted at the 0.05 level of significance.

Chapter 4

Results

A total of eighty eight participants were recruited to participate in this nutrition education program. Thirty nine participants were assigned to the control group (n=39), and forty nine participants were in the intervention group (n=49).

Participant Demographics

Baseline demographic characteristics of participants demonstrate no significant difference among control and intervention group participants as presented in Table 2. The average age of participants in both groups was 17.5 years. Sixty percent of participants in each group were females. In terms of ethnicity, the majority of the participants in both groups identified themselves as Mexican-Americans followed by Hispanic/Latino. Forty six percent of participants in the control group, and 40 percent in the intervention group defined themselves as Mexican-Americans.

Participant Characteristics

Characteristics of participants are depicted in Table 3. Similar percentages of participants in the control and intervention groups reported to be unemployed (64.1% vs 67.4 %). The vast majority of the participants in both groups responded they had never taken a nutrition course prior to this nutrition education program. The question on prior participation in a nutrition course was useful to exclude those participants who had previously enrolled in a nutrition course. Within the control group 74.4% participants responded never taken a nutrition course prior to this investigation, whereas 71.4% participants in the intervention provided the same answer. The majority of the participants in both the intervention and control groups reported getting their nutrition information from T.V./Internet, and from someone at school; 33.3% of participants in

the control group reported getting their nutrition information from T.V./Internet. Similarly, while 20% of participants in the intervention group reported that most of their nutrition information was derived from T.V./Internet source. School was also one of the most influential places from which participants were getting their nutrition information. Among participants in the control group, 30.3% reported getting nutrition information from a school source compared to 35.6% of the participants in the intervention group. The least common place or person from which the participants in both groups reported getting their nutrition information from was from a doctor. No significant difference was observed in participant characteristics among those in the control and intervention groups.

Anthropometric measurements

Anthropometric measurements including high (m), weight (kg), and waist circumference (cm) were taken for all participants in this nutrition education program. Height and weight were used to calculate BMI (kg/m^2). These measurements were analyzed in terms of participants' sex.

Homogeneity was observed in anthropometric measurements according to sex of participants within the control and intervention groups. As seen in Table 4, height for males was similar for participants in the control and intervention groups (1.8 ± 0.1 vs 1.7 ± 0.0) while the mean high for females was the same for those in the control and intervention group (1.6 ± 0.1 m). Weight for males in the control group was 73.6 ± 15.9 kg and 76.6 ± 13.3 kg for those in the intervention group. Mean weight for females in the control group was 61.8 ± 11.6 kg and 59.9 ± 8.4 kg for females in the intervention group.

There was no significant difference in waist circumference of males in intervention and control groups (85.5 ± 11.2 vs 85.0 ± 11.1 cm). Females in the control group had a waist circumference of 80.9 ± 10.0 cm while the same measurement for females in the intervention

group was 76.6 ± 7.2 cm. Body mass index (BMI) for males in the control group was 23.8 ± 3.8 kg/cm², and 25.4 ± 4.5 kg/cm² for males in the intervention group, BMI was found to measure. Females in the control group had a BMI of 24.2 ± 3.9 kg/cm² while the BMI of females in the intervention group was BMI of 23.0 ± 3.5 kg/cm² (Table 4).

Based on the BMI measurements for male and female participants in both the control and intervention group, it can be inferred that most of the participants in this nutrition education program were under the healthy weight category, according to the percentile ranges expressed by the CDC, with the exception of male participants in the control group.

Nutrition Knowledge Test

The purpose of testing reported nutrition knowledge was to test Hypothesis # 1 which stated there will be a significant increase in nutrition knowledge expressed as the change in score from pretest to posttest in students who will be part of the nutrition education intervention due to the exposure to nutrition content. Results of the nutrition knowledge test are shown as Means scores and Standard Errors (SE) for correct responses on the nutrition knowledge test controlling for prior nutrition knowledge due to prior nutrition exposure of participants in the control and intervention groups

As seen in Table 5, Mean scores and (SE) at baseline for participants in the control group was 65.1 (2.2). After ten weeks no significant difference was detected (68.6 (2.2)). A substantial difference was observed in the results for participants in the intervention group. At baseline, participants in the intervention group had a Mean score of 63.0 with a SE of 2.1. After the intervention, participants had a Mean score of 83.6 with a SE of 2.1 ($p < 0.001$). These results express a significant twenty point increase in Mean score of participants that were exposed to the nutrition education intervention, thus accepting hypothesis #1.

Nutritional Intake

The purpose of analyzing changes in participants' nutritional intake pre and post intervention was to test Hypothesis # 2, which stated there will be a significant increase in nutrient intake between baseline and post-intervention reported by participants in the study group as a result of information regarding nutrients of concern during adolescence covered throughout the intervention. Nutritional intake for participants is reported as a mean \pm SD. Thirty four nutrients were selected to identify the difference in nutritional intake of participants.

Participant's pre and post nutritional intake was analyzed by sex at pre and post intervention among the control and intervention groups. Table 6 outlines the data for nutritional intake of female participants at pre and post intervention within both groups. Nutritional intake of male participants at pre and post intervention for both, the control and intervention groups are shown in Table 7. No significant difference was observed when comparing baseline and post intervention dietary intake of female and male participants.

The percentage of total calories from fat for female participants in the control group, at baseline was 33% and 34% at post-intervention. A slight decrease in percentage of total calories from fat from 37% to 35% was observed for female participants in the intervention group. Male participants in the control group had a percentage of total calories from fat of 40 at baseline and 38% at post-intervention. Participants in the intervention group had 38% of total calories from fat at baseline and 36% at post-intervention (Figure 2). The recommended intake of fat is 25 – 35% of total calories from fat (CDC, 2011). Both, female and male participants in both groups exceeded the recommended percentage of total calories from fat.

Carbohydrate intake for females in the control group, at baseline was reported to be 236.7 ± 110.7 , while at post-intervention it was found to be 209.6 ± 61.6 . Similar results were observed

with carbohydrate intake for females in the intervention group. At baseline, carbohydrate intake for females in the intervention group was 230.5 ± 81.4 g, and found 221.0 ± 70.1 post-intervention (Table 6). These results demonstrate that female participants are exceeding the recommended intake for carbohydrates of 130 grams per day for females within the ages of 14-18 years.

Male participants in the control group had a carbohydrate intake of 264.5 ± 106.0 g at baseline and a carbohydrate intake of 247.3 ± 80.2 g at post-intervention. Among the intervention group, intake of carbohydrates for male participants was 303.6 ± 123.6 g at baseline and at 254.2 ± 91.2 g after the intervention. Male participants are also exceeding the recommended intake for carbohydrates among males within the ages of 14-18 years, set 130 grams per day.

Dietary fiber intake among female participants in the control group was 14.4 ± 7.8 g at baseline, and 11.6 ± 5.5 g post intervention. Female participants among the intervention group had a dietary fiber intake of 13.1 ± 9.6 g at baseline, and 15.7 ± 14.9 g post-intervention (Table 6). The DRI for fiber intake for females, ages 14-18 years is 26 grams per day. Based on these recommendations, female participants in the control and intervention groups show a deficiency in their fiber intake.

Male participants in the control group had a dietary fiber intake of 15.9 ± 7.5 g at baseline, and 16.3 ± 9.0 g post-intervention. Among the intervention group, dietary fiber intake of male participants was 18.5 ± 8.0 g at baseline, and 15.8 ± 7.1 g post-intervention (Table 6). Fiber intake for males within the ages of 14-18 year is recommended to be at 38 grams per day. According to these recommendations, male participants failed to meet the recommended intake of fiber.

Calcium intake for female participants among the control group was 532.0 ± 275.7 mg at baseline and 678.2 ± 563.1 mg post-intervention. Among the intervention group, calcium intake of female participants was 612.7 ± 333.9 mg at baseline and 657.3 ± 306.9 mg post-intervention (Table 6). The recommended calcium intake for females within the ages of 14-18 years is 1300 milligrams (mg) per day. Based on these recommendations, female participants did not meet the recommended calcium intake.

Male participants in the control group had a calcium intake of 896.3 ± 388.5 mg at baseline and 787.9 ± 399 mg post-intervention. Calcium intake of male participants among the intervention group was 1102.6 ± 645.1 mg at baseline and 1013.4 ± 471.9 mg post-intervention. Calcium intake for males within the ages of 14-18 is recommended to be at 1300 mg per day (Table 7). The intake of calcium for male participants was shown to be lower than the recommended intake therefore male participants did not meet recommendations for calcium intake.

Iron intake of female participants in the control group was found to be at 11.2 ± 5.0 mg and 10.3 ± 4.6 mg post-intervention. Females in the intervention group had an iron intake of 11.5 ± 5.6 mg at baseline and 10.9 ± 5.1 mg post-intervention (Table 6). Intake of iron for females within the ages of 14-18 years is recommended to be 15 mg per day. Based on these recommendations, it can be concluded that female participants were not meeting the recommended intake of iron intake per day.

Male participants in the control group had an iron intake of 20.2 ± 13.7 mg at baseline and 16.8 ± 7.4 mg post-intervention. Among the intervention group, male participants had an iron intake of 16.8 ± 10.4 mg at baseline similarly to 16.4 ± 8.5 mg iron intake after the intervention (Table 7). The recommended iron intake for males within the ages of 14-18 years is

set at 11 mg per day. According to these recommendations male participants were exceeding iron intake per day.

Post- Intervention Survey

The purpose of having participants answering a post-intervention survey was to test Hypothesis # 3 which stated students in the intervention group will demonstrate positive attitudes towards modifying eating patterns after being exposed to the nutrition education intervention. Ninety four percent of participants that were exposed to the nutrition education program stated that they were willing to modify their eating patterns after learning the information they received. Only two percent of participants stated that they were not willing to modify their eating habits, and four percent of participants stated that they did not know whether they would change their eating patterns. One hundred percent of participants stated that they found the information presented to them to be valuable and interesting. Ninety four percent of participants stated they were going to share the information they learned with their household members, as well as ninety two percent of the participants stating they were also going to share the information they learned with their peers (Figure 3).

Chapter 5

Discussion

Some nutrition education studies conducted in adolescents have concluded that although adolescents seem to comprehend the significance of lowering fat intake, cholesterol and sodium, they frequently do not know which foods have an excessive amount of these nutrients. The purpose of the present study was to expose a group of high school to a nutrition education hypothesized to increase reported nutrition knowledge and change behavior with the use of hands on activities that compared content of nutrients in different foods and made emphasis on the association of healthy eating practices in the prevention of chronic disease. Importance throughout the nutrition lessons was also given to the association of unhealthy eating and the risk of developing nutrition related conditions such as obesity, diabetes, and heart diseases.

Participant Demographics and Characteristics

Based on the results found from the survey, participants in both the control and intervention groups had similar demographic characteristics. Both age and ethnicity were found to be similar among all participants. About 80% of participants in each group reported to be Mexican, Mexican-Americans, and Hispanics or Latinos. This sample is representative of the Hispanic population in El Paso Texas. Anthropometric measurements were also found to be related in measurements among male and female participants. Other factors such as work situation of participants, and whether or not they had received nutrition education lessons prior to the intervention was also found to have analogous results among both the control and intervention group members. Acquisition of nutrition information by participants, participant's belief they ate healthy, and the role peers played in terms of the nutritional patterns participants followed reflected consistent results as well.

Changes in Reported Nutrition Knowledge

The objective of this study was to test reported nutrition knowledge of participants in the control and intervention group pre- and post-intervention. Hypothesis # 1 stated there will be a significant increase in nutrition knowledge expressed as the change in score from pretest to posttest in students who will be part of the nutrition education intervention due to the exposure to nutrition content. Participants in both, the control and intervention groups, took that same test at baseline and both groups displayed similar results which were below a Mean score of 70. This nutrition education program shows similarity with findings from the study by Brook, U., & Tepper, I., (1997), in which student's nutritional knowledge was at 48%, and showed no improvement throughout the students' years in high school.

After the guided nutrition lessons, participants in the control group remained with a Mean score below 70, whereas participants in the intervention group did reflect a substantial improvement of 20 points in their score, after being exposed to the intervention. The gain in knowledge after participants received instruction in nutrition found in this research study concurs with the positive results found by Poppell, A., Stanberry, A. M., Blackwell, A. P., & Davidson, C. W., (2001).

The positive results obtained from this study can be attributed to the guided nutrition lessons that were offered to these participants in which participants were not only exposed to the materials in a traditional format but they were also actively participating in hands on activities, navigating the web, watching videos, engaging in group discussions, food demonstrations, etc. given materials to take with them and use as study tools and reference materials. Hypothesis # 1 is supported by this study based on the results obtained from the reported nutrition knowledge test. These results also demonstrate that more nutrition education programs should be put into

practice in order to help adolescents learn information that can be beneficial to them in the near future.

Changes in Nutrient Intake

The second specific objective of this study was to compare baseline dietary intake of participants to Dietary Reference Intakes (DRIs). Hypothesis # 2 stated there will be a significant increase in nutrient intake between baseline and post-intervention reported by participants in the study group as a result of information regarding nutrients of concern during adolescence covered throughout the intervention. Participants in the control and intervention groups showed similar nutrient intake at baseline. Although there was no significant difference in nutrient intake between baseline and post-intervention for participants in the control or the intervention groups for the majority of the nutrients, there was a slight decrease of total carbohydrates (303.6 ± 123.6 g vs 254.2 ± 91.2 g) and total sugars (128.4 ± 57.1 g vs 82.5 ± 42.5 g) for male participants in the intervention group. A slight decrease between baseline and post-intervention for grams of carbohydrates (230.5 ± 81.4 g vs 221.0 ± 70.1 g) was also detected in females participating in the intervention group. In terms of carbohydrate intake, this study found that both female and male participants were exceeding the recommended intake for carbohydrates. These results reflect similarity with findings from Frary, Johnson, & Wang, (2004), in which it is stated that teenagers ingest more added sugars as part of their total energy percentage.

Even though reported nutrition knowledge of participants in the intervention group was significant, the time of duration of the study could not be sufficient for students to make drastic changes to their diets. These findings are in accordance with results from a study performed by Poppell, et al, 2001, where participants, did show improvement in their nutrition knowledge, however their food selection showed minimal improvement as well as no major difference for

those that received instruction in nutrition versus those in the control group which did not receive instruction in nutrition.

Dietary fiber intake among female and male participants within the control and intervention groups of this study was found to be below the recommended intake for females and males within 14-18 years of age. These findings concur with results stated by Granner, Sargent, Calderon, Hussey, Evans, & Watkins, (2004), where it is reported that adolescents have been found to have the lowest intakes of fruit and vegetables which are sources of dietary fiber. Striegel-Moore, et al., (2006) also state that as children get older, the consumption of fruits and vegetables is distinctively deficient.

Calcium intake among female and male participants in both the control and intervention groups in this study was reported to be lacking according to the set recommendations for females and males within the ages of 14-18 years. This study's results in terms of calcium intake are analogous to results shown by Lytle & Kubik, Nutritional issues for adolescents, (2003), where it was found that intake of dairy products, which are the leading sources of dietary calcium are also inadequate among adolescents. Lytle & Kubik, Nutritional issues for adolescents, (2003), also found that adolescent females' intake of calcium declines when compared to calcium intake during childhood.

Iron intake among female participants in the control and intervention groups at baseline and post-intervention was found to be below recommended levels among females participating in this study. Male participants in this study were found to exceed the recommended intake of iron, but this could be attributed to a higher intake of products that contain protein which is higher among male participants when compared to female participants of this study

Overall results of nutrient intake by female and male participants in this study reject hypothesis number two. Similar results in the fluctuations within the association between nutrition knowledge and dietary patterns were also found by Velazquez, Pasch, Ranjit, Mirchandani, & Hoelscher, (2011). One reason, for which no changes in dietary patterns between pre and post-intervention were observed among female and male participants, could be that nutritional intake was taken right after the nutrition education program ended. This may have given participants less time to process the information they had learned and therefore not being able to follow recommendations given throughout the nutrition lessons. Another possibility could be that participants may not have had a lot of support from their household members or their peers, when trying to follow healthier eating patterns.

Post-Intervention Survey

The third objective of this study was to record attitudes of participants post-intervention. Hypothesis # 3 stated that students in the intervention group will demonstrate positive attitudes towards modifying eating patterns after receiving instruction in nutrition. This investigation had 100 % participation on post-intervention questionnaires. Results from this study show positive findings due to the majority of the participants stating they were willing to modify their eating patterns, and all participants expressing they found the information presented to them to be valuable and interesting. These results are similar to those found by Abood, Black, & Coster, (2008), where participants formed positive behavior intentions which included eating fewer sweets and fried fruits as well as other factors that contribute to poor health.

The majority of participants also expressed they would be sharing the information they learned with their peers, and their household members. These positive results also concur with findings stated by Hoelscher, Evans, Parcel, & Kelder (2002), where it was found that when a

higher number of adolescents are reached at places such as schools, interventions have the potential to influence youth. Overall, hypothesis # 3 was supported by the findings of this study.

Conclusion

To summarize, results found by this study suggested that reported nutrition knowledge appears to increase in adolescent participants after being exposed to a nutrition education program introduced at a science class. Results from this study also indicate that adolescents are not meeting the recommended intake of selected nutrients, therefore adolescents are at a higher risk of developing chronic conditions that are associated with poor nutritional patterns. Finally, positive results in participant attitudes towards modifying eating patterns, value and interest of information presented, and possibility of sharing information learned from the nutrition lessons with peers and family members were also found.

Recommendations

Based on the results found in this study, it is the researcher's recommendation that more interventions include knowledge as an important variable to analyze when trying to assist adolescents in the formation of long lasting nutrition related behaviors. It is also important to have more interventions that focus on how to assist youth so that their nutritional patterns can follow dietary guidelines. Attitudes towards modifying eating patterns, value of information learned, and interest in sharing information learned with peers and household members should also be an important part of any intervention that targets nutrition in adolescents so the information acquired can serve as a means to improve the relevance and impact of future nutrition education programs that target adolescents.

Because the majority of the participants in this nutrition education program identified themselves as Mexican-American or Hispanic, and no other study has focused on Mexican-

American or Hispanic adolescents in the El Paso region, more interventions should focus on trying to determine what factors can assist Mexican-American or Hispanic youth in developing healthy nutritional behaviors. This study's results also demonstrate schools play an important role when disseminating nutrition information to adolescents, and therefore school districts should place more attention in the nutrition education students are receiving in order to cooperate with public health interventions that target adolescent nutrition.

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Tables

Table 2

Demographic Characteristics of Participants in the Control and Intervention Groups

<i>Variables</i>	<u>Control (n = 39)</u>	<u>Intervention (n = 49)</u>
Age , (years, $\bar{x} \pm SD$)	17.5 \pm 0.8	17.5 \pm 0.7
Sex , (n, %)		
Male	15 (38.5)	19 (38.8)
Female	24 (61.5)	30 (61.2)
Ethnicity (n, %)		
White	4 (10.3)	2 (4.1)
Mexican-American	18 (46.2)	20 (40.8)
African-American	1 (2.6)	0 (0)
Mexican	6 (15.4)	5 (10.2)
Hispanic/Latino	20 (40.8)	19 (38.8)
Other	0 (0)	3 (6.1)
Family members living at home (n, %)		
Total (<5 members)	20 (51.3)	21 (42.9)
Total (>5 members)	19 (48.7)	28 (57.1)
Family Members living at home		
By age , ($\bar{x} \pm SD$)		
Children (<18 years of age)	1.9 \pm 1.4	1.8 \pm 1.2
Adults (> 18 years of age)	2.6 \pm 0.9	2.7 \pm 1.1
Level of Education (n, %)		
Father		
None	3 (7.7)	7 (14.3)
Less than high school	8 (20.6)	8 (16.3)
High school graduate	12 (30.8)	11 (22.5)
Some college	6 (16.33)	8 (16.3)
College Graduate	10 (25.6)	15 (30.6)
Mother		
None	1 (2.6)	1 (2.0)
Less than high school	3 (7.7)	12 (24.5)
High school graduate	10 (25.6)	14 (28.6)
Some college	9 (23.1)	11 (22.5)
College Graduate	6 (41.0)	11 (22.45)

SD= Standard Deviation, Numbers in parenthesis represent percentages

Table 3

Characteristics of Participants in Control and Intervention Groups

<i>Variables</i>	<u>Control (n = 39)</u> <i>n (%)</i>	<u>Intervention (n = 49)</u> <i>n (%)</i>
Work Situation		
Not employed	25 (64.1)	33 (67.4)
Employed	14 (35.9)	16 (32.7)
Prior participation in nutrition course		
Not Received	29 (74.4)	35 (71.4)
Received	5 (12.8)	8 (16.3)
Do not know	5 (12.8)	6 (12.2)
Acquisition of nutrition information		
Parents	7 (21.2)	4 (8.9)
Family members (other than parents)	1 (3.0)	7 (15.6)
Doctors	1 (3.0)	3 (6.7)
T.V./Internet	11 (33.3)	9 (20.0)
School	10 (30.3)	16 (35.6)
Other	3 (9.1)	6 (13.3)
Involved in Extracurricular Activities		
No	22 (56.4)	21 (42.9)
Yes	17 (43.6)	28 (57.1)
Participation in free lunch or breakfast program		
No	18 (46.1)	19 (38.8)
Yes	21 (53.9)	29 (59.2)
Don't know	0 (0)	1 (2.0)
Self belief one eats healthy		
No	15 (38.5)	22 (44.9)
Yes	17 (43.6)	19 (38.8)
Don't know	7 (18.0)	8 (16.3)
Self's nutrition influenced by peers		
No	24 (61.5)	30 (61.2)
Yes	14 (35.9)	15 (30.6)
Don't know	1 (2.6)	4 (8.2)
Self skips meals		
No	10 (25.6)	15 (30.6)
Yes	29 (74.4)	34 (69.4)
Obesity affecting family members living at home		
No	22 (56.4)	23 (46.9)
Yes	16 (41.0)	18 (36.7)
Don't know	1 (2.6)	8 (16.3)

Table 4

Anthropometric Measurements by Sex of Participants in Control and Intervention Groups

<i>Variables</i>	<u>Control (n = 39)</u> $\bar{x} \pm SD$	<u>Intervention (n = 49)</u> $\bar{x} \pm SD$
Height (m)		
Male	1.8 ± 0.1	1.7 ± 0.0
Female	1.6 ± 0.1	1.6 ± 0.1
Weight (kg)		
Male	73.6 ± 15.9	76.6 ± 13.3
Female	61.8 ± 11.6	59.9 ± 8.4
Waist Circumference (cm)		
Male	85.5 ± 11.2	85.0 ± 11.1
Female	80.9 ± 10.0	76.6 ± 7.2
BMI (kg/m²)		
Male	23.8 ± 3.8	25.4 ± 4.5
Female	24.2 ± 3.9	23.0 ± 3.5

SD= Standard Deviation

Table 5

Means and Standard Errors (SE) for Correct Responses on the Nutrition Knowledge Test
Controlling for Prior Nutrition Knowledge of Participants in the Control and Intervention
Groups, Excluding Participants with Prior Nutrition Exposure

<i>Group</i>	<i>Baseline</i>		<i>Post-Intervention</i>	
	Mean	SE	Mean	SE
Control (n =34)	65.1	2.2	68.6	2.2
Intervention (n = 41)	63.0	2.1	83.6	2.1
p-value (for t-test of effect slice)	0.43 ns		<0.001 *	

ns=not significant and * = significant at the 0.05 level of significance

Table 6

Nutritional Intake of Female Participants at Baseline and Post-Intervention

Nutritional Variables	Baseline		Post-Intervention		DRI
	Control (n= 24) Mean ± SD	Intervention (n= 30) Mean ± SD	Control (n= 24) Mean ± SD	Intervention (n=30) Mean ± SD	
Calories (kcal)	1821.7 ± 762.1	1831.1 ± 668.5	1604.1 ± 506.3	1719.8 ± 538.7	1800
Calories from Fat (kcal)	612.7 ± 237.9	691.5 ± 307.4	552.8 ± 222.6	600.8 ± 266.2	
Calories from Saturated fat (kcal)	199.6 ± 95.9	205.8 ± 81.1	182.6 ± 107.5	190.0 ± 83.9	
Protein (g)	59.3 ± 23.5	61.0 ± 19.6	60.0 ± 23.2	64.4 ± 19.5	46
Carbohydrates (g)	236.7 ± 110.7	230.5 ± 81.4	209.6 ± 61.6	221.0 ± 70.1	130
Other carbs (g)	107.4 ± 73.2	108.4 ± 60.0	90.3 ± 36.2	427.3 ± 1513.2	
Total sugars (g)	77.3 ± 57.1	81.0 ± 33.0	77.8 ± 33.1	87.1 ± 42.4	
Dietary fiber (g)	14.4 ± 7.8	13.1 ± 9.6	11.6 ± 5.5	15.7 ± 14.9	26
Soluble fiber (g)	1.3 ± 1.0	0.8 ± 0.7	0.7 ± 0.6	1.2 ± 1.2	
Fat (g)	73.9 ± 36.7	76.9 ± 34.2	61.5 ± 24.7	66.5 ± 29.1	ND
Saturated fat(g)	22.2 ± 10.7	22.9 ± 9.0	20.3 ± 11.9	21.1 ± 9.3	ND
Trans fatty acid (g)	0.2 ± 0.3	2.7 ± 8.4	0.3 ± 0.6	0.3 ± 0.4	ND
Cholesterol (mg)	175.0 ± 110.1	178.8 ± 100.8	193.3 ± 73.8	238.8 ± 144.4	ND
Water (g)	988.7 ± 800.2	960.5 ± 396.1	863.7 ± 444.9	1003.6 ± 426.4	2.3
Vitamin A-IU (IU)	2844.0 ± 2289.2	2406.1 ± 1517.3	2831.2 ± 2154.9	3135.1 ± 3364.8	700
Vitamin C (mg)	65.9 ± 59.4	50.1 ± 37.5	48.1 ± 24.4	71.6 ± 63.8	65
Vitamin D-IU (IU)	75.3 ± 67.3	98.3 ± 86.1	117.8 ± 68.5	79.3 ± 67.3	5
Vitamin K (mcg)	31.0 ± 77.9	10.9 ± 11.4	10.5 ± 12.5	16.4 ± 14.7	75
Vitamin E (mg)	3.2 ± 2.3	3.0 ± 2.1	2.1 ± 1.9	3.5 ± 2.5	15
Calcium (mg)	532.0 ± 275.7	612.7 ± 333.9	678.2 ± 563.1	657.3 ± 306.9	1300
Iron (mg)	11.2 ± 5.0	11.5 ± 5.6	10.3 ± 4.6	10.9 ± 5.1	15
Magnesium (mg)	125.1 ± 58.7	135.6 ± 89.5	92.1 ± 50.9	123.9 ± 67.1	350
Chromium (mcg)	5.0 ± 5.5	2.9 ± 3.0	2.5 ± 2.9	2.1 ± 2.7	24
Copper (mg)	0.5 ± 0.2	0.5 ± 0.3	0.3 ± 0.2	0.5 ± 0.3	890
Iodine (mcg)	33.3 ± 27.1	38.8 ± 37.6	41.3 ± 39.9	38.1 ± 28.1	150
Manganese (mg)	1.2 ± 1.0	1.1 ± 0.9	1.3 ± 2.3	1.1 ± 0.9	1.6
Phosphorus (mg)	603.6 ± 273.6	683.0 ± 348.6	483.6 ± 293.7	647.0 ± 264.2	1250
Potassium (mg)	1540.7 ± 745.5	1323.9 ± 475.6	1230.8 ± 667.1	1388.0 ± 735.1	4.7
Sodium (mg)	2997.8 ± 1613.2	2977.3 ± 1062.4	2683.6 ± 1148.0	2842.8 ± 936.7	1.5
Zinc (mg)	5.3 ± 2.7	5.8 ± 3.9	4.0 ± 2.9	5.2 ± 2.6	9
Folate (mcg)	199.0 ± 108.5	178.1 ± 87.8	168.0 ± 70.6	207.3 ± 123.3	400
Omega 3 Fatty Acid (g)	0.5 ± 0.4	0.6 ± 0.4	0.5 ± 0.4	0.8 ± 0.6	1.1
Omega 6 Fatty Acid (g)	3.5 ± 2.8	4.4 ± 4.1	2.8 ± 1.8	5.6 ± 4.4	11

ND= Not determined at this time, SD= Standard Deviation

Table 7

Nutritional Intake of Male Participants Pre- and Post-Intervention

Nutritional Variables	Baseline		Post-Intervention		DRI
	Control (n= 19) Mean \pm SD	Intervention (n= 15) Mean \pm SD	Control (n= 19) Mean \pm SD	Intervention (n= 15) Mean \pm SD	
Calories (kcal)	2156.7 \pm 801.0	2548.0 \pm 904.9	2075.5 \pm 586.5	2175.2 \pm 827.2	2200
Calories from Fat (kcal)	865.5 \pm 485.5	967.6 \pm 409.2	787.4 \pm 272.1	794.6 \pm 332.2	
Calories from Saturated fat (kcal)	282.8 \pm 132.9	344.8 \pm 148.1	245.9 \pm 84.3	284.4 \pm 101.8	
Protein (g)	95.5 \pm 49.4	97.8 \pm 35.3	81.1 \pm 25.0	97.2 \pm 51.9	52
Carbohydrates (g)	264.5 \pm 106.0	303.6 \pm 123.6	247.3 \pm 80.2	254.2 \pm 91.2	130
Other carbs (g)	134.4 \pm 61.3	131.8 \pm 71.0	120.7 \pm 51.7	116.7 \pm 39.1	
Total sugars (g)	77.1 \pm 62.7	128.4 \pm 57.1	76.2 \pm 39.3	82.5 \pm 42.5	
Dietary fiber (g)	15.9 \pm 7.5	18.5 \pm 8.0	16.3 \pm 9.0	15.8 \pm 7.1	38
Soluble fiber (g)	1.5 \pm 1.5	1.7 \pm 0.8	1.3 \pm 0.7	1.5 \pm 1.2	
Fat (g)	81.1 \pm 31.0	107.6 \pm 45.5	87.5 \pm 30.3	88.4 \pm 36.9	ND
Saturated fat(g)	26.6 \pm 9.6	38.3 \pm 16.5	26.7 \pm 9.1	31.6 \pm 11.3	ND
Trans fatty acid (g)	0.7 \pm 1.0	1.2 \pm 1.4	0.6 \pm 1.0	1.4 \pm 1.8	ND
Cholesterol (mg)	275.3 \pm 183.5	347.2 \pm 149.0	248.1 \pm 175.5	448.4 \pm 446.6	ND
Water (g)	1008.8 \pm 625.4	1558.7 \pm 1140.7	1010.2 \pm 460.3	1423.1 \pm 997.0	3.3
Vitamin A-IU (IU)	3052.0 \pm 2269.5	3581.4 \pm 2661.0	2945.8 \pm 2431.6	4074.3 \pm 2183.3	900
Vitamin C (mg)	74.6 \pm 58.9	118.9 \pm 86.2	91.2 \pm 143.3	81.4 \pm 65.2	75
Vitamin D-IU (IU)	109.8 \pm 56.0	239.7 \pm 222.2	136.1 \pm 70.6	280.2 \pm 162.8	5
Vitamin K (mcg)	16.6 \pm 10.6	20.7 \pm 14.4	57.6 \pm 161.7	36.7 \pm 41.0	75
Vitamin E (mg)	3.1 \pm 2.5	4.2 \pm 2.4	4.3 \pm 3.2	4.5 \pm 3.2	15
Calcium (mg)	896.3 \pm 388.5	1102.6 \pm 645.1	787.9 \pm 399.0	1013.4 \pm 471.9	1300
Iron (mg)	20.2 \pm 13.7	16.8 \pm 10.4	16.8 \pm 7.4	16.4 \pm 8.5	11
Magnesium (mg)	185.1 \pm 85.0	214.3 \pm 114.4	169.8 \pm 92.9	216.7 \pm 142.0	410
Chromium (mcg)	2.3 \pm 2.5	4.9 \pm 3.2	8.3 \pm 13.4	8.7 \pm 13.2	35
Copper (mg)	0.7 \pm 0.5	0.8 \pm 0.5	0.7 \pm 0.4	0.8 \pm 0.6	890
Iodine (mcg)	49.7 \pm 21.5	119.4 \pm 110.0	54.9 \pm 41.9	103.2 \pm 96.0	150
Manganese (mg)	1.4 \pm 0.8	1.6 \pm 1.1	1.8 \pm 1.2	1.6 \pm 1.5	2.2
Phosphorus (mg)	1027.0 \pm 428.0	1271.5 \pm 627.9	903.1 \pm 434.0	1236.5 \pm 735.0	1250
Potassium (mg)	2826.6 \pm 2688.3	2662.8 \pm 1128.7	1753.9 \pm 682.7	2280.2 \pm 986.8	4.7
Sodium (mg)	3434.9 \pm 1360.1	4994.7 \pm 4710.8	3745.6 \pm 1218.8	3350.3 \pm 851.4	1.5
Zinc (mg)	9.4 \pm 4.1	11.9 \pm 8.3	7.2 \pm 4.1	11.9 \pm 9.1	11
Folate (mcg)	285.0 \pm 124.8	344.2 \pm 242.7	298.0 \pm 188.3	324.1 \pm 248.7	400
Omega 3 Fatty Acid (g)	1.0 \pm 0.5	1.1 \pm 0.6	0.7 \pm 4.1	1.1 \pm 0.6	1.6
Omega 6 Fatty Acid (g)	6.7 \pm 3.2	7.2 \pm 4.8	5.3 \pm 3.5	7.4 \pm 6.6	16

ND= Not determined at this time, SD= Standard Deviation

Figures

Figure 2

Percentage of Calories from fat among Control and Intervention Participants at Baseline and Post-Intervention

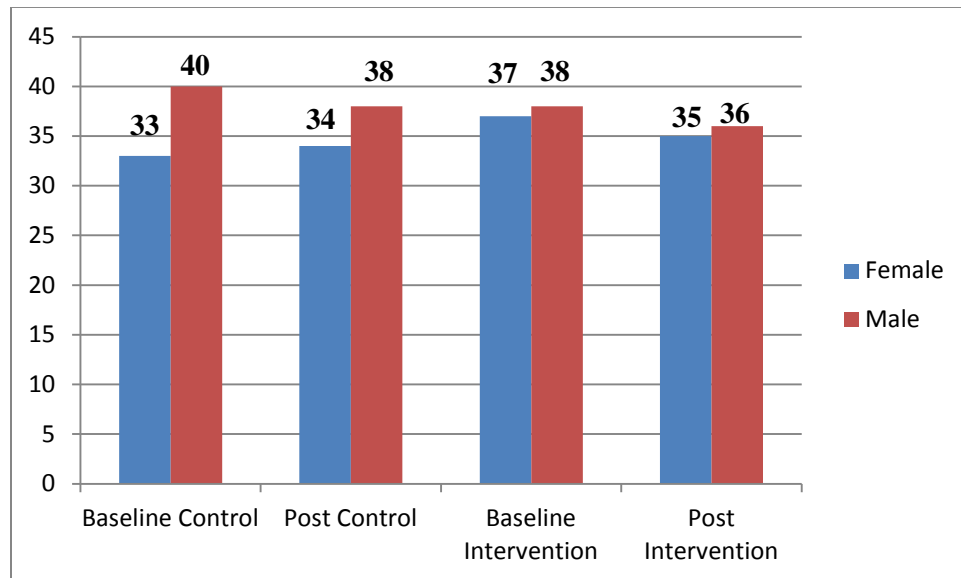
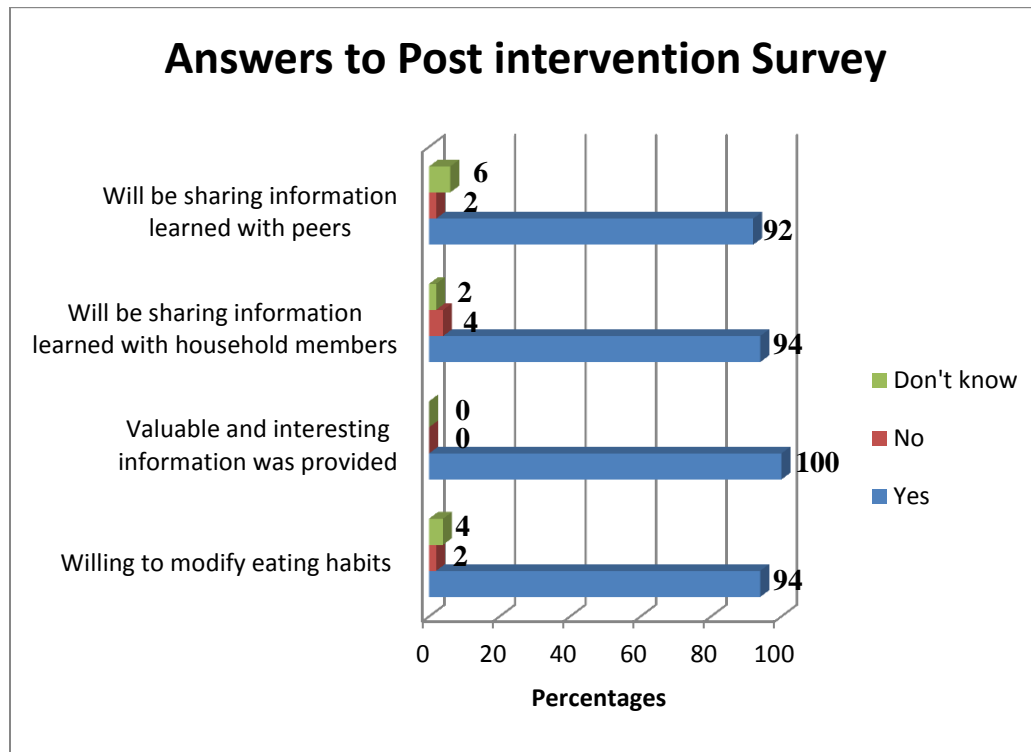


Figure 3

Percent of Responses to Post Intervention Survey



Appendix A- Cover Letter and Consent forms in English and Spanish

Fall Semester 2010

REMOVED Parents and Students

REMOVED

El Paso, Texas **REMOVED**

Dear Parent/Guardian and Student,

My name is Leticia Cortez, a graduate student in the Master's in Public Health Program at The University of Texas at El Paso. I would like to conduct a thesis project consisting of a nutrition intervention as part of my requirements for graduation. The nutrition intervention is aimed at students attending **REMOVED** who are enrolled in a health education course. During the nutrition intervention I will be working under the supervision of Dr. Maria Duarte-Gardea who is my thesis supervisor and a professor of nutrition and chair at the Department of Public Health Sciences.

I would like to ask that you read the attached consent form which gives an explanation of the purpose of the research, procedures, and further pertinent information about this intervention. I would like to ask that after you, the parent/guardian and the student have gone over the consent form, if you, the parent/guardian and student agree to have the student participate in this intervention, that both, you the parent/guardian and student sign the consent form, and return it to the students' health education instructor.

Thank you,

Leticia Cortez
Master's in Public Health Graduate Student
University of Texas at El Paso

Enclosure: Consent Form

Intervention Group, form in English

CONSENT FORM TO PARTICIPATE IN A RESEARCH STUDY

Nutrition Education Intervention

Research Title: Effectiveness of a Nutrition Education Intervention for High School Students

Principal Investigator: Maria Duarte-Gardea, PhD, The University of Texas at El Paso, College of Health Sciences. 1101 N. Campbell St., El Paso, Texas 79902; Phone: (915) 747-7252; e-mail: moduarte@utep.edu

Purpose of the Research: The purpose of the study is to deliver educational materials and activities aimed at promoting and improving nutrition knowledge among high school students in the school system.

Procedures:

If parent/guardian and student choose to allow the student to participate in this study:

- 1) Parents and Participant (Student/You) will sign this consent form
- 2) You will be given a pre-assessment one week before the nutrition education intervention begins:
 - a. You will provide demographic information such as age, gender, education, ethnicity
 - b. You will also provide your height and weight
 - c. You will respond to questions such as having previously taken a nutrition course, and participation in sports or any leisure activities. Questions will be focused on the nutrition curriculum.
- 3) You will be asked to fill out a three day dietary record
- 4) You will be undergoing three different nutrition lessons which include the following topics:
 - a. Day 1: Introduction to Nutrition, Whole Foods vs. Processed Foods, and carbohydrates.
 - b. Day 2: Fruits and Vegetables and Proteins
 - c. Day 3: Fats and cholesterol and an introduction to *MyPyramid*
- 5) Participants will be given a post-assessment one week after the nutrition education intervention ends.

Risks for Participants:

There are a few risks to the student for participating in the study. Potential risks include: 1) feeling anxiety while answering the nutrition knowledge test; 2) feeling fatigued when completing the questionnaires or any of the written data collection procedures; 3) becoming upset if you/student learns he/she is engaging in behaviors that increase risk of future health

conditions; 4) encountering resistance from student's family when trying to engage in healthier eating habits

Benefits:

There may be some benefit to the student for participating in the study. The educational materials the student will receive may help him/her improve their lifestyle and their family's lifestyle with regard to eating habits. Also, information learned during this study may help others in the future. It is possible that there is no benefit to the student for participating in this study.

Voluntary Participation:

The student's participation in this study is entirely voluntary and he/she may refuse to participate or discontinue participation at any time without penalty. The parent's and student's decision about whether or not to participate in the study will not affect the benefits the student may receive in the classroom.

Optional Procedures:

If the parent/guardian and the student decide not to participate in this research study, the students will have to get in contact with his/her teacher so that he/she can be given an alternate assignment.

Costs/Payments:

There are no costs for participating in this study.

Questions:

If you have any questions about this study, please contact Dr. Maria Duarte-Gardea at 915-747-7252.

If you have any questions or concerns about your rights as a research subject, call Lola Norton, IRB Administrator, at (915) 747-8841 or irb.orsp@utep.edu

Confidentiality:

The student's information will be kept confidential in accordance with local, state, and federal laws. The researchers may use and share your health information to conduct the research, or share your health information as required by law with representatives of government organizations, the Institutional Review Board at The University of Texas at El Paso, or other persons who are required to watch over the safety and the process of research. We will not release your personal information for public use. Also, no publication about the research will reveal your identity without your specific written permission.

Consent:

Parent/Guardian: Print and sign your name below only if you understand the information given to you about the research and give consent to have your son/daughter take part in this study. Make sure that any questions have been answered and that you understand the study. If you decide to allow your son/daughter to take part in this research study, a copy of this signed consent form will be given to you.

I hereby give my consent for my son/daughter to participate in this research study and agree that information can be collected, used and shared by the researchers and staff for the research study described in this form. I will receive a signed copy of this consent form.

Student: Print and sign your name below only if you understand the information given to you about the research and choose to take part. Make sure that any questions have been answered and that you understand the study. If you decide to take part in this research study, a copy of this signed consent form will be given to you.

I hereby give my consent to participate in this research study and agree that information can be collected, used and shared by the researchers and staff for the research study described in this form. I will receive a signed copy of this consent form.

Signatures:

Name of Parent/Guardian (Print)

Parent/Guardian's Signature

Date/Time

Name of Student/Participant (Print)

Participant's Signature

Date/Time

Name of Individual Obtaining Consent

Signature of Individual Obtaining Consent

Date/Time

Intervention Group-form in Spanish

FORMA DE CONSENTIMIENTO PARA PARTICIPAR EN UN ESTUDIO DE INVESTIGACION

Título de la Investigación: La Eficacia de una Intervención de Educación Nutricional para Estudiantes de Secundaria.

Investigador Principal: Maria Duarte-Gardea, PhD, University of Texas at El Paso, 1101 N. Campbell St., El Paso, Texas 79902; (915) 747-7252; correo electrónico: moduarte@utep.edu

Propósito de la Investigación: El propósito de este estudio es implementar materiales y actividades educativos para promover y mejorar el conocimiento nutricional entre estudiantes de secundaria dentro del sistema educativo

Procedimientos:

Si el padre/guardian y el estudiante deciden que el estudiante participara en el estudio:

- 1) Padre/Guardian y el/la participante (estudiante) deberán firmar esta forma de consentimiento;
- 2) Los participantes (estudiante) tomara un examen, una semana antes de iniciar con la intervención de educación nutricional. El participante(estudiante):
 - a. Provera información demográfica como edad, género, educación, etnicidad
 - b. Provera su estatura y peso
 - c. Responderá preguntas como por ejemplo haber tomado algún curso de nutrición previamente, el/la estudiante participan en alguna actividad extracurricular (deportes), y otras preguntas relacionadas con la nutrición. Las preguntas serán enfocadas al plan de estudio de nutrición que será impartido a los estudiantes.
- 3) Los participantes (estudiante) llenaran un registro dietético de tres días.
- 4) Los participantes recibirán tres diferentes clases las cuales incluyen los siguientes temas:
 - a. Día 1: Introducción al tema de nutrición, y el tema de Comidas enteras vs. Comidas Procesadas
 - b. Día 2: Frutas y Vegetales, Proteínas
 - c. Día 3: Grasas y Colesterol, y una introducción a la pirámide alimenticia
- 5) Participantes tomara un examen una semana después de terminar la intervención

Riesgos de Participar:

Hay pocos riesgos para el/la estudiante al participar en el estudio. Riesgos potenciales para los participantes podrían incluir: 1) sensación de ansiedad al responder una prueba sobre conocimientos sobre nutrición; 2) sensación de fatiga al llenar los cuestionarios o algún otro documento que requiera que el participante escriba; 3) sentir enojo si el/la estudiante aprenden que realizan comportamientos que están aumentando los riesgos de futuras enfermedades ; 4)

encontrar resistencia de la familia cuando se trata de cambiar los tipos de alimentos que se sirven en las comidas.

Beneficios:

Hay la posibilidad de que exista un beneficio para el/la estudiante al participar en el estudio. Los materiales educativos que el/la estudiante recibirá podrían ayudarle a mejorar su etilo de vida y el de su familia en relación a la alimentación. Además, información que aprenda en el estudio podría ayudarle a otras personas en el futuro. Hay la posibilidad que no haya beneficio para el/la estudiante al participar en el estudio.

Participación Voluntaria:

La participación del estudiante en este estudio es totalmente voluntaria y el/ella puede negarse a participar o no continuar su participación en cualquier momento sin que haya alguna repercusión negativa. La decisión del padre/guardian y del estudiante, sobre el participar o no en el estudio no le va a afectar al estudiante en relación a los beneficios que el/la estudiante pueda recibir en el salón de clases.

Procedimientos Opcionales:

Si usted el padre/guardian y el/la estudiante deciden no participar en este estudio, el/la estudiante deberá contactar a su profesor para que se le pueda asignar una tarea alterna.

Costos/Pagos:

No hay ningún costo para usted por participar en el estudio.

Preguntas:

Si usted (o su hijo(a)) tienen alguna pregunta sobre este estudio, por favor llame a la Dra. Maria Duarte al teléfono 747-7252 .

Si usted tiene preguntas o preocupaciones acerca de sus derechos como sujeto de investigación, llame al Coordinador Institucional de Revisión de Investigaciones de la Universidad de Texas, El Paso, Lola Norton al 915-747-7939.

Confidencialidad:

La información del estudiante será mantenida con estricta confidencialidad de acuerdo a las leyes locales, estatales y federales. Los investigadores pueden usar y compartir su información de salud como se requiere por ley con representantes de organizaciones gubernamentales, el Comité Revisor Institucional de le Universidad de Texas El Paso, u otras personas encargadas de monitorear la seguridad y el proceso de la investigación. El público no tendrá acceso a su

información. También, ninguna publicación acerca del estudio incluirá su identidad sin pedirle consentimiento por escrito a usted.

Consentimiento:

Padre/Guardian

Imprima y firme su nombre abajo solamente si usted entendió la información que se le ofreció acerca de la investigación y da permiso a que su hijo(a) forme parte del estudio. Asegúrese que todas sus preguntas fueron respondidas y que usted entendió el estudio. Si usted decide que su hijo(a) forme parte de este estudio de investigación, usted recibirá una copia de esta forma firmada de consentimiento.

Yo doy mi consentimiento a mi hijo(a) de participar en este estudio de investigación y estoy de acuerdo que información puede ser recolectada, usada y compartida por los investigadores y el personal de este estudio como se describe en esta forma. Yo recibiré una copia firmada de esta forma de consentimiento.

Estudiante:

Imprima y firme su nombre abajo solamente si usted entendió la información que se le ofreció acerca de la investigación y decide formar parte del estudio. Asegúrese que todas sus preguntas fueron respondidas y que usted entendió el estudio. Si usted decide formar parte de este estudio de investigación, usted recibirá una copia de esta forma firmada de consentimiento.

Yo doy mi consentimiento de participar en este estudio de investigación y estoy de acuerdo que información puede ser recolectada, usada y compartida por los investigadores y el personal de este estudio como se describe en esta forma. Yo recibiré una copia firmada de esta forma de consentimiento.

Firmas:

Nombre del Padre/Guardian (Letra de Molde)

Firma del Padre/Guardian

Fecha/Hora

Nombre del Participante (Letra de Molde)

Firma del Participante

Fecha/Hora

Nombre de la Persona Obteniendo Consentimiento

Firma de la Persona Obteniendo Consentimiento

Fecha/Hora

Control Group- form in English

CONSENT FORM TO PARTICIPATE IN A RESEARCH STUDY

Nutrition Education Intervention

Research Title: Effectiveness of a Nutrition Education Intervention for High School Students

Principal Investigator: Maria Duarte-Gardea, PhD, The University of Texas at El Paso, College of Health Sciences. 1101 N. Campbell St., El Paso, Texas 79902; Phone: (915) 747-7252; e-mail: moduarte@utep.edu

Purpose of the Research: The purpose of the study is to provide educational materials aimed at promoting and improving nutrition knowledge among high school students in the school system.

Procedures:

If parent/guardian and student choose to allow the student to participate in this study:

- 1) Parents and Participant (Student/You) will sign this consent form
- 2) You will provide demographic information such as age, gender, education, ethnicity, and will respond to questions related to dietary patterns.
- 3) You will be given a nutrition test twice; upon enrollment and three weeks after enrollment.
 - a. You will also have your height, weight, and waist circumference measured by the school nurse
- 4) You will respond to questions such as having previously taken a nutrition course, and participation in sports or any leisure activities.
- 5) You will be asked to fill out a three day dietary record twice: upon enrollment and three weeks after enrollment
- 6) You will continue taking your regular health lessons without any modifications.

Risks for Participants:

There are a few risks to the student for participating in the study. Potential risks include: 1) feeling anxiety while answering the nutrition knowledge test; 2) feeling fatigued when completing the questionnaires or any of the written data collection procedures; 3) becoming upset if you/student learns he/she is engaging in behaviors that increase risk of future health conditions; 4) encountering resistance from student's family when trying to engage in healthier eating habits.

Benefits:

There may be some benefit to the student for participating in the study. The educational materials the student will receive may help him/her improve their lifestyle and their family's lifestyle with

regard to eating habits. Also, information learned during this study may help others in the future. It is possible that there is no benefit to the student for participating in this study.

Voluntary Participation:

The student's participation in this study is entirely voluntary and he/she may refuse to participate or discontinue participation at any time without penalty. The parent's and student's decision about whether or not to participate in the study will not affect the benefits the student may receive in the classroom.

Optional Procedures:

If the parent/guardian and the student decide not to participate in this research study, the students will have to get in contact with his/her teacher so that he/she can be given an alternate assignment.

Costs/Payments:

There are no costs for participating in this study.

Questions:

If you have any questions or concerns about your participation as a research subject, please contact the research principal investigator Dr. Maria O. Duarte-Gardea at (915) 747-7252) or moduarte@utep.edu, and the UTEP Institutional Review Board (IRB) at (915-747-8841) or irb.orsp@utep.edu.

Confidentiality:

The student's information will be kept confidential in accordance with local, state, and federal laws. The researchers may use and share your health information to conduct the research, or share your health information as required by law with representatives of government organizations, the Institutional Review Board at The University of Texas at El Paso, or other persons who are required to watch over the safety and the process of research. We will not release your personal information for public use. Also, no publication about the research will reveal your identity without your specific written permission.

Consent:

Parent/Guardian: Print and sign your name below only if you understand the information given to you about the research and give consent to have your son/daughter take part in this study. Make sure that any questions have been answered and that you understand the study. If you decide to allow your son/daughter to take part in this research study, a copy of this signed consent form will be given to you.

I hereby give my consent for my son/daughter to participate in this research study and agree that information can be collected, used and shared by the researchers and staff for the research study described in this form. I will receive a signed copy of this consent form.

Student: Print and sign your name below only if you understand the information given to you about the research and choose to take part. Make sure that any questions have been answered and that you understand the study. If you decide to take part in this research study, a copy of this signed consent form will be given to you.

I hereby give my consent to participate in this research study and agree that information can be collected, used and shared by the researchers and staff for the research study described in this form. I will receive a signed copy of this consent form.

Signatures:

Name of Parent/Guardian (Print)

Parent/Guardian's Signature

Date/Time

Name of Student/Participant (Print)

Participant's Signature

Date/Time

Name of Individual Obtaining Consent

Signature of Individual Obtaining Consent

Date/Time

Control Group- form in Spanish
**FORMA DE CONSENTIMIENTO PARA PARTICIPAR EN UN ESTUDIO DE
INVESTIGACION**

Título de la Investigación: La Eficacia de una Intervención de Educación Nutricional para Estudiantes de Secundaria.

Investigador Principal: Maria Duarte-Gardea, PhD, University of Texas at El Paso, 1101 N. Campbell St., El Paso, Texas 79902; (915) 747-7252; correo electrónico: moduarte@utep.edu

Propósito de la Investigación: El propósito de este estudio es proveer materiales educativos para promover y mejorar el conocimiento nutricional entre estudiantes de secundaria dentro del sistema educativo

Procedimientos:

Si el padre/guardian y el estudiante deciden que el estudiante participara en el estudio:

- 1) Padre/Guardian y el/la participante (estudiante) deberán firmar esta forma de consentimiento;
- 2) Provera información demográfica como edad, género, educación, etnicidad, y responderá preguntas relacionadas con los patrones alimenticios.
- 3) Los participantes (estudiante) tomaran un examen de nutrición durante dos periodos;después de firmar forma consentimiento de participación y tres semanas después.
 - a. El participante(estudiante) acudira con la enfermera de la escuela para que se le tome la estatura, peso, y circunferencia de la cintura
- 4) Responderá preguntas como por ejemplo haber tomado algún curso de nutrición previamente, el/la estudiante participan en alguna actividad extracurricular (deportes), y otras preguntas relacionadas con la nutrición.
- 5) Los participantes (estudiante) llenaran un registro dietético de tres días durante dos periodos: después de firmar forma de consentimiento de participación y tres semanas después.
- 6) Los participantes (estudiantes) continuaran con sus clases de salud sin ninguna modificación.

Riesgos de Participar:

Hay pocos riesgos para el/la estudiante al participar en el estudio. Riesgos potenciales para los participantes podrían incluir: 1) sensación de ansiedad al responder una prueba sobre conocimientos sobre nutrición; 2) sensación de fatiga al llenar los cuestionarios o algún otro documento que requiera que el participante escriba; 3) sentir enojo si el/la estudiante aprenden que realizan comportamientos que están aumentando los riesgos de futuras enfermedades ; 4) encontrar resistencia de la familia cuando se trata de cambiar los tipos de alimentos que se sirven en las comidas.

Beneficios:

Hay la posibilidad de que exista un beneficio para el/la estudiante al participar en el estudio. Los materiales educativos que el/la estudiante recibirá podrían ayudarle a mejorar su etilo de vida y el de su familia en relación a la alimentación. Además, información que aprenda en el estudio podría ayudarle a otras personas en el futuro. Hay la posibilidad que no haya beneficio para el/la estudiante al participar en el estudio.

Participación Voluntaria:

La participación del estudiante en este estudio es totalmente voluntaria y el/ella puede negarse a participar o no continuar su participación en cualquier momento sin que haya alguna repercusión negativa. La decisión del padre/guardian y del estudiante, sobre el participar o no en el estudio no le va a afectar al estudiante en relación a los beneficios que el/la estudiante pueda recibir en el salón de clases.

Procedimientos Opcionales:

Si usted el padre/guardian y el/la estudiante deciden no participar en este estudio, el/la estudiante deberá contactar a su profesor para que se le pueda asignar una tarea alterna.

Costos/Pagos:

No hay ningún costo para usted por participar en el estudio.

Preguntas:

Si usted (o su hijo(a)) tienen alguna pregunta sobre este estudio, por favor llame a la Dra. Maria Duarte al teléfono 747-7252 .

Si usted tiene preguntas o preocupaciones acerca de sus derechos como sujeto de investigación, llame al Coordinador Institucional de Revisión de Investigaciones de la Universidad de Texas, El Paso, Lola Norton al 915-747-7939.

Confidencialidad:

La información del estudiante será mantenida con estricta confidencialidad de acuerdo a las leyes locales, estatales y federales. Los investigadores pueden usar y compartir su información de salud como se requiere por ley con representantes de organizaciones gubernamentales, el Comité Revisor Institucional de la Universidad de Texas El Paso, u otras personas encargadas de monitorear la seguridad y el proceso de la investigación. El público no tendrá acceso a su información. También, ninguna publicación acerca del estudio incluirá su identidad sin pedirle consentimiento por escrito a usted.

Consentimiento:**Padre/Guardian**

Imprima y firme su nombre abajo solamente si usted entendió la información que se le ofreció acerca de la investigación y da permiso a que su hijo(a) forme parte del estudio. Asegúrese que todas sus preguntas fueron respondidas y que usted entendió el estudio. Si usted decide que su hijo(a) forme parte de este estudio de investigación, usted recibirá una copia de esta forma firmada de consentimiento.

Yo doy mi consentimiento a mi hijo(a) de participar en este estudio de investigación y estoy de acuerdo que información puede ser recolectada, usada y compartida por los investigadores y el personal de este estudio como se describe en esta forma. Yo recibiré una copia firmada de esta forma de consentimiento.

Estudiante:

Imprima y firme su nombre abajo solamente si usted entendió la información que se le ofreció acerca de la investigación y decide formar parte del estudio. Asegúrese que todas sus preguntas fueron respondidas y que usted entendió el estudio. Si usted decide formar parte de este estudio de investigación, usted recibirá una copia de esta forma firmada de consentimiento.

Yo doy mi consentimiento de participar en este estudio de investigación y estoy de acuerdo que información puede ser recolectada, usada y compartida por los investigadores y el personal de este estudio como se describe en esta forma. Yo recibiré una copia firmada de esta forma de consentimiento.

Firmas:

Nombre del Padre/Guardian (Letra de Molde)

Firma del Padre/Guardian

Fecha/Hora

Nombre del Participante (Letra de Molde)

Firma del Participante

Fecha/Hora

Nombre de la Persona Obteniendo Consentimiento

Firma de la Persona Obteniendo Consentimiento

Fecha/Hora

Appendix B- Teacher Consent Form

CONSENT FORM FROM TEACHER TO ASSIST IN DATA COLLECTION FOR A RESEARCH STUDY

Nutrition Intervention Study

I consent to support the above cited study by requesting students enrolled in my anatomy and physiology class and who are currently enrolled at **REMOVED** to complete four different surveys. The surveys to be completed by the students are 1) demographic information questionnaire, 2) dietary records, 3) nutrition knowledge test to be administered twice; once at the beginning of the study and a second one for weeks later, and 4) post- intervention survey.

Signatures:

Name of High School Teacher (print)

Teacher Signature

Date/Time

Witness (print)

Witness' Signature

Date/Time

Name of Individual Obtaining Consent

Signature of Individual Obtaining Consent

Date/Time

Appendix C- Pre- Intervention Survey

Participant # _____



Department of Public Health Sciences “Effectiveness of a Nutrition Education Intervention with High School Students”

- 1.) What is your age? _____ years
- 2.) What is your gender? Male _____ Female _____
- 3.) What ethnic group do you identify with the most? White _____ Mexican-American _____
African-American _____ Mexican _____ Hispanic/Latino _____
Other _____, Explain _____
- 4.) Do you work? Yes _____ No _____
If yes, how many hours per week, and where do you work? _____

- 5.) How many people live in your house? _____
How many children? _____ How many adults? _____
- 6.) What is your father's education level?
_____ Less than high school _____ High school graduate _____ Some college
_____ College graduate
- 7.) What is your father's occupation? _____
- 8.) What is your mother's education level?
_____ Less than high school _____ High school graduate _____ Some college
_____ College graduate

9.) What is your mother's occupation? _____

10.) Have you ever taken a nutrition course? (For Example under the WIC program)

Yes _____ No _____ Don't know/don't remember _____

11.) Where do you get most of your nutrition and health information? _____

12.) Are you involved in any extracurricular activities (sports)? Yes _____ No _____

Don't know _____ If so, which one(s)? _____

13.) Do you participate in the free lunch or breakfast program at school? Yes _____

No _____ Don't know _____

14.) What is healthy eating? Please explain. _____

15.) Do you believe you eat healthy? Yes _____ No _____ Don't know _____

Why or why not? Please explain. _____

16.) Do your peers (friends) play an important role when it comes to choosing what you eat? Yes _____ No _____ Don't know _____

Why or why not? Please explain. _____

17.) Do you skip any meals? Yes _____ No _____ Don't know _____

If yes, which meal do you most frequently skip? Breakfast _____ Lunch _____

Dinner _____ Why do you skip these meals? Please Explain. _____

18.) Is anyone in your home overweight or obese? Yes_____ No_____

Don't know _____ If so, who? _____

19.) What meals does your family sit down together to eat, if any?

Breakfast_____ Lunch_____ Dinner_____ Other_____

Anthropometric Measures

1.) What is the participant's height? _____ feet _____ inches

2.) What is participant's weight? _____lbs.

3.) What is the participant's waist circumference? _____

4.) Participant's BMI (kg/m^2) _____

Appendix D- School Nurse Consent Form

CONSENT FORM TO ASSIST IN DATA COLLECTION FOR A RESEARCH STUDY

Nutrition Intervention Study

I consent to assist in the collection of clinical measurements to support the above cited study. The clinical measurements include the following: height, weight, and waist circumference. Approximately 120 high school students who are currently taking an anatomy and physiology course and enrolled at **REMOVED** will require these measurements.

Signatures:

Name of School Nurse (Print)

El Dorado High School- Nurse Signature

Date/Time

Witness Print

Witness' Signature

Date/Time

Name of Individual Obtaining Consent

Signature of Individual Obtaining Consent

Date/Time

Appendix E- 3-Day Dietary Record

Nutrition Education Project

Directions for completing a 3-day food record

In this activity you will complete a 3-day food record on yourself using the attached forms. Record your food and beverage intake for two weekdays (for example Thursday will be Day 1 and Friday will be Day 2) and one weekend day (Saturday will be Day 3).

Provide responses that are as accurate as possible.

1. Keep your food record current.
2. List foods immediately after they are eaten.
3. Please record all entries.
4. Record only one food item per line.
5. Be as specific as possible when describing the food item eaten. For example include brand names whenever possible.
6. **Do not alter your normal diet during the period you keep this diary.**

Time	Food Item and Method of Preparation	Amount Eaten
7 AM	Apple, raw, fresh	1 medium
12 PM	Beef stew	1 fist
12 PM	Bread, whole wheat, fresh	2 slices
3 PM	Cereal, Corn Flakes	2 cups
	with sugar	2 teaspoons
	with milk, low fat	1 cup
7 PM	Chicken, fried	2 legs
7 PM	Coleslaw, with mayo	1 cup
7 PM	Eggs (fried in butter)	2 large
7 PM	Mexican Rice	2 serving spoons

Nutrition Education Project

Daily Food Intake

Day One

Name _____

Date _____

Please record all foods consumed during the day including all meals, snacks and beverages.

Time	Food or Beverage Consumed	Amount

Is this what you normally eat? YES NO		

Nutrition Education Project

Daily Food Intake

Day Two

Name _____

Date _____

Please record all foods consumed during the day including all meals, snacks and beverages.

Time	Food or Beverage Consumed	Amount

Is this what you normally eat? YES NO		

Nutrition Education Project

Daily Food Intake

Day Three

Name _____

Date _____

Please record all foods consumed during the day including all meals, snacks and beverages.

Time	Food or Beverage Consumed	Amount

Is this what you normally eat? YES NO		

Appendix F-Pre and Post Nutrition Knowledge Test



Department of Public Health Sciences “Effectiveness of a Nutrition Education Intervention with High School Students” Student Post-Assessment Nutrition Knowledge Questions

1. Why is it important for people to have daily balanced meals?
 - a.) to obtain all the necessary nutrients
 - b.) to prevent chronic diseases
 - c.) to obtain the necessary energy to sustain daily activities
 - d.) a, b, & c
 - e.) none of the above
2. Refined products are those that have been processed. Which of the following are examples of refined products?
 - a.) avocado
 - b.) white flour
 - c.) broccoli
 - d.) none of the above
3. Processed foods have been stripped of many of their natural nutrients in order to be used in other products. They also contain additional artificial ingredients and preservatives as well as excessive amounts of sodium and sugar. All of the following are processed foods except:
 - a.) hot dogs
 - b.) white flour
 - c.) potato chips
 - d.) carrots
4. Which of the following are food items that contain carbohydrates?
 - a.) Breads and cereals
 - b.) Fruits and vegetables
 - c.) Milk and milk products
 - d.) All of the above
5. Which of the following are chronic health conditions that may be caused by overweight and obesity?
 - a.) cancer
 - b.) heart disease
 - c.) Type 2 diabetes
 - d.) all of the above
6. Whole grains are sources of complex carbohydrates, fiber, vitamins, and minerals.
 - a) True
 - b) false

7. Whole grain products contain complex carbohydrates. Which of the following are benefits that whole grain products have on your health?
- a.) help your eyesight
 - b.) Packed with vitamins and minerals
 - c.) are high in fiber
 - d.) both b & c
8. Food products such as candies, cakes, ice cream contain added sugars. These products have fewer nutrients and add _____ calories.
- a.) no
 - b.) extra
 - c.) very few
 - d.) a good amount of
9. Fruits and vegetables are _____ in calories and help prevent _____.
- a.) low, obesity
 - b.) high, diabetes
 - c.) high, obesity
 - d.) low, growth
10. Fruits and vegetables contain all of the following except:
- a.) high amounts of calories
 - b.) vitamins
 - c.) fiber
 - d.) minerals
11. When you eat plenty of fruits and vegetables, you can _____:
- a.) lower the risk of heart disease and stroke
 - b.) prevent common vision problems
 - c.) prevent some types of cancers
 - d.) a and c
12. Which of the following would be tips for people to increase the consumption of fruits and vegetables?
- a.) keep fruits out where you can see them
 - b.) trying new recipes
 - c.) explore produce aisle
 - d.) all of the above
13. Fruits and vegetables are good sources of antioxidants. Their main function is:
- a.) to help people lose weight
 - b.) lower HDL
 - c.) protect cell against radicals that cause cell damage
 - d.) none of the above
14. What are four nutrients of special interest in the diet of adolescences?
- a.) Vitamin D, Vitamin A, Fiber, Calcium
 - b.) Vitamin C, Vitamin D, Iron, Calcium
 - c.) All vitamins and fiber
 - d.) Vitamin D, Vitamin A, Iron, & Calcium

15. The function of Vitamin D, a nutrient found in sea food such as salmon, eggs, and milk, is:

- a.) building strong bones
- b.) keep teeth and gums healthy
- c.) increase absorption of calcium
- d.) both a & c

16. What is a protein?

- a.) main structural material in the body
- b.) main source of energy for the body
- c.) a carbohydrate
- d.) triglyceride

17.) _____ amino acids are those nutrients that cannot be produced by your body and you get from foods such as meats and milk products.

- a.) Essential
- b.) Processed
- c.) refined
- d.) complete

18.) What are the two types of proteins?

- a.) amino acids and trans fats
- b.) whole and processed
- c.) monounsaturated and polyunsaturated fats
- d.) complete and incomplete

19.) Complete proteins contain _____ essential amino acids, and can be found in _____.

- a.) no, fruits
- b.) few, vegetables
- c.) all, animal based products
- d.) no, whole grain products

20.) Incomplete proteins lack _____ amino acids, and can be found in _____.

- a.) one or more, fruits
- b.) one, vegetables
- c.) one or more, grains
- d.) both a & c

21.) _____ are two or more incomplete proteins sources that together provide adequate amounts of essential amino acids.

- a.) complete proteins
- b.) incomplete proteins
- c.) all types of proteins
- d.) complementary proteins

22.) Which of the following is an example of a complementary protein?

- a.) A piece of meat and candy
- b.) eggs with butter
- c.) an apple
- d.) beans and a wheat tortilla (bean burrito)

- 23.) Excessive intake of dietary protein can have harmful effects on health. Which of the following are conditions that can be attributed to following a diet with excess protein.
- a.) Osteoporosis
 - b.) Kidney problems
 - c.) Heart Disease
 - d.) All of the above
- 24.) State whether the following statement is true or false: Boys and Girls need the same amount of protein consumption?
- a.) True
 - b.) False
- 25.) State whether the following statement is true or false: Fats including cholesterol are nutrients that the body does not need.
- a.) True
 - b.) False
- 26.) State whether the following statement is true or false: Fat is stored in the body as fat cells when people consume fat and is not burned as energy.
- a.) True
 - b.) False
- 27.) One of the functions of fat is to act as a(n) _____ to protect from the body from low temperatures.
- a.) nutrient
 - b.) insulator
 - c.) carbohydrate
 - d.) protein
- 28.) State whether the following statement is true or false: The cholesterol in your body is only a result of heredity.
- a.) True
 - b.) False
- 29.) What are the two main types of cholesterol?
- a.) trans fats and saturated fats
 - b.) minerals and antioxidants
 - c.) HDL and LDL
 - d.) HDL and amino acids
- 30.) _____ scavenge cholesterol from blood, and is also known as the “good” cholesterol.
- a.) LDL
 - b.) Nutrients
 - c.) HDL
- 31.) _____ carry cholesterol from the liver to the rest of your body. It is also known as “bad” cholesterol.
- a.) LDL
 - b.) HDL
 - c.) HDL and LDL
 - d.) Antioxidants

32.) This type of fat can improve blood cholesterol levels, and is mainly found in foods from plants, for example vegetable oils.

- a.) Saturated fat
- b.) Trans fat

- c.) Unsaturated fat
- d.) none of the above

33.) Which of the following is one of the two most harmful types of fats?

- a.) Saturated fat
- b.) Trans fat

- c.) both a & b
- d.) Unsaturated fats

34.) Saturated fats mainly come from _____.

- a.) foods from plants such as coconut oil
- b.) lard (manteca), and poultry with skin

- c.) whole milk dairy products such as ice cream
- d.) grain products
- e) a, b, & c

35.) State whether the following statement is true or false: Trans fats are very harmful fats, can be found in fried foods prepared by restaurants and can raise the bad cholesterol.

- a.) True

- b.) False

Appendix G-Post Intervention Survey



Department of Public Health Sciences “Effectiveness of a Nutrition Education Intervention with High School Students” Post Intervention Questionnaire

1.) After taking part in the nutrition education intervention, are you willing to modify your eating habits? Yes_____ No_____ Don't know_____

Please explain your answer_____

2.) Do you believe that the topics covered in the intervention provided valuable and interesting information? Yes_____ No_____ Don't know_____

Please explain your answer_____

3.) Will you be sharing the information you learned with your peers?

Yes_____ No_____ Don't know_____ Please Explain your answer_____

4.) Will you be sharing the information you learned with those who live in your household?

Yes_____ No_____ Don't know_____

Please Explain your answer _____

5.) Is there anything else that you might have liked to have learned about regarding nutrition and health that was not covered in the lesson? Yes_____ No_____ Don't know_____

If yes, please describe. _____

6.) What did you like or dislike about the lesson's content or the way they were taught? _____

7.) Do you have any suggestions on how to improve the lessons? Yes_____ No_____

Don't know_____ If yes, please explain. _____

8.) Any other comments on this that you would like to share? _____

Curriculum Vita

Leticia Cortez was born and raised in El Paso, Texas. She is the oldest daughter of Jose and Leticia Cortez, and the oldest sister to Celeste Cortez Martinez and Polette Cortez. She graduated from The University of Texas at El Paso in the fall of 2004. She obtained a Bachelor's of Science in Microbiology with a minor in Chemistry. After graduating, Leticia began working as a high school chemistry teacher and has been teaching for close to seven years. She began pursuing her Masters of Public Health in 2008 while continuing to work as a chemistry teacher. While pursuing her master's degree, she was an intern at University Medical Center Foundation where she had the opportunity to work on an intervention titled Simple Steps: Diabetes & Obesity Prevention Program. As a student in the Masters of Public Health program, Leticia also had the opportunity to present her study at a poster presentation held in April, 2012, by the Texas Dietetic Association. Leticia graduated in May of 2012 from The University of Texas at El Paso with a Master of Public Health (MPH) degree. After obtaining her MPH, Leticia began her pursuit of a career in medicine.