Relation Between Weight Status, Gender, Ethnicity and the Food and Activity Choices of Adolescents

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Relation Between Weight Status, Gender, Ethnicity and the Food and Activity Choices of Adolescents

by

Heather Leanne Curtiss

A thesis submitted in partial fulfillment of the requirements for the degree of Educational Specialist
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Relation Between Weight Status, Gender, and Ethnicity and the Food and Activity Choices of Adolescents

Heather Leanne Curtiss

ABSTRACT

The present study examined the relationship between the variables weight status (expected weight, overweight), ethnicity, and gender and the dependent variables dietary intake and physical activity behaviors among adolescents. The data presented in this study were collected using the Nutrition Questionnaire for High School Students, which was completed by 199 adolescents in a high school in southwest Florida in February of 2004. Multivariate analysis of variance (MANOVA) was used to identify differences in dietary intake and physical activity behaviors between weight status groups.

The primary questions in this study related to interactions and main effects between the variables weight category, ethnicity, and gender and the dependent variables dietary intake and physical activity behaviors. Weight category was determined by computing each participant’s body mass index (BMI = weight in kilograms/height in meters$^2$). A BMI > 24.9 was considered overweight and a BMI < 25.0 was considered expected weight. Ethnicity and gender were based on self-report.

The findings of this study indicate that there are group differences in dietary intake behaviors and physical activity behaviors. With respect to dietary intake behaviors, main effects were observed for weight category, gender, and ethnicity. However, follow-up univariate F-tests were not significant. The lack of statistical significances may be due to the very small sample sizes which reduced statistical power. Medium effect sizes
were reported for gender differences on milk consumption (males had higher means than females), and for ethnic differences on junk food consumption (African Americans had the highest consumption followed by Caucasians and Latinos, respectively).

For physical activity behaviors, main effects were observed for gender and ethnicity, but not for weight category. The follow-up univariate F-tests were significant for gender differences on vigorous activity behaviors (males had higher means than females), and for ethnic differences on moderate activity behaviors (Caucasians had the larger mean followed by African Americans and Latinos, respectively). Medium effect sizes were also observed on these pairwise comparisons.

Implications for the field of school psychology are discussed with example opportunities for school psychologists to assist in the development of accommodation plans, to collaborate with medical professionals to address overweight and some of its physical and mental health consequences, to help create environments that encourage health-supporting behaviors, and to assist in the development of individual and school-wide interventions.
Chapter 1

Introduction

Statement of the Problem

The increasing number of overweight children and adolescents in the United States is widely recognized as a serious public health issue (Troiano, 2002). Over the past 30 years, the proportion of young Americans who are overweight has increased from approximately 5% in the early 1970s to 15% in 2000 (Goran, Ball, & Cruz, 2003). The prevalence of overweight continues to increase dramatically such that it has been recognized as a chronic disease, affecting many demographic groups, including children and adolescents (Loke, 2002; Strauss & Pollack, 2001; Troiano, 2002; Wang, 2001). The U.S. Surgeon General expressed his views on the essential elements to prevent chronic diseases and obesity in a report published by the Centers for Disease Control and Prevention (CDC):

As a society, we can no longer afford to make poor health choices such as being physically inactive and eating an unhealthy diet; these choices have led to a tremendous obesity epidemic. As policy makers and health professionals, we must embrace small steps toward coordinated policy and environmental changes that will help Americans live longer, better, healthier lives. (2003a, p. 1)

Because of the dramatic increase in prevalence of pediatric overweight over the past three decades, it is now imperative to determine the correlates of overweight in youth.
Problems Associated with Pediatric Overweight

Individuals who are overweight are at increased risk for hypertension, adverse lipid profiles, type II diabetes, early orthopaedic problems, and some types of cancer, as well as psychosocial consequences (Loke, 2002). Likewise, overweight adolescents are at increased risk for developing these diseases in adulthood, as overweight children are more likely to become overweight adults. Annual obesity-related medical costs for children age 6-17 years have reached $127 million making childhood obesity an economic burden as well (Goran et al., 2003).

The incidence of type II diabetes has emerged as a critical health issue in overweight children (Goran et al., 2003; Sorof & Daniels, 2002). One study reported a 10-fold increase in the incidence of type II diabetes in adolescents between 1982 and 1994 (Pinhas-Hamiel et al., 1996). It appears that African-American, Hispanic American, and Native American adolescents are at an even greater risk for developing the disease. However, some researchers suggest that this increase in prevalence can be partially explained by increased surveillance and improved screening methods in clinical practice (Goran et al., 2003).

Over the past 20 years, researchers have determined that hypertension is a threatening disease process in adolescents as well as adults (Rocchini, 1999). Incidence estimates range from 0.5 to 11% of youth under the age of 18 as being affected by hypertension. Hypertension can be a precursor to cardiovascular disease if not properly managed, and can be associated with myocardial hypertrophy, persistent headaches, blurred vision, convulsions, and coma in the worst of cases. Hyperlipidemia is another known risk factor for the development of adult-onset heart disease associated with
overweight. It results in abnormalities of lipid metabolism and their treatment and can ultimately result in a higher serum LDL cholesterol concentration, a higher plasma cholesterol level, and atherogenesis. Diets that contain high levels of saturated fat and cholesterol content are implicated in hyperlipidemia.

Orthopaedic problems may be especially troublesome for youth who are overweight. Excess weight places an extreme burden on the lower limbs and is associated with orthopaedic diseases such as bilateral tibia vara (knee pain resulting from bowed legs), slipped upper femoral epiphyses (hip pain arising from abnormal forces on the femoral growth plate), and pes planus (poor foot arches) (Loke, 2002). Loke (2002) suggested that while these orthopaedic problems may put an individual at increased risk for osteoarthritis in adulthood, perhaps more immediately troublesome is their effect on a child’s ability to exercise, “thus creating a vicious cycle, with increasing and worsening obesity and joint disease” (p. S703).

*Theoretical Framework of Pediatric Overweight*

A complex myriad of factors have been implicated in the development and expression of pediatric overweight. There are a number of syndromes associated with childhood overweight, which are classified as genetic (e.g., Turner syndrome, Prader-Willi syndrome), endocrine (e.g., hypothyroidisms, growth hormone deficiency), and others (e.g., Cohen syndrome, Carpenter syndrome). The cause of primary overweight in children and adolescents, a condition not associated with a syndrome, appears to be more closely associated with environmental factors such as lack of physical activity, unhealthy eating behaviors, or a combination of the two (Saelens & Daniels, 2003).
A developmental-systems perspective to the expression of pediatric overweight formed the theoretical basis of the present study (Mash & Dozois, 2003). This perspective is consistent with both transactional and ecological views, and emphasizes the importance of individual, family, social, community, and cultural factors in predicting and understanding development (Mash & Dozois, 2003). Toward this end, emphasis was placed on individual behaviors related to overweight (i.e., dietary intake and physical activity) and the environments (i.e., family, school, community) in which these behaviors are developed and maintained.

**Rationale for the Study**

Although dietary intake and physical activity behaviors have been identified in the literature as primary factors associated with the development and expression of overweight, research is needed to determine the influence of other variables or secondary factors. For example, it is important to determine whether certain subgroups (i.e., youth of different ethnic backgrounds or socio-cultural backgrounds, youth of different gender, etc.) are at higher risk for pediatric overweight due to the types of health behaviors in which they engage (Neumark-Sztainer et al., 1996). If patterns emerge in which some subgroups are at higher risk for poor dietary intake behaviors but not at risk for poor physical activity behaviors, appropriate interventions can be designed to meet the group’s specific strengths and limitations. Similarly, it is also important to determine if overweight youth engage in more health-compromising behaviors than average weight youth with regard to dietary intake and physical activity. Furthermore, it is important to determine in which behaviors are they engaging (e.g., either less physical activity or
increased consumption of junk food, or both of these behaviors combined) that may prevent them from attaining a healthy weight.

The CDC (2002) suggested that creating environments that promote and support regular physical activity, and healthy eating behaviors are essential to reducing the overweight epidemic. School systems may be primary targets for creating such environments because children and adolescents spend a large portion of their day in school. School systems can also serve as a forum for the implementation of prevention and intervention programs that may help in the battle against the current overweight epidemic. As obesity has escalated to the status of a “national epidemic,” more than ever there is a need for a proactive approach to overweight that emphasizes primary prevention.

**Purpose of the Study**

Many researchers (Beech, Rice, Myers, Johnson, & Nicklas, 1999; Forshee & Storey, 2003; Munoz, Krebs-Smith, Ballard-Barbash, & Cleveland, 1997; Neumark-Stzainer et al., 1996; Videon & Manning, 2003) have provided evidence that adolescents are consuming inadequate servings of fruits, vegetables and grains. Though a secular trend of inadequate consumption has been documented (Munoz et al., 1997), there are also significant differences in consumption levels among specific subgroups (e.g., defined by race, age, SES) (Neumark-Sztainer et al., 1996). With respect to physical activity, data collected in the last decade indicate a substantial decline in physical activity levels for adolescents in all 50 of the United States (Hayman, 2002). Therefore, it comes as no surprise that adolescents are increasingly reporting higher levels of engagement in sedentary activities, such as TV viewing, computer activities, and/or playing video
games. Although it is clear that adolescents are not consuming adequate servings of healthy foods nor are they engaging in adequate levels of physical activity, to date, very few investigations have examined the differences in dietary intake and physical activity behaviors of adolescents among different weight categories. As such, it is difficult to say with certainty that these variables alone are contributing to the overweight epidemic in young Americans.

The purpose of this study was to determine whether there is a relationship between the independent variables of weight status (expected weight, overweight), as measured by body mass index (BMI), ethnicity, and gender and the dependent variables of dietary intake and physical activity behaviors among adolescents. Specifically, the research questions and hypotheses included:

1. What is the relationship between weight category, gender, and ethnicity and the dependent variables of dietary intake (fruit/vegetables, dairy, meat/beans, grains, and junk foods) among adolescents?

Hypotheses: It was hypothesized that overweight adolescents would consume more dairy food, meat/beans, and junk food and less fruit/vegetables and grain products. This hypothesis was not generated based on previous research because there is a lack of studies that have explored this question. It was expected that there would be a relationship between gender and dairy food intake, with boys more likely than girls to consume the daily recommended servings of dairy. This hypothesis is based on the research by Munoz et al. (1997) and Neumark-Sztainer et al (2002). No other significant relationships between variables were expected.
2. What is the relationship between weight category, gender, and ethnicity, and the dependent variables of physical activity (vigorous activity and moderate activity) among adolescents?

Hypothesis 1: It was hypothesized that overweight adolescents would engage in less physical activity than expected weight peers. This hypothesis is based on the research by Boutelle, Neumark-Sztainer, Story, and Resnick (2002) and Maffeis, Zaffanello, and Schultz (1997). It was expected that there would be a relationship between gender and physical activity, with boys more likely than girls to meet the weekly recommendations for physical activity. This hypothesis is based on the research by Andersen et al. (1998), Gordon-Larsen et al. (1999), and Troiano (2002). It was hypothesized that there would be a relationship between ethnicity and gender and physical activity, with African American and Latino/Hispanic girls less likely than Caucasian girls to meet the weekly recommendations. This hypothesis is based on the research by Andersen et al. (1998). It was expected that there would be a relationship between ethnicity and gender and physical activity, with Latino/Hispanic boys less likely than African American and Caucasian boys to meet the weekly recommendations. This hypothesis is based on the research by Andersen et al. (1998).

3. What is the relationship between the independent variables weight category, gender, and ethnicity, and the dependent variable sedentary activity among adolescents?

Hypothesis: It was hypothesized that overweight adolescents would engage in more sedentary activity. This hypothesis is based on the research by Boutelle, Neumark-Sztainer, Story, and Resnick (2002) and Maffeis, Zaffanello, and Schultz (1997). It was expected that there would be a relationship between ethnicity and sedentary
activity, with African American and Latino/Hispanic adolescents engaging in higher levels of sedentary activity than Caucasian adolescents. This hypothesis is based on the research by Andersen et al. (1998), Dowda et al. (2001), and Troiano (2002). No other significant relationships between variables were expected.

Significance of the Study

To date, there is a dearth of literature on whether or not the eating and physical activity behaviors of adolescents in different weight categories (expected weight versus overweight) are different or similar. Although it is clear that food choices and activity level influence adiposity, the behaviors of adolescents in different weight categories has not been explored in detail. Because many interventions focus on changing eating behaviors and increasing levels of physical activity, it seems logical to study the behaviors of youth in different weight categories. In this way, if certain patterns of behaviors emerge as typical in a specific group, interventions can be designed that directly address those patterns of behaviors. Identification of patterns of dietary intake and physical activity behaviors between different weight groups could provide school staff with direction for creating intervention programs designed to improve the nutritional choices of adolescents and increase their levels of physical activity.

Definition of Terms

*Body Mass Index.* Body mass index refers to an equation (weight in kilograms/height in meters$^2$) that is used as a measure of adiposity.

*Overweight.* Overweight is defined as a body mass index greater than 24.9 (Rosner, Prineas, Loggie, & Daniels, 1998).
Expected weight. Expected weight is defined as a body mass index between 18.5 and 24.9 (Rosner, Prineas, Loggie, & Daniels, 1998).

Dietary Intake. Dietary intake refers to the number of servings of food from a particular food group (e.g., fruits/vegetables, meat/beans, dairy, grains and junk food) that participants report consuming per day.

Developmental-Systems Perspective. This perspective emphasizes the importance of individual, family, social, community, and cultural factors in predicting and understanding development (Mash & Dozois, 2003).

Junk Food. Junk food is defined by any of the examples provided on the Nutrition/Physical Activity Questionnaire for High School (e.g., soda, potato chips, candy bars, etc.).
Chapter 2
Review of Selected Literature

Overview

The purpose of this chapter is to present a discussion of the dietary intake and physical activity behaviors in which adolescents engage that contribute to the development and expression of pediatric overweight. Toward this end, a review of the literature discussing the recent rise in pediatric overweight will be presented, followed by a presentation of methods to assess weight and body mass index. Then a discussion of the nongenetic (environmental) influences on overweight will be introduced, more specifically, dietary intake and physical activity behaviors.

Overweight and Obesity

According to data from the National Health and Nutrition Examination Survey III (NHANES III, 1988-1994), overweight among children has increased among all age, race, and sex groups over the past 30 years (Sorof & Daniels, 2002). More specifically, data analyses published by the Centers for Disease Control and Prevention (CDC) indicated that about 10% to 15% of children and adolescents are overweight within every age and sex group (2002). In particular, among adolescents (12-17 years of age), the percentage of overweight increased similarly for both boys and girls from 5% in 1970 to 14% in 1999.
More recent data from the National Longitudinal Survey of Youth (NLSY) found slightly higher prevalence rates of overweight compared to those of the NHANES III. The NLSY was a cohort study that included 8,270 children aged 4 to 12 years and monitored overweight trends in children from 1986-1998. In this study approximately 20% of youth were overweight.

Although a secular trend in the increase of pediatric obesity has been documented, more recent data suggest that overweight is more common among specific population subgroups (Strauss & Pollack, 2001). For example, data from the National Longitudinal Survey of Youth (NLSY) (Strauss & Pollack, 2001) indicated that overweight increased fastest among minorities and southerners, creating major demographic differences in the prevalence of pediatric overweight by 1998. Among African American and Hispanic populations, the number of children with a BMI greater than the 85th percentile increased significantly, but nonsignificantly for Caucasian children (Strauss & Pollack, 2001). While overweight prevalence was similar in southern and western states in 1986, by 1998 the overall prevalence had increased to 10.8% in western states and to 17.1% in southern states.

Neumark-Sztainer and Hannan (2000) assessed the prevalence of dieting and disordered eating among adolescents using the Commonwealth Fund Surveys of the Health of Adolescent Girls and Boys and found that approximately 24% of the population was overweight. This study utilized a nationally representative sample of 6,728 adolescents in grades 5 to 12. Another finding of this study was that disordered eating behaviors were strongly correlated with overweight status.
The state of Florida has similar percentages of high school students who are overweight when compared to national averages. In 2001, 10% of all Florida high school students were overweight compared to 11% nationally (CDC, 2001a). Data from the Youth Risk Behavior Surveillance Survey found that high school males in Florida had higher rates of overweight compared to females, 10% versus 7%, respectively (CDC, 2002). However, high school females were more likely to think they were overweight (35%) and had made more attempts to lose weight (55%) than high school males (21% and 24%, respectively).

Health Complications Associated with Obesity

Physical Health

Beyond measurement validity, Dietz and Robinson (1998) proposed that the clinical validity of body mass index (BMI) as a measure of adiposity is even more important to consider. They defined clinical validity as “whether the BMI in children and adolescents is associated with current or future morbidity rates” (Dietz & Robinson, 1998, p.191). Among adults, it is clear that an increased BMI is associated with a number of health problems (e.g., heart disease, type II diabetes, high blood pressure, and some forms of cancer) and higher mortality rates (CDC, 2001b; Dietz & Robinson, 1998). Fewer data are available from child and adolescents studies, although some associations have been demonstrated between BMI and increased blood pressure, adverse lipoprotein profiles, non-insulin-dependent diabetes mellitus, and early atherosclerotic lesions (Dietz & Robinson, 1998; Wright, Parker, Lamont, & Craft, 2001).

Morrison et al. (1999) found an association between increased BMI and higher levels of total cholesterol (plasma lipids and lipoproteins), in a cross-sectional study of
body composition and cardiovascular disease (CVD) in African American and Caucasian children from 1975 through 1990. An examination of total cholesterol levels for females found that mean cholesterol was higher in the 1989-1990 study cohorts than those of the 1973-1975 cohorts. Additionally, in the 1989-1990 cohorts there were also significant increases in the prevalence of elevated cholesterol.

In contrast to these findings, Wright et al. (2001) found that BMI at age 9 years was significantly correlated with BMI at age 50 but not with percentage body fat at age 50. In addition, there was an inverse association between BMI at age 9 and measures of lipid and glucose metabolism in both sexes and with blood pressure in women at age 50. However, when adult percentage fat instead of BMI was adjusted for, only the inverse associations with triglycerides and total cholesterol in women remained significant (Wright et al., 2001).

These data suggest that being thin in childhood did not offer protection against adult fatness or health risk, and that percentage body fat may be a more accurate predictor of adult health risk. However, these findings should be interpreted cautiously because data were only available for a relatively small number of participants at both periods (n = 412) and follow up was only to age 50. Therefore, the researchers used proxy markers for morbidity and not the actual outcomes.

Moving beyond looking only at the physical consequences of overweight, Schwimmer, Burwinkle, and Varni (2003) examined health-related quality of life (QOL) in obese children and adolescents compared with children who are healthy or those diagnosed as having cancer. Health-related quality of life (QOL) is a multidimensional
construct that includes physical, emotional, social, and school functioning (Schwimmer et al., 2003).

During the study, the selected participants included 106 children and adolescents between the ages of 5 and 18 years, who had been referred to an academic children’s hospital for evaluation of obesity. Parents, children, and adolescents each completed a pediatric QOL inventory (PedsQL 4.0) separately. The inventory was self-administered for all participants except children aged 5 to 7 years. The researchers hypothesized that children and adolescents who were overweight would have worse health-related QOL findings as seen in other pediatric chronic health conditions (Schwimmer et al., 2003).

Findings of the study indicated that compared with healthy children, obese children and adolescents reported significantly lower health-related QOL in all domains (e.g., physical, emotional, social, and school functioning). Sixty-five percent of the sample had one or more obesity-related comorbid condition: diabetes mellitus (3.8%), obstructive sleep apnea (6.6%), tibia vara (1.9%), polycystic ovary syndrome (2.8%), non-alcoholic fatty liver disease (28.3%), hyperinsulinemia (51.9%), and dyslipidemia (36.8%) (Schwimmer et al., 2003). Nine children (8.5%) had asthma reflecting national prevalence data, and anxiety or depression was present in 14 children and adolescents (13.2%), which is higher than the national prevalence. There were no significant differences in QOL scores by sex or ethnicity; and neither age nor SES was significantly correlated with QOL scores.

Notably, Schimmer et al. (2003) also reported that obese children and adolescents missed more days from school (mean [SD] of 4.2 [7.7] days) than healthy children and adolescents (mean 0.7 [1.7] days). Although the reasons for absenteeism were not
explored, the data are similar to the rates of absenteeism found in children and adolescents with other chronic diseases such as diabetes and asthma (Vetiska, Glabb, Periman, & Daneman, 2000).

Acknowledged limitations of this study concern the process of subject recruitment and the degree of obesity encountered. The children and adolescents were selected based on having been referred for evaluation and treatment of obesity. Furthermore, the cohort studied had a mean BMI z score of 2.6 (SD = 0.5), which is a BMI of approximately 38 in an adult and is in the range of severely obese. These findings may not generalize to samples of children and adolescents with lesser degrees of obesity.

*Mental Health*

Investigations on psychosocial and behavioral variables associated with obesity (Neumark-Sztainer et al., 2000; Pesa, Syre, & Jones, 2000) have revealed significant differences between overweight and non-overweight adolescents. Pesa et al. (2000) used data from female participants of the National Longitudinal Study of Adolescent Health (n = 3197) to determine whether overweight female adolescents differ from normal and underweight female adolescents with respect to a set of psychosocial factors, while controlling for body image. Body image was measured by participants’ responses (e.g., underweight, slightly underweight, about the right weight, slightly overweight, and overweight) to a question about how they think of themselves in terms of weight. A multivariate analysis of variance was used to test whether the two groups differed with respect to measures of depression, self-esteem, trouble in school, school connectedness, family connectedness, sense of community, autonomy, protective factors, and grades (Pesa et al., 2000).
Results from the study revealed a significant difference between groups on the combined set of psychosocial factors without controlling for body image and controlling for body image (Pesa et al., 2000). Prior to controlling for body image, significant differences between the overweight and normal/underweight groups were observed for the following variables: grades (self-report of A, B, C, etc.); self-esteem (e.g., “…you have a lot of good qualities;…you feel you are just as good as other people”;…etc.); depression (e.g., “How often were each of these things true during the past week:…you were bothered by things that usually don’t bother you?...you felt you couldn’t shake the blues, even with help from your friends and family?”...etc.); trouble in school (e.g., “How often during the past month did you have trouble getting along with teachers….with students?...paying attention?”…etc.) and protective factors (e.g., “How much do you feel that adults care for you?” etc.) (Pesa et al., 2000). Furthermore, the factors grades and self-esteem were the most powerful in defining the overall differences among groups. However, after adjusting for body image self-esteem was only a modest contributor towards defining group differences, while grades continued to make a strong contribution. Additionally, Pesa et al. (2000) found that depression was no longer significant. This suggests that when body image is statistically controlled, depression is not a factor in differentiating overweight and nonoverweight female adolescents.

In summary, a major finding of this study was that low self-esteem among overweight female adolescents might be better explained by body image as opposed to the physical condition of overweight. This may be an important discovery for educators and health professionals when they are planning curriculum to educate students on
healthy body weight and the choices adolescents can make to achieve a healthy body weight.

**Body Mass Index**

As the prevalence of childhood overweight and obesity continue to increase at dramatic rates, the need for a widely accepted measure to assess this serious medical condition has become critical. Measurements of skinfold thickness, body density and weight-for-height are some of the most common measures utilized to assess body composition. Skinfold thickness consists of using a caliper to measure skinfold thickness at a specific body part, usually the tricep, abdomen, or upper thigh. It offers a direct measurement of subcutaneous fat and is well correlated with percentage body fat but interobserver agreement is usually not high and measurements of fatter individuals are difficult to reproduce (Dietz & Bellizzi, 1999).

Measurements of body density are determined either by underwater weighing or dual-energy X-ray absorptiometry (DXA). Both measures are expensive and require a significant amount of time. In underwater weighing, the weight of the individual is divided by the volume of water displaced by the individual, corrected for air in the lungs. Then, body composition is estimated on assumed densities of fat mass and fat-free mass (Dietz & Bellizzi, 1999). The use of DXA has become an alternative measure of density. DXA measures bone density directly and thus can adjust for the composition of fat-free mass. It offers several advantages over underwater weighing, such as immersion is not required so a wider age range of individuals can be assessed, it appears to be less dependent on assumptions about the density of fat-free mass, and no correction is required for residual air in the lungs (Dietz & Bellizzi, 1999).
At present, expert committees from various international health institutes (e.g., World Health Organization, International Obesity Task Force, Centers for Disease Control and Prevention) support the use of body mass index to help define adult obesity and recommend its use for children and adolescents. However, no consensus exists on the utility of the BMI to children and adolescents (Dietz & Robinson, 1998). For example, the WHO recommends using the BMI 85th percentile to define overweight and the fifth percentile for underweight, with all values in between considered to be in the “expected” range (Wang, 2001). The CDC BMI-for-age growth charts recommend slightly different percentiles. Using age- and sex-specific reference data, values below the 5th percentile are considered underweight; values from the 5th up to the 85th percentile are considered an expected weight; from the 85th to 95th percentile is considered at risk of being overweight; and at the 95th percentile and above, children and adolescents are classified as overweight (CDC, 2001b).

Proponents of the use of BMI as a measure of adiposity for children and adolescents argue that it is simple, inexpensive, and noninvasive; it correlates with subcutaneous total body fatness in adolescents; and has statistical properties that make it a reliable and valid screening tool (Chen et al., 2002; Rosner et al., 1998). Moreover, Dietz and Robinson (1998) suggested that clinicians will increasingly use BMI because it is easily calculated from height and weight, two routine measures in clinical settings and included in medical records.

In a review of the strengths and limitations of existing approaches to the measurement of childhood obesity, Dietz and Bellizzi (1999) reported strong correlations of percentage body fat with BMI in boys and girls of different ages and ethnic groups.
They analyzed the results of five empirical studies that evaluated the correlations between BMI and one of two common measurements of body density, underwater weighing, and dual-energy X-ray absorptiometry (DXA, a full body measure of bone density). The resulting correlation coefficients of percentage body fat measured with underwater weighing and BMI were lower than those measured with DXA and BMI, respectively.

All of the studies Dietz and Bellizzi reviewed had approximately 100 participants with equal samples of boys and girls, which were similarly grouped into age-based categories. However, only two of the studies examined children and adolescents in non-white racial or ethnic groups (Dietz & Bellizzi, 1999). Although correlation coefficients between percentage body fat and BMI for Caucasian and African American children appeared comparable across all ages, African American children had lower percentages of body fat than did Caucasian children with the same BMI (Dietz & Bellizzi, 1999). Dietz and Bellizzi concluded that BMI should be used cautiously in the assessment of overweight across populations until more studies involve ethnic groups other than Caucasians.

Although expert panels such as the International Task Force on Obesity, the European Childhood Obesity Group, and the National Center for Health Statistics support the BMI as a reasonable index of adiposity in children and adolescents (Dietz & Robinson, 1998), they acknowledge some important limitations to this approach. First, because studies on the relationship between percent body fat and BMI have been predominantly exclusive to Caucasian and African American children in a limited number of countries, caution is required when applying BMI cutoff point to assess the prevalence of obesity in other ethnic populations (Chen et al., 2002; Dietz & Bellizzi,
1999; Dietz & Robinson, 1998). Second, most of the “growth curves” have been derived from cross-sectional surveys as opposed to longitudinal studies; therefore, caution is necessary when inferring longitudinal patterns of growth. The resulting curves “may not reflect individual, birth-cohort, or secular-trend effects that may alter longitudinal trajectories of growth among individuals or groups” (Dietz & Robinson, 1998, p. 192).

With these limitations acknowledged, expert panels recommend that growth charts only be used as a first level screening tool. If a child has a BMI value that is outside the expected range for age, the child should be referred for further clinical assessment by a health care provider (Rosner et al., 1998). The health care provider will determine if a more sophisticated and/or comprehensive measure of adiposity is necessary.

**Nongenetic Influences on Overweight**

Multiple factors are related to the high prevalence of pediatric overweight. Although genetic/endogenous factors (e.g., genes and metabolism) contribute to the development of overweight and obesity (Kiess et al., 2001; Saelens & Daniels, 2003), recent data from the National Longitudinal Survey of Youth (Strauss & Pollack, 2001) indicate that overweight increased so significantly and steadily among all ethnic groups between 1986 and 1998 that it could not be fully explained by genetics. Additionally, the average weight of children who were overweight had increased between 1986 and 1998 (Strauss & Pollack, 2001). This trend is similar to that observed for adults (Hayman, 2002), and suggests that nongenetic/environmental (potentially modifiable) factors may be contributing more to the epidemic than genetic factors.
The following section will present specific discussions of the non-genetic factors that influence pediatric overweight. Toward this end, a thorough discussion of the impact of dietary intake and physical activity behaviors will be presented as these two factors have been well-documented in the literature to contribute to overweight. Within the discussions of dietary intake and physical activity behaviors, factors that have been documented in the literature to impact these behaviors will be presented at the beginning of each discussion.

**Dietary Intake**

The purpose of this section is to provide a comprehensive discussion of the current trends in dietary intake patterns of adolescents. Toward this end, this section begins with an overview of dietary intake behaviors and then introduces the factors gender, ethnicity, and SES as environmental factors that impact dietary intake behaviors. A discussion of the impact of BMI on dietary intake will not be provided due to the paucity of research on this factor. To date, very few investigators have explored whether overweight children and adolescents have different dietary intake patterns from their expected weight peers.

The majority of American adolescents are not eating a balanced diet (Neumark-Sztainer, Story, Hannan, & Croll, 2002). Research on dietary intake patterns of adolescents (Beech et al., 1999; Middleman, Vazquez, & Durant, 1998; Munoz et al., 1997; Neumark-Sztainer et al., 2002) overwhelmingly suggests that adolescents are consuming inadequate servings of fruits, vegetables and grains, and excessive amount of fats and sugars based on the recommendations of the Food Guide Pyramid (US Department of Agriculture [USDA], 1992). At present, the USDA recommends that
adolescents eat a minimum of the following number of servings from each food group: grains (6 servings), vegetables (3 servings), fruits (2 servings), dairy (2-3 servings), and meat (3 ounces or 1 serving).

Munoz et al. (1997) examined food intake of 3,307 children and teenagers with the US Department of Agriculture’s 1989-1991 Continuing Surveys of Food Intakes by Individuals. They compared the food intake of these children and adolescents with the USDA recommendations and found that 16% did not meet any recommendations, and 1% regularly ate foods from all five-food groups (grains, vegetables, fruits, dairy products, meat/proteins). With respect to fruit and vegetable consumption, less than 36% of participants met the recommendations. Caucasian participants had the highest number of servings of grains and dairy, and African Americans had the highest number of servings of vegetables and meat.

A major strength of the Munoz et al. (1997) study was that in addition to the number of servings of vegetables and fruits youth consumed, they examined the number of servings of grains, dairy products, and meat products consumed, as well. There have been limited reports on child and adolescent intakes of these latter groups relative to the Pyramid recommendations. Looking at particular food groups in isolation prohibits a more comprehensive understanding of adolescent eating behaviors. Furthermore, if children are eating too few vegetables and fruits it is important to investigate whether their behaviors are similar or different across the other food groups.

Fruit and vegetable consumption among adolescents has been the focus of the majority of studies looking at adolescent dietary intake. Six of seven food intake questions on the 2001 Youth Risk Behavior Surveillance Survey (CDC, 2003b) assess
intake of fruit/fruit juices and vegetables, and the remaining item asks about dairy product consumption. A driving force behind the focus on fruit and vegetable consumption is that certain types of cancer, diabetes, hypertension, and cardiovascular disease have been linked to inadequate consumption of fruits and vegetables (Block, Patterson, & Subar, 1992; Cavadini, Siega, & Popkin, 2000; Nicklas, Farris, & Smoak et al., 1988; Steinmetz, & Potter, 1996).

Cohort studies on intake of fruits and vegetable have demonstrated their protective effect against cancer (CDC, 2003a). A major concern of health professionals is the impact of poor eating patterns on healthy adolescent growth and development (Society for Adolescent Medicine, 1999). Furthermore, poor eating habits formed in adolescence may continue into adulthood, increasing future risk for development of disease and compromised health (Videon & Manning, 2003).

Numerous surveys have reported that among adolescents, consumption of fruit and vegetables is significantly lower than the recommended amount (Beech et al., 1999; Middleman, Vazquez & Durant, 1998; Videon & Manning, 2003). Videon and Manning (2003) produced estimates of the frequency of adolescents’ \( n = 18,177 \) consumption of fruits, vegetables, and dairy foods based on data from the National Longitudinal Study of Adolescent Health (Add Health 1995). The results demonstrated that large percentages of adolescents reported eating fewer than the recommended servings of vegetables (71%), fruits (55%), and dairy foods (47%), and that these patterns differed by race, SES, and parental presence at the evening meal.
Gender

In 1997, Munoz et al. reported differences in adolescent eating patterns across all of the food groups by gender, age, and ethnicity. When food group intakes were averaged, females did not meet minimum recommendations for any group, whereas males met minimum recommendations for grains, vegetables, and meat. Additionally, males were more likely than females to meet dairy recommendations.

Findings of gender differences in intake of fruits and vegetables among adolescents are equivocal. Neumark-Sztainer et al. (2002) found inadequate fruit and vegetable consumption to be more prevalent and statistically significant among males than females. In spite of these findings, Beech et al. (1999) reported no significant differences between males (2.70 servings) and females (2.63 servings). Interestingly, Beech et al. found that girls reported being more confident in their ability to eat five servings of fruits and vegetables per day than did boys.

Gender differences in fat, calcium, and grain intake have also been reported in the literature (Neumark-Sztainer et al., 2002). Results of data from the Minnesota Adolescent Health Survey (MAHS) found that higher percentages of boys (65.1%), compared with girls (47.7%), were consuming 30% or more of their total energy from fat and 10% or more from saturated fat (Neumark-Sztainer et al., 2002). Boys’ higher consumption of total energy from fat may be partially explained by the fact that they are more likely than girls to meet the grain, dairy, and meat recommendations (Munoz et al., 1997). Specifically, dairy and meat products can contain high amounts of fat depending on the type of product and/or how it is prepared (whole milk vs. skim; fried chicken vs. grilled chicken breast).
A goal of Healthy People 2010, a comprehensive, nationwide health promotion and disease prevention program developed by the US Department of Health and Human Services (Neumark-Sztainer et al., 2002), is to increase the proportion of persons 2 years and older (target: 75% of all people) who consume no more than 30% of calories from fat and less than 10% of calories from saturated fat. In the MAHS study, lower percentages of girls were consuming the recommended amounts of calcium and grains, which may have been attributed to higher total calorie consumption among the boys (mean = 2252 ± 1111 calories) compared to girls (mean = 2014 ± 1015 calories) (Neumark-Sztainer et al., 2002). Another factor that may contribute to lower percentages of girls meeting recommendations is that girls are significantly more likely to report eating nothing for breakfast than are boys (Videon & Manning, 2003).

**Ethnicity**

Across ethnic groups, inconsistent patterns of food intake activity have been reported. Beech et al. (1999) reported significant ethnic differences in the frequency of fruit and vegetable intake, with Caucasian adolescents reporting the highest mean consumption (2.70 servings), followed by Hispanics (2.55 servings) and African Americans (2.31 servings). Standard deviations were not reported in this article. This study was conducted in the Archdiocese of New Orleans School System where 83% of eligible participants were Caucasian, 9% Hispanic, and 5% African American and results may not be generalizable to urban public high schools.

Neumark-Sztainer et al. (2002) reported contrary findings where fruit and vegetable intake was lowest among Caucasian adolescents in a sample of 4,746 students from public middle and high schools in the Minneapolis, St. Paul, and Osseo school
districts in Minnesota. Hispanic adolescents had the highest percentages of fruit and vegetable intake with 39.1% of girls and 32.5% of boys meeting the Healthy People 2010 target of five combined servings of fruits and vegetables a day. The ethnic backgrounds of students in this sample were representative of the respective school districts with 48.5% Caucasian, 19% African American, 19.2% Asian American, 5.8% Hispanic, 3.5% Native American, and 3.9% mixed or other.

Overall, the differences in dietary intake among different ethnic groups are equivocal, and studies suggest that both geographic location and ethnicity may affect consumption of fruits and vegetables (Gower & Higgins, 2003). A lucid finding is that mean food group intake for the adolescent population as a whole is below even minimum recommendations for fruits, vegetables, and grains (Gower & Higgins, 2003; Munoz et al., 1997; Neumark-Sztainer et al., 2002, Story Neumark-Stzaner, & French, 2002). Interestingly, none of the reviewed studies measured whether or not adolescents were consuming too many servings of meat or dairy products, or foods from any food group for that matter. This information would be valuable in terms of understanding whether or not adolescents are eating too many items from particular food groups and would be useful to guide the development of interventions addressing student knowledge of healthy food choices and behavior modification.

*Socio-economic Status*

Some research demonstrates that a higher percentage of children in higher income categories are meeting the fruit and dairy recommendations with adolescents in lower income categories more likely to consume insufficient fruits and vegetables (Lowry, Kann, Collins, & Kolbe, 1996; Munoz et al., 1997; Neumark-Sztainer et al., 1996).
Additionally, Videon and Manning (2003) found “higher levels of parental education were associated with lowered odds of poor vegetable, fruit, and dairy food consumption” (p. 368). However, two studies (Neumark-Sztainer et al., 2002; Munoz et al., 1997) found that youths with the lowest SES reported the second highest intake levels of fruits and vegetables (behind youths from the higher SES categories). Both studies reported similar findings on the relationship of SES and fat consumption. These findings are difficult to interpret. It may be that parents from the lowest and highest SES groups both know the benefits of fruit and vegetable consumption and thus encourage their children to eat these food. At the same time, both groups may avoid purchasing as many items from the other food groups, but for parents in the highest SES group it is a matter of choice, while parents in the lowest SES group simply cannot afford to make such a choice.

Other Factors

A complex myriad of factors are associated with adolescent eating behaviors. Some of the factors that influence adolescent food choices are related to individual influences like food preferences, taste, and sensory perceptions of food, self-efficacy, and knowledge. Social-environmental influences have also been implicated, for example, family environment, demographic characteristics (ethnicity, SES, culture, age, sex), family meals, peers, and the media/advertising; and finally, physical-environmental influences such as school environment, fast-food restaurants, vending machines and convenience stores (Hayman, 2002; Middleman, Vazquez, & Durant, 1998; Neumark-Sztainer et al., 1996; Story, Neumark-Sztainer, & French, 2002). These influences are just starting to receive attention in the literature, however, at present the degree to which each of them influence pediatric overweight is not clear. The present study does not
include these factors because they are difficult to measure within a school setting and valid tools to assess these factors are still being developed. A comprehensive review of these influences is available (Hayman, 2002).

In summary, numerous studies have identified that American adolescents are not eating a balanced diet. More specifically, adolescents as a whole are consuming inadequate servings of fruits, vegetables and grains, and excessive servings of fats and sugars based on the recommendations of the Food Guide Pyramid. Although some studies suggest that specific ethnic groups are more likely to consume adequate servings of some food groups than others, the research is equivocal and no consistent patterns of food intake can be identified. However, gender and SES differences have resulted in consistent patterns. Boys are more likely than girls to meet the grain, dairy, and meet recommendations, and also consume higher percentages of calories from fat. With regard to SES, youth from higher income categories are more likely to meet the fruit and dairy recommendations when compared to youth in lower income categories, but interestingly, youth from the lowest SES categories report the second highest intake levels of fruits and vegetables.

**Physical Activity**

The purpose of this section is to provide a comprehensive discussion of the current trends in physical activity patterns of adolescents. Toward this end, this section begins with an overview of physical activity behaviors and then introduces the factors gender, ethnicity, and BMI as environmental factors that impact dietary intake behaviors. A discussion of the impact of SES on physical activity will not be provided due to the paucity of research on this factor.
Data from seminal nationwide surveys, the Youth Risk Behavior Surveillance System (YRBSS), the National Longitudinal Study of Adolescent Health (Add Health), and Third National Health and Nutrition Examination Survey (NHANES III), demonstrate that the percentage of students who participate in physical education classes in high school has steadily decreased over the last decade. For example, 59.6% of surveyed students (grades 9-12) reported participating in physical education classes in 1995, but two years later only 48.8% reported participation (Dowda, Ainsworth, Addy, Saunders & Riner, 2001). The percentage of students participating in daily physical education classes decreased even further in 1997 to 27% (Centers for Disease Control, 1997). Furthermore, on the 2001 Youth Risk Behavior Surveillance System (YRBSS), Florida youth were less likely to engage in physical education than U.S. high school students in general (CDC, 2003b) Traditionally, physical education classes provided students with the opportunity “to learn about physical activity and exercise, develop behavioral and motor skills that support lifelong activity, and encourage physical activity outside of physical education classes” (Andersen, Crespo, Bartlett, Cheskin, & Pratt, 1998, p. 938). As such, the decline in physical education participation may result in significant public health implications.

A report of the Surgeon General (CDC, 2003a) recommends that adolescents engage in at least three bouts of moderate to vigorous physical activity per week during which they sweat or breathe hard for 20 minutes or more on each occasion. Additionally, moderate physical activity is recommended on a daily basis, with a minimum of five bouts a week, and includes engaging in any of the following activities for at least 30
minutes: walking two miles, mowing the lawn or performing household chores (e.g., mopping), skipping rope, and riding a bike.

Regular physical activity is associated with a number of positive health benefits. Physical activity is particularly important for the development and maintenance of healthy bones, muscles, and joints; to help control weight gain and reduce body fat; and to prevent or delay the development of high blood pressure (CDC, 1997). It can also help to increase flexibility, balance, and endurance (CDC, 1997). Additionally, Pate, Trost, Levin, and Dowda (2000) found a positive association between physical activity engagement and health related behaviors (i.e., increased consumption of fruits and vegetables, decreased engagement in cigarette or marijuana use and alcohol consumption).

Prevalence estimates of the number of bouts of vigorous physical activity per week for U.S. children (8-16 years) from NHANES III data indicate that overall, 80% of children reported engaging in vigorous physical activities that made them sweat or breathe hard three or more times per week (Andersen et al., 1998; Dowda et al., 2001). In the 1996 Add Health study, 33.2% \( (N = 13,157) \) of the adolescents reported that they participated in five or more episodes of moderate to vigorous physical activity per week (Gordon-Larsen, McMurray & Popkin, 1999). Based on data from the National Health Interview Survey, the CDC reported that only 65% of adolescents engaged in the recommended amount of vigorous physical activity in 1999. As a result, the CDC has incorporated a physical activity and fitness objective in the Healthy People 2010 campaign targeted toward adolescents: increase the proportion of adolescents who engage
in vigorous physical activity that promotes cardiovascular fitness at least 3 days per week for 20 or more minutes per session (CDC, 2001b).

*Gender*

Nationally and in the state of Florida, boys of all ethnic groups report higher levels of engagement in vigorous physical activity, exercise programs and sports participation (Andersen et al., 1998; Dowda et al., 2001; Gordon-Larsen et al., 1999; Pate et al., 2000). For example, data from the 2001 YRBSS indicated that 73% of male youth in the U.S. participated in vigorous activity in three of the last seven days, compared with 57% of female youth. The percentage of Florida male and female youth engaging in vigorous activity was slightly lower than the national prevalence 68% and 49%, respectively. Male youth are also more likely to participate in high school and/or nonschool sports teams (Pate et al., 2000).

Andersen et al. (1998) reported higher prevalence rates of vigorous physical activity engagement for both boys and girls with data from NHANES III. In their study, 85% of boys reported vigorous physical activity engagement compared to 74% of girls. A phenomenon central to both gender groups is a decrease in bouts of physical activity engagement with increasing age and/or grade level (Andersen et al., 1998; Gordon-Larsen et al., 1999; Troiano, 2002). Statistics released by the CDC indicated that 72% of 9th-grade students reported engaging in vigorous physical activity compared to 56% of 12th graders (CDC, 2001a). In regards to participation in daily physical education classes, a greater than 50% decrease was observed between ninth and twelfth grade students in the U.S. and Florida in 2001 (CDC, 2001a).
Ethnicity

Nationally and in the state of Florida, African American (60%) and Hispanic (61%) youth are less likely than Caucasian (67%) youth to engage in vigorous and moderate physical activity and more likely to report no vigorous/moderate physical activity in the last seven days (Andersen et al., 1998; CDC, 2001a). On the contrary, data from the 2001 YRBSS indicate that African Americans (41%) and Hispanics (39%) are more likely to participate in daily physical education classes than their Caucasian (30%) peers (CDC, 2001c).

The 1996 Add Health study reported small ethnic differences in the number of episodes of moderate to vigorous physical activity per week for males (Gordon-Larsen et al., 1999). Two studies (Andersen et al., 1998; Gordon-Larsen et al., 1999) observed an interaction between sex and ethnicity, with minority females engaging in much lower levels of moderate to vigorous physical activity compared to Caucasian females. Almost half of the African American females and 41.6% of Hispanic females in the study reported engaging in 0-2 sessions of vigorous physical activity per week.

In a study on sports participation and health-related behaviors among U.S. youth, Pate et al. (2000) reported that Caucasian students (65.6%) were more likely than African American (55.2%) or Hispanic students (52.5%) to report sports participation. Pate et al. found that participation on sports teams was associated with an increase in many positive health behaviors. For example, for males and females across all ethnicities, sports participants were more likely to report eating fruits and vegetables on the previous day and more likely to report three or more 20-minute sessions of vigorous physical activity in the previous week.
In regards to engagement in sedentary activities (e.g., watching television and videos, playing computer and video games), African American and Hispanic youth report higher levels of engagement compared to Caucasian youth (Andersen et al., 1998; CDC, 2001b; Dowda et al., 2001; Gordon-Larsen et al., 1999; Pate, Heath, Dowda, & Trost, 1996; Troiano, 2002). Nationwide, approximately 26-30% of youth reported watching four or more hours of television per day (Andersen et al., 1998; Dowda et al., 2001). Gordon-Larsen et al. (1999) analyzed mean number of hours of television per week and mean composite inactivity hours per week (TV and video viewing, and computer and video game playing) and found that African Americans reported the highest levels of inactive engagement followed by Hispanics and Caucasians. African Americans reported 29.7 composite inactivity hours per week, followed by Hispanics (22.2 hours) and Caucasians (19.3 hours).

**BMI**

Boutelle, Neumark-Sztainer, Story, and Resnick (2002) evaluated weight control behaviors, eating, and physical activity behaviors among obese, overweight, and non-overweight adolescents. Their results showed that there is an inverse relationship between weight status in male and female adolescents and engagement in vigorous physical activity three or more times per week. As compared to the nonoverweight group, overweight and obese youth were significantly less likely to report three or more bouts of physical activity per week (Boutelle et al., 2002).

Other studies (Maffeis, Zaffanello, & Schutz, 1997; Mayer, 1975) have found that obese children are less likely to participate in moderate or vigorous activity and more likely to participate in sedentary activity. In contrast, Huttenen, Knip, and Paavilainen
(1986) found no difference in the time non-overweight and obese children spent in physical activity, but obese children were less likely to participate in formal sports teams and received lower grades in physical education in school. Overall, the literature is scant on whether or not BMI is associated with decreased participation in physical activity. Furthermore, the existing studies reported mixed results, and there is a need for further investigations in order to obtain a clearer understanding of the relationship between weight status and engagement in physical activity.

To summarize, youth across the United States are increasingly becoming more sedentary and less physically active. The percentage of students participating in daily physical education classes continues to decline and Florida youth are less likely to engage in physical education than U.S. high school students in general. Overall, boys of all ethnicities report higher levels of engagement in all types of physical activity than girls. Ethnic variations do exist. African American and Hispanic youth are more likely to report participation in daily physical education classes, but are less likely than Caucasian youth to engage in physical activity.

Conclusion

“The development and expression of obesity is influenced by the interaction of genetic and nongenetic factors” (Hayman, 2002, p. 213). Nongenetic factors such as dietary intake and physical activity are generally viewed as targets for intervention because of the degree to which they are modifiable influences on overweight and obesity. As obesity in children and adolescents becomes an epidemic of global proportions, the need for effective interventions becomes paramount.
School systems have long served as the forum for overweight programs and interventions have mostly been focused on children who are already overweight (Saelens & Daniels, 2003). However, now that overweight has become a national public health issue, the need for a paradigm shift is evident. It seems logical that a proactive approach to overweight that focuses on primary prevention would be preferred, especially since childhood overweight has been associated with increased risks of a number of cardiovascular diseases, type II diabetes, as well as an increased risk of adult overweight and obesity and associated morbidities (Williams et al., 2002).

In order to create effective intervention and prevention programs for childhood overweight, it is important to have a comprehensive understanding of the types of behavior in which children and adolescents engage that are associated with weight gain. While dietary intake and physical activity behaviors have been identified in the literature as factors associated with the development and expression of overweight, there remains much to learn. If there is a positive relationship between weight status and dietary intake and physical activity, it would be reasonable to assume that these would be targets for behavioral modification. The present study examines the relationship between weight status, as measured by body mass index, and dietary intake and physical activity behaviors.
Chapter 3

Method

The present study assessed the differences in eating behaviors and physical activity behaviors among high school students (grades 9-12) who are at an expected weight or overweight based on gender and ethnicity. The primary variables were BMI, dietary intake, and physical activity behaviors; whereas the secondary variables included gender, ethnicity, and socioeconomic status. This chapter will focus on a discussion of the participants, setting, instrumentation, independent and dependent variables, procedure, data analysis, and potential limitations of this study.

Participants

A specific high school was chosen as the site for data collection because the staff was participating in a statewide grant that promotes the development and enhancement of school-based programs to support student health. The school is located in a large school district in southwest Florida. In 2002-2003, it had an enrollment of approximately 2,100 students, of whom 50% were neighborhood students and 69% were minorities (African American, $n = 595$; Caucasian, $n = 655$; Hispanic, $n = 543$; Native American, $n = 9$; Asian, $n = 94$, Multiracial, $n = 39$). Forty-six percent of the student population received free and reduced lunch. At the time of data collection, the school employed full-time support personnel (i.e., school psychologist, guidance counselors, social worker, and school nurse).
Archival data were accessed for the purpose of this study from a database at this high school. Data from 199 students in grades 9 through 12 who were surveyed and screened were retrieved and analyzed. In order to maintain confidentiality, participant names and student identification numbers were not disclosed to this researcher. The present researcher had no relationship to the participants.

The sample was 59% female. The race/ethnic proportions of the students were: 35.2% Latino/Hispanic, 31.2% African-American, and 26.1% Caucasian/White, 4.5% Asian, and 3% “Other” (N = 199). The students’ ages ranged from 14 to 19 years with a mean age of 15.95 (N =198, SD =1.24). The students’ body mass indices (BMI) ranged from 16 to 55 with a mean of 23.76 (N =194, SD =5.83). Approximately 23.5% of students (n = 42) were overweight as classified by a BMI greater than or equal to 25. One-hundred twelve students (N =199, 56.3%) qualified for free or reduced lunch. A summary table of participant characteristics of students who met inclusion criteria (N = 179) will be presented in the results chapter.

**Instrumentation**

*Socio-demographic variables.* Sex, school grade, ethnicity, and age were based on self-report data obtained from the Nutrition/Physical Activity Questionnaire for High School Students. Ethnicity was assessed with the following question: “Do you think of yourself as…(1) African American; (2) Caucasian/White; (3) Hispanic/ Latino; (4) Native American/Alaskan; (5) Asian; and (6) Other:______.” Participants were asked to choose one response. Participants who chose any response other than African American, Latino/Hispanic, or Caucasian/White, were not included in the data analyses for purposes of this study but were available in the summary statistics report for school personnel.
The prime determinant of socioeconomic status was whether or not the participant was eligible for free or reduced lunch. This information was obtained from the county school district database using student identification numbers. The school nurse collected this information and provided it to this researcher via the participant questionnaires so that participants were not identifiable.

**Body mass index.** One independent variable in the present study was body mass index (BMI). Participants’ BMI was calculated with the equation weight in kilograms/height in meters$^2$. To calculate this measurement, a BMI calculator was utilized that requires one to align the measurements for an individual’s weight in pounds with his/her height in inches and then provides the BMI of that individual. Beam balance scales were used to measure weight with participants wearing no shoes or heavy jackets. Similarly, height was measured with participants wearing no shoes and standing erect against a wall-mounted scale. All BMI screenings occurred during school hours (between 8:00 a.m. and 2:00 p.m.). Registered Nurses from a local hospital who were formally trained in the BMI procedures assisted the high school’s nurse in conducting all of the measurements.

**Nutrition/physical activity questionnaire.** The Nutrition/Physical Activity Questionnaire for High School was utilized to obtain all data for this study. The original questionnaire was developed by a joint effort between county school district staff and a faculty member from the School Psychology program at the University of South Florida. The original questionnaire was used at the present high school setting during the 2002-2003 academic year to obtain descriptive information regarding student demographics, eating behaviors, exercise behaviors, and how students rated themselves on a range of
categories (e.g., grades, looks, friends, weight, happiness, etc.). The present researcher became familiar with this tool after volunteering to participate in the data analysis of the 2002-2003 data collection and decided to include the results of a modified form of this questionnaire in the present research study.

In the original questionnaire, dietary intake behaviors examined were vegetables, fruits and fruit juices, milk and milk products, meat and beans, breads and cereals, and junk food. Participants were asked, “How many servings from the following food groups do you eat or drink each day?” and were provided with examples of foods falling under each category (six questions in total). Responses from the dietary intake items were tested for internal consistency reliability (.77) using Cronbach’s alpha. Those same dietary intake questions were examined in the present study. In general, however, there has been limited research on the reliability and validity of food frequency questionnaires, and some research reports that they tend to overestimate intake of several nutrients and overall energy (Baranowski et al., 2000).

Modifications to the dietary intake section of the original questionnaire included adding more examples of types of items that fall under each food-group category and providing concrete examples of the amount one would have to eat to qualify as one serving size (e.g., vegetables includes 1 potato, 1 salad bowl of lettuce, 1 ear of corn or side serving of canned corn, etc). The rationale for including more food items was to provide participants with a clearer standard as to what qualifies as a serving size under each category. Serving sizes were based on the U.S. Department of Agriculture’s Food Guide Pyramid recommendations (Lee & Nieman, 1993).
Items regarding physical activity were added to this questionnaire and were borrowed from the Youth Risk Behavior Survey Surveillance (YRBSS) to assess participants’ levels of physical activity and inactivity. The YRBSS was developed in 1990 to monitor health risk behaviors that significantly contribute to the leading causes of death, disability, and social problems among youth and adults in the United States (CDC, 2003). Determinations of participants’ physical activity behaviors will be made from the following two survey questions: (1) On how many of the past 7 days did you exercise or participate in physical activities for at least 20 minutes that made you sweat and breathe hard, such as basketball, jogging, swimming laps, tennis, fast bicycling or similar aerobic activities? and (2) On how many of the past 7 days did you participate in physical activities for at least 30 minutes that did not make you sweat or breathe hard, such as fast walking, slow bicycling, skating, pushing a lawn mower, or mopping floors? Participants’ physical inactivity behaviors will be determined from the following question: (1) In an average school day (Monday-Friday), how many hours do you spend doing any of the following activities: watching television/movies, playing video games, reading, homework, or on the computer/Internet? Brener et al. (1999) assessed test-retest reliability of the 1999 YRBSS and the kappa statistic for physical activity behaviors ranged from 52.3% to 58.1%, with a mean of 55.2%. The reader is referred to Appendix A to view the Nutrition/Physical Activity Questionnaire for High School.

There are other items on the questionnaire related to eating behaviors and physical activity that are not discussed in detail here because the items were not relevant to the present investigator’s research questions. These items include questions 5-10 in the Student Information portion and items 3-5 and 7-9 in Part II: Physical Activity. However,
they did provide relevant data on health-related behaviors to staff members from the high
school who were collaborating in this study; therefore, the present investigator ran
descriptive statistics on these items and made them available for high school staff use. In
total, there were 25 items on the questionnaire and it took approximately 10-15 minutes
for a high school aged student to complete.

Procedure

Data collection. The data presented in this study were obtained from the Nutrition
Questionnaire for High School students, which was completed by 199 adolescents in a
high school in southwest Florida in February of 2004. Prior to the distribution of parent
consent letters for student participation in the study, approval to collect these data was
obtained from the county school district. The county school district required that active
consent forms be utilized to obtain parent consent and student assent. The parent consent
forms included a brief description of the increase in pediatric overweight and its health
consequences, a definition of BMI, and an overview of the Nutrition/Physical Activity
Questionnaire for High School. In addition, the consent forms discussed the incentives
students would be eligible for based on participation in the study. Additionally, the letters
described the incentives being offered to students for participation (e.g., each student
participating in the study automatically received two hours of community service to add
to their community service hour logs, they were provided with fruit juice and crackers
after participating in the study, and they were entered into a raffle to win 1 of 4 gift
certificates worth $25.00 for a local mall).

Approximately 1,987 parent consent forms were distributed to all students
enrolled in an English course in January 2004. A return rate of 1.26% (25 consent forms)
necessitated the distribution of a second round of consent forms. In the second round (February, 2004), 800 letters were distributed to all students enrolled in physical education and nutrition courses who were present on the day of distribution. A return rate of 25% (199 signed forms) was obtained. Before these data were accessed, approval was also obtained from the Institutional Review Board at the University of South Florida so that this investigator could use the data for the purposes of this study.

Students with signed consent forms were called down to the school clinic between 8:00 am – 2:30 pm to participate in the study. They completed the questionnaire first and then proceeded to a measurement station to have their weight and height measured by staff nurses. They turned in their questionnaires and then were provided with a snack before returning to class. The data collection for the study required a total of four full school days (8:00 am – 2:50 pm) to complete, and each participant missed approximately 20 minutes of class instruction to participate in the study. Data were stored in a locked file cabinet in the school nurse’s clinic to ensure participant confidentiality.

Data scoring. The principal investigator used two software packages to organize and analyze the data. Specifically, these software packages were Excel of the Microsoft Office XP Standard for Students and Teachers (Microsoft Excel, 2002) and the Statistical Package for the Social Sciences (SPSS) software (Statistical Package for Social Sciences Version 9.0 [SPSS], 1999). First, the BMI of a participant was entered into Excel, followed by their demographic information and dietary intake responses. The Nutrition/Physical Activity Questionnaire for High School Students core scales encompass nutrition/dietary intake (6 items), and physical activity behaviors (9 items of which 3 were analyzed in the present study). For all nutrition/dietary intake questions,
participants selected a response that ranged from 0-7 servings of a particular food group per day. For dietary intake items, data were entered directly as reported so that higher scores indicated increased number of servings consumed. Participant responses were compared to the recommendations of the USDA Food Guide Pyramid (US Department of Agriculture [USDA], 1992). For the first two physical activity items, participants selected a response that ranged from 0-7 days of physical activity per week. These data were entered directly as reported so that higher scores indicated greater amounts of physical activity behaviors and thus, were compared to the recommendations of Healthy People 2010 (CDC, 2001b). The final item related to physical activity assessed the amount of time per day (Monday-Friday) participants reported engaging in sedentary activities. Responses ranged from 0 hours per day to 5 or more hours per day and were also entered as reported with higher scores indicating greater amounts of physical inactivity behaviors.

Data Analyses. Initially, descriptive statistics were calculated for each sociodemographic variable, and for dietary intake and physical activity behaviors. Reliability analyses were also conducted for correlations among the dependent variables dietary intake (fruit/vegetables, milk, meat, bread/grains, and junk food) ($\alpha = .73$) and physical activity (vigorous, moderate, and sedentary activity) ($\alpha = .73$) and can be found in Appendices B and C.

Two analyses of multivariate analysis of variance (MANOVA) were used to determine (1) whether an overall difference in dietary intake behaviors existed between weight category groups and (2) whether an overall difference in physical activity behaviors existed between weight category groups. The mathematics of MANOVA is based on a set of assumptions that were tested before the analysis was conducted. The
MANOVA assumptions are (1) participants are randomly sampled from the population of interest, (2) observations are statistically independent of one another, and (3) univariate and multivariate normality (Bray & Maxwell, 1985).

The primary questions in this study related to main effects between the independent variables BMI, ethnicity, and gender and the dependent variables dietary intake and physical activity behaviors. However, the researcher first looked for interactions between the independent variables so that the findings for main effects would not be confounded.

Bray and Maxwell (1985) reported that MANOVA is usually used when researchers (1) want to evaluate mean differences on several criterion variables, and (2) want to look at the relationships among the variables. Bray and Maxwell suggest that MANOVA typically involves a two-step process. First, the researcher tests the null hypothesis of no differences in the means for the different groups, and if significance is found, the second step is to explain group differences with follow-up tests. The tests of MANOVA were followed up by univariate tests for each dependent variable to provide information concerning the variables that were most important for group separation (Bray & Maxwell, 1985). To control for Type I error, alpha was set at the .05 level of probability. Finally, effect sizes were reported as a measure of practical significance (Onwuegbuzie & Teddlie, 2003) so that more objective interpretations of the magnitude of the effect and its practical significance could be derived.

Multivariate analyses require the use of a large sample size for optimal power (Bruning & Kintz, 1987). Although an appropriate sample size has not been established, a general rule is that “the total sample size of the sample should be at least 20 times the
number of dependent variables times the number of experimental groups compared” (Brunig & Kintz, 1987, p. 230). However, to date, a general rule for total sample size has not been adopted by the research community, and the consensus is that bigger sample sizes are always better.

Delimitations

The proposed research design incorporated a deliberate limitation related to participant ethnic diversity. For purposes of this study, participants who reported any ethnicity other than (a) African American, (b) Caucasian/White, or (c) Hispanic/ Latino were eliminated from the data prior to performing the statistical analysis. In addition, those participants who reported more than one ethnic background also were eliminated from the final sample. These data were not utilized in the present study because this investigator did not believe there would be a sufficient number of participants that reported more than one ethnic background or reported the “Other” category to perform meaningful statistical analyses.
Chapter 4

Results

This chapter presents the results addressing each of the research questions. Sample characteristics of participants who met inclusion criteria are presented first, followed by a discussion of the tests of assumptions associated with multivariate analysis of variance (MANOVA). Next, an analysis of the interactions among the independent variables is presented followed by an analysis of any main effects. Finally, the results of the MANOVA and univariate follow-up tests looking at group differences in dietary intake behaviors are presented followed by the MANOVA and univariate follow-up tests looking at group differences in physical activity behaviors.

Participant Characteristics

Inclusion criteria were met by 178 of the 199 high school students who were surveyed and screened. Table 1 presents a description of the sample. Body mass index (BMI) averaged 31.98 ($SD = 5.11$) for overweight and 21.26 (2.26) for expected weight (healthy) subjects. The participants were fairly evenly distributed across ethnicity, however, the majority of participants were female (63%). Additionally, approximately 40% of the participants were in the ninth grade, followed by 22% in grades 10 and 12, and 18% in grade 11.
Table 1.

*Sample Characteristics of Participants*

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Overweight (n = 42)</th>
<th>Expected weight (healthy) (n = 137)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body Mass Index, Percent</td>
<td>23.5%</td>
<td>76.5%</td>
</tr>
<tr>
<td>Mean</td>
<td>31.98</td>
<td>21.26</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>5.11</td>
<td>2.26</td>
</tr>
<tr>
<td>Ethnicity, No. (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>African American</td>
<td>15 (35.7)</td>
<td>45 (32.8)</td>
</tr>
<tr>
<td>Caucasian</td>
<td>11 (26.1)</td>
<td>41 (30.0)</td>
</tr>
<tr>
<td>Latino</td>
<td>16 (38.2)</td>
<td>51 (37.2)</td>
</tr>
<tr>
<td>Gender, No. (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>12 (28.6)</td>
<td>54 (39.4)</td>
</tr>
<tr>
<td>Female</td>
<td>30 (71.4)</td>
<td>83 (60.6)</td>
</tr>
<tr>
<td>Grade, No. (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>14 (33.3)</td>
<td>54 (39.4)</td>
</tr>
<tr>
<td>10</td>
<td>5 (11.9)</td>
<td>36 (26.6)</td>
</tr>
<tr>
<td>11</td>
<td>10 (23.8)</td>
<td>20 (14.5)</td>
</tr>
<tr>
<td>12</td>
<td>13 (30.9)</td>
<td>27 (19.7)</td>
</tr>
<tr>
<td>Free or Reduced Lunch, No. (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lunch</td>
<td>23 (54.7)</td>
<td>76 (55.5)</td>
</tr>
</tbody>
</table>

*Note.* N = 179. *Overweight* = BMI equal to or greater than 25; Expected weight (healthy) = 18.5 - 24.9; BMI = (wt. (Kg)/Ht. (m²)).

Figure 1 displays a comparison of the percentages of males and females who were overweight in each ethnic group. For African American and Latino students, the percent of females and males who were overweight was relatively similar, with more females...
being overweight than males. However, the Caucasian group differed from the African American and Latino groups in terms of percentages of males and females who were overweight; there was a higher percentage of overweight males than overweight females.

![Graph showing percentage of males and females who are overweight by ethnic group.](image)

Figure 1. Comparison of percent of males and females who are overweight by ethnic group. Sample sizes for boys: African Americans, $n = 3$; Caucasians, $n = 6$; and Latinos, $n = 3$; for girls: African Americans, $n = 12$; Caucasians, $n = 5$; and Latinos, $n = 13$.

Chi-Square tests were conducted to determine if there was a significant difference between the percentages of overweight males and females in each ethnic group. The obtained statistics are presented for males and females, respectively, $\chi^2(2, n = 66) = 1.636, p = .441$ and $\chi^2(2, n = 113) = 1.794, p = .408$. For males, 26.1% of Caucasians were overweight, followed by African Americans (16.6%) and Latinos (12%). For females, 30.9% of Latinos were overweight, followed by African Americans (29.3%) and Caucasians (17.3%). A one-way analysis of variance was conducted to test for mean differences in BMI among ethnic groups. The test was not significant at the specified .05 significance level, $F(2,176) = 0.613, p = .543$. Approximately 25.4% of African
Americans were overweight, followed by Latinos (23.8%) and Caucasians (21.2%).

Figure 2 displays the mean BMI scores for each ethnic group.

Figure 2. Mean body mass indices for each ethnic group. Sample sizes: African American, \( n = 60 \); Caucasian, \( n = 52 \); and Latino, \( n = 67 \).

**MANOVA for Dietary Intake**

The dependent variables were fruit/vegetables, milk, meat/beans, breads and junk food, scaled from 0 to 7 servings per day. The data were screened prior to conducting the 2(weight category) \( \times \) 2(gender) \( \times \) 3(ethnicity) factorial MANOVA to test for the three assumptions: (1) independence of observations, (2) multivariate normality, and (3) equal population covariance matrices for the \( p \) dependent variables (Stevens, 2002). The sample sizes, means, and standard deviations for all of the groups across each dietary intake variable are displayed in Table 2.

With regard to independence of observations, the observations were assumed to be independent because all students completed the surveys alone under the supervision of the school nurse. Multivariate normality was assessed for each of the 12 groups by
examining box plots for multivariate outliers and examining each group’s skewness and kurtosis values across each dependent variable.

Table 2.

*Means and Standard Deviations on Dietary Intake Variables*

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Fruit/</th>
<th>Vegetables</th>
<th>Milk</th>
<th>Meat/Beans</th>
<th>Bread</th>
<th>Junk Food</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Weight</td>
<td>4.61</td>
<td>2.71</td>
<td>2.87</td>
<td>1.84</td>
<td>3.10</td>
<td>1.80</td>
</tr>
<tr>
<td>Expected weight</td>
<td>4.48</td>
<td>2.87</td>
<td>2.38</td>
<td>1.86</td>
<td>3.57</td>
<td>1.98</td>
</tr>
<tr>
<td>Overweight</td>
<td>4.27</td>
<td>2.21</td>
<td>3.29</td>
<td>1.89</td>
<td>3.46</td>
<td>1.71</td>
</tr>
<tr>
<td>Gender</td>
<td>4.75</td>
<td>3.00</td>
<td>2.45</td>
<td>1.76</td>
<td>3.07</td>
<td>1.92</td>
</tr>
<tr>
<td>Male</td>
<td>4.57</td>
<td>2.76</td>
<td>2.37</td>
<td>2.05</td>
<td>3.61</td>
<td>1.95</td>
</tr>
<tr>
<td>Female</td>
<td>4.67</td>
<td>2.76</td>
<td>2.83</td>
<td>1.63</td>
<td>2.90</td>
<td>1.74</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>4.55</td>
<td>2.74</td>
<td>3.04</td>
<td>1.79</td>
<td>3.11</td>
<td>1.81</td>
</tr>
</tbody>
</table>

*Note.* $n = 177$. Dependent variables were scaled from 0 to 7 servings per day.

Approximately 52% of the groups met the assumption of multivariate normality (i.e., no extreme outliers and both skewness and kurtosis values equal to or less than ± 1).

Table 3 summarizes the nine groups that showed some evidence of multivariate outliers, skewness and kurtosis. A closer analysis of this table revealed that with the exception of the “Healthy Latino Girl” group ($n = 29$), all of the groups had sample sizes under 20 which makes it difficult to get an accurate representation of the group distribution on the
dependent variables. Skewness and kurtosis values for overweight males across all three ethnic groups were excluded from this table because their sample sizes were so small (ranging from $n = 3$ to $n = 6$) that SPSS could not calculate values across the majority of the dependent variables. In the few instances that they were calculated, the obtained values indicated non-normality, which is expected with very small sample sizes.

Similarly, the group “Overweight Caucasian Girl” ($n = 5$) consistently displayed non-normal skewness and kurtosis values across each of the dependent variables, and thus were left off the table. A closer look at the 12 groups revealed that although the sample sizes were on average small and unequal, the means and standard deviations appeared to be similar across groups and no patterns of variability were observed.

Using Box’s M test the hypothesis of equal covariance matrices on the dependent variables across groups was rejected $F = 1.26$, $p = .029$. Based on these results and what is known about the robustness of MANOVA, it seemed reasonable to proceed with the multivariate analysis.

Table 3.

*Multivariate Outliers, Skewness and Kurtosis Values for Dietary Intake*

<table>
<thead>
<tr>
<th>Weight, Race, Gender</th>
<th>Dependent Variable</th>
<th>N</th>
<th>No. of Outliers</th>
<th>No. of Extreme Outliers</th>
<th>Skewness</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Healthy AA* Male</td>
<td>Fruit/Vegetables</td>
<td>15</td>
<td>0</td>
<td>0</td>
<td>-0.74</td>
<td>1.09</td>
</tr>
<tr>
<td>Healthy AA* Male</td>
<td>Junk Food</td>
<td>15</td>
<td>0</td>
<td>0</td>
<td>-0.53</td>
<td>-1.16</td>
</tr>
</tbody>
</table>
Table 3 (continued).

<table>
<thead>
<tr>
<th>Weight, Race, Gender</th>
<th>Dependent Variable</th>
<th>N</th>
<th>No. of Outliers</th>
<th>No. of Extreme Outliers</th>
<th>Skewness</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Healthy Caucasian Male</td>
<td>Fruit/Vegetables</td>
<td>17</td>
<td>2</td>
<td>0</td>
<td>1.56</td>
<td>2.67</td>
</tr>
<tr>
<td>Healthy Caucasian Male</td>
<td>Junk Food</td>
<td>17</td>
<td>0</td>
<td>0</td>
<td>0.38</td>
<td>-1.34</td>
</tr>
<tr>
<td>Healthy Latino Male</td>
<td>Fruit/Vegetables</td>
<td>21</td>
<td>0</td>
<td>0</td>
<td>-0.05</td>
<td>-1.04</td>
</tr>
<tr>
<td>Healthy Latino Female</td>
<td>Fruit/Vegetables</td>
<td>29</td>
<td>1</td>
<td>2</td>
<td>1.96</td>
<td>3.68</td>
</tr>
<tr>
<td>Overweight Latino Female</td>
<td>Fruit/Vegetables</td>
<td>13</td>
<td>0</td>
<td>1</td>
<td>1.35</td>
<td>1.07</td>
</tr>
<tr>
<td>Overweight AA* Female</td>
<td>Milk</td>
<td>12</td>
<td>0</td>
<td>1</td>
<td>2.85</td>
<td>8.95</td>
</tr>
<tr>
<td>Overweight AA* Female</td>
<td>Junk</td>
<td>12</td>
<td>0</td>
<td>0</td>
<td>-0.25</td>
<td>-1.66</td>
</tr>
</tbody>
</table>

*Note. Healthy = Expected weight. AA* = African American. Outlier was defined as no extreme outliers and both skewness and kurtosis values equal to or less than ± 1.

There was no evidence for an interaction between gender and weight category, Wilks Lambda = .95, F(5, 161) = 1.52, p = .19, between gender and ethnicity, Wilks Lambda = .93, F(10, 322) = 1.23, p = .27, between weight category and ethnicity, Wilks Lambda = .90, F(10, 322) = 1.70, p = .08, or between weight category, ethnicity and gender, Wilks Lambda = .96, F(10, 322) = 0.62, p = .80. There was a statistically significant main effect for weight category, Wilks Lambda = .91, F(5, 161) = 3.03, p = .0122, for gender, Wilks Lambda = .91, F(5, 161) = 3.05, p = .0117, and for ethnicity, Wilks Lambda = .81, F(10, 322) = 3.50, p = .0002. Additional analyses were conducted aimed at identifying how groups differed on the dependent variables.
Tests of between-subjects effects were conducted to find differences among the groups (weight category, ethnicity, and gender) on each dependent variable. Table 4 summarizes the probability values ($p$-values) for the between-subjects effects. There was a statistically significant effect for gender on milk consumption ($p = .028$) and a statistically significant effect for ethnicity on junk food consumption ($p = .004$). The effect for ethnicity on junk food was followed-up with Tukey’s HSD ($a_{FW} = .01$). The Tukey tests are conducted to make pairwise comparisons between each ethnic group on the dependent variable with the alpha adjusted to .01 to control for Type I error rates.

Effect sizes were computed for all effects using Cohen’s $d$ ($d = M_1 - M_2$ / pooled $SD$; $0.2-0.5 =$ “small”; $0.5-0.8 =$ “medium”; $>0.8 =$ “large”) (Cohen, 1988).

<table>
<thead>
<tr>
<th>Independent Variables</th>
<th>Fruit/Vegetables</th>
<th>Milk</th>
<th>Meat/Beans</th>
<th>Breads</th>
<th>Junk Food</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>.782</td>
<td>.028*</td>
<td>.060</td>
<td>.406</td>
<td>.823</td>
</tr>
<tr>
<td>Weight Category</td>
<td>.978</td>
<td>.214</td>
<td>.190</td>
<td>.085</td>
<td>.257</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>.768</td>
<td>.418</td>
<td>.170</td>
<td>.095</td>
<td>.004*</td>
</tr>
</tbody>
</table>

Note. $n = 177$. Significant at .05 level. Effect Sizes are Cohen’s $d$ ($0.2-0.5 =$ “small”; $0.5-0.8 =$ “medium”; $>0.8 =$ “large”).

Although there was a main effect for weight category, the tests of between-subjects effects were not significant for any of the dependent variables. Small effect sizes were obtained for each dependent variable (fruits/vegetables, $d = 0.06$; milk,
$d = 0.28$; meat/beans, $d = 0.26$; bread, $d = 0.26$; and junk food, $d = 0.24$). Figures 3 and 4 visually display the mean differences between weight categories for dietary intake for males and females, respectively.

*Figure 3.* Males’ mean scores on dietary intake variables by weight category ($n = 42$). F & V = Fruit/vegetables, M & B = Meat/beans.
Figure 4. Females’ mean scores on dietary intake variables by weight category (n = 137).

F & V = Fruit/vegetables, M & B = Meat/beans.

For milk consumption, the mean for the males was larger than that of the females ($M = 3.29, SD = 1.90$ and $M = 2.45, SD = 1.76$, respectively), and the effect size was medium, $d = 0.50$. For ethnic differences on junk food consumption, pairwise Tukey tests ($\alpha_{FW} = .01$) were significant for African Americans versus Caucasians ($p = .005$) and for African Americans versus Latinos ($p = .004$). Effect sizes were computed for African Americans versus Caucasians, African Americans versus Latinos, and Latinos versus Caucasians. African Americans had the highest mean ($M = 4.07, SD = 2.07$), followed by Latinos and Caucasians ($M = 2.96, SD = 1.71, M = 2.90, SD = 2.06$, respectively). For African Americans versus Caucasians, the effect size was medium, $d = 0.61$, and for African Americans versus Latinos, the effect size was medium, $d = 0.58$. The standardized effect size for Caucasians versus Latinos was small, $d = -0.015$. 
MANOVA for Physical Activity

The dependent variables for physical activity were vigorous activity, moderate activity, and sedentary activity. Vigorous and moderate activities were scaled from 0 to 7 days per week. Sedentary activity was scaled from 0 to 5 or more hours per day. The data were screened prior to conducting the 2(weight category) X 2(gender) X 3(ethnicity) factorial MANOVA to test for the three assumptions: (1) independence of observations, (2) multivariate normality, and (3) equal population covariance matrices for the \( p \) dependent variables (Stevens, 2002). The sample sizes, means, and standard deviations for all of the groups across each physical activity variable are displayed in Table 5.

With regard to independence of observations, the observations were assumed to be independent because all students completed the surveys alone under the supervision of the school nurse. Multivariate normality was assessed for each of the 12 groups by examining box plots for multivariate outliers and examining each group’s skewness and kurtosis values across each dependent variable.

Table 5.

<table>
<thead>
<tr>
<th>Dependent Variables</th>
<th>Vigorous Activity</th>
<th>Moderate Activity</th>
<th>Sedentary Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group</td>
<td>M</td>
<td>SD</td>
<td>M</td>
</tr>
<tr>
<td>Healthy</td>
<td>3.28</td>
<td>2.16</td>
<td>2.51</td>
</tr>
<tr>
<td>Overweight</td>
<td>2.71</td>
<td>2.40</td>
<td>2.48</td>
</tr>
</tbody>
</table>
Table 5 (continued).

<table>
<thead>
<tr>
<th>Group</th>
<th>Dependent Variables</th>
<th>Vigorous Activity</th>
<th>Moderate Activity</th>
<th>Sedentary Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td></td>
<td>4.15</td>
<td>2.22</td>
<td>2.80</td>
</tr>
<tr>
<td>Female</td>
<td></td>
<td>2.55</td>
<td>2.00</td>
<td>2.33</td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>African American</td>
<td></td>
<td>2.93</td>
<td>2.25</td>
<td>2.29</td>
</tr>
<tr>
<td>Caucasian</td>
<td></td>
<td>3.56</td>
<td>2.26</td>
<td>3.37</td>
</tr>
<tr>
<td>Latino</td>
<td></td>
<td>3.01</td>
<td>2.23</td>
<td>2.03</td>
</tr>
</tbody>
</table>

*Note. n* = 177. Dependent variables vigorous and moderate activities were scaled from 0 to 7 days a week. The dependent variable sedentary activity was scaled from 0 to 6 (0 = no sedentary activity; 1 = less than 1 hour per day; 2 = 1 hour per day; 3 = 2 hours per day; 4 = 3 hours per day; 5 = 4 hours per day; 6 = 5 or more hours per day."

Approximately 40% of the groups met the assumption of multivariate normality (i.e., no extreme outliers and both skewness and kurtosis values equal to or less than ± 1). Table 6 summarizes the 10 groups that showed some evidence of multivariate outliers, skewness, and kurtosis. Several of these groups had sample sizes smaller than 20, which makes it difficult to get an accurate representation of the group distribution on the dependent variables. Once again, skewness and kurtosis values for overweight males across all three ethnic groups were excluded from this table because their sample sizes were so small (ranging from *n* = 3 to *n* = 6) that SPSS could not calculate values across the majority of the dependent variables. In the few instances where they were calculated, the obtained values indicated non-normality, which is expected with very small sample sizes. Similarly, the group “Overweight Caucasian Girl” (*n* = 5) consistently displayed
non-normal skewness and kurtosis values across each of the dependent variables, and thus were left off the table. Using Box’s M test the hypothesis of equal covariance matrices on the dependent variables across groups was not rejected, $F = .874, p = .73$. Based on these results and what is known about the robustness of MANOVA, it seemed reasonable to proceed with the multivariate analysis.

Table 6

Multivariate Outliers, Skewness and Kurtosis Values for Physical Activity

<table>
<thead>
<tr>
<th>Weight, Race, Gender</th>
<th>Dependent Variable</th>
<th>$n$</th>
<th>No. of Outliers</th>
<th>Extreme Outliers</th>
<th>Skewness</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Healthy Caucasian Male</td>
<td>Sedentary Activity</td>
<td>17</td>
<td>0</td>
<td>0</td>
<td>-0.03</td>
<td>-1.19</td>
</tr>
<tr>
<td>Healthy Latino Male</td>
<td>Vigorous Activity</td>
<td>22</td>
<td>0</td>
<td>0</td>
<td>0.04</td>
<td>-1.11</td>
</tr>
<tr>
<td>Healthy AA* Female</td>
<td>Vigorous Activity</td>
<td>29</td>
<td>0</td>
<td>0</td>
<td>0.17</td>
<td>-1.43</td>
</tr>
<tr>
<td>Healthy Caucasian Female</td>
<td>Moderate Activity</td>
<td>24</td>
<td>0</td>
<td>0</td>
<td>0.09</td>
<td>-1.22</td>
</tr>
<tr>
<td>Healthy Caucasian Female</td>
<td>Sedentary Activity</td>
<td>24</td>
<td>0</td>
<td>0</td>
<td>0.25</td>
<td>-1.25</td>
</tr>
<tr>
<td>Healthy Latino Female</td>
<td>Moderate Activity</td>
<td>29</td>
<td>0</td>
<td>1</td>
<td>1.54</td>
<td>1.91</td>
</tr>
<tr>
<td>Overweight AA* Female</td>
<td>Moderate Activity</td>
<td>12</td>
<td>1</td>
<td>1</td>
<td>1.88</td>
<td>2.93</td>
</tr>
<tr>
<td>Overweight AA* Female</td>
<td>Sedentary Activity</td>
<td>12</td>
<td>0</td>
<td>0</td>
<td>0.42</td>
<td>-1.68</td>
</tr>
<tr>
<td>Overweight Latino Female</td>
<td>Moderate Activity</td>
<td>13</td>
<td>0</td>
<td>0</td>
<td>0.28</td>
<td>-1.13</td>
</tr>
<tr>
<td>Overweight Latino Female</td>
<td>Sedentary Activity</td>
<td>13</td>
<td>0</td>
<td>0</td>
<td>0.07</td>
<td>-1.34</td>
</tr>
</tbody>
</table>

Note. Healthy = Expected weight. AA* = African American. Outlier was defined as no extreme outliers and both skewness and kurtosis values equal to or less than ± 1.
There was no evidence for an interaction between gender and weight category, Wilks Lambda = .97, $F(3, 163) = 1.12, p = .34$, between gender and ethnicity, Wilks Lambda = .94, $F(6, 326) = 1.79, p = .1011$, between weight category and ethnicity, Wilks Lambda = .96, $F(6, 326) = .99, p = .43$, or between weight category, ethnicity and gender, Wilks Lambda = .94, $F(6, 326) = 1.67, p = .13$. The main effect for gender was statistically significant, Wilks Lambda = .88, $F(3, 163) = 7.09, p = .0002$, as was the main effect for ethnicity, Wilks Lambda = .87, $F(6, 326) = 3.83, p = .01$. There was no main effect for weight category, Wilks Lambda = .99, $F(3, 163) = .02, p = .99$.

Additional analyses were conducted to determine which groups differed on which of the dependent variables.

Tests of between-subjects effects were conducted to find differences among the groups (ethnicity and gender) on each dependent variable. Table 7 summarizes the p-values for the between-subjects effects. Gender differences were found on the dependent variable vigorous activity, $F(1, 165) = 20.43, p < .0001$. The mean for the males was larger than that of the females ($M = 4.15, SD = 2.22$ and $M = 2.55, SD = 2.00$, respectively), and the effect size was medium, $d = 0.77$.

Ethnic differences were found on the dependent variable moderate activity $F(2, 165) = 8.49, p = .0003$. For ethnic differences on moderate activity, pairwise Tukey tests ($\alpha_{FW} = .0167$) were conducted and were statistically significant for Caucasians versus Latinos ($p = .002$). The other group comparisons were not statistically significant (African Americans versus Caucasians, $p = .018$, African Americans versus Latinos, $p = .776$). Caucasians had the highest mean ($M = 3.37, SD = 2.22$), followed by African
Americans and Latinos ($M = 2.29$, $SD = 2.17$ and $M = 2.03$, $SD = 2.10$, respectively).

Pairwise effect sizes were computed for Caucasians versus African Americans (medium effect, $d = 0.63$), African Americans versus Latinos (small effect, $d = 0.12$), and Caucasians versus Latinos (medium effect, $d = 0.51$).

Table 7.

*Probability Values for Between-Subjects Effects*

<table>
<thead>
<tr>
<th>Independent Variables</th>
<th>Vigorous Activity</th>
<th>Moderate Activity</th>
<th>Sedentary Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>.0001*</td>
<td>.4651</td>
<td>.8034</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>.3050</td>
<td>.0003*</td>
<td>.0553</td>
</tr>
</tbody>
</table>

*Note. N = 178. Significant at .05 level. Effect Sizes are Cohen’s $d$ (.2-.5 = “small”; .5-.8 = “medium”; > .8 = “large”).*

Although the test of between-subjects effects was not significant for ethnicity and sedentary activity ($p = .055$), pairwise Tukey tests ($\alpha_{FW} = .0167$) were conducted and were statistically significant for African Americans versus Caucasians ($p = .002$), and African Americans versus Latinos ($p = .026$). The comparison between Caucasians and Latinos was not significant ($p = .577$). On this variable Caucasians had the lowest levels of sedentary activity ($M = 3.65$, $SD = 1.60$), followed by Latinos and African Americans, respectively ($M = 3.94$, $SD = 1.70$, $M = 4.69$, $SD = 1.39$). Pairwise effect sizes were computed for Caucasians versus African Americans (medium effect, $d = 0.66$), Latinos
versus African Americans (small effect, $d = 0.48$), and Caucasians versus Latinos (small effect, $d = 0.19$).

Although there was no main effect for weight category, the means scores of males and females were graphed for physical activity and sedentary activity to provide a visual representation of how these groups differed. Effect sizes were also computed separately for males and females. For males, small effect sizes were obtained when comparing weight groups: vigorous activity, $d = 0.45$; moderate activity, $d = 0.40$; and sedentary activity, $d = 0.19$. Males had similar mean differences between weight groups on the variables vigorous and moderate activity (see Figure 5), and had similar mean scores on sedentary activity (see Figure 6). For females, small effect sizes were also obtained when comparing weight groups: vigorous activity, $d = 0.46$; moderate activity, $d = 0.15$; and sedentary activity, $d = 0.08$. There was more separation between weight category groups on the variable vigorous activity (see Figure 7), but the two groups had fairly similar mean scores on moderate activity (see Figure 7) and sedentary activity (see Figure 8).
**Figure 5.** Males’ mean scores on physical activity variables by weight category ($n = 66$). Overweight ($n = 12$) and expected weight ($n = 54$).

**Figure 6.** Males’ mean scores on sedentary activity variable by weight category ($n = 66$). Overweight ($n = 12$) and expected weight ($n = 54$).
Figure 7. Females’ mean scores on physical activity variables by weight category \((n = 111)\). Overweight \((n = 29)\) and expected weight \((n = 82)\).

Figure 8. Females’ mean scores on sedentary activity variable by weight category \((n = 111)\). Overweight \((n = 29)\) and expected weight \((n = 82)\).

Although there was no interaction between gender and ethnicity, the means and standard deviations are reported in Table 8. Effect sizes were also computed for each of
the variables to provide further insight on how the groups differed on the dependent variables. On the dependent variable vigorous physical activity, the effect sizes for pairwise ethnic comparisons for males were all small (e.g., African Americans versus Caucasians, $d = 0.16$; African Americans versus Latinos, $d = 0.45$; and Caucasians versus Latinos, $d = 0.29$). The effect sizes for pairwise ethnic comparisons for females were also small (e.g., African Americans versus Caucasians, $d = 0.33$; African Americans versus Latinos, $d = 0.15$; and Caucasians versus Latinos, $d = 0.17$). On the dependent variable moderate physical activity, the effect sizes for pairwise ethnic comparisons for males were varied (African Americans versus Caucasians, $d = 0.90$, large effect; African Americans versus Latinos, $d = 0.03$, small effect; and Caucasians versus Latinos, $d = 0.87$, large effect). The effect sizes for pairwise ethnic comparisons for females were small (e.g., African Americans versus Caucasians, $d = 0.24$; African Americans versus Latinos, $d = 0.14$; and Caucasians versus Latinos, $d = 0.37$). Finally, on the dependent variable sedentary activity, the effect sizes for pairwise ethnic comparisons for males were varied (African Americans versus Caucasians, $d = 0.52$, medium effect; African Americans versus Latinos, $d = 0.28$, small effect; and Caucasians versus Latinos, $d = 0.24$, small effect). The effect sizes for pairwise ethnic comparisons for females were also varied (e.g., African Americans versus Caucasians, $d = 0.75$, medium; African Americans versus Latinos, $d = 0.61$, medium; and Caucasians versus Latinos, $d = 0.12$, small).
Table 8.

Means and Standard Deviations on Dependent Variables

<table>
<thead>
<tr>
<th>Group</th>
<th>Vigorous Activity</th>
<th>Moderate Activity</th>
<th>Sedentary Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
</tr>
<tr>
<td>Males</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>African Americans</td>
<td>4.63</td>
<td>2.11</td>
<td>2.16</td>
</tr>
<tr>
<td>Caucasians</td>
<td>4.30</td>
<td>2.16</td>
<td>4.09</td>
</tr>
<tr>
<td>Latinos</td>
<td>3.70</td>
<td>2.33</td>
<td>2.22</td>
</tr>
<tr>
<td>Females</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>African Americans</td>
<td>2.36</td>
<td>1.96</td>
<td>2.33</td>
</tr>
<tr>
<td>Caucasians</td>
<td>3.04</td>
<td>2.20</td>
<td>2.86</td>
</tr>
<tr>
<td>Latinos</td>
<td>2.67</td>
<td>2.00</td>
<td>2.02</td>
</tr>
</tbody>
</table>

Note. n = 177. Dependent variables vigorous and moderate activities were scaled from 0 to 7 days a week. The dependent variable sedentary activity was scaled from 0 to 6 (0 = no sedentary activity; 1 = less than 1 hour per day; 2 = 1 hour per day; 3 = 2 hours per day; 4 = 3 hours per day; 5 = 4 hours per day; 6 = 5 or more hours per day.

Summary

The findings of this study indicate that there are group differences in dietary intake behaviors and physical activity behaviors. With respect to dietary intake behaviors, main effects were observed for weight category, gender, and ethnicity. However, follow-up univariate F-tests were not significant due to power issues with very small sample sizes. Medium effect sizes were reported for gender differences on milk consumption (males had higher means than females), and for ethnic differences on junk food consumption (African Americans had the highest consumption followed by Caucasians and Latinos, respectively).
For physical activity behaviors, main effects were observed for gender and ethnicity, but not for weight category. The follow-up univariate F-tests were significant for gender differences on vigorous activity behaviors (males had higher means than females), and for ethnic differences on moderate activity behaviors (Caucasians had the larger mean followed by African Americans and Latinos, respectively). Medium effect sizes were also observed on these pairwise comparisons.
Chapter 5

Discussion

The present study examined relationships among the independent variables weight category, gender, and ethnicity and the dietary intake behaviors and physical activity behaviors of adolescents. The following discussion addresses the findings of this study in relation to the research hypotheses. This discussion also considers the strengths and limitations of the present study followed by suggested directions for future research. The chapter will conclude with a discussion of the implications of the present study for the field of school psychology.

Dietary Intake

This section will address the two hypotheses that were generated with relation to the first research question on dietary intake behaviors.

It was hypothesized that overweight adolescents would consume more dairy products, meat/beans, and junk food and less fruit/vegetables and grain products as compared to their expected weight peers.

Overall, male and female overweight adolescents in this study reported consuming similar servings of dietary intake variables as their expected weight peers. With regard to fruits/vegetables, on average, overweight males reported consuming one serving more per day than expected weight males, and overweight females reported consuming on average one serving less per day than expected weight females. It is not
clear as to why these results were found. It is quite possible that overall differences in fruit/vegetable consumption could not be found due to power issues associated with the small sample size of both male and female overweight groups. However, effect sizes compensate for power issues, and for these variables the obtained effects were small. With group sample sizes as small as the ones in the present study, it is possible that the sample results are skewed and do not reflect the population.

In terms of average consumption of dairy products, overweight adolescents reported similar servings per day as their expected weight peers. Contrary to some of the findings in the literature on inadequate adolescent consumption of fruit and vegetables, and milk products (Beech et al., 1999; Middleman, Vazquez & Durant, 1998; Munoz et al., 1997; Videon & Manning, 2003), male and female adolescents of both weight categories reported consuming the recommended 3-5 servings of fruits and vegetables per day, and the recommended 2-3 servings of dairy products per day (US Department of Agriculture [USDA], 1992). With regard to fruits and vegetables, 42.1% of students reported meeting the daily recommended servings, while 57.9% did not. Approximately 40% of participants in the present study reported consuming the daily recommendation for dairy products, while 30% reported consuming too many servings, and the remaining 30% did not meet the minimum recommendation.

These findings should be interpreted cautiously because it is not clear whether or not adolescents are able to accurately classify all of the foods they eat into their correct food group category. For example, with regard to the category fruit/vegetables, although sample items of foods in this category were provided, the list was by no means comprehensive; thus, it is possible that participants categorized items like fruit juices
(e.g., ones that are not 100% pure juice and more likely to contain as much sugar or more as a soda), chewy fruit snacks (e.g., fruit roll-ups), and fruit-flavored snack bars into this category. These items would not count as fruits/vegetables and would inflate the number of servings of fruits/vegetables consumed per day. A possible way to address this issue would be to provide students with pictures of these commonly eaten snacks and put X’s through them indicating that they do not qualify as a fruit.

Interestingly, males and females in both the expected weight and overweight categories reported average servings of meat/bean consumption well above the recommendation of one serving per day. For males, the overweight group reported approximately one more serving per day (4 versus 3.34), while for females the overweight group reported approximately one-half more serving per day (3.40 versus 2.95). This result is not surprising in light of the fast-food culture of the United States. Chicken nuggets, fried chicken tenders, hamburgers, burritos, tacos, pizza with meat toppings, sausage and egg breakfast sandwiches, and hot dogs have become staples in the modern fast-food diet. It is easily conceivable that if an adolescent eats one of these items per meal, they would exceed the recommendation of one serving of meat per day. In this study, 82% of participants reported consuming more than the recommended daily servings of meet/beans (e.g., 1 serving), while 14% reported 1 serving, and the remaining 3.4% reported 0 servings.

To date, there have been very few studies investigating adolescent consumption of meat/beans relative to the Pyramid recommendations, but in general, the research suggests that adolescents are consuming inadequate servings of meat/bean products (Munoz et al., 1997). The results of the present study are inconsistent with previous
findings and future research is warranted. Based on these findings, the hypothesis that overweight adolescents would consume increased servings of meat/beans per day as compared to expected weight peers was not supported.

Interestingly, males and females in both weight groups reported consuming an average of three bread/grain products per day, which is below the Pyramid recommendation of six servings per day. In this study, only 12.4% of participants reported consuming the daily recommendation. Consequently, the hypothesis that overweight adolescents would consume fewer bread/grain products per day than expected weight peers was not supported. This finding is consistent with the literature in that adolescents, in general, do not meet the minimum recommendations for grains (Munoz et al., 1997).

Males and females in both weight categories reported consuming an average of three servings of junk food per day. There are no recommendations for maximum number of servings of junk food per day. Based on this finding, the hypothesis that overweight adolescents would consume more junk food than expected weight peers was not supported.

It was expected that there would be a relationship between gender and dairy food intake, with males more likely than females to consume the daily recommended servings of dairy products.

Males reported consuming statistically significantly more servings of dairy products than females, but males were not more likely than females to report consuming the daily recommended servings (i.e., 2-3 servings) of dairy products per day. In fact, both gender groups, regardless of weight category, reported consuming, on average,
between 2-3 servings of milk products per day, which is inconsistent with the findings of Neumark-Sztainer et al. (2002). It is unclear as to why the findings of the present study were inconsistent with past research but a hypothesis is that the Nutrition/Physical Activity Questionnaire for High School Students provided several examples of items that constitute as dairy products and perhaps other studies did not provide participants with such examples. Thus, students may have been more accurate in categorizing items into this group. This hypothesis was not supported based on the findings of the present study.

Physical Activity

Four hypotheses were generated with regard to the second research question on physical activity behaviors. This section will address each of these hypotheses.

*It was hypothesized that overweight adolescents would engage in less physical activity (vigorous and moderate activity) than expected weight peers.*

Some studies (Boutelle et al., 2002; Fontvielle, Friska, & Ravussin, 1993; Maffeis, Zaffanello, & Schutz, 1997; Mayer, 1975) have found that overweight adolescents are less likely to participate in moderate or vigorous activity. For females, the present study found similar results; overweight females reported engaging in fewer bouts per week of vigorous and moderate activity, on average, than their expected weight peers. In contrast, the present study found overweight adolescent males to report engaging in more bouts of vigorous and moderate activity per week than their expected weight peers. However, the sample size for overweight males was small ($n = 12$) suggesting that the findings from this study should be interpreted with caution. In summary, although the differences were not statistically significant, the sample means for females were
consistent with the hypothesis while the sample means for males were not consistent with the hypothesis.

_It was expected that there would be a relationship between gender and physical activity, with males more likely than females to meet the weekly recommendations._

Consistent with previous findings (Andersen et al., 1998; Dowda et al., 2001; Gordon-Larsen, McMurray, & Popkin, 1999), males did report higher levels of physical activity than females. In terms of meeting the weekly recommendations, males, on average, reportedly met the vigorous activity recommendation (>2 per week), but, on average, fell slightly short of the recommendation of 30 minutes of daily engagement in moderate activity (e.g., fast walking, slow bicycling, skating, pushing a lawn mower, or mopping floors). However, a combination of 3 days of vigorous activity and 4 days of moderate activity would be superior to the recommendation of daily moderate physical activity. The responses to these two items were not summed across participants to get an overall physical activity score. Females, on the other hand, did not meet the weekly recommendations for vigorous or moderate activity when looking at average scores. Even if their scores on these two items would have been summed, they still would not achieve the minimum recommendation of daily moderate physical activity. Based on the sample means for males and females engagement in physical activity, males were more likely to meet the weekly recommendations than females. In light of the small sample sizes and the unequal numbers of males and females (66 versus 113, respectively), these findings should be interpreted with caution.

_It was expected that there would be a relationship between ethnicity and gender and physical activity (vigorous and moderate activity), with African American and_
Latino/Hispanic females less likely than Caucasian females to meet the weekly recommendations.

Although it was stated in the previous section that females did not meet the weekly recommendations for vigorous activity, this is only true for the gender group as a whole. When females were analyzed based on ethnic group, Caucasian females, on average, just met the minimum recommendation of three days a week for vigorous activity. Although Latino and African American females did not meet this recommendation, on average, they were less than one point behind the Caucasian females. These results are consistent with the findings of Pate et al. (2000), whereby Caucasian females were more likely than African American or Latino females to meet vigorous activity recommendations. With regard to moderate physical activity, on average, females across all three ethnic groups were below the minimum recommendation of seven days a week. Again, although the sample mean scores were consistent with the hypothesis for the variable vigorous activity, no differences were found on the variable moderate activity.

It was expected that there would be a relationship between ethnicity and gender and physical activity (vigorous and moderate activity), with Latino/Hispanic males less likely than African American and Caucasian males to meet the weekly recommendations.

This hypothesis was not supported for the dependent variable vigorous activity because no interactions were observed. In fact, males across all three ethnic groups, on average, reported engaging in three or more bouts of vigorous physical activity per week, which meets the minimum weekly recommendations. These findings were inconsistent with national and state data from the Youth Risk Behavior Surveillance Survey (CDC,
2001), which indicate that Caucasian males are more likely than their African American and Latino peers to meet the weekly recommendations. A possible explanation for the inconsistency is that the participants in the present study are not similar to those in other studies because they were recruited based on their enrollment in physical education and/or nutrition courses at the high school. A hypothesis is that these students are already engaging in vigorous activities as part of their coursework and/or they are enrolled in these courses because they like to engage in vigorous physical activity behaviors. Thus, ethnicity may not be a factor that contributes to the engagement in vigorous physical activity behaviors among subgroups of adolescents that are highly active. With regard to moderate physical activity, all three ethnic groups, on average, were below the weekly recommendations, thus, not supporting the hypothesis; but again, it cannot be determined whether or not participants would have met the weekly recommendations for both variables had their scores on each item been summed into a new variable.

Sedentary Activity

Two hypotheses were generated with regard to the third research question on sedentary activity behaviors. This section will address each of these hypotheses.

It was hypothesized that overweight adolescents would engage in more sedentary activity as compared to their expected weight peers.

Many studies have found that overweight adolescents are more likely than their expected weight peers to engage in sedentary activities (Maffeis, Zaffanello, & Schutz, 1997; Mayer, 1975), however, in the present study the mean differences in sedentary activity were not statistically significant. A closer look at means differences revealed that, on average, overweight adolescents reported engaging in approximately the same number of
hours of sedentary activity per day as expected weight peers. Again, the overweight adolescents in this sample may not represent the population because the group sample size was so small. On another note, it is possible that adolescents of both weight categories are equally engaged in sedentary activities. Being physically active in vigorous or moderate activity does not preclude spending time in sedentary activities during the evening hours or on the weekend. This should be explored further with larger sample sizes to determine if similar sedentary activity behaviors are observed in other samples. This hypothesis was rejected based on these findings.

*It was expected that there would be a relationship between ethnicity and sedentary activity, with African American and Latino/Hispanic adolescents engaging in higher levels of sedentary activity than Caucasian adolescents.*

Although the differences in mean scores were not statistically significant, a medium effect size was observed for the comparison of Caucasians versus African Americans. This result was consistent with the findings of Andersen et al. (1998), whereby African Americans, on average, reported engaging in more hours per day of sedentary activity. However, Latino and Caucasian adolescents in this sample reported similar levels for sedentary activity, a result that is not consistent with the findings of many studies (Andersen et al., 1998; CDC, 2001; Dowda et al., 2001; Pate et al., 1996; Troiano, 2002). Again, the sample means only represent the sedentary activity behaviors of adolescents in the present study. This hypothesis was rejected based on these findings.

*Strengths of the Present Study*

The present study has several strengths that are worth mentioning before a discussion of the limitations is presented. First, this study was one of the first to compare
the eating behaviors of adolescents in different weight categories. To date, very few research studies have examined this issue. In fact, most studies look solely at the consumption levels of fruits/vegetables and dairy products for boys versus girls and across different ethnic groups and socio-economic statuses. The current investigator believes that it is important to look more closely at the eating behaviors of adolescents in different weight categories to get a fuller understanding of how these groups may be different. It is known that these groups differ tremendously in terms of physical and sedentary activity, but much less is known about the eating patterns of these groups.

The ethnic diversity of the sample was also a strength of the present study. In fact, the study sample mirrored the ethnic diversity of the high school in terms of proportions of minority groups represented. It is important to get an ethnically proportionally representative sample when trying to fully understand behaviors as dynamic as eating behaviors and physical activity behaviors. Additionally, ethnic minorities (e.g., African Americans and Latinos) have been identified as subgroups at an increased risk for decreased engagement in physical activity and increased engagement in sedentary activity, thus, it was notable that the study sample had an approximately equal proportion of participants from each ethnic group (e.g., African Americans, Latinos, and Caucasians).

Screening each participant in the study for body mass index (BMI) was a time-intensive process. A registered nurse or nurse intern conducted all of the weight and height measurements for each participant in the present study. This is considered a strength of the present study because obtaining a reliable and valid BMI is dependent on properly weighing and measuring each participant, and being sure to utilize the same
procedures with each participant. For example, the nurses required that each participant remove their shoes and any heavy jackets, sweaters, sweatshirts, and heavy jewelry that might skew either of the measurements.

Finally, for dietary intake items in each food group, specific examples of a serving size were provided. When reviewing the Nutrition/Physical Activity Questionnaire for High School Students prior to the study, the issue of whether or not all adolescents were aware of the measurements associated with a serving size for each food group was considered. It was determined that an adolescent may not be familiar with the number of ounces in a cup, or how many ounces were in a serving of meat. Thus, this researcher created concrete examples of what a serving size would be across each food group to help students better gauge how many servings from each food group they consume per day.

Limitations

There are several external and internal limitations to this study that warrant discussion. First, the participants were selected from only one high school in a large school district in southwest Florida. In terms of external validity, the population and ecological transferability (Tashakkori & Teddlie, 2003) of the research was minimized, and the results from the sample likely cannot be generalized beyond the participants in this specific school. However, it should be noted that the present sample was very diverse in terms of ethnicity, grade level and/or age, and SES. Second, for the MANOVA looking at group differences in dietary intake behaviors, inclusion criteria were met by only 179 of the original 199 participants. Although there is not an established rule on a minimum number of participants, as was seen in the present study, once participants start are
divided into groups based on characteristics (i.e., gender, ethnicity, and weight category) it is difficult is to get groups that approximate a normal distribution without a relatively large sample. Thus, in the present study, some of the groups had as few as three participants and this was too few to make meaningful comparisons that can be generalized beyond this sample.

Further, other threats to external validity include temporal validity and specificity of variables. With regard to temporal validity (Onwuegbuzie, 2003), it is possible that the research findings cannot be generalized across time. In the context of a developmental-systems perspective, an argument could be made that across time, the factors that influence dietary intake and physical activity are subject to varying degrees of change, and thus, may influence the behaviors in which adolescents engage.

In terms of identifying and constructing data collection instruments, difficulties in assessing dietary intake need to be considered. Specifically, when the Nutrition/Physical Activity Questionnaire for High School Students was developed, examples of food items falling in each category were based on the cultural and ethnic experiences of the developers of the questionnaire. The tenets of transformative theory (Mertens, 2003) suggest that a food frequency questionnaire would be better developed if the insights and experiences of members of ethnic and cultural minorities (what types of foods in each category that they commonly eat) were included. Therefore, exclusion of foods commonly eaten by different groups may result in misleading findings.

Another limitation to the use of a food frequency questionnaire is that the research on the reliability and validity of the scores they produce has been sparse, with further testing necessary. Baranowski et al. (2000) suggested that food frequency questionnaires
tend to overestimate energy consumption and consumption of several nutrients when compared with a validation standard. However, Rockett et al. (1997) concluded that a “simple self-administered questionnaire completed by older children and adolescents can provide nutritional information about this age group” (p. 808). In order to address this potential limitation, the present investigator provided concrete examples of serving sizes as opposed to relying solely on metric measurements. For example, under the category “Fruit and fruit juice”, examples of 1 serving size are as follows, “Includes 1 cup of grapes or berries [a coffee mug full]”.

Finally, there is limited research to address the reliability and validity of scores obtained from self-report instruments for measurement of physical activity. Weston, Petosa, and Pate (1996) assessed the reliability and validity of scores obtained from a self-report instrument they developed that required youth in grades 7-12 to recall previous day physical activity. Correlations between self-report physical activity level and pedometer (a measure of footstrikes) and Caltrac counts (a measure of body movements) were .88 and .77, respectively. Interrater and test-retest reliability were .99 and .98, respectively. Further studies are necessary in order to determine the technical adequacy of self-report instruments for measurement of physical activity.

The sole reliance on BMI as a measurement of adiposity also imposed a limitation in the present study. Most of the BMI growth curves have been derived from cross-sectional surveys and thus, caution is necessary when inferring longitudinal growth patterns as they may not represent individual, birth-cohort, or secular-trend effects. In addition, individuals who have a higher percentage of muscle mass tend to get increased BMI scores that often fall in the “overweight” category based on their weight for height.
It is possible that some of the participants in the present study engaged in sports activities that promote the development of muscle mass and thus, may have BMI scores in the overweight range.

**Directions for Future Research**

To address the issue of population and ecological transferability, future studies could be designed in other school districts within the state, as well as studies outside of the state in various regions of the United States. These data would be useful for making within-state, between states, and regional comparisons of food and activity behaviors of children and adolescents. Although these data currently exist for several of the dependent variables, they do not exist for the variables meat/bean products, junk food, and grains.

With regard to small sample size, this was a major limitation in the present study, especially when trying to make comparisons by weight category, gender, and ethnicity. As was pointed out in the present study, it was very difficult to obtain multivariate normality for some of the subgroups (i.e., overweight males across all three ethnic groups) due to the extremely small sample sizes. Future studies could investigate the differences in groups more closely if larger sample sizes were utilized. Although several attempts were made to recruit participants in the present study, the final sample was relatively small.

Related to sample size, several participants in the present study did not meet inclusion criteria because they reported “Other” for their ethnicity. A closer examination of the groups with which some of these participants identified, revealed an interesting finding. Some participants selected the “Other” category and hand wrote in “Black”. They did not identify as African American either because they simply do not identify
with this ethnic group or perhaps because they or their ancestors identify as Jamaican Americans, Haitian Americans or any other ethnic minority group that racially is Black, but ethnically is not African American. In light of this finding, future surveys should address how to include all members of the Black race, similar to how for members of the White race the option is “Caucasian/White”. Perhaps a solution to this issue would be to create a category titled “African American/Black”.

Future studies might be conducted in school districts where passive consent forms are accepted for student participation in order to increase the number of participants. Or, a more salient reward system for participants should be developed to increase the likelihood that students would participate. With regard to identifying and constructing data collection instruments, future researchers might examine the types of foods that are commonly eaten among the cultural groups in their sample, especially in schools where there are large proportions of ethnic minority groups. Children and adolescents may not be familiar with the categories into which different food items are classified and thus, classify them incorrectly. There are many items that are marketed today as “fruit snacks,” but are no more closely related to a fruit than a can of soda. Future research may include a panel of diverse students from the study site to make suggestions on how to revise the survey items such that they are more culturally sensitive. In addition, future research on physical activity behaviors should include a variable that combines each participant’s levels of vigorous and moderate activity to get an overall picture of physical activity.

In the present study, there was a statistically significant difference for ethnicity on junk food consumption, with African Americans reporting consuming statistically significantly more servings of junk food per day than Caucasians and Latinos. This
significant difference was not hypothesized a priori. This finding is interesting and this investigator is not aware of any factors in the present study that may have contributed to this significant difference. A possible hypothesis is that African American students may be consuming more servings of soda per day than the other ethnic groups. In light of this finding, future studies should explore ethnic differences on junk food consumption to see if similar results are found.

Additionally, the present study found that 82% of participants reported consuming more than the recommended one serving per day of meat/beans. In light of this fact, future research is warranted to determine if this finding can be replicated with other samples. Over consumption of meat is associated with negative health consequences (e.g., increased consumption of fat, increased consumption of animal proteins, increased consumption of cholesterol, etc…) and can lead to future health problems, especially if the meats being consumed are highly processed, injected with growth hormones and antibiotics, and high in fat.

Another finding of this study was that only 9.6% of students reported meeting the daily recommended servings across all of the food groups. This means that about 90% of students reported not eating items from at least one or more food groups. This is an alarming statistic and future studies should investigate the degree to which adolescents are eating items from all of the food groups, and whether or not they are meeting the guidelines across each food group.

Implications for the Field of School Psychology

Pediatric overweight is increasingly becoming a major public health concern. As the proportion of children and adolescents who are overweight in this country increases,
policy makers, public health personnel, and health professionals are trying to make known the negative health consequences associated with this serious epidemic. As mentioned previously, some of the negative health consequences associated with pediatric overweight include: increased blood pressure, adverse lipoprotein profiles, non-insulin-dependent diabetes mellitus, early atherosclerotic lesions, asthma, and low body image (Pesa et al., 2000). Additionally, overweight children and adolescents miss more days from school than healthy children and adolescents, and the rates of absenteeism are similar to those found in children and adolescent with other chronic diseases (Vetiska et al., 2000).

In school systems, school psychologists serve a role of child advocate. They are not only concerned with each child’s academic, social, and emotional well-being, but also with the physical and mental health of each and every child. The present study has implications for the field of school psychology. First, it is important for school psychologists to realize the increasing proportion of students who are overweight. Approximately 1 out of 5 students is overweight nationally (CDC, 2001), and in the present study 23.5% of the participants were overweight. This finding provides support that the sample in the present investigation was similar to those of other research studies in terms of percent of participants overweight.

Knowing the physical and mental health consequences associated with pediatric overweight, school psychologists may be asked to serve these children by assisting in the development of accommodation plans for these children where necessary (i.e., creating a schedule and plan for class transitions, securing an appropriately-sized work place within classrooms and other facilities in the school, securing elevator passes in schools with
multiple levels), linking these children to community resources that serve children who are overweight, and/or providing these children with individual or group therapy sessions to promote their social and emotional well-being.

Second, as professionals with extensive training in consultation and leadership, school psychologists could serve on a school-wide staff committee aimed at increasing the opportunities for healthy food choices during school meals and increased opportunities for children to engage in recess and/or physical education classes. For example, school psychologists may be involved in developing a “healthy behaviors campaign” whereby students are provided incentives for engaging in specific health supporting behaviors (i.e., eating 3-5 fruits and vegetables a day, increasing the number of minutes they engage in physical activity activities each week, etc.). In developing school-wide interventions to increase health-supporting behaviors, school psychologists are in an excellent position to conduct needs assessments to identify the student-perceived barriers to engagement in such behaviors. Within the framework of a problem-solving model, school psychologists have extensive training to serve the role of facilitator to staff committees in addressing issues that surround this epidemic.

As discussed in the literature review for this study, students are spending far less time in physical activities, whether it is at home or in the schools (CDC, 2001). Furthermore, recess opportunities seem to be varied depending upon several factors: state of residence, school district, and the individual school (Andersen et al., 1998). Finally, as professionals with extensive training in cognitive and behavioral theories, school psychologists could play an integral role in the development of physical activity interventions for students with pediatric overweight. First, in developing appropriate
physical activity interventions, consultation with medical professionals will be critical. In many districts, school psychologists are already consulting with medical professionals to address other students’ chronic-health needs. Second, and as mentioned previously, school psychologists’ have the training to collect data on student perceived barriers to engaging in physical activity and to identify what types of activities in which students would be more willing and interested to engage. Finally, they can also identify the types of reinforcement that would best motivate students to follow through on their plans.

A final area in which school psychologists can make tremendous contributions is in both formative and summative evaluation. School psychologists are well-trained in data collection and analysis, and can be utilized to conduct program evaluations to determine the efficacy of interventions. They have the analytical skills to recognize when an intervention is not supporting the development of students, and the ability to make adjustments where necessary.

Conclusion

Pediatric overweight is a preventable health problem that has its roots in a myriad of behaviors, some of which were examined in the present study (e.g., dietary intake and physical activity behaviors). Although many of the hypotheses of this study could not be strongly supported, there was evidence for group differences across the dependent variables. These results should be interpreted cautiously due to the small group sample sizes. Given the severe consequences associated with pediatric overweight, poor nutritional choices, lack of physical activity and increased inactivity, further investigations of this issue are warranted in order to respond to this increasing epidemic.
References


Appendices
Appendix A: Nutrition/Physical Activity Questionnaire for High School Students

**Student Information:** Please provide the following information (*Circle One*).

<table>
<thead>
<tr>
<th>1. Sex</th>
<th>3. What grade are you in?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>9th 10th 11th 12th</td>
</tr>
<tr>
<td>Female</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2. Ethnicity: Do you think of yourself as…?</th>
</tr>
</thead>
<tbody>
<tr>
<td>African American</td>
</tr>
<tr>
<td>Asian</td>
</tr>
<tr>
<td>Caucasian/White</td>
</tr>
<tr>
<td>Latino/Hispanic</td>
</tr>
<tr>
<td>Native American/Alaskan</td>
</tr>
<tr>
<td>Other: _______________________</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>4. How old are you?</th>
</tr>
</thead>
<tbody>
<tr>
<td>13 17</td>
</tr>
<tr>
<td>14 18</td>
</tr>
<tr>
<td>15 19</td>
</tr>
<tr>
<td>16 20</td>
</tr>
</tbody>
</table>

| 5. How many days during the school week (Monday-Friday) do you eat breakfast? |
|-----------------------------|-----------------------------|
| 1 2 3 4 5                   |

| 6. How many days during the school week (Monday-Friday) do you eat lunch? |
|-----------------------------|-----------------------------|
| 1 2 3 4 5                   |

<table>
<thead>
<tr>
<th>7. Have you ever been on a diet?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes No</td>
</tr>
</tbody>
</table>

| 8. Do you think you get enough exercise? |
| Yes No                                  |

| 9. Do you think you eat a balanced diet? |
| Yes No                                  |

| 10. Do you think you have too much stress in your life? |
| Yes No                                              |

**Part I. Nutrition: How many servings from the following food groups do you eat or drink each day?** Please circle your response.

<table>
<thead>
<tr>
<th>Food Groups (examples of 1 serving size are provided in parentheses)</th>
<th>Servings per Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vegetables (Includes 1 potato, 1 salad bowl of lettuce, 1 ear of corn or side serving of canned corn, side serving of broccoli or any other vegetable)</td>
<td>0 1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>Fruit and fruit juice (Includes 1 apple, banana, peach; 1 apple, orange, grapefruit juice, 1 cup of grapes or berries [a coffee mug full])</td>
<td>0 1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>Milk/milk products (Includes 1 cup milk, 1 cup of yogurt, 1 slice of cheese, ice cream etc.)</td>
<td>0 1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>Meat and beans (Includes 1 hamburger patty, hot dog, chicken breast, 1 side serving of beans, 2 eggs, 1 piece of fish, 1 palm full of nuts, 4 tablespoons of peanut butter)</td>
<td>0 1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>Breads, cereals, crackers (Includes 1 slice of bread, 1 side serving of rice or pasta, small bowl of oatmeal or cereal, ½ bagel, 2 pancakes, 8 animal crackers, 3 cups popcorn, 6 saltine-type crackers, 2 rice cakes)</td>
<td>0 1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>Junk foods (Includes 1 can of soda, 1 candy bar, 1 small bag of potato/corn chips, etc.)</td>
<td>0 1 2 3 4 5 6 7</td>
</tr>
</tbody>
</table>
Part II. Physical Activity: The following questions are about physical activity. Circle only one answer for each question.

1. On how many of the past 7 days did you exercise or participate in physical activities for at least 20 minutes that made you sweat and breathe hard, such as basketball, jogging, swimming laps, tennis, fast bicycling or similar aerobic activities?

<p>| | | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0 days</td>
<td>1 day</td>
<td>2 days</td>
<td>3 days</td>
<td>4 days</td>
<td>5 days</td>
<td>6 days</td>
<td>7 days</td>
</tr>
</tbody>
</table>

2. On how many of the past 7 days did you participate in physical activity for at least 30 minutes that did not make you sweat or breathe hard, such as fast walking, slow bicycling, skating, pushing a lawn mower, or mopping floors?

<p>| | | | | | | | |</p>
<table>
<thead>
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<th></th>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0 days</td>
<td>1 day</td>
<td>2 days</td>
<td>3 days</td>
<td>4 days</td>
<td>5 days</td>
<td>6 days</td>
<td>7 days</td>
</tr>
</tbody>
</table>

3. On how many of the past 7 days did you do exercises to strengthen or tone your muscles, such as push-ups, sit-ups, or weight lifting?

<p>| | | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0 days</td>
<td>1 day</td>
<td>2 days</td>
<td>3 days</td>
<td>4 days</td>
<td>5 days</td>
<td>6 days</td>
<td>7 days</td>
</tr>
</tbody>
</table>

4. In an average week when you are in school (Monday-Friday), on how many days do you go to physical education (PE) classes?

<p>| | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0 days</td>
<td>1 day</td>
<td>2 days</td>
<td>3 days</td>
<td>4 days</td>
<td>5 days</td>
</tr>
</tbody>
</table>

5. During an average physical education (PE) class, how many minutes do you spend actually exercising or playing sports?

<table>
<thead>
<tr>
<th>I do not take PE</th>
<th>Less than 10 minutes</th>
<th>10 to 20 minutes</th>
<th>21 to 30 minutes</th>
<th>More than 30 minutes</th>
</tr>
</thead>
</table>

6. In an average school day (Monday-Friday), how many hours do you spend doing any of the following activities: watching television/movies, playing video games, reading, homework, or on the computer/Internet?

<table>
<thead>
<tr>
<th>0 (No time on these activities)</th>
<th>Less than 1 hour per day</th>
<th>1 hour per day</th>
<th>2 hours per day</th>
<th>3 hours per day</th>
<th>4 hours per day</th>
<th>5 or more hours per day</th>
</tr>
</thead>
</table>

7. Are there any other physical activities that you do in a typical week that you want to share with us? If so, what is the activity and how much time do you spend doing it?
Appendix A: Nutrition/Physical Activity Questionnaire for High School Students (Continued)

8. If your school hosted a school-wide activity day in which you could participate in team/individual sports (e.g., climbing wall, running races) would you be interested in participating?  
   Yes  No
### Appendix B: Correlation Matrix for Dietary Intake Variables

#### Correlations Between Dependent Variables for Dietary Intake

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Fruit/Vegetables</th>
<th>Milk</th>
<th>Meat</th>
<th>Bread</th>
<th>Junk Food</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fruit/Vegetables</td>
<td>-</td>
<td>.38</td>
<td>.33</td>
<td>.36</td>
<td>.28</td>
</tr>
<tr>
<td>Milk</td>
<td>-</td>
<td>.43</td>
<td>.46</td>
<td>.18</td>
<td></td>
</tr>
<tr>
<td>Meat</td>
<td>-</td>
<td>-</td>
<td>.54</td>
<td>.34</td>
<td></td>
</tr>
<tr>
<td>Bread</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>.27</td>
<td></td>
</tr>
<tr>
<td>Junk Food</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

Participants (N = 197)
Appendix C: Correlation Matrix for Dietary Intake Variables

*Correlations Between Dependent Variables for Physical Activity*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Vigorous</th>
<th>Moderate</th>
<th>Sedentary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vigorous</td>
<td>-</td>
<td>.41</td>
<td>.06</td>
</tr>
<tr>
<td>Moderate</td>
<td>-</td>
<td>-</td>
<td>.01</td>
</tr>
<tr>
<td>Meat</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Participants (N = 197)