EVALUATION OF ADOLESCENT ATTITUDES AND KNOWLEDGE TOWARD NUTRITION, PHYSICAL ACTIVITY, SELF ESTEEM, AND BODY IMAGE

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ABSTRACT

Nutrition education programs attempting to modify behaviors with potentially long-term health outcomes, such as obesity, diabetes, and cardiovascular disease, play a significant role in health education, particularly among adolescents. Additionally, Social Cognitive Theory suggests personal factors, such as body image and self-esteem, are equally important in shaping adolescent decision making and, ultimately, long-term health outcomes. This study explored relationships among self-esteem, body image, Eating Attitudes Test (EAT) scores, body mass index (BMI), food intakes, physical activity behaviors, knowledge of and attitudes toward physical activity, and nutrition during adolescence. Seventh grade students from health classes in two separate public schools (N = 142, 58 males and 84 females) participated in a five-day nutrition education unit and completed nutrition knowledge, self-esteem, body image, eating behavior, and physical activity questionnaires. BMI was calculated from self-reported height and weight data. Average subject age was 12.96 years of males and 12.93 years for females. Males and females showed significant improvement in their nutrition knowledge (t = 4.56, p<0.01 and t = 7.68, p <0.01, respectively). The study also revealed highly significant relationships among both male and female subjects with regard to self-esteem and body image (r = 0.546,
p<0.01 and r = 0.564, p <0.01) as well as body image and BMI (r = -0.451, p<0.01 and r = -0.540, p<0.01). Further, among female subjects, relationships existed between self-esteem and EAT scores (r = -0.405, p <0.01), self-esteem and BMI (r = -0.290, p <0.01), and body image and EAT scores (r = -0.388, p<0.01). Nutrition knowledge positively correlated to self-esteem for female subjects (r = 0.286, p <0.01), however for male subjects nutrition knowledge was not related to other study factors. In terms of physical activity outcomes, significant relationships existed between knowledge of and attitudes toward physical activity for both males and females (r = 0.329, p<0.05 and r = 0.322, p<0.01, respectively). Finally, positive, significant relationships were found between self-esteem and attitudes toward physical activity (r = 0.277, p<0.05 and r = 0.242, p<0.05). Although these results indicate self-esteem, body image, EAT scores, attitudes toward physical activity, and BMI are interrelated, adolescents do not view healthy nutrition as an avenue of self-improvement. Future nutrition education programs should focus upon both personal and behavioral factors to further promote positive long-term health outcomes in the adolescent audience.
Dedicated to my husband and friend, Todd.
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CHAPTER 1

INTRODUCTION

Adolescence is a time of rapid growth and change. During the adolescent growth spurt, individuals gain 15 percent of their adult height, 50 percent of their adult weight, and 45 percent of their bone structure (National Dairy Council, 1999). Despite the increased need for a healthful, growth-promoting diet, adolescents often fail to consume nutrients in sufficient amounts to reach the dietary recommendations for their age group. Cusatis and Shannon (1996) found that, as a group, both males and females failed to consume even half of the recommended dietary intakes as estimated by Food Guide Pyramid groupings. However, they consumed substantial amounts of sugar and fat. Those involved in sports and other physical activities demonstrated increased adherence to recommended intakes.

Unhealthy dietary habits during adolescence translate to unhealthy behaviors during adulthood, ultimately leading to both short-term and long-term repercussions. These practices can promote such long-term health problems as cardiovascular disease, cancer, diabetes, obesity, and osteoporosis (Cusatis and Shannon, 1996). The incidence of these diseases among adolescents is on the rise, indicating the problem is closer than many realize.
Consumption of high fat, high sugar diets and lack of physical activity during youth have been linked to childhood and adolescent weight gain. A chain-reaction effect ensues, particularly among females. Weight gain correlates with decreased self-esteem, in addition to increasing one’s risk of adult obesity and other related health concerns. Low self-esteem positively associates with sadness and loneliness, as well as an increased potential to engage in other unhealthy behaviors such as smoking and alcohol consumption. These behaviors, in turn, cause the individual’s self-esteem to plummet even lower (Strauss, 2000).

At times low self-esteem and lack of knowledge combine, manifesting as unhealthy food restrictions and inappropriate dieting behaviors. Martin et al. (1999) found 43 percent of the 630 teens studied had anomalous eating habits. These included following "slimming" diet regimens without healthcare-related advice, consumption of large quantities of food in short periods of time without provocation, going periods of time without eating, and laxative use. None of the subjects were obese, 55.4 percent were within normal weight ranges, and 26.8 percent were underweight. Similarly, Crespo et al. (2001) found 22.6 percent of females and 9.9 percent of males surveyed had attempted to lose weight in the past 12 months without the existence of justifiable reasons for weight restriction.

In response to the declining state of child and adolescent health in the United States, several leading health organizations have focused their attention upon these issues. In 1996, the U.S. Surgeon General released a report entitled “Physical Activity and Health Among Adolescents and Young Adults” which examined current physical
activity participation and made recommendations for improvements. The report found that approximately one-half of America’s youth aged 12 to 21 do not exercise vigorously on a regular basis. Additionally, participation decreased with age: while recommendations are met by 69 percent of those aged 12 to 13 years, they are only met by 38 percent of those aged 18 to 21 years (U.S. Dept. HHS, 1996).

More recently, the Surgeon General released the “Call to Action to Prevent and Decrease Overweight and Obesity,” (U.S. Dept. HHS, 2001a). Despite attempts to decrease the incidence of overweight children and adolescents, the rate has nonetheless rapidly increased. A comparison of the 1980 National Health and Nutrition Examination Survey (NHANES) II data and 1999 NHANES data illustrates that the percentage of overweight children aged 6 to 11 has increased from 7 to 13 percent, and even more alarming, the incidence of overweight among adolescents aged 12 to 19 years has increased from 5 to 14 percent (U.S. Dept. HHS, 2001a).

The Healthy People 2010 campaign also highlights the need for nutrition and physical activity intervention. Two of the ten Leading Health Indicators, or factors reflecting primary public health concerns, include “Physical Activity and Fitness” and “Nutrition and Overweight.” The 2010 campaign goals demonstrate optimism, though they are not unrealistic. For example, with regards to physical activity and fitness, four goals specifically relate to adolescents:
22-6) Increase the proportion of adolescents who engage in moderate physical activity for at least 30 minutes on 5 or more of the previous 7 days (baseline 27%, goal 35%).

22-8) Increase the proportion of the Nation’s public and private schools that require daily physical education for all students (baseline 17%, goal 25% among middle schools).

22-9) Increase the proportion of adolescents who participate in daily school physical education (baseline 29%, goal 50%).

22-10) Increase the proportion of adolescents who spend at least 50 percent of school physical education class time being physically active (baseline 38%, goal 50%).

Similarly, goals have similarly been established to address the Leading Health Indicator “Nutrition and Overweight.” These include a reduction of overweight incidence among children and adolescents as well as increased fruit, vegetable, and whole-grain product consumption and decreased fat and total calorie consumption. In many ways, goals related to nutrition mirror year 2000 Dietary Guidelines for Americans (U.S. Dept. HHS and USDA, 2000).

Those establishing goals increasingly look to health care providers and schools to spread the word. Chapter 19 of Healthy People 2010 contends, “A well-designed curriculum that effectively addresses essential nutrition education topics can increase students’ knowledge about nutrition, help to shape appropriate attitudes, and help
develop the behavioral skills students need to plan, prepare, and select healthful meals and snacks” (U.S. Dept. HHS, 2000). The prior statement perfectly describes a primary goal of this research project: to teach adolescents about nutrition-related implications in their lives.

Ultimately, in addition to relying upon teachers for dissemination of health-promotion curricula, accurate information from knowledgeable professionals should be delivered to students. This allows students to increase their scope of knowledge, thus better preparing them to make wise decisions regarding their current and future health. In light of short- and long-term implications related to nutrition and physical activity, as well as the urgency of national health promotion campaigns similarly related to these topics, it is appropriate to examine adolescent behaviors. Additionally, the observed interplay of social and personal issues make it important to study the role adolescent diet and exercise practices play in the development and maintenance of self-esteem, body image, and eating attitudes.

The purpose of this study was to expand the available research-based knowledge regarding adolescent behavior by identifying relationships among self-esteem, body image, eating attitudes, self-reported dietary intake, physical activity levels, nutrition knowledge, and attitude toward and knowledge of exercise. The following research questions were addressed.
Research Questions

1. Were scores on a Nutrition Knowledge quiz impacted by a five-day nutrition and exercise intervention series?

2. Do seventh grade students in Tuscarawas County have correct knowledge and strong, positive attitudes regarding physical activity?

3. What are daily dietary intakes by seventh graders in Tuscarawas County based upon answers to a Block Short Food Frequency Form (FFQ) (National Cancer Institute)?

4. What are typical levels of activity for seventh graders in Tuscarawas County based upon responses to an activity inventory?

5. Is knowledge of nutrition and knowledge and attitude towards physical activity related to self-reported dietary intakes, physical activity behaviors, self-esteem, body image, and eating behaviors?

Study Significance

The U.S. Surgeon General has called attention to two primary health concerns facing America’s youth: poor nutritional health and lack of physical activity, both of which ultimately result in obesity and chronic disease (U.S. Dept. HHS, 2001, 1996). Strauss et al. (2001) and Cusatis and Shannon (1996) suggest Bandura’s Social
Cognitive Theory serves as a basis for exploration into adolescent eating behaviors and general health. This theory contends health outcomes result from a multitude of factors rather than direct cause and effect relationships. Application of this theory to adolescent nutrition and health promotion involves exploration of behavioral factors, such as the variety of foods the adolescent consumes and how often he/she exercises, as well as numerous personal and environmental factors. Personal factors include one's attitudes and beliefs towards nutrition, exercise, health, body image, self-esteem, and unique personality traits. Environmental factors are those that form the context in which behaviors take place, such as one's family structure, peer influences, school and community activities, and body mass index.

Many studies have examined factors impacting adolescent health, such as physical activity and BMI, dietary intakes and family influences, and eating disorders and self-esteem. However none of the studies reviewed examined the interplay of multiple factors. While this task is cumbersome at best, understanding relationships between nutrition, physical activity, self-esteem, body image, and eating behaviors will assist health professionals, teachers, and parents in providing better health-promoting education to our nation's youth.

**Definitions**

**Body Image:** mental image of one's own body and the feelings and attitudes associated with that view.
**Childhood overweight:** A sex- and age-specific BMI at or above the 95th percentile, based on revised Centers for Disease Control and Prevention (CDC) growth charts (U.S. Dept. HHS, 2001)

**Disordered/Anomalous eating:** Eating or not eating, absence of internal cues of hunger or satiety (York, 2001 and Martin, 1999).

**Eating disorder:** A condition resulting from eating or not eating for a duration and frequency long enough to cause physiologic complications; clinically diagnosed by DSM IV guidelines (York, 2001)

**Physical activity:** A behavior most often defined in the context of energy expenditure; any body movement produced by the skeletal muscles resulting in a substantial increase over the resting energy expenditure (Malina, 2001)

**Physical activity units:** Operationalized as the number of physical activities subjects report having taken part in during a period of one week.

**Sedentary activity:** Activities requiring limited use of muscle groups and do not significantly raise energy expenditure above resting levels.

**Self-esteem:** Level of feelings of self-worth or personal satisfaction with one’s own roles and performance in these roles.
CHAPTER 2

REVIEW OF LITERATURE

The scientific community is ever gaining increased knowledge regarding disease risk factors and preventive measures. Health professionals and lay people alike generally accept the idea that circumstances early in life impact health later in life. This belief is evidenced by the healthcare paradigm shift from disease treatment to disease prevention.

An example of this shift can be seen in the area of cardiovascular disease, America's leading cause of death (U.S. Dept. HHS, 1998). High cholesterol, hypertension, and obesity are recognized heart disease risk factors that can be impacted by dietary changes (Whitney and Rolfes, 1996). In the past, health professionals tended to wait until heart disease was apparent before seeking corrective actions, even among high-risk patients. More recently professionals have been encouraged to recognize high-risk patients, seek early intervention measures, and attempt to proactively educate the population at risk (U.S. Dept. HHS, 1998).

This trend has been accompanied by an increase in the availability of materials targeted toward consumer education. Roadside billboards, television advertisements, public service announcements, and even food manufacturers seek to translate positive
dietary habits into concrete health outcomes. Every year an increasing number of food
product manufacturers take advantage of nutrition label health claim provisions made
possible by the Food and Drug Administration (FDA) (U.S. FDA, 2001, 1994).

**Focusing on Health Education for Youth**

While in the past health education has by and large been targeted toward
adults, research increasingly indicates a need for development of appropriate health
and nutrition education materials for children and adolescents (Siega-Riz *et al.*, 2001;
Schneider, 2000; Troiano, 2000; and Gaziano, 1998). Teenagers are a particularly
important target population in terms of health intervention, as the teenage years
represent a period of significant physical and mental growth during one’s lifetime.

Traditionally, during adolescence the scope of responsibility and accountability
increases, both at home and school. An example of this expansion can be seen with
respect to the school lunch program. In elementary school, students are typically
allowed to pack their lunch or purchase the school-prepared tray lunch with little room
for decision making. In middle school, a la carte items typically supplement tray line
options. By the time a student reaches high school, he or she may be given many
lunch choices including a packed lunch, tray service, expanded a la carte options, or
even leaving the school grounds during the lunch period to eat at an area restaurant.

Parents and teachers remain important guiding forces in the lives of teenagers,
but peers gain increasing influence over decisions. In reference to the above example,
parents and teachers inform teens of appropriate and healthy lunch selections. Yet,
despite the presence and input of older, wiser individuals, teens turn to their peers for validation of their ideas and beliefs, no longer accepting the advise of their elders as the final word. As it happens in the case of school lunch, teens select French fries and breaded chicken strips over the mashed potatoes and grilled chicken (Siefert and Hoffnung, 1999).

Adolescents test boundaries, physically and cognitively, as they seek to enlarge their scope of independence. Physically, they experiment with various health-related behaviors with possible positive or negative outcomes. For example, teens may try the latest fad diet or supplement in an attempt to quickly and easily decrease weight or increase muscle. Alternately, they may decide to start a physical activity program or aim to decrease their soft drink intake in an effort to improve their athletic performance. Cognitively, adolescents are at a point of increased understanding of abstract concepts. Early in adolescence, seeds of knowledge are planted. As adolescence progresses and youth gain maturity, they also gain ability to draw reasonable conclusions and make connections between cause and effect relationships (Mitchell, 1997).

In terms of health promotion, early in adolescence, teens may know that bones are made of calcium and that osteoporosis is a disease in which the bones lose calcium, thus becoming increasing fragile. In mid- and late-adolescence, teens begin to recognize the cause and effect relationship existing between calcium and osteoporosis: people who do not take in enough calcium will not build strong bones and will increase their risk of developing osteoporosis later in life. The ultimate goal
is internalization of health messages and reflection of health beliefs in behaviors: If I drink milk, which contains calcium, I will build stronger bones and be at decreased risk of osteoporosis when I am older. For some, this comes with maturity, but for others the future is simply too far ahead to think about. Regardless, behaviors of youth gain permanence during adolescence and become lifelong health behaviors (Miller and Maropis, 1998; Sweeting et al., 1994).

In light of the varied stimuli impacting adolescent perception, researchers suggest Bandura’s Social Cognitive Theory serves as a basis for exploration into adolescent eating behaviors and general health (Strauss et al., 2001; Cusatis and Shannon, 1996). Application of this theory to adolescent nutrition and health promotion requires researchers to not only examine behavioral factors, such as the food consumption and exercise habits, but also various personal and environmental factors. Personal factors include attitudes and beliefs towards nutrition, exercise, health, body image, self-esteem, and unique personality traits. Environmental factors consist of factors include one’s family structure, peer influences, school and community activities, and body mass index.

**Youth at Risk**

Like many developed nations, the United States, in most respects, has become a nation of convenience. Driving and public transportation are preferred over walking, and the latest edition of the weekly sitcom is preferred over exercising and playing outside (Schneider, 2000). Foods are produced, processed, and transported to the store
for ready consumption. The ease of snack foods, prepackaged readymade foods, and fast foods appeal to Americans’ fast-paced lifestyle, even that of youth (Schneider, 2000).

The combination of poor food choices and physical inactivity, two behaviors seen in increasing frequency among teens, lead adolescents down the path to an unhealthy future. Obesity, Type 2 diabetes, cardiovascular disease, and osteoporosis have been linked to risky health behaviors during adolescence since these behaviors ultimately carry over into adulthood (U.S. Dept. HHS, 2001b).

Heart Disease

The Task Force on Children and Youth was developed for the purpose of examining the heart health needs of America’s Youth. Heart disease affects more than 600,000 children in the United States, either in the form of a congenital defect or the initial stages of cardiovascular disease. If cardiovascular disease continues at its current rate, approximately 30,000,000 youth will die due to a cardiovascular related cause. Additionally, the Task Force contends cardiovascular disease may begin as early as fetal development since some individuals are genetically predispositioned toward the disease (Moller et al., 1993).

Overweight and Obesity

Overweight and obesity are serious health issues in the United States, for both youth and adults. Although overweight and obesity are largely preventable, in the
year 2000 alone they contributed to approximately 300,000 deaths and over $117 billion lost due to uncompensated time away from work, medical expenses, and decreased productivity (U.S. Dept. HHS, 2001b). Among children and adolescents, overweight is linked to cardiovascular disease, hypertension, diabetes, and asthma in adulthood as well as adult overweight (Gao and Chumlea, 1999).

Although the popular media often refers to the problem of “Childhood Obesity,” specific definitions for overweight and obesity do not exist for individuals less than 20 years of age (CDC, 2001). This lack of definition not only creates confusion among media sources and the general public, but it also creates confusion among the scientific community as they seek to compare findings. Researchers are hesitant to establish specific definitions for childhood and adolescent obesity since body composition changes during this period of life, and weight is an unreliable measure of body fatness in young people (CDC, 2001).

Overweight, on the other hand, is a more approachable subject. It has traditionally been defined as a sex and age-specific BMI at or above the 95th percentile on revised Centers for Disease Controls and Prevention (CDC) growth charts (CDC, 2002 and U.S. Dept. HHS 2001c). Less commonly, BMI at or above the 85th percentile has also been used as an indicator (CDC, 2001). Adult standards for overweight and obesity (BMI = 25.0 – 29.9 and BMI = 30.0 and above for overweight and obese, respectively) are not appropriate for use with children and adolescents (NIH, Online 2002). Unless otherwise specified, reported data are determined utilizing BMI at or above the 95th percentile.
In recent years, the incidence of overweight among children and adolescents has reached epidemic proportions, prompting the U.S. Surgeon General to emphasize the issue in his 2001 “Call to Action to Prevent and Decrease Overweight and Obesity” (U.S. Dept. HHS, 2001a). Childhood and adolescent overweight are also addressed in Healthy People 2010 objective 19-3: Reduce the proportion of children and adolescents who are overweight and obese. The 1988-94 NHANES baseline measure for this objective was 11 percent incidence for both children aged 6 to 11 years and adolescents aged 12 to 19 years. A 2010 target for both groups was set at 5 percent (U.S. Dept. HHS, 2000).

Despite growing alarm among health authorities, the incidence of overweight among America’s youth continues to increase at a rapid pace. During the period between the 1980 National Health and Nutrition Examination Survey (NHANES) II results and 1999 NHANES results, the percentage of overweight children aged 6 to 11 has increased from 7 to 13 percent. The increase among adolescents aged 12 to 19 years is even more alarming: 14 percent of adolescents were considered overweight in 1999 as compared to only 5 percent in 1980 (U.S. Dept. HHS, 2001a).

While the Surgeon General urges health professionals to approach overweight and obesity as “…preventable and treatable problems with realistic and exciting opportunities to improve health and save lives,” researchers indicate this is a multifaceted problem with complex solutions (U.S. Dept. HHS, 2001a; CDC, 2001; Robinson, 2001; Crespo et al., 2001; Strauss et al., 2001; Bradley et al., 2000).
Increased caloric intake, decreased physical activity, and increased television viewing and computer use have been sighted as possible explanations for increased overweight among youth.

A survey-based study by Crespo et al. (2001) lends support to a multi-factorial approach for decreasing youth overweight. This research group utilized NHANES III data for 4,069 youth aged 8 to 16 years to examine relationships between television viewing, caloric intake, physical activity, and overweight. Results indicated almost 50 percent of youth surveyed viewed two or more hours of television each day, with males watching more than females. Time spent in front of the television was associated with increased caloric intake as well as increased prevalence of overweight, especially for females (Crespo et al., 2001). Research by Taras et al. (1989) and Robinson and Killen (1995) support findings by Crespo et al., in that increased television viewing was associated with increased purchasing and consumption of the high calorie foods. Although 56.7 percent of youth were physically active five or more days per week, no significant correlations were found between vigorous physical activity and weight. This report was limited in that data were self-reported, physical activity data was of questionable accuracy, and inquiry did not extend to computer or video game usage (Crespo et al., 2001).

Strauss et al. (2001) gives a more complete view of activity patterns in their cross-sectional study of 92 youth (44 males and 48 females) aged 10 to 16 years. Physical activity, as assessed by a biaxial accelerometer, was compared to sedentary activity, as determined by questionnaire responses. On average, 10.4 ± 0.8 hours per
day were spent in sedentary activities such as doing homework, watching television, working on the computer, and attending class. Both males and females spent approximately 24.5 percent of their time exercising until age 13 years, at which time males were significantly more active than females (23.5% of time spent in physical activity for males versus 19.0% of time spent in physical activity for females) (Strauss et al., 2001). This finding coincides with Bradley et al.'s (2000) conclusion that television viewing increased in popularity among females but decreased in popularity among males as subjects increased in age. Strauss et al. (2001) found sedentary activity inversely related to moderate activity but not to high activity. Thus, subjects who were very active took time to be physically active regardless of the amount of time they spent in sedentary activities. Subjects who were moderately active, on the other hand, were likely to be less sedentary. This relationship explains why children who limit sedentary activities gain less weight than those who are more sedentary.

**Nutrition Attitudes and Dietary Intakes**

Dietary intake during adolescence profoundly impacts growth, health promotion, and development of life-long eating behaviors (U.S. Dept HHS, 1988; Story and Alton, 1996). Adolescents require greater nutrient intakes than children or adults since they must meet demands for growth and development (Mitchell, 1997). Although relationships between good nutrition and good overall health are well recognized within medical professions, adolescents often overlook the importance of adequate nutrition (O’Dea, 1999). Thus, over-consumption of fats and sugary foods
paired with under-consumption of nutrient dense foods and inactivity, common adolescent behaviors, has contributed to epidemic levels of obesity among adolescents in the U.S. and around the world.

Cusatis and Shannon (1996) found, on average, students achieved a 46.6 percent adherence to Food Guide Pyramid recommendations. Males and females both met recommendations for meat/poultry/fish/nuts/legume (protein) consumption and males consumed adequate dairy food intakes. Females averaged 80 percent consumption of dairy products. Both groups fell short in terms of fruit, vegetable, and grain consumption. Sugar and fat consumption, however, were substantial among both males and females. These findings coincide with later research indicating snack foods and fast foods account for approximately 30 percent of an adolescent’s daily dietary intakes (Whal, 1999).

Dwyer et al. (2002) noted even less favorable intakes in their report of the Child and Adolescent Trial for Cardiovascular Health (CATCH) study. This study compared students who participated in a cardiovascular health and nutrition education program with a cohort group not receiving the educational intervention. All 1,532 eighth graders involved in a CATCH study subset provided 24-hour dietary recalls that were simultaneously entered into the University of Minnesota Nutrition Data System (NDS) for analysis. Food Guide Pyramid group servings were then converted to Healthy Eating Index (HEI) food group and nutrient scores. Additionally, subjects reported their level of participation in the School Lunch Program.
As a whole, subjects did not adequately consume any of the Food Guide Pyramid food groups. Male subjects had significantly higher sub-scores than females for grains, vegetables, and meats as well as for cholesterol and sodium. School Lunch Program participants, regardless of intervention group, had significantly higher food group intakes than non-participants with the exception of fruit group intakes, which were only marginally higher (Dwyer et al., 2002).

Adolescents' failure to meet Food Guide Pyramid recommendations are explained in part by focus group studies conducted by Story and Resnick (1986). These researchers found youth concerns with their peers' impressions and fitting into social norms move healthful eating to a low position on their priority lists. There exists a lack of urgency regarding future health implications stemming from current health behaviors.

Neumark-Sztainer et al. (1999) echo these statements in a more recent investigation of adolescent eating behaviors. Their study involved 21 focus groups made up of a total of 141 male and female adolescents attending public schools in St. Paul, Minnesota. Students were asked what they perceived as barriers to following recommended dietary guidelines. Students consistently expressed concern regarding time restraints. They were involved in many activities, and eating healthy did not rank highly enough for it to gain their attention. Furthermore, many students felt they were too young to worry about their health, stating they will worry about nutrition issues when they are older and physically impacted by declining health.
Although students taking part in the focus groups were not concerned with their current or future health, they were very concerned with the taste and cost of their food. According to students, “junk” food tastes better than “health” food and is less expensive. In support of their claims, students reasoned they could purchase a popular combination meal at a fast food restaurant for less than they could purchase a healthful sandwich, salad, and milk (Neumark-Sztainer et al., 1999). Exact figures were not given to support such statements, and regional pricing variability could impact their accuracy.

As Story and Resnick (1986) and Neumark-Sztainer et al. (1999) indicate, peer influences and prior notions regarding food and nutrition greatly impact eating behaviors. When peer-provided nutrition information is correct, this influence can be a strong, positive move in the direction of good health. However, research by O’Dea (1999) indicates students often lack important nutrition information. In this study of 1,131 male and female students from twelve randomly selected schools, 31 percent reported diets containing “forbidden” foods. These foods were commonly forbidden by parents, or by the children themselves, due to beliefs that the foods caused hyperactivity and diabetes (i.e. dietary sugars), acne and menstrual pain (i.e. chocolate), or consumption was inherently “bad.” These nutrition myths were well ingrained into the community and accepted without question.

Additionally, Martin et al. (1999) reported that of 630 adolescents surveyed, 46.3 percent exhibited anomalous eating behaviors, such as food restrictions or
binging accompanied by compensatory actions. Students with anomalous eating behaviors and those with "normal" eating behavior performed equally well on a 14-question evaluation of nutrition knowledge. Thus, even though the two groups had the same knowledge base they were not implementing their current knowledge into their lifestyles equally.

Unhealthy eating behaviors are often unwittingly promoted within the U.S. public school system. The pre-school and noon-time school store has become a lucrative money maker in the eyes of athletic departments, PTA's, and student organizations. The school store appeals to students' desires for tasty, low-priced, yet nutritiously lacking items. Of 24 San Diego County public middle schools, Wildey et al. (2000) found 14 schools operated school stores. All of these stores were open before and after school, and eight stores were open during lunch hours. Approximately 47 percent of the 1,678 students returning questionnaires made food purchases from the store at least once every week. Analysis of food sold during the one-week assessment period revealed 88.5 percent were high fat and/or sugar snacks. No fruits or vegetables were available for students to purchase. On average, students consumed 8.7 grams of fat and 23.0 grams of sugar per snack. Additionally, approximately 40 percent of all beverages sold were classified as soft drinks. School stores open during lunchtime directly competed with cafeteria services in that students at schools with lunchtime operating stores were significantly less likely to utilize the school's cafeteria services.
Physical Activity

A 1996 report issued by the Center for Disease Control states, "The body responds to physical activity in ways that have important positive effects on musculoskeletal, cardiovascular, respiratory, and endocrine systems." The report goes on to cite reduced risk of premature mortality, heart disease, hypertension, colon cancer, and diabetes as well as decreased depression and anxiety, improved mood, and increased ability to perform activities of daily living as additional benefits of regular, moderate intensity physical activity (U.S. Dept. HHS, 1996). Since the release of the Surgeon General's Report, longitudinal research conducted by Kemper and associates has further substantiated increased bone mass development and reduced risk of cardiovascular disease associated with neuromotor and cardiovascular exercise, respectively (Kemper et al., 2000 and Twisk et al., 2000). Additionally, Strauss et al.'s cross-sectional study of physical activity and psychosocial correlates positively associated high activity levels with increased self-efficacy (Strauss et al., 2001).

Quality research has led many primary health-promoting organizations to unified recognition of the benefits of regular physical activity. The American College of Sports Medicine, Center for Disease Control and Prevention, American Heart Association, National Institute of Health, and President's Council on Physical Fitness and Sports are a few of such health promotion organizations to issue specific physical activity recommendations for both adults and youth (ACSM, 1995; CDC, 1995; NIH, 1996).
Despite this knowledge, trends involving physical activity are similar to those identified in regards to dietary intakes: adequate physical activity is on the decline among America’s youth. According to a review of 26 studies utilizing heart-rate monitors to estimate youth activity, America’s youth attain 60 or more minutes of light, low-intensity every day. However, on average youth exercised less than 30 minutes per day at moderate or high-intensities (Epstein et al., 2001). The U.S. Surgeon General reaffirms this lack of activity in his report on Physical Activity and Health among Adolescents and Young Adults which stated approximately one-half of America’s youth aged 12 to 21 do not exercise vigorously on a regular basis. Furthermore, participation decreases with age: 69 percent of those aged 12 to 13 years meet exercise recommendations while only 38 percent of those aged 18 to 21 years meet recommendations. Females tend to be less active than males in terms of both moderate and vigorous physical activity (U.S. Department of Health and Human Services, 1996).

Unfortunately, this decline in activity during adolescence continues into adulthood. In a review of literature dating from 1957 to 1999, Manila (2001) found significant, though typically low to moderate, correlations between child and adolescent physical activity and health as well as between adolescent and adult physical activity and health. The results of Manila’s review are more strikingly represented in the U.S. Surgeon report finding that 60 percent of adults in the U.S. are not regularly active and an additional 25 percent have sedentary lifestyles (U.S. Dept. HHS, 1996).
Several studies, both in the United States and other countries, have sought to determine relationships between adolescent and adult physical activity behaviors. Comparison of these studies can be difficult as there are more than 30 different physical activity assessment methods with varying validity and reliability depending upon the type of study conducted (Armstrong et al., 2000). Additionally, longitudinal studies, which involve tracking of subjects, tend to show strong correlations with regards to short time spans, but correlations weaken as the amount of time between testing points increases (Manila 2001, Campbell et al., 2001). Both longitudinal and cross-sectional designs utilizing surveys and physical methods are described below.

The Cardiovascular Health in Children and Youth (CHIC) study is an example of a longitudinal, survey design. CHIC involved a subset of 656 U.S. students in third through tenth grade who concurrently participated in a physical activity study spanning over a six-year period (Bradley et al., 2000). Participants were asked to identify the three things they usually did “the most.” This method was based upon effective outcomes reported among youth in Williams et al.’s 1980 review of the “Know Your Body” program. Activities were categorized according to their corresponding MET level. Subjects reporting MET’s in the 1 to 3 range were considered to be sedentary while those reporting MET’s in the 5 to 8 range were considered active. For each grade level, males were consistently more active than females. Additionally, subjects reported fewer active behaviors as they aged (Bradley
et al., 2000). Study outcomes are limited in that the technique utilized may sample activities enjoyed or activities of personal importance to a greater extent than it measures degree of involvement in physical activity.

Interestingly, researchers reported popularity of activities in addition to level of physical activity. For males, top-ranking activities during sixth and seventh grades consistently included basketball, baseball, football, and running. Television quickly crept into the second place position for eighth grade males, pushing baseball and football further down the list. Females expressed interest in a greater variety of activities during the middle school years than their male counterparts. Interestingly, females overall became more active in team sports during middle school, however this participation dropped off sharply during high school. More specifically, the top three activities for females in the sixth grade were basketball, walking, and running. For seventh graders, the top-three activities were talking on the phone, walking, and basketball. Among females in the eighth grade, talking on the phone remained the top-ranking activity, however, basketball was pushed further down the list as this activity was replaced by walking and running. These activities illustrate movement among from vigorous activity and team sports to more individualized, sedentary activities, particularly among females. Changes in activity patterns may be related to corresponding pubertal status, however further researcher is needed to explore this topic. Bradley et al. found it to be a significant indicator among female subjects but not among male subjects in this study (Bradley et al., 2000).
The Amsterdam Growth and Health Longitudinal Study (AGAHLs) by Kemper and colleagues (Kemper et al., 2001a; Kemper et al., 2001b; and Van Mechelen, 2000), is unique in that it tracked a cohort of male (98) and female (83) subjects over a 14 year period. Body composition, physical fitness as determined by specific physical tasks, physical activity determined via a cross-checked interview, habitual physical activity behaviors, and intensity of physical activity were assessed six times throughout the study.

Researchers found an overall decrease in habitual physical activity among subjects over the 14-year study period. There were significant decreases for both sexes in terms of vigorous activities but increases seen in terms of moderate activities (van Mechelen et al., 2000). Leonard (2001) suggests physical activity indicators in this study may be distorted, however, in light of studies comparing exercise-based research methods which found interview techniques underestimate energy expenditure among highly active individuals and overestimates energy expenditure among sedentary individuals (Davidson et al., 1997 and Leonard et al., 1997).

AGAHLs researchers noted physical activity during adolescence did not strongly correlate to physical activity during adulthood, however specific physical indicators, such as aerobic fitness, during adolescence did positively correlate to adult physical activity (Kemper et al., 2001a). Interestingly, Kemper and associates determined subjects lacked stability in terms of their actual physical activity behaviors, but they tended to be relatively stable in their degree of physical fitness (Kemper et al., 2001b). Campbell et al. (2001) reported similar results in their 12-year
study of youth and adolescents in that they found low to moderate stability in aerobic fitness from youth to early adulthood and poor stability of physical activity during this same time period. While lifestyle changes during late adolescence and the early twenties interfere with physical exercise patterns, the importance of physical fitness in one’s life remains reasonably constant.

Like national surveys in other countries, such as the AGAHLIS, the Youth Risk Behavior Surveys (YRBS) have provided much insight into physical activity behaviors among youth in the United States. Both Lowry et al. (2001) and Caspersen et al. (1999) utilized YRBS data outcomes in their respective studies.

Lowry et al. (2001) approached the subject of physical activity from the standpoint of participation in high school physical education (PE) classes. This research group analyzed YRBS data for students in grades 9 through 12 during data collection years 1991, 1993, 1995, and 1997 to estimate the prevalence of PE enrollment and level of physical activity during class. Physical activity during class was defined as attaining 20 minutes or more of moderate activity during an average class period. While total enrollment remained unchanged from 1991 to 1997 (48.9% and 48.8%, respectively), daily attendance decreased from 41.6 percent to 27.4 percent and those being physically active in PE class decreased from 80.7 percent to 74.0 percent. Lowry et al.’s study is limited in that data are self-reported and the YRBS does not ask specific questions regarding school PE class policy or the type of instruction students received (Lowry et al., 2001).
Caspersen et al. (1999) also used the YRBS data set as a basis for physical activity research, however this research team compared 1992 data to 1991 Health Promotion/Disease Prevention data for adults to obtain a cross-sectional effect. Like Lowry et al. (2001), Caspersen et al. (1999) found a consistent decrease in physical activity between the ages of 12 and 21. Further, this decline continued through early adulthood, which slightly overlaps the YRBS by including ages 18 through 29, until it gradually stabilized and potentially increased after age 30. Caspersen and colleagues also determined the significant difference seen between male and female participation in vigorous activities continues into adulthood. Among adolescent respondents, 11.3 percent more males than females reported regular, vigorous physical activity. Adult men participated in regular, sustained activity and strengthening exercises at rates 5.5 percent and 18.2 percent greater than adult females, respectively (Caspersen et al., 1999).

Lowry et al. (2001) and Caspersen et al. (1999) point out striking differences between activity during early adolescence and late adolescence, or even adulthood, as well as between males and females. However, some feel even these attention-getting reports underestimate the true depth of this problem. Research comparing the YRBS methods to standardized methods, such as heart rate monitors and/or doubly labeled water, suggests YRBS outcomes greatly overestimate actual physical activity participation (Strauss et al., 2001 and Livingstone et al., 1992).

Armstrong et al. (2000) utilized continuous heart rate monitoring to examine the frequency, intensity, and duration of physical activity among sixth grade students.
(mean age 11.1 ± 0.4 years) in the United Kingdom. Body composition data was also
collected. Subjects were followed over a three-year period. For each data collection
point, males (N = 104, 73, and 81 for study years 1, 2, and 3, respectively) spent a
significantly greater percentage of their time participating in moderate and vigorous
activities than their female counterparts (N = 98, 70, and 79 for study years 1, 2, and 3,
respectively). However, for both males and females, moderate and physical activity
declined over the three-year study period. Males decreased from spending 9.18 ± 4.52
percent of their time moderately exercising and 4.36 ± 2.75 percent of their time
vigorously exercising during year 1 to 5.94 ± 2.66 percent of time moderately
exercising and 2.54 ± 1.53 percent of time vigorously exercising in year 3. Among
females, the percent of time spent moderately exercising decreased from 7.33 ± 4.25
percent to 4.27 ± 2.06 percent over three years, while percent of time spent vigorously
exercising slipped from 2.93 ± 2.99% to 1.60 ± 1.06 percent. Body mass and
anthropometric measures did not significantly correlate to the amount of time students
spent exercising. Overall, this study demonstrates a marked decline in physical
activity during early adolescence, however it was unable to establish relationships
between physical activity and physical fitness indicators. Additionally, the study did
not examine long-term outcomes of physical activity declines, such as implications
upon adult physical activity and health (Armstrong et al., 2000).

Studies denote lack of structured school physical education classes as a
contributor to decreased physical activity among adolescents. Lowry et al. (2001)
found that 94 percent of high schools in the United States requires their students to
enroll in at least one physical education (PE) class during their high school career. However, only 67 percent of PE class requirements are met. Only two percent of high schools require four years of PE class participation while 23 percent allow other classes, including band, cheerleading, and chorus, to meet PE requirements.

Self Esteem, Self Efficacy, and Body Image

Self-esteem, self-efficacy, and body image are difficult to separate; discussion of one factor naturally leads to discussion of the others. Particularly for adolescent females, the link between self-esteem, body image, and eating behaviors becomes extremely important. This may be attributed to the marked increase in body fat females encounter during adolescence. Prior to the onset of puberty, females, like their male counterparts, have approximately 8 percent body fat. This increases to approximately 22 percent by the end of puberty (Killen et al., 1993).

According to Harter and Rosenberg (1990), self-esteem is made up of two elements important to food behaviors and body satisfaction. These include how a person believes others of importance view him/her as well as how a person performs at a task viewed as personally important. This, in part, explains why confidence in "the way I look" was the most important determinant of self-worth for white middle school-aged females (American Association of University Women, 1990), as this statement reflects an element of how these students believed themselves to be perceived by others.
Self-esteem was one of several components examined by The National Longitudinal Study of Adolescent Health, a study designed to collect data regarding social and physical factors impacting adolescents. A subset of data, reported by Pesa (1999), illustrated a link between self-esteem and eating behaviors. Of the 2,536 adolescent females responding to questionnaires, 56 percent indicated unspecified eating disturbances. Within this grouping, 43 percent were classified as having low self-esteem based upon the Rosenberg Self-Esteem Scale.

Cusatis and Shannon (1996) found statistical ties between self-efficacy and eating behaviors in their study of seventh and tenth graders. Strong predictors of students obtaining adequate daily food intakes to meet requirements included a number of nutrient dense snacks, parental influence, and self-efficacy. The students’ confidence in their abilities also negatively correlated with their consumption of high sugar snacks. These findings suggest students who exhibit positive personal beliefs make healthier nutrition choices.

Cusatis and Shannon were unable to show relationships between body image and eating behaviors; however, previous studies by Tobin-Richards et al. (1983) and Wardle and Beales (1986) suggested such relationships exist. Females generally exhibit increased levels of body image dissatisfaction, which has been correlated to increased use of restrictive eating behaviors for weight management.

O’Dea (1999) also noted connections between body image and restrictive eating practices. Questionnaires and focus group results demonstrated females were
more likely to restrict eating due to weight concerns. Interestingly, mothers were more likely to restrict a daughter's food choices than a son's food choices.

Eating Disorders

An eating disorder may be defined as, "...an excessive preoccupation with the figure and control of body weight, together with a markedly insufficient and/or irregular food intake" (Martin et al., 1999). More specifically, two of the most common eating disorders include anorexia nervosa, characterized by a refusal to maintain a minimally normal body weight accompanied by a distorted body image, and bulimia nervosa, which involves repeated episodes of binge eating followed by compensatory behaviors such as vomiting or use of laxatives (Whitney and Rolfes, 1996).

Aside from the personality of the individual and contributing familial factors, such as genetic influence, researchers have begun to examine the impact other factors may have upon disordered eating patterns. For example, in a questionnaire-centered study, Martin et al. (1999) recently examined body dissatisfaction, the use of a strict, slimming diet, and media/peer influence upon disordered eating patterns. Among girls exhibiting altered eating patterns, only 17.7 percent were moderately or aesthetically obese while 26.8 percent were underweight and 55.4 percent were of an appropriate weight. The altered eating behavior was not justified by a real need to lose weight. Distorted body image was strongly related to eating patterns as evidenced by the
increased number of times subjects with altered eating behaviors reported to view themselves in mirrors as opposed to individuals with normal eating behaviors.

**Intervention Programs for Adolescents**

Studies vary in their approach and scope regarding nutrition research. Some studies, such as the Child and Adolescent Trial of Cardiovascular Health (CATCH) study (Dwyer et al., 2002), address only one aspect of health, in this case, food choices to decrease cardiovascular disease risk. Other studies, such as the Teen Activity Project (TAP) (Leslie et al., 1999), are multifaceted, involving nutrition, physical activity, and self-esteem. These studies, and others, will be discussed below, because investigating previous nutrition education study outcomes will help determine the direction nutrition education and research should take in the future.

**Nutrition Focused Intervention**

The multi-center Child and Adolescent Trial of Cardiovascular Health (CATCH) study was aimed at providing heart-healthy nutrition education to male and female students in grades three to five at 96 elementary schools across the United States. To determine long-term impacts of this intervention, the study tracked a subset of subjects was tracked over three years. Researchers found subjects who received nutrition education intervention and those in the control group did not vary significantly in terms of their overall food group consumption. However, students in the CATCH intervention group consumed significantly less fat and saturated fat, two
factors strongly emphasized in the education materials (Dwyer et al., 2002). Thus, this program positively impacted the youth involved by effectively influencing their food choices.

Gortmaker et al. (1999) are one of few research groups to explore the impact of long-term school-based nutrition education interventions aimed at reducing obesity. The research team evaluated the effectiveness of Planet Health, a two-year curricula incorporated into five subject areas. Subjects included 1,295 ethnically diverse sixth and seventh graders from ten public schools. Students from five schools were placed in the intervention group, and students from the remaining five schools were placed in the control group. Curricula focused upon decreasing television viewing and high fat food consumption while increasing fruit and vegetable consumption and physical activity. Obesity, hours of television viewing, dietary intakes, and physical activity levels were evaluated prior to and following the intervention. Researchers defined obesity using several measures including body mass index and a triceps skin fold greater than or equal to those specified for age and gender at the 85th percentile. Prevalence of obesity was significantly reduced among females within the intervention group, however it increased 2.2 percent among females in the control group. Additionally, females in the intervention group significantly increased the consumption of fruits and vegetables. There were no significant differences in prevalence of obesity or fruit and vegetable intakes among intervention and control
group males. Both males and females significantly decreased television viewing hours per day. Although differences between schools were statistically minimized, such differences limit the generalizability of these results.

**Self-Esteem, Body Image, and Eating Disorder Focused Intervention**

Some researchers (Carter et al., 1997; Killen et al., 1993) have argued that traditional information-giving approaches utilized in many interventions lack efficacy or ultimately do more harm than good. It has been suggested traditional methods introduce young people to unhealthy eating behaviors and essentially provide youth with a how-to guide to eating disorder development.

Killen et al. (1993) are one of the first research teams to evaluate the efficacy of traditional teaching methods in modifying eating attitudes and behaviors of adolescent females within the confines of a controlled study. A total of 931 sixth and seventh grade students completed the study. Students either took part in regular classroom activities (the control group) or in a healthy weight regulation program. The subjects in the intervention group received an 18-session didactic instruction. All subjects completed anthropometric, demographic, and questionnaire data prior to and following the intervention as well as at intervals of 7, 14, 18, and 24 months.

Questionnaires included the Eating Disorder Inventory, a dietary restraint scale, and a nutrition knowledge test. Additionally, at baseline subjects took part in structured clinical interviews to evaluate eating disorder symptoms. Those with multiple disordered eating behaviors were considered at high risk. While nutrition
knowledge improved significantly among intervention group subjects as compared to those in the control group, other measures were unchanged as a result of receiving the intervention. Among high-risk subjects, those receiving the intervention demonstrated fewer eating disorder tendencies, however they were not significantly lower than those in the control group. Thus, Killen et al. (1993) concluded traditional nutrition education programs aimed at modifying eating behaviors and attitudes lacked efficacy.

Carter et al. (1997) further suggested traditional nutrition education methods could result in the development of unhealthy eating behaviors. In Carter et al.'s pilot study of a cognitive-behavioral based eating disorder intervention, researchers unexpectedly found an increase in dietary restraint practices among study participants. The study involved 50 females with a mean age of 13.1 years who attended eight weekly classes for 45 minutes. The classes consisted of didactic teaching, small group discussion, role-playing, and homework assignments. Subjects completed a knowledge questionnaire, the self-report Eating Disorder Examination (EDE-Q) and the child Eating Attitudes Test (EAT) prior to and following intervention as well as at a six-month follow-up testing. Knowledge significantly increased from baseline to the post-intervention testing, and despite a slight decrease at the 6-month follow-up, this increase in nutrition knowledge remained statistically significant. Post-intervention, both the EDE-Q global score and the EAT score were significantly decreased. However, at the six-month follow-up, scores were at or higher than pre-intervention levels. Most concerning, the EDE-Q dietary restraint subscale was significantly higher than baseline at the six-month follow-up assessment. These results suggest the
subjects may have used the information provided in this program to more effectively limit their food intake, rather than decrease their restrictive eating habits as the researchers had intended. This study has potentially far reaching implications for nutrition educators, however these implications are limited by the narrow scope of this study, the small sample size, and absence of a control group. In addition to these limiting research design factors, intervention group subjects were asked to track their food intakes for a two-week period, which may have exaggerated shape, weight, and intake concerns (Carter et al., 1997).

Carter’s research group repeated this study (Stewart et al., 2001) with a larger intervention group consisting of 459 female students and a control group consisting of 386 female students. The subjects had a mean age of 13.4 years, and there were no significant differences between the study and control groups. Similar to their previous intervention, the program was highly interactive with role-playing, group discussion, and some didactic components. Once again, subjects completed knowledge, EDE-Q, and EAT questionnaires prior to and following intervention and six months later. Like with the pilot study, EDE-Q global scores and EAT scores decreased in the intervention group immediately following intervention and then increased to near baseline at the six-month follow-up with scores remaining lower than control group scores. Unlike the previous trial, restraint subscale scores did not increase significantly above baseline at the six-month follow-up for intervention group subjects. Additionally intervention group restrain scores remained lower than control group scores. Thus, unlike the pilot study, the follow-up study demonstrated this
interaction-based design was able to realize short term, positive outcomes. Further, the larger sample involved in this trial and presence of a control group increased this study’s overall strength (Stewart et al., 2001).

In light of research indicating potential negative outcomes associated with traditional teaching methods, O’Dea and Abraham developed a multi-factorial, self-esteem based-intervention program, entitled Everybody’s Different. Unlike traditional programs, this intervention involves group activities, teamwork, games, use of drama, and role-playing. Thus the program emphasizes positive aspects of self rather than negative aspects of unhealthy behaviors. The effectiveness of this new approach was tested against traditional information-giving techniques in a study of 470 male and female middle school students (aged 11.1 to 14.5) who attended either the new, self-esteem based approach or traditional health classes. Both study groups answered questionnaires to assess their change in beliefs, self-concept, and values from baseline to unit completion and at a 12-month follow-up. Height and weight information were also obtained at each testing interval. The new intervention positively impacted body satisfaction, body image, self-concept, and eating attitudes among both males and females. However, there were no significant differences between anthropometric data and weight loss practices. Influence upon body image and eating attitudes were still apparent at the 12-month follow up, particularly among students identified as being at high-risk (O’Dea and Abraham, 2000).

Recognizing possible shortcomings of prior research that indicated negative outcomes due to traditional teaching methods (Carter et al., 1997; and Killen et al.,
1993) Santonastaso et al. (1999) conducted a controlled study involving both didactic and interactive components to explore the impact of such interventions in mid-adolescent females. The study involved 308 female subjects with average age 16.1 who were divided evenly into intervention and control groups. The intervention consisted of a two-hour class that met once a week for four weeks. The control group participated in their regularly planned class activities. All students completed the Eating Attitudes Test (EAT) and the Eating Disorder Inventory (EDI) prior to intervention and one year after intervention. The follow-up included 265 students (86% of the original sample). Students were considered “low-risk” if their baseline EAT score was <30 and “high-risk” if their baseline EAT score was >30.1. Within the “low-risk” intervention group, EDI body dissatisfaction and EDI interpersonal distrust were significantly lower at the follow-up testing. EDI interpersonal distrust was also significantly lower among the “low risk” control group as well. No significant changes were seen within “high-risk” intervention or control groups. This study indicates intervention may be most effective among low-risk students. While the intervention did not have a significantly positive impact, it did not negatively impact students either.

**Physical Activity Based Programs**

Like “Everybody’s Different,” the Teen Activity Project (TAP) attempted to build self-esteem while encouraging healthy eating habits and physical activity. An initial, information-gathering stage involved focus group discussion among female
African American and Latina middle school students and their mother and/or grandmother. The focus groups identified barriers to physical activity, such as self-consciousness when exercising with boys, dissatisfaction with the current program, unwillingness to mess up hair and makeup, and a lack of role models, as well as incentives, such as improved physical appearance and self-confidence. In response to the information provided during the focus groups, an innovative after-school dance program was developed. This program stressed proper diet and healthy lifestyle choices. Participants demonstrated improved knowledge in the areas of physical fitness and food choices. Self-esteem and willingness to participate in physical fitness increased notably, however, actual food and exercise choices were slow to reflect new knowledge and skills (Leslie et al., 1999).

Importance of this Research Study

Adolescent eating behaviors not only affect an adolescent's current status, but also involve future health implications. While many studies have attempted to determine underlying factors influencing adolescents' food choices, many questions remain. Just as previous studies have examined adolescents in particular regions of the U.S., and at times regions of the world, this study seeks to determine the nutritional status of middle-school students in Tuscarawas County, Ohio. Further, the researchers conducting the proposed study hope to advance the ideas currently in progress, thus furthering the field of adolescent nutrition.
CHAPTER 3

METHODS

The purpose of this study was to explore relationships among nutrition knowledge, self-esteem, body image, eating attitudes, self-reported dietary intake and physical activity levels, and attitude toward and knowledge of exercise. Additionally, this study was intended to explore the effect of traditional nutrition education upon nutrition knowledge. This study was granted approval by The Ohio State University Biomedical Sciences Review Committee (Appendix A).

The Study Population

The target population for this study was seventh grade students. Youth in this grade are typically between 12 and 14 years of age, and thus are at the threshold of adolescence. They are beginning to explore the freedoms and liberties that accompany Junior High or Middle School status, including increased input regarding decisions which will ultimately impact their future. These newfound responsibilities often lead to impulsive behaviors for which teenagers are well known. Although adolescents have a general realization that specific actions lead to specific outcomes, they struggle
to apply these observations to their own lives. In short, teens generally radiate the impression that they are “invincible,” and bad things cannot happen to them.

Despite their impulsive actions and invincible façade, students at this age have an adequate natural/earth science base upon which applied science concepts can be built. Cognitive development, including the understanding of abstract concepts and cause-effect relationships, begins during early adolescence (Mitchell, 1997). Students gain increased recognition of their options as well as the consequences of their actions. While the consequences of good or poor nutrition lack immediacy, adolescence remains an important time of intervention since teenagers are in the process of forming lifelong opinions and habits. Thus, this group was an interesting, though challenging, population for the study of nutrition and physical activity perceptions, attitudes, and knowledge.

Subjects

The researcher approached administrators from two middle schools in Tuscarawas County, Ohio, regarding the proposed study. Claymont Middle School, located in Dennison, has an average enrollment of 577 students with approximately 16 students per class and an average expenditure of $5,901 per pupil. Welty Middle School, located in New Philadelphia, has an average enrollment of 716 students with approximately 33 students per class and an average expenditure of $5,295 per pupil (Ohio Department of Education Local Report Card, 2001). Previously established relationships between the researcher and both schools led to increased communication
regarding desired nutrition intervention discussion topics and decreased the length of
time required for administrators to grant the researcher permission to conduct the
study within the schools' seventh grade classes. Letters of Support from School
Administrators to the Biomedical Review Committee are located in Appendix B.

Within these schools, six teachers volunteered to participate in this study.
Their classes included computer, science, life skills, and (female) physical education
at one school and combined (male and female) physical education and special
education at the other school. At the first school, the life skills class was selected
because the nutrition and physical education unit developed for this study fit well with
previously planned life skills curriculum. All students were required to take the life
skills class for a nine-week period during the school year, and scheduling allowed for
two classes of seventh graders to participate in the intervention daily. At the second
school, the physical education class was selected because all seventh grade students
were required to take it for a nine-week period during the school year, and it allowed
for a larger number of male and female subjects for the week of intervention.

Development of the Educational Activity

The researcher worked with educators at the schools to design a five-day
nutrition and physical activity intervention to complement standard classroom
activities. School administrators suggested a five-day unit because they felt this was
an appropriate amount of time to gain rapport with the students, cover the suggested
topics, and collect necessary data with minimal interruption to regular classroom activities. Teachers were agreeable to a five-day time period since the instruction fit into a one-week lesson plan.

Topics for the intervention series were determined in several ways. First, the researcher spoke with the teachers to see what topics they typically taught as part of a nutrition and exercise unit. Teachers were also asked to suggest special topics they saw as important health issues facing their students. Appropriate snacking, sports nutrition, and eating disorders were among the topics suggested. On occasion, the researcher had been invited to schools for a one-class nutrition overview. The researcher called upon these experiences, as well, to determine appropriate content. Finally, the researcher reviewed other programs designed for adolescent audiences, including the Fit Kid Connection designed by OHIO NET (Nutrition Education and Training Program) and Ohio Dairy Council and National Beef Association education materials.

School administrators, the teachers involved in data collection, six additional middle school teachers, and an expert panel consisting of five graduate students and faculty at The Ohio State University reviewed the proposed curriculum and educational materials. In particular, the middle school teachers were asked to focus upon literacy level, word choices, and appropriateness for grade level. Additionally, the instrument was pilot tested in a class of 30 students (see p. 52). Teachers, administrators, and students returned suggestions to the researcher and materials were adapted as necessary.
Ultimately, nine topics were selected for the educational intervention. These included 1) Food Guide Pyramid, 2) Serving Sizes, 3) Nutrition Labels, 4) Health Food Claims, 5) Fast Foods, 6) Snack Foods, 7) Physical Activity, 8) Sports Nutrition, and 9) Eating Disorders/Fad dieting. Hands-on activities and discussion helped students to use multiple learning pathways to incorporate nutrition and health messages. Classes lasted 50 minutes and approximately two topics were covered each day, depending on student interest and involvement. An outline was developed so all students would be exposed to specific information included on the Nutrition Knowledge Pre- and Post-tests. See Appendix F for the final five-day curriculum outline. Development of the Nutrition Knowledge test is addressed later in this chapter.

Consent

Parental consent forms (Appendix C) were required for the collection of data in this study because the subjects involved were less than 18 years of age. One month in advance of the study start date, parents received a blank consent form with an informative letter of support from their child’s teacher as well as a letter from the researcher describing the study (Appendix D). The researcher’s letter was school-specific, included the nature and goals of the research, and listed multiple means by which the researcher could be contacted with questions or concerns. It stated that participation was voluntary and, therefore, no student would be penalized for lack of participation. This point was reiterated in an oral script that was read to students prior
to the start of data collection (Appendix E). The Ohio State University Biomedical Sciences Review Committee approved the protocol prior to commencement of the research project (Appendix A).

Packets were assembled by the researcher five weeks in advance of the planned start date for each school and delivered to each of the teachers (n = 3). Each teacher willingly assumed the responsibility of sending information home to parents, addressing student/parental concerns, collecting human consent forms, and returning all consent forms to the researcher. Students and parents were assured participation in the questionnaire portions of the study was voluntary and would not impact course grades.

**Questionnaire Administration**

Prior to the nutrition and exercise education series, students with signed parental consent forms on file were given an eight-part questionnaire (Appendix G) consisting of measures for self-esteem, body image, eating attitudes, self-reported physical activity levels, and attitude toward and knowledge of nutrition and exercise (Survey I). A follow-up questionnaire (Appendix H) including a nutrition knowledge test, a food frequency questionnaire, and demographic information sheet was administered on the final day of the five-day educational program (Survey II). Completion of Survey I required approximately 35 minutes per subject while Survey II completion required approximately 10-15 minutes per subject.
Of the 168 students in the classes, a total of 157 participants (93 females and 64 males) returned signed consent forms. Eighty-one females and fifty-three males completed both portions of the questionnaire (Survey I and Survey II). An additional four females and five males completed only Survey Part I, while another eight females and six males completed only Survey Part II. Students choosing not to participate in the questionnaire portions of the study (n = 11, 3 females and 8 males) were permitted to work quietly on regular classroom assignments or participate in physical education activities in a separate gymnasium. These students either forgot to return the consent prior to the first day of data collection (n = 10) or their parents had concerns regarding the student’s involvement in a research study (n = 1). The nutrition and exercise education portion of the study was considered an element of on-going class content and all students participated.

Development of the Questionnaire

Pre-intervention and post-intervention instruments were developed for this study. The initial questionnaire (Survey I) consisted of a 116-item questionnaire intended to measure 1) eating attitudes, 2) self-esteem, 3) body image, 4) attitude toward nutrition and exercise, 5) physical activity levels, and 6) nutrition knowledge. The post-intervention instrument (Survey II) included a 58-item food frequency questionnaire and demographic information sheet as well as the 20-question nutrition knowledge test from the initial instrument. For both Survey I and II, each questionnaire portion was scored individually.
Physical Activity Knowledge and Attitudes

The first part of the pre-intervention questionnaire addressed knowledge of and attitudes toward physical activity. Six statements measured the individual's knowledge of physical activity, namely the benefits of regular physical activity, recommended frequency and duration of exercise, and exercise best for preventing heart disease. Responses to another six statements assessed attitude toward physical activity, specifically perceptions of difficulty of exercise, health risk and reaction, and barriers to exercise. Internal consistency for these variables, as represented by Cronbach's alpha, was 0.58 (Young et al, 1996). Possible answers to all statements included strongly agree (SA), agree (A), neutral (N), disagree (D), or strongly disagree (SD). Responses were scored on a Likert-type scale of 1 to 5 with a score of 5 indicating a correct or positive response and a score of 1 indicating an incorrect or negative response. Scores for the knowledge and attitude portions were totaled separately, and a score of 75 percent or greater was selected to reflect "strong" knowledge of or "positive" attitude toward physical activity. A score of 30 points was possible for both portions, with 75 percent equaling a score of 22.5.

Eating Attitudes Test

The second part of the questionnaire measured eating attitudes. It is recognized that many factors contribute to eating disturbances, including body image, weight, fatness, and self-esteem. The Eating Attitudes Test (EAT) is a 26-item instrument that has been widely used as a screening tool for eating disturbances.
Although initially developed for adult women, the validity of the 26-item EAT questionnaire for use in adolescent populations has been demonstrated by Button and Whitehouse (1981), Mann et al. (1983), and Williams et al. (1986). The test was scored on a 6-point Likert-type scale with possible responses ranging from always to never. A response of "always" was worth 3 points, an answer of "very often" was assigned a value of 2 points, and a choice of "often" received 1 point. The rest of the responses did not receive point values. A cut-off of 20 or more has been used as an indicator of a possible eating disorder (Garner et al., 1982). Furthermore, Rosen et al. (1988) suggests normative values for adolescent populations. These are 5.2 \pm 5.3 for males and 11.9 \pm 10.8 for females.

Self-Esteem

Next, the Rosenberg Self-Esteem Inventory was used to measure self-esteem, or the degree to which an individual likes or dislikes him- or herself (Rosenberg, 1979). Since an individual's self-worth may influence specific health behaviors, self-esteem was assessed to determine its degree of influence on the dietary intake, body image, and physical activity (Schaefer et al., 1999). Participants responded to 10 statements, 5 positive and 5 negative. Positive and negative questions were interspersed to decrease the likelihood of response bias. A Likert scale was used with points ranging from 1 to 4. Positively phrased questions were scored as follows: strongly agree, 4 points; agree, 3 points; disagree, 2 points; and strongly disagree, 1 point. Reverse scoring was used for negatively phrased questions, thus responses
were scored strongly disagree, 4 points; disagree, 3 points; agree, 2 points; and strongly agree, 1 point. Overall self-esteem scores were determined by summing the values for each question with a possible range of 10 to 40 points. A score of 32.5 or higher indicated high self-esteem. The reliability and validity of this instrument are well established. In a sample of 28 subjects, the test-retest reliability coefficient over 2 weeks was 0.85, and convergent validity was between 0.56 and 0.83 (Silber and Tippett, 1965).

**Body Image and Perception of Body Image**

Body image and body image perception were addressed in the next two sections. The first contains 10 statements Huddy, Nieman, and Johnson (1993) adapted from previous studies by Saltzer (1982, 1978) in which he examined Weight Locus of Control. Six statements reflecting positive feelings about body image were scored 3 points if the subject agreed, 2 points if he/she was undecided, and 1 point if he/she disagreed. Statements suggesting negative feelings toward body image (n = 4) were scored in reverse. A maximum score of 30 points reflected the most positive body image while a minimum score of 10 points reflected the least favorable body image. Internal reliability using Cronbach's alpha has been established at 0.72 (Huddy et al., 1993).

A figure rating scale was used to measure body image perception. Participants were asked to identify their current and ideal body size from a series of nine schematic figures of males/females developed by Thompson and Gray (1995). The figures range
from underweight to overweight with a corresponding number under each (10 to 90, respectively). A body image discrepancy score was calculated by subtracting the ideal score from the actual score. Thompson and Altabe (1991) reported test-retest reliabilities ranging from 0.55 to 0.71 for six different ratings in females over a two-week period.

Silhouette choosing tasks are one of the most widely used methods of assessing body image (Thompson, Penner, and Altabe, 1990). Cohn et al. (1987), Paxton et al. (1991) and Tiggemann and Dyer (1995) successfully incorporated adult figure rating scales into studies of adolescent females. Although child and adolescent scales have been developed (Tiggemann and Pennington, 1990; Phelps et al., 1993; and Sherman, Iacono, and Donnelly, 1995), these age-appropriate scales have not been shown to be more effective than generalized, adult scales in determining body image perception among adolescents 11 years of age and older (Sherman, Iacono, and Donnelly, 1995).

Physical Activity

Physical activity was measured by assessing the types and frequency of activities the subjects participated in on a weekly basis. This questionnaire was adapted from the Center for Disease Control’s Youth Risk Behavior Survey (Kann et al., 1995). While subjective in nature, the activity checklist requires little time and places few demands upon subjects (Sirard and Pate, 2001). Additionally, a correlation
of 0.74 has been reported for the weekly activity checklist format as compared to energy expenditure estimated by a 3-day Caltrac uniaxial accelerometer in a 4th grade sample (Sallis et al., 1993).

Given examples of light and strenuous activity, subjects were asked how many times per week they participated in each. Subjects were not asked to estimate the amount of time per week they devoted to selected activities. In a study of activity assessment tools, Rifas-Shiman et al., (2001) found adolescents tended to underestimate weekly physical activity in seasonal sports when responding to an annual activity checklist format, as opposed to season-specific formats. Thus, students were instructed to take into account any seasonal variations in physical activity.

Possible checklist responses included not at all (none), 1-2 times, 3-4 times, and 5-7 times per week. Light activities were arbitrarily assigned to the lower option, thus for calculation purposes a light activity was recorded as 0 (not at all), 1, 3, or 5 activity units. Strenuous activities were arbitrarily assigned to the higher option and recorded as 0 (not at all), 2, 4, or 6 activity units. The light and strenuous activity ratings were then summed to obtain an overall "activity unit" score.

Subjects were also asked to estimate the amount of time they spent in physical activity each day. This study took place during the school year, thus limiting the possible amount of daily physical activity. Based upon statistical measures, students reporting greater than 6 hours of physical activity per day were excluded from this portion of the data analysis.
**Nutrition Knowledge**

Nutrition knowledge was assessed on both the pre- and post-intervention instruments using a 20-question multiple-choice test developed by the researchers. All questions were based upon material covered in the five-day nutrition and exercise series. Questions were arranged chronologically in the same order as topics were discussed.

The number of questions pertaining to each topic area was determined by the amount of time spent discussing the topic. For example, since an entire day's lesson was devoted to the Food Guide Pyramid, including foods found within each group and significant nutrient contributions of each food group, there were six Pyramid-related questions. Additionally, there were three questions based upon fad dieting and eating disorders, two questions each for serving sizes, nutrition labels, health food claims, and physical activity, and one question each for fast foods, snacking, and sports nutrition. For each question, subjects could select one of four possible answers. Correct answers were assigned a value of 5 points. All incorrect answers were worth no points.

**Nutrition Knowledge Test Content Validity**

An expert panel including several faculty members and graduate students in the Department of Human Nutrition and Food Management as well as teachers and administrators at the two middle schools reviewed the instrument for content validity. Specifically, teachers and administrators were asked to evaluate clarity,
appropriateness, format, and literacy level for each question. Teachers completed a brief evaluation form and returned it to the researcher. The Nutrition Knowledge Test was modified prior to pilot testing based on teacher suggestions.

**Nutrition Knowledge Test Pilot Study**

A pilot group consisting of 43 students in the seventh grade computer class at Claymont Middle School took the nutrition knowledge test in a pre-test/post-test fashion with a five-day interval between each testing. There was no nutrition or physical education intervention between testing points. This class was selected for the pilot study because the students had not had life skills yet, and thus had not received intense nutrition education instruction. Additionally, there was no chance these students would be involved in the intervention group because they would remain in computer during the data collection period. An identical test format was used for both the pre- and post-test. A mean score of $7.6279 \pm 2.75$ was obtained on the first testing, and a mean score of $6.58 \pm 3.38$ was obtained on the second testing. There was no statistically significant difference between scores from test day 1 to test day 2 ($t = -1.947, p > 0.05$), suggesting nutrition and physical activity knowledge does not increase if no intervention takes place.

**Food Frequency Questionnaire**

The post-intervention survey included a National Cancer Institute (Block) food frequency questionnaire (FFQ) to assess self-reported dietary intake. Reliability for
the 62-item FFQ has been established using test-retest methods with a Cronbach’s alpha of 0.72 (Block, 1990). Although the FFQ is not the gold standard in terms of dietary assessment, Rockett and Colditz (1997) point out it is advantageous for adolescent populations in that completion is not highly demanding and the FFQ can be self-administered. The standard FFQ lacks snack foods, such as potato chips and fried foods, and therefore may underestimate intake of certain food categories. However, the FFQ’s purpose for this study was intra-group ranking and comparison of individuals’ diets, not discernment of absolute quantitative intake. Similar FFQ’s have been used for child and adolescent populations in the collection of National Health and Nutrition Examination Survey (NHANES III) as well as the Hispanic Health and Nutrition Examination Survey.

Responses to the frequency of consumption of the items on the questionnaire were analyzed for Food Guide Pyramid (FGP) group membership utilizing The Food Processor Nutrition Analysis Software version 7.8 from ESHA Research, Salem, Oregon. Nutrient and energy specific data could not be compared with previously published dietary assessments of adolescent diets because the NCI’s DietSys program, which has been validated for use with the Block FFQ, could not be obtained for FFQ analysis. However, data from the questionnaire was used to investigate relationships with other variables and as a basis for comparison with previously reported FGP consumption.

For ease of data analysis, subjects were given a Dietary Score (DS) for each food group as well as an overall dietary score. DS was based upon recommended FGP

55
intakes for each group. For example, the FGP suggests 6 to 11 servings from the grain food group. Subjects with 6 or more servings were given 1 point while subjects with less than 6 servings were given no points. Other daily food group recommendations include 3 vegetables, 2 fruits, 2 meats, and 2 milks. The “other” group should be consumed “sparingly,” thus an intake of 3 or fewer “others” was awarded 1 point while greater than 3 “others” was awarded no points. DS for each food group, and the “other” group, were summed for an overall Food Guide Pyramid Dietary Score (FGP-DS).

Additionally, Food Guide Pyramid group totals for each subject were converted to Healthy Eating Index (HEI) Food Scores to facilitate comparisons with previously reported studies involving adolescent HEI scores. The HEI uses the following recommendations: 9 grains for girls, 9.9 for boys; 4 vegetables for girls, 4.5 for boys; 3 fruits for girls, 3.5 for boys; 2 milks for girls, 3 for boys; and 2.4 meats for girls, 2.6 for boys. The “other” category was not taken into consideration for HEI Food Scores. A subject received 10 points for each food group in which the recommendation was met. Thus, a male subject eating 9.9 or more grain servings received 10 points for that food group. Subject who ate no servings for a particular food group received 0 points for that group. Scores for intermediate consumption were calculated by dividing the number of servings consumed by the number of servings recommended. The resulting number was then multiplied by 10 to attain the
food group score. For example, if a female subject ate 7 grains, the grain score would have been $7/9 \times 10 = 7.8$. Scores for each subject were summed to obtain an overall HEI Food Score. The maximum Food Score was 50.

Demographics

The final Survey II component was a one-page information sheet that included age, number of people living within the home, number of siblings, and number of meals eaten as a family per week. Subjects were also asked to rank the importance of various nutrition information sources including parents, teachers, doctors, television, radio, magazines, newspaper, and other. Ranking of these sources helped the researcher determine the importance of each source in encouraging healthy nutrition attitudes and knowledge.

Subjects were asked for self-report measures of height in inches and weight in pounds. These measures were converted to centimeters and kilograms, respectively, and used to calculate each subject's body mass index (BMI). Shannon et al., (1991) reported approximately 10 percent of adolescents failed to provide self-report height and weight data. Furthermore, non-reporters differed from their peers in that they were more likely to be male, shorter, and lighter. Younger adolescents, or those in the 12 to 13 year age group, were also more likely than older adolescents to leave height and weight questions blank. Subjects 12 to 13 years of age on average underestimated their height by 1.8 to 3.0 cm and their weight by 1.1 to 1.8 kg, possibly due to their
rapid growth and lack of body awareness. While self-reporting is of questionable reliability among young adolescents, the combination of underestimated height and weight imparts little bias upon mean BMI (Humes and Faricy, 2001).

Data Analysis

Data were numerically coded and analyzed using the SPSS version 11.0 for Windows statistics program (SPSS Inc., 2002). Descriptive statistics analyzed were means, standard deviations, and frequencies for all questionnaires. Pearson correlations coefficients and regression models were used to determine relationships between nutrition knowledge and other study factors as well as knowledge of and attitude toward physical activity and other study factors. These constructs were then compared to self-esteem, body image satisfaction, body image perception, body mass index, eating attitudes, and dietary intakes. T-tests for independent means were used to test for differences between knowledge pretest and posttest scores as well as for differences between males and females with regards to each questionnaire component. Dietary Intakes were compared to standards established by the U.S. Department of Agriculture Food Guide Pyramid guidelines. Finally a contingency table and Chi-square were used to test independence in the measures change in nutrition knowledge and dietary intakes.
CHAPTER 4

RESULTS

Data were collected prior to intervention (Survey I) and on the last day of intervention (Survey II). Survey I included the Nutrition Knowledge Questionnaire, Body Image Questionnaire, Body Image Perception Figure Rating Scale, Rosenberg Self-Esteem Inventory, Eating Attitudes Test, Physical Activity Attitudes and Knowledge Questionnaire, and Physical Activity Checklist. Survey II included the Nutrition Knowledge Questionnaire (identical to Survey I questionnaire), Food Frequency Questionnaire, and the Demographic Data Sheet. See Table 1. Each questionnaire was scored independently. Results of responses on individual questionnaires are reported, followed by correlation data. A summary of the order in which the descriptive and correlation data are discussed appears in Table 2.

<table>
<thead>
<tr>
<th>Survey I</th>
<th>Survey II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nutrition Knowledge Questionnaire</td>
<td>Nutrition Knowledge Questionnaire</td>
</tr>
<tr>
<td>Body Image Questionnaire</td>
<td>Food Frequency Questionnaire</td>
</tr>
<tr>
<td>Body Image Perception Figure Rating Scale</td>
<td>Demographic Data Sheet</td>
</tr>
<tr>
<td>Rosenberg Self-Esteem Inventory</td>
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<tr>
<td>Eating Attitudes Test</td>
<td></td>
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<tr>
<td>Physical Activity Attitudes and Knowledge</td>
<td></td>
</tr>
<tr>
<td>Physical Activity Checklist</td>
<td></td>
</tr>
</tbody>
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Table 1: Survey I and II Content Areas

59
<table>
<thead>
<tr>
<th>Descriptive Information</th>
<th>Correlation Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>* Subjects</td>
<td>* Nutrition Knowledge v. Physical Activity Knowledge and Attitudes</td>
</tr>
<tr>
<td>* Nutrition Knowledge Pretest and Posttest</td>
<td>* Baseline Nutrition Knowledge and Dietary Intakes</td>
</tr>
<tr>
<td>* Dietary Intakes</td>
<td>* Nutrition Knowledge Change and Dietary Intakes</td>
</tr>
<tr>
<td>* Food Guide Pyramid Groupings</td>
<td>* Physical Activity Behaviors and Dietary Intakes</td>
</tr>
<tr>
<td>* Healthy Eating Index</td>
<td>* Body Image, Body Image Perception, Self-Esteem, Eating Attitudes Test, Body Mass Index</td>
</tr>
<tr>
<td>* Physical Activity Opinion and Knowledge v. Reported Behavior</td>
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</tr>
<tr>
<td>* Eating Attitudes Test</td>
<td></td>
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<tr>
<td>* Rosenberg Self-Esteem Inventory</td>
<td></td>
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<tr>
<td>* Body Image Questionnaire</td>
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<tr>
<td>* Body Image Perception</td>
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<td>* Family Background</td>
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<tr>
<td>* Ranking of Nutrition Information Sources</td>
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</tbody>
</table>

Table 2: Chapter Four Descriptive and Correlation Data Summary Flowchart
Description of Subjects

Of a possible 168 subjects, 157 returned signed parental consent forms and participated in the study. Fifty-eight males and 85 females completed Survey I, and 59 males and 89 females completed Survey II (Table 1). A total of 134 subjects completed both of the surveys. Reported numbers for each questionnaire may vary as subjects had the right to leave questions unanswered if they so desired.

The Demographic Data Sheet, including age, height, and weight questions, was completed by 146 subjects. Three males and seven females were unsure of their height and/or weight status. Means include all subjects who reported their age, height, or weight, respectively. Mean age of subjects (58 males, 88 females) was 12.9 ± 0.5 years. Mean self-reported heights for males (N = 55) and females (N = 85) were 64.6 ± 3.7 inches and 60.5 ± 3.0 inches, respectively. Mean weights for males (N = 55) and females (N = 81) were 127.7 ± 28.3 pounds and 110.0 ± 21.9 pounds, respectively. Mean Body Mass Index (BMI) for males and females 21.5 ± 4.1 kg/m² and 19.86 ± 3.5 kg/m², respectively, indicating desirable weight for height (BMI < 25 kg/m² for males and <26 kg/m² for females based on CDC growth charts at the 95th percentile). See Table 3.
<table>
<thead>
<tr>
<th>Sex</th>
<th>N</th>
<th>Age ± SD (Years)</th>
<th>N</th>
<th>Height ± SD (Inches)</th>
<th>N</th>
<th>Weight ± SD (Pounds)</th>
<th>N</th>
<th>BMI ± SD (Kg/m²)</th>
<th>Range of BMI</th>
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</thead>
<tbody>
<tr>
<td>Male</td>
<td>58</td>
<td>12.9 ± 0.5</td>
<td>55</td>
<td>64.5 ± 3.7</td>
<td>55</td>
<td>127.7</td>
<td>55</td>
<td>21.5 ± 4.1</td>
<td>14.9 – 33.4</td>
</tr>
<tr>
<td>Female</td>
<td>88</td>
<td>12.9 ± 0.5</td>
<td>85</td>
<td>60.5 ± 3.0</td>
<td>84</td>
<td>110.0</td>
<td>81</td>
<td>19.86 ± 3.5</td>
<td>14.7 – 31.4</td>
</tr>
</tbody>
</table>

Table 3: Male and Female Age, Height, and Weight

**Nutrition Knowledge Questionnaire**

The Nutrition Knowledge questionnaire was administered prior to the educational intervention and at the end of the last day of intervention. The pre- and posttest were completed by 133 subjects, however statistically determined outliers (those with a −4 or greater difference in score from pretest to posttest, 4 males and 4 females) were excluded from data analysis, thus the data below include the 125 remaining subjects.

Mean scores on the Nutrition Knowledge pre- and posttests were 8.4 ± 3.1 and 11.4 ± 3.6 out of 20, respectively (Table 4). This represents a significant improvement in scores (t = 12.33, p<0.01) from pretest to posttest. When male and female data were analyzed separately, both groups achieved statistically significant improvements in scores (Table 4).
<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Pretest Score ± SD</th>
<th>Posttest Score ± SD</th>
<th>Difference ± SD</th>
<th>Paired t-test value</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>125</td>
<td>8.4 ± 3.1</td>
<td>11.4 ± 3.6</td>
<td>3.0 ± 2.8</td>
<td>t = 12.33, p&lt;0.01</td>
</tr>
<tr>
<td>Males</td>
<td>49</td>
<td>8.0 ± 3.0</td>
<td>11.1 ± 3.5</td>
<td>3.1 ± 2.9</td>
<td>t = 7.35, p&lt;0.01</td>
</tr>
<tr>
<td>Females</td>
<td>76</td>
<td>8.7 ± 3.1</td>
<td>11.7 ± 3.7</td>
<td>3.0 ± 2.7</td>
<td>t = 9.89, p&lt;0.01</td>
</tr>
</tbody>
</table>

Table 4: Mean Nutrition Knowledge Pretest and Posttest Scores for Males and Females

Males and females improved in all nine contents areas. Only one question, "Overall, the Food Guide Pyramid helps people to create diets that are (answer) varied, moderate, and balanced," was missed more on the post-test than the pre-test.

The greatest improvements for males were in the areas of food guide pyramid groups, calcium, fast foods, and eating disorders. For females, areas of greatest improvement included food guide pyramid group knowledge, calcium, lactose intolerance, health claims, and fast foods. The most improved questions for males and females, as well as the number and percent of subjects who improved, are listed in Table 5.
<table>
<thead>
<tr>
<th>Male</th>
<th>Increase</th>
<th>Female</th>
<th>Increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>10. Which of the following fluid milk products has the most calcium? Answer: they all have about the same amount.</td>
<td>17 Subjects (35%)</td>
<td>11. People in which ethnic group are least likely to have lactose intolerance? Answer: Caucasian</td>
<td>46 Subjects (61%)</td>
</tr>
<tr>
<td>12. For a food to be labeled “fat free” it must have __. Answer: &lt; 0.5 g fat.</td>
<td>17 Subjects (35%)</td>
<td>12. For a food to be labeled “fat free” it must have __. Answer: &lt; 0.5 g fat.</td>
<td>46 Subjects (61%)</td>
</tr>
<tr>
<td>2. Which of the following equals one vegetable serving? Answer: ½ cup of raw carrots.</td>
<td>14 Subjects (29%)</td>
<td>10. Which of the following fluid milk products has the most calcium? Answer: they all have about the same amount.</td>
<td>29 Subjects (38%)</td>
</tr>
<tr>
<td>1. Foods in the Breads, Cereal, and Other Grain Products group of the FGP mostly provide ___. Answer: complex carbohydrates.</td>
<td>13 Subjects (27%)</td>
<td>2. Which of the following equals one vegetable serving? Answer: ½ cup of raw carrots.</td>
<td>24 Subjects (32%)</td>
</tr>
<tr>
<td>18. __ is an eating disorder in which a person eats a lot of food and then causes them-selves to vomit to get rid of the food they have eaten. Answer: bulimia nervosa.</td>
<td>12 Subjects (24%)</td>
<td>14. A hamburger, small shake, and large fry would “use up” how much of the average adolescent’s daily calories? Answer 1/3 for males, ½ for females.</td>
<td>24 Subjects (32%)</td>
</tr>
<tr>
<td>14. A hamburger, small shake, and large fry would “use up” how much of the average adolescent’s daily calories? Answer 1/3 for males, ½ for females.</td>
<td>10 Subjects (20%)</td>
<td>1. Foods in the Breads, Cereal, and Other Grain Products group of the FGP mostly provide ___. Answer: complex carbohydrates.</td>
<td>21 Subjects (28%)</td>
</tr>
</tbody>
</table>

Table 5: Most Improved Nutrition Knowledge Questions and Corresponding Number and Percentage of Subjects with Improvement of a possible 49 Male and 76 Female Subjects.
Dietary Intake

Based on Food Frequency Questionnaires completed by 101 subjects, dietary intakes were estimated to be $5.4 \pm 4.6$ grain servings, $5.5 \pm 4.6$ vegetable servings, $3.1 \pm 2.6$ fruit servings, $3.4 \pm 2.9$ meat/poultry/fish/nut/legume (protein) servings, $3.0 \pm 2.4$ dairy servings, and $4.5 \pm 4.2$ snack and others (snack) servings (Table 6). Subjects consuming more total servings from all groups were more likely to consume adequate servings from each group. Vegetable intake of males was significantly greater than that of females ($t = 2.702, p < 0.01$). There were no significant differences between male’s and female’s number of servings for other food groups. See Table 6.

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Grains</th>
<th>Veg</th>
<th>Fruit</th>
<th>Meat</th>
<th>Milk</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recommended</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FGP Intakes</td>
<td>6-11</td>
<td>3-5</td>
<td>2-4</td>
<td>2-3</td>
<td>2-3</td>
<td></td>
<td>Sparingly (&lt; 3)</td>
</tr>
<tr>
<td>All Subjects</td>
<td>101</td>
<td>$5.4 \pm 4.6$</td>
<td>$5.5 \pm 4.6$</td>
<td>$3.1 \pm 2.6$</td>
<td>$3.4 \pm 2.9$</td>
<td>$3.0 \pm 2.4$</td>
<td>$4.5 \pm 4.2$</td>
</tr>
<tr>
<td>Males</td>
<td>38</td>
<td>$5.5 \pm 4.3$</td>
<td>$7.1 \pm 5.8$</td>
<td>$3.6 \pm 3.1$</td>
<td>$3.7 \pm 2.9$</td>
<td>$3.2 \pm 2.6$</td>
<td>$5.3 \pm 4.2$</td>
</tr>
<tr>
<td>Females</td>
<td>63</td>
<td>$5.4 \pm 4.8$</td>
<td>$4.6 \pm 3.4$</td>
<td>$2.8 \pm 2.1$</td>
<td>$3.2 \pm 2.9$</td>
<td>$2.8 \pm 2.3$</td>
<td>$4.0 \pm 4.1$</td>
</tr>
<tr>
<td>Significance</td>
<td>101</td>
<td>$t = 0.128, \ p = 0.898$</td>
<td>$t = 2.702, \ p &lt; 0.01^* \text{ (Statistically Significant)}$</td>
<td>$t = 1.575, \ p = 0.119$</td>
<td>$t = 0.781, \ p = 0.436$</td>
<td>$t = 0.718, \ p = 0.475$</td>
<td>$t = 1.506, \ p = 0.135$</td>
</tr>
</tbody>
</table>

Table 6: Comparison of Mean Food Group Servings for Males and Females (Mean ± SD) * Statistically Significant

Pearson correlation coefficients were used to assess relationships between individual groups of the Food Guide Pyramid. Statistically significant correlations for each food group are described both textually and visually below.
Grains

Among males (N = 38) significant, positive correlations were found between grain servings and protein, dairy, and snack servings (r = 0.430, p<0.01; r = 0.682, p<0.01; and r = 0.840, p<0.01, respectively). Figure 1. For females (N = 63), moderate, statistically significant, positive correlations were found between grain servings and vegetable, protein, dairy, and snack servings (r = 0.556, p<0.01; r = 0.621, p<0.01; r = 0.505, p<0.01; and r = 0.653, p<0.01, respectively). See Figure 2.

Figure 1: Grain Servings v. Servings from Other Groups for Males. Note: Scatter plot Fit Lines order in legend corresponds to their order of appearance on the graph.
Figure 2: Grain Servings v. Servings from Other Groups for Females. Note: Scatter plot Fit Lines order in legend corresponds to their order of appearance on the graph.

**Vegetables**

Moderate, significant, positive correlations were found between vegetable servings of males and protein and snack servings ($r = 0.439$, $p<0.01$ and $r = 0.430$, $p<0.01$, respectively). See Figure 3. In addition to the positive correlation noted above between grain and vegetable servings for females, a moderate, statistically significant, positive correlation was also found between vegetable servings of females...
and protein servings ($r = 0.601, p<0.01$). Also, a weak, statistically significant correlation was found between vegetable servings and snack servings ($r = 0.388, p<0.01$). See Figure 4.

Figure 3: Vegetable Servings v. Servings from Other Groups for Males. Note: Scatter plot Fit Lines order in the legend corresponds to their order of appearance on the graph.
Figure 4: Vegetable Servings v. Servings from Other Groups for Females. Note: Scatter plot Fit Lines order in the legend corresponds to their order of appearance on the graph.

Fruit

For males, no statistically significant relationships were found between fruit servings and servings from other food groups. See Figure 5. For females, weak, statistically significant correlations were found between fruit servings and protein and dairy servings (r = 0.273, p = 0.03 and r = 0.305, p = 0.015, respectively). See Figure 6.
Figure 5: Fruit Servings vs. Servings from Other Groups for Males. Note: Scatter plot Fit Lines order in legend corresponds to their order of appearance on the graph.
Figure 6: Fruit Servings v. Servings from Other Groups for Females. Note: Scatter plot Fit Lines order in legend corresponds to their order of appearance on the graph. Others and Vegetables appear as one line.

Protein

In addition to moderate, significant, positive correlations reported above between protein servings and grain and vegetable servings for males, a moderate, significant, positive correlation also existed between protein servings and snack servings ($r = 0.423$, $p<0.01$). See Figure 7. Meat servings for females positively correlated with servings from every other group (Pearson correlation coefficients
listed in Figure 8, below). This may suggest females consume protein in mixed dishes and/or females who eat protein generally consume a wider variety of foods than those who limit protein servings.

![Graph showing correlation between Protein Servings and Comparison Group Servings](image)

**Figure 7:** Protein Servings v. Servings from Other Groups for Males. Note: Scatter plot Fit Lines order in legend corresponds to their order of appearance on the graph.
Figure 8: Protein Servings v. Servings from Other Groups for Females. Note: Scatter plot Fit Lines order in legend corresponds to their order of appearance on the graph.

Dairy

Moderate, statistically significant, positive correlations were found between dairy group servings and grain and snack servings for males ($r = 0.682$, $p < 0.01$ and $r = 0.621$, $p < 0.01$, respectively). See Figure 9. For females, moderate, statistically significant, positive correlations were found between dairy group servings and grain, fruit, protein, and snack servings (snack servings, $r = 0.550$, $p < 0.01$). See Figure 10.
Figure 9: Dairy Servings v. Servings from Other Groups for Males. Note: Scatter plot Fit Lines order in legend corresponds to their order of appearance on the graph.
Snacks and Other Items

Moderate, statistically significant, positive correlations were found between snack group servings and vegetable, protein, and dairy servings for males (Pearson r values previously reported). A strong, statistically significant, positive correlation was found between snack group servings and grain servings (Pearson r values previously reported). See Figure 11. For females, moderate, statistically significant, positive correlations were found between snack group servings and grain, vegetable, protein,
and dairy servings (Pearson r values previously reported). See Figure 12.

Interestingly, snack servings did not correspond with fruit servings for males or females.

Figure 11: Snack Servings v. Servings from Other Groups for Males. Note: Scatter plot Fit Lines order in legend corresponds to their order of appearance on the graph.
Juice, Milk, and Soft Drink Intakes

Juice, milk, and soft drink intakes were considered on an individual basis. The FFQ defines a soft drink as a non-diet carbonated beverage. Males consumed a mean of $1.6 \pm 2$ juice, $1.7 \pm 1.5$ milk, and $1.3 \pm 1.7$ soft drink servings daily. There were no significant correlations between juice, milk, or soft drink consumption. Females consumed a mean of $1.2 \pm 1.2$ juice, $1.7 \pm 1.7$ milk, and $1.2$ soft drink servings daily.
There was an unexpected moderate positive correlation between milk and pop consumption for females ($r = 0.338, p < 0.01$, Table 7). Such findings indicate soft drink and juice consumption did not limit milk consumption among subjects.

<table>
<thead>
<tr>
<th></th>
<th>Juice</th>
<th>Milk</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Males</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Milk</td>
<td>$r = 0.097, p = 0.561$</td>
<td></td>
</tr>
<tr>
<td>Pop</td>
<td>$r = -0.093, p = 0.580$</td>
<td>$r = 0.238, p = 0.149$</td>
</tr>
<tr>
<td><strong>Females</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Milk</td>
<td>$r = 0.218, p = 0.087$</td>
<td></td>
</tr>
<tr>
<td>Pop</td>
<td>$r = 0.156, p = 0.222$</td>
<td>$r = 0.338, p &lt; 0.01^*$</td>
</tr>
</tbody>
</table>

Table 7: Correlations between Milk, Soft Drink, and Juice Consumption for Males and Females * Statistically Significant

**Healthy Eating Index**

Food Guide Pyramid intake information was converted to Healthy Eating Index (HEI) equivalents, as described in Chapter 3. A single sample t-test was used to compare HEI equivalents with the CATCH study’s non-intervention control group consisting of 605 8th grade students (Dwyer et al., 2002). Subjects in the present study consumed significantly more vegetables, fruits, and meats than those involved in the CATCH study control group ($t (100) = 10.7, p<0.01$; $t (100) = 7.145, p<0.01$; and $t (100) = 8.625, p<0.01$, respectively). See Table 8.
<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Grains</th>
<th>Vegetables</th>
<th>Fruit</th>
<th>Meat</th>
<th>Milk</th>
</tr>
</thead>
<tbody>
<tr>
<td>CATCH HEI</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control Group</td>
<td>101</td>
<td>4.8</td>
<td>4.9</td>
<td>4.5</td>
<td>5.7</td>
<td>7.4</td>
</tr>
<tr>
<td>All Subjects</td>
<td>101</td>
<td>4.9 ± 3.1</td>
<td>7.9 ± 2.8</td>
<td>6.8 ± 3.2</td>
<td>7.9 ± 2.6</td>
<td>7.6 ± 3.0</td>
</tr>
<tr>
<td>t test</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>significance</td>
<td>101</td>
<td>t = 0.388, p = 0.699</td>
<td>t = 10.741, p &lt; 0.01</td>
<td>t = 7.145, p &lt; 0.01</td>
<td>t = 8.625, p &lt; 0.01</td>
<td>t = 0.792, p = 0.430</td>
</tr>
</tbody>
</table>

Table 8: Correlation of HEI Equivalents and CATCH Study Non-intervention Control Group Data (Mean ± SD) for all subjects.

**Physical Activity Opinion and Knowledge**

The Physical Activity Opinion and Knowledge Questionnaire was completed by 143 subjects (58 males and 85 females). As a combined group, subjects had a mean score of 22.3 ± 3.6 out of a possible 30 on the opinion portion, 21.8 ± 2.7 out of 30 on the knowledge portion, and 44.2 ± 5.1 out of 60 on the test as a whole.

Although mean scores were just under the 22.5 and 45-point cut-off indicating strong knowledge or attitude toward physical activity, 37.1% of subjects indicated strong positive opinions toward physical activity, 25.9% demonstrated accurate knowledge of physical activity. See Table 9.

Male subjects (N = 58) had a mean score of 21.9 ± 3.6 on the opinion portion, with 34.5% of male subjects reflecting strong, positive opinions. The mean score for males on the knowledge portion was 21.8 ± 2.7. In this area, 20.7% of male subjects demonstrated strong knowledge. See Table 9. Distribution of male opinion and knowledge scores are shown in Figures 13 and 14, respectively.
Female subjects (N = 85) achieved higher, though not statistically significant, scores than males for both physical activity opinion and knowledge. Mean female physical activity scores were 22.6 ± 3.5 for opinion, 21.9 ± 2.8 for knowledge, and 44.5 ± 5.2 overall. Findings are summarized in Table 9. Score distribution for physical activity opinion and knowledge shown on Figures 15 and 16, respectively.
### Opinion Scores for Females

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Mean Opinion +1 SD</th>
<th>% High Opinion</th>
<th>Mean Knowledge +1 SD</th>
<th>% High Knowledge</th>
<th>Mean Total Score +1 SD</th>
<th>% High Total Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Subjects</td>
<td>143</td>
<td>22.3 ± 3.6</td>
<td>37.1</td>
<td>21.8 ± 2.7</td>
<td>25.9</td>
<td>44.2 ± 5.1</td>
<td>41.3</td>
</tr>
<tr>
<td>Males</td>
<td>58</td>
<td>21.9 ± 3.6</td>
<td>34.5</td>
<td>21.8 ± 2.7</td>
<td>20.7</td>
<td>43.6 ± 5.1</td>
<td>32.8</td>
</tr>
<tr>
<td>Females</td>
<td>85</td>
<td>22.6 ± 3.5</td>
<td>38.8</td>
<td>21.9 ± 2.8</td>
<td>29.4</td>
<td>44.5 ± 5.2</td>
<td>47.1</td>
</tr>
</tbody>
</table>

Table 9: Means and Percentiles for Scores of Physical Activity Opinion and Knowledge by Males and Females.

**Physical Activity Behaviors**

Physical activity was defined as bodily exertion for the sake of health, and activity units were defined as the number of activities in which a subject reported taking part during the period of 1 week. Males and females reported 25.8 ± 12.4 and 25.0 ± 10.3 activity units per week and 3.9 ± 2.1 and 3.6 ± 2.2 hours of physical activity per week, respectively. Independent t-tests were calculated to compare mean male and female physical activity units and male and female hours of activity per week. No significant differences were found (Table 10).
Table 10: Activity Units and Hours of Activity Reported by Males and Females

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Activity Units Per Week</th>
<th></th>
<th>N</th>
<th>Hours of Activity Per Week</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males</td>
<td>58</td>
<td>25.8 ± 12.4</td>
<td>43</td>
<td>3.9 ± 2.1</td>
<td></td>
</tr>
<tr>
<td>Females</td>
<td>85</td>
<td>25.0 ± 10.3</td>
<td>76</td>
<td>3.6 ± 2.2</td>
<td></td>
</tr>
<tr>
<td>Significance</td>
<td>143</td>
<td>t = 0.397, p = 0.69</td>
<td>119</td>
<td>t = 0.849, p = 0.40</td>
<td></td>
</tr>
</tbody>
</table>

Independent t-tests were used to compare mean light and strenuous activity among males and females. A significant difference between the two groups was found for light activity (t = 4.78, p < 0.01). Mean male light activity (3.9 ± 0.5 units) was significantly greater than the mean female light activity (2.8 ± 0.3 units). No significant difference was found between males and females for strenuous activity (t = 1.03, p > 0.05). See Figure 17 and Table 11.

![Figure 17: Participation in Light and Strenuous Physical Activity among Males and Females](image-url)
<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Light Activity Mean ± SD</th>
<th>Strenuous Activity Mean ± SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males</td>
<td>58</td>
<td>3.9 ± 0.5</td>
<td>10.4 ± 1.4</td>
</tr>
<tr>
<td>Females</td>
<td>85</td>
<td>2.8 ± 0.3</td>
<td>9.3 ± 1.0</td>
</tr>
<tr>
<td>Significance</td>
<td>143</td>
<td>t = 4.78, p &lt; 0.01</td>
<td>t = 1.03, p &gt; 0.05</td>
</tr>
</tbody>
</table>

Table 11: Mean Weekly Units of Light and Strenuous Activity of Males and Females * Statistically Significant

Based on reported activities, both male and female subjects appear to have favored individual exercise over team sports, indicating subjects did not rely upon organized sport activity for their daily physical activity.

<table>
<thead>
<tr>
<th>Ranking</th>
<th>Males</th>
<th>Females</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Fishing</td>
<td>Jogging</td>
</tr>
<tr>
<td>2</td>
<td>Biking</td>
<td>Swimming</td>
</tr>
<tr>
<td>3</td>
<td>Swimming</td>
<td>Biking</td>
</tr>
<tr>
<td>4</td>
<td>Weight Training</td>
<td>Bowling</td>
</tr>
<tr>
<td>5</td>
<td>Jogging</td>
<td>Volleyball</td>
</tr>
<tr>
<td>6</td>
<td>Baseball</td>
<td>Baseball</td>
</tr>
<tr>
<td>7</td>
<td>Bowling</td>
<td>Other Strenuous Activities (i.e. Basketball)</td>
</tr>
<tr>
<td>8</td>
<td>Other Light Activities (i.e. Walking)</td>
<td>Aerobic Activity</td>
</tr>
<tr>
<td>9</td>
<td>Other Strenuous Activities (i.e. Football)</td>
<td>Weight Training</td>
</tr>
</tbody>
</table>

Table 12: Ranking of Physical Activities for Males and Females as determined by Reported Frequency of Activity
Physical Activity Attitude, Knowledge, and Behaviors

Pearson correlation coefficients were used to evaluate relationships between attitude toward and knowledge of physical activity and actual physical activity behaviors (reported activities and hours of activity per week). Weak significant correlations were found between attitude toward physical activity and number of activities reported per week for males and females \((r = 0.287, p = 0.030\) and \(r = 0.275, r = 0.011\)). There were no other significant correlations (Table 13).

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Activity Units</th>
<th>N</th>
<th>Hours Per Week</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male PA Attitudes</td>
<td>57</td>
<td>(r = 0.287)</td>
<td>43</td>
<td>(r = -0.183)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(p = 0.030*)</td>
<td></td>
<td>(p = 0.240)</td>
</tr>
<tr>
<td>Male PA Knowledge</td>
<td>57</td>
<td>(r = 0.077)</td>
<td>43</td>
<td>(r = -0.166)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(p = 0.570)</td>
<td></td>
<td>(p = 0.287)</td>
</tr>
<tr>
<td>Female PA Attitudes</td>
<td>84</td>
<td>(r = 0.275)</td>
<td>76</td>
<td>(r = 0.097)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(p = 0.011*)</td>
<td></td>
<td>(p = 0.403)</td>
</tr>
<tr>
<td>Female PA Knowledge</td>
<td>84</td>
<td>(r = 0.207)</td>
<td>76</td>
<td>(r = 0.089)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(p = 0.058)</td>
<td></td>
<td>(p = 0.445)</td>
</tr>
</tbody>
</table>

Table 13: Correlation of Physical Activity Opinion and Knowledge and Physical Activity Behaviors of Males and Females.
* Statistically Significant

Chi-square tests of independence were utilized to further explore relationships between physical activity attitudes, knowledge, and behaviors. Using statistical percentiles, subjects were divided into two participation groups based upon their reported activities per week. Those reporting 23 or more activity units per week were considered active athletic participants while those reporting fewer than 23 activity
units per week were considered passive athletic participants. Subjects were also divided into high and low attitude/knowledge groups based upon the 22.5-point cut-off described above. No significant relationships were found for males or females in terms of attitude toward or knowledge of physical activity and actual physical fitness behavior (Tables 14 and 15).

<table>
<thead>
<tr>
<th>Male</th>
<th>Low Physical Activity Attitude</th>
<th>High Physical Activity Attitude</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passive Participants</td>
<td>N = 17</td>
<td>N = 12</td>
<td>N = 29</td>
</tr>
<tr>
<td>Active Participants</td>
<td>N = 14</td>
<td>N = 14</td>
<td>N = 28</td>
</tr>
<tr>
<td>Total</td>
<td>N = 31</td>
<td>N = 26</td>
<td>N = 57</td>
</tr>
</tbody>
</table>

Chi-square (1) = 0.427, p = 0.514; Factors are Independent

<table>
<thead>
<tr>
<th>Female</th>
<th>Low Physical Activity Attitude</th>
<th>High Physical Activity Attitude</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passive Participants</td>
<td>N = 28</td>
<td>N = 12</td>
<td>N = 50</td>
</tr>
<tr>
<td>Active Participants</td>
<td>N = 13</td>
<td>N = 14</td>
<td>N = 34</td>
</tr>
<tr>
<td>Total</td>
<td>N = 41</td>
<td>N = 43</td>
<td>N = 84</td>
</tr>
</tbody>
</table>

Chi-square(1) = 2.556, p = 0.110; Factors are Independent

Table 14: Chi-square assessment of Attitude toward Physical Activity and Athletic Participation of Males and Females.
Table 15: Chi-square assessment of Knowledge of Physical Activity and Athletic Participation of Males and Females

<table>
<thead>
<tr>
<th>Gender</th>
<th>Low Physical Activity Knowledge</th>
<th>High Physical Activity Knowledge</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Passive Participants</td>
<td>N = 20</td>
<td>N = 9</td>
<td>N = 29</td>
</tr>
<tr>
<td>Active Participants</td>
<td>N = 17</td>
<td>N = 11</td>
<td>N = 28</td>
</tr>
<tr>
<td>Total</td>
<td>N = 37</td>
<td>N = 20</td>
<td>N = 57</td>
</tr>
</tbody>
</table>

Chi-square (1) = 0.426, p = 0.514; Factors are Independent

<table>
<thead>
<tr>
<th>Gender</th>
<th>Low Physical Activity Knowledge</th>
<th>High Physical Activity Knowledge</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Passive Participants</td>
<td>N = 30</td>
<td>N = 20</td>
<td>N = 50</td>
</tr>
<tr>
<td>Active Participants</td>
<td>N = 15</td>
<td>N = 19</td>
<td>N = 34</td>
</tr>
<tr>
<td>Total</td>
<td>N = 45</td>
<td>N = 39</td>
<td>N = 84</td>
</tr>
</tbody>
</table>

Chi-square (1) = 2.052, p = 0.152; Factors are Independent

Eating Attitudes Test

A total of 142 subjects (58 males and 84 females) completed the Eating Attitudes Test. A score of 20 points or more indicates a possible eating disorder (Garner et al., 1982). Male mean score was 6.9 ± 5.6 points, and female mean score was 10.6 ± 9.6 points. Eating disorder risk was low among both groups. Male and female data were compared using a t-test for independent samples. Females, as a group, demonstrated significantly higher propensity towards disordered eating behavior (score ≥ 20) than males, as 11.9% of females indicated a possible eating disorder risk compared to 1.7% of males (t = 2.67, p < 0.01, Table 16).
<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Mean Score ± SD</th>
<th>% With Scores &gt; 20</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Subjects</td>
<td>142</td>
<td>9.06 ± 8.3</td>
<td>7</td>
</tr>
<tr>
<td>Males</td>
<td>58</td>
<td>6.9 ± 5.6</td>
<td>1.7</td>
</tr>
<tr>
<td>Females</td>
<td>84</td>
<td>10.6 ± 9.6</td>
<td>11.9</td>
</tr>
</tbody>
</table>

Table 16: Scores on the Eating Attitudes Test for Males and Females

Rosenberg Self-Esteem Inventory

The Rosenberg Self-Esteem Inventory was completed by 142 subjects (58 males and 84 females). Males reported significantly higher self-esteem than females with a mean score of 28.2 ± 6.25 for males versus 26.2 ± 7.7 for females (t = 1.68, p<0.1). The mean for males and females combined was 27.0 ± 5.7.

Subjects were classified into one of four self-esteem groups based upon quartiles: very low (10.0 – 17.5), low (17.6 – 25.0), moderate (25.1 – 32.5), and high (32.6 – 40). Twelve (14.3%) females rated themselves as having very low self-esteem, 26 (30.9%) had low self-esteem, 27 (32.2%) had moderate self-esteem, and 19 (22.6%) indicated a high level of self-esteem. For males, 2 (3.4%) were very low, 19 (32.8%) were low, 20 (34.5%) were moderate, and 17 (29.3%) were high. Overall, 14 (9.9%) were very low, 41 (28.9%) were low, 51 (35.9%) were moderate, and 36 (25.3%) were high (Table 17).
<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Mean ± SD</th>
<th>Very Low N (%)</th>
<th>Low N (%)</th>
<th>Moderate N (%)</th>
<th>High N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Subjects</td>
<td>142</td>
<td>27.0 ± 5.7</td>
<td>14 (9.9%)</td>
<td>41 (28.9%)</td>
<td>51 (35.9%)</td>
<td>36 (25.3%)</td>
</tr>
<tr>
<td>Males</td>
<td>58</td>
<td>28.2 ± 6.25</td>
<td>2 (3.4%)</td>
<td>19 (32.8%)</td>
<td>20 (34.5%)</td>
<td>17 (29.3%)</td>
</tr>
<tr>
<td>Females</td>
<td>84</td>
<td>26.2 ± 7.7</td>
<td>12 (14.3%)</td>
<td>26 (30.9%)</td>
<td>27 (32.2%)</td>
<td>19 (22.6%)</td>
</tr>
</tbody>
</table>

Table 17: Self-Esteem Inventory Means and Classifications for Males and Females

**Body Image**

A total of 143 subjects (58 males and 85 females) completed the Body Image questionnaire with a mean score of 21.6 ± 4.7 out of 30. The male group’s slightly higher scores indicated a greater body image satisfaction than was found within the female group, however these differences were not statistically significant ($t = 1.786$, $p = 0.076$, Table 18).

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Mean ± SD</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Subjects</td>
<td>143</td>
<td>21.6 ± 4.7</td>
<td></td>
</tr>
<tr>
<td>Males</td>
<td>58</td>
<td>22.5 ± 4.7</td>
<td>$t = 1.786$, $p = 0.076$</td>
</tr>
<tr>
<td>Females</td>
<td>85</td>
<td>21.1 ± 4.6</td>
<td></td>
</tr>
</tbody>
</table>

Table 18: Mean Body Image Questionnaire Scores for Males and Females

**Body Image Perception**

A total of 135 subjects indicated their current and ideal body perceptions on the body image Figure Rating Scale. Body image discrepancy was then determined by
subtracting current from ideal. Males (N = 55) had a mean current body image of 5.67 ± 1.4 and a mean ideal body image of 5.11 ± 1.1. Females (N = 80) reported a mean current body image of 3.79 ± 1.8 and mean ideal body image of 2.85 ± 1.3.

Although females reported significantly lower current and ideal body perceptions (t = 6.5, p<0.01, and t = 10.6, p<0.01, respectively), the mean difference in perceptions for males and females was not statistically significant. See Table 19 below.

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Mean Current Perception ± SD</th>
<th>Mean Ideal Perception ± SD</th>
<th>Mean Difference in Perception ± SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males</td>
<td>55</td>
<td>5.67 ± 1.4</td>
<td>5.11 ± 1.1</td>
<td>-0.56 ± 1.2</td>
</tr>
<tr>
<td>Females</td>
<td>80</td>
<td>3.79 ± 1.8</td>
<td>2.85 ± 1.3</td>
<td>-0.96 ± 1.4</td>
</tr>
<tr>
<td>Significance</td>
<td>133</td>
<td>t = 6.5, p&lt;0.01*</td>
<td>t = 10.6, p&lt;0.01*</td>
<td>t = 1.7, p = 0.083</td>
</tr>
</tbody>
</table>

Table 19: Mean score for Body Image Perceptions of Males and Females  
* Statistically Significant

Family Background

Subjects were asked how many siblings they had, including step- and half-siblings, and how many meals their family ate together each week. Subjects (54 males and 88 females) reported a mean of 2.2 ± 1.7 siblings and 5.8 ± 4.6 meals together per week. There was no correlation between number of siblings and eating meals together (r = -0.141, p = 0.094). See Table 20.
<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Mean # of Siblings ± SD</th>
<th>Mean # of Meals/Week ± SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Subjects</td>
<td>142</td>
<td>2.2 ± 1.7</td>
<td>5.8 ± 4.6</td>
</tr>
<tr>
<td>Males</td>
<td>54</td>
<td>2.1 ± 1.6</td>
<td>5.8 ± 4.1</td>
</tr>
<tr>
<td>Females</td>
<td>88</td>
<td>2.4 ± 1.8</td>
<td>5.8 ± 4.9</td>
</tr>
<tr>
<td>Correlation</td>
<td></td>
<td>Pearson r = -0.141, p = 0.094</td>
<td></td>
</tr>
</tbody>
</table>

Table 20: Number of Siblings and Family Meals Eaten Together Per Week

Interestingly, relationships were found between number of siblings and other survey factors. For males, number of siblings was moderately, negatively correlated with scores on the Nutrition Knowledge pretest \( r = -0.338, p = 0.014 \), and moderately, positively correlated with EAT scores \( r = 0.452, p < 0.01 \). For females, there was a weak negative correlation between number of siblings and Nutrition Knowledge posttest scores \( r = -0.242, p = 0.023 \).

**Ranking of Nutrition Information Sources**

Subjects ranked nutrition information sources on a scale of 1 to 8 with 1 representing the source most relied upon and 8 representing the source least relied upon. Subjects \( N=119 \) selected direct (face-to-face) sources, including parents, teachers, and doctors over media sources, including television, radio, magazines, and newspapers (Table 21). Subjects relying upon direct sources were compared to those relying upon media sources in terms of their change in nutrition knowledge. An improvement in nutrition knowledge of 4 or more points from pre-test to post-test was considered a high change in knowledge while those improving 3 or fewer points were
considered to have a low change in nutrition knowledge. None of the males relying upon media sources for nutrition information attained a high level of change in nutrition knowledge, and only 5 of the females selecting media sources had a high level of change in nutrition knowledge. These numbers are too small to compare statistically (Table 22).

<table>
<thead>
<tr>
<th></th>
<th>Males</th>
<th>Mean Score ± SD</th>
<th>Females</th>
<th>Mean Score ± SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Parents</td>
<td>2.2 ± 1.6</td>
<td>Parents</td>
<td>2.0 ± 1.4</td>
</tr>
<tr>
<td>2</td>
<td>Doctors</td>
<td>2.4 ± 1.5</td>
<td>Doctor</td>
<td>2.1 ± 1.4</td>
</tr>
<tr>
<td>3</td>
<td>Teachers</td>
<td>3.3 ± 2.0</td>
<td>Teachers</td>
<td>3.4 ± 1.6</td>
</tr>
<tr>
<td>4</td>
<td>Television</td>
<td>4.6 ± 1.8</td>
<td>Magazines</td>
<td>4.6 ± 1.7</td>
</tr>
<tr>
<td>5</td>
<td>Magazines</td>
<td>4.9 ± 1.6</td>
<td>Television</td>
<td>4.7 ± 1.7</td>
</tr>
<tr>
<td>6</td>
<td>Newspaper</td>
<td>5.6 ± 1.5</td>
<td>Radio</td>
<td>5.7 ± 1.2</td>
</tr>
<tr>
<td>7</td>
<td>Radio</td>
<td>5.8 ± 1.8</td>
<td>Newspaper</td>
<td>5.8 ± 1.5</td>
</tr>
<tr>
<td>8</td>
<td>Other</td>
<td>6.5 ± 2.2</td>
<td>Other</td>
<td>7.0 ± 1.9</td>
</tr>
</tbody>
</table>

Table 21: Ranking of Nutrition Information Sources from Most Relyed Upon (1) to Least Relyed Upon (8) with Mean Scores for Each Source Provided for Males and Females.

<table>
<thead>
<tr>
<th></th>
<th>Males</th>
<th>Direct Sources</th>
<th>Media Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low Knowledge Change</td>
<td>13</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>High Knowledge Change</td>
<td>18</td>
<td>0</td>
</tr>
<tr>
<td>Females</td>
<td>Low Knowledge Change</td>
<td>31</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>High Knowledge Change</td>
<td>27</td>
<td>5</td>
</tr>
</tbody>
</table>

Table 22: Number of Males and Females with Low and High Changes in Nutrition Knowledge who rely Upon Direct and Media Nutrition Information Sources
Examine Relationships between Study Factors

A combination of methods, including Pearson correlation coefficients, Chi-square tests of independence, linear regression models, and scatter plot evaluation, were utilized to fully examine relationships existing among various factors described above.

Pre-Intervention Nutrition Knowledge v. Physical Activity Attitudes, Knowledge, and Behaviors

Pearson correlation coefficients were calculated for relationships between pre-intervention nutrition knowledge (Pre-NK, pretest scores) and attitude toward and knowledge of physical activity as well as physical activity behaviors. For males and females, statistically insignificant trends were found for all factors (Table 23).

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Physical Activity Opinion</th>
<th>N</th>
<th>Physical Activity Knowledge</th>
<th>N</th>
<th>Activity Units</th>
<th>N</th>
<th>Hours Physical Activity/Week</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male Pre-NK</td>
<td>58</td>
<td>r = 0.190, p = 0.154</td>
<td>58</td>
<td>r = 0.109, p = 0.417</td>
<td>57</td>
<td>r = 0.190, p = 0.156</td>
<td>43</td>
<td>r = 0.197, p = 0.207</td>
</tr>
<tr>
<td>Female Pre-NK</td>
<td>85</td>
<td>r = 0.033, p = 0.766</td>
<td>85</td>
<td>r = 0.112, p = 0.306</td>
<td>85</td>
<td>r = -0.058, p = 0.601</td>
<td>76</td>
<td>r = -0.124, p = 0.287</td>
</tr>
</tbody>
</table>

Table 23: Pre-intervention Nutrition Knowledge v. Physical Activity Opinion, Knowledge, and Behaviors. Pearson r and p-values provided. * Statistically Significant
Subjects were divided into two groups based upon their Pre-NK. Subjects who scored below the 50th percentile (1 to 10 points) were considered to have low Pre-NK and those who scored above the 50th percentile (11 or more points) were considered to have high Pre-NK. Additionally, subjects were divided into high and low physical activity knowledge and attitude groups (as described previously, scores greater than 22.5 were considered high, those below 22.5 were considered low).

Chi-square tests of independence were then calculated to compare pre-intervention nutrition knowledge and attitude toward and knowledge of physical activity for males and females. With regard to physical activity attitude, no significant relationship was found for males (Chi-square = 0.014, p = 0.905) or females (Chi-square = 0.153, p = 0.696). With regard to physical activity knowledge, no significant relationship was found for males (Chi-square = 1.234, p = 0.267) or females (Chi-square = 0.088, p = 0.767). Pre-intervention nutrition knowledge and physical activity attitude and knowledge appear to be independent of each other. See Tables 24 and 25.
<table>
<thead>
<tr>
<th>Male</th>
<th>Low Physical Activity Attitude</th>
<th>High Physical Activity Attitude</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Pre-NK</td>
<td>N = 24</td>
<td>N = 16</td>
<td>N = 40</td>
</tr>
<tr>
<td>High Pre-NK</td>
<td>N = 6</td>
<td>N = 8</td>
<td>N = 14</td>
</tr>
<tr>
<td>Total</td>
<td>N = 30</td>
<td>N = 24</td>
<td>N = 54</td>
</tr>
</tbody>
</table>

Chi-square = 1.234, p = 0.267; Factors are Independent

<table>
<thead>
<tr>
<th>Female</th>
<th>Low Physical Activity Attitude</th>
<th>High Physical Activity Attitude</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Pre-NK</td>
<td>N = 29</td>
<td>N = 30</td>
<td>N = 59</td>
</tr>
<tr>
<td>High Pre-NK</td>
<td>N = 10</td>
<td>N = 12</td>
<td>N = 22</td>
</tr>
<tr>
<td>Total</td>
<td>N = 39</td>
<td>N = 42</td>
<td>N = 81</td>
</tr>
</tbody>
</table>

Chi-square = 0.088, p = 0.767; Factors are Independent

Table 24: Chi-square of the Association between Pre-intervention Nutrition Knowledge and Physical Activity Attitude for Males and Females

<table>
<thead>
<tr>
<th>Male</th>
<th>Low Physical Activity Knowledge</th>
<th>High Physical Activity Knowledge</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Pre-NK</td>
<td>N = 25</td>
<td>N = 15</td>
<td>N = 40</td>
</tr>
<tr>
<td>High Pre-NK</td>
<td>N = 9</td>
<td>N = 5</td>
<td>N = 14</td>
</tr>
<tr>
<td>Total</td>
<td>N = 34</td>
<td>N = 20</td>
<td>N = 54</td>
</tr>
</tbody>
</table>

Chi-square = 0.014, p = 0.905; Factors are Independent

<table>
<thead>
<tr>
<th>Female</th>
<th>Low Physical Activity Knowledge</th>
<th>High Physical Activity Knowledge</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Pre-NK</td>
<td>N = 32</td>
<td>N = 27</td>
<td>N = 59</td>
</tr>
<tr>
<td>High Pre-NK</td>
<td>N = 13</td>
<td>N = 9</td>
<td>N = 22</td>
</tr>
<tr>
<td>Total</td>
<td>N = 45</td>
<td>N = 36</td>
<td>N = 81</td>
</tr>
</tbody>
</table>

Chi-square = 0.153, p = 0.696; Factors are Independent

Table 25: Chi-square of Association between Pre-intervention Nutrition Knowledge and Physical Activity Knowledge for Males and Females
Post-intervention Nutrition Knowledge v. Physical Activity Attitudes, Knowledge, and Behaviors

Pearson correlation coefficients were calculated for relationships between post-intervention nutrition knowledge (Post-NK) and attitude toward and knowledge of physical activity as well as physical activity behaviors. For males a moderate, statistically significant relationship was found between Post-NK and attitude toward physical activity. No other statistically significant relationships were found for males or females between Post-NK and any other factors (Table 26).

<table>
<thead>
<tr>
<th>Male Post-NK</th>
<th>N</th>
<th>Physical Activity Opinion</th>
<th>N</th>
<th>Physical Activity Knowledge</th>
<th>N</th>
<th>Activity Units</th>
<th>N</th>
<th>Hours Physical Activity/Week</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>53</td>
<td>( r = 0.317 ) ( p = 0.021^* )</td>
<td>53</td>
<td>( r = 0.176 ) ( p = 0.207 )</td>
<td>52</td>
<td>( r = 0.208 ) ( p = 0.138 )</td>
<td>39</td>
<td>( r = -0.275 ) ( p = 0.090 )</td>
</tr>
<tr>
<td>Female Post-NK</td>
<td>80</td>
<td>( r = 0.121 ) ( p = 0.284 )</td>
<td>80</td>
<td>( r = 0.088 ) ( p = 0.438 )</td>
<td>79</td>
<td>( r = -0.021 ) ( p = 0.853 )</td>
<td>76</td>
<td>( r = -0.130 ) ( p = 0.278 )</td>
</tr>
</tbody>
</table>

Table 26: Post-intervention Nutrition Knowledge v. Physical Activity Opinion, Knowledge, and Behaviors. Pearson r and p-values provided. * Statistically Significant

Chi-square tests of independence were calculated to compare post-intervention nutrition knowledge and attitude toward and knowledge of physical activity for males and females. Subjects were divided into two groups based upon their post-intervention nutrition knowledge. Subjects who scored below the 50\(^{th}\) percentile (1 to 10 points) were considered to have low Post-NK and those who scored above the 50\(^{th}\)
percentile (11 or more points) were considered to have high Post-NK. No significant relationships were found between Post-NK and physical activity attitude or knowledge for males or females. Post-intervention nutrition knowledge and physical activity attitude and knowledge appear to be independent of each other. See Tables 27 and 28.

<table>
<thead>
<tr>
<th>Male</th>
<th>Low Physical Activity Attitude</th>
<th>High Physical Activity Attitude</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Post-NK</td>
<td>N = 14</td>
<td>N = 6</td>
<td>N = 20</td>
</tr>
<tr>
<td>High Post-NK</td>
<td>N = 13</td>
<td>N = 16</td>
<td>N = 29</td>
</tr>
<tr>
<td>Total</td>
<td>N = 27</td>
<td>N = 22</td>
<td>N = 49</td>
</tr>
</tbody>
</table>

Chi-square = 3.032, p = 0.082; Factors are Independent

<table>
<thead>
<tr>
<th>Female</th>
<th>Low Physical Activity Attitude</th>
<th>High Physical Activity Attitude</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Post-NK</td>
<td>N = 15</td>
<td>N = 14</td>
<td>N = 29</td>
</tr>
<tr>
<td>High Post-NK</td>
<td>N = 21</td>
<td>N = 26</td>
<td>N = 47</td>
</tr>
<tr>
<td>Total</td>
<td>N = 36</td>
<td>N = 40</td>
<td>N = 76</td>
</tr>
</tbody>
</table>

Chi-square = 0.357, p = 0.550; Factors are Independent

Table 27: Chi-square of the Association between Post-intervention Nutrition Knowledge and Physical Activity Attitude for Males and Females

96
<table>
<thead>
<tr>
<th>Male</th>
<th>Low Physical Activity Knowledge</th>
<th>High Physical Activity Knowledge</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Post-NK</td>
<td>N = 13</td>
<td>N = 7</td>
<td>N = 20</td>
</tr>
<tr>
<td>High Post-NK</td>
<td>N = 20</td>
<td>N = 9</td>
<td>N = 29</td>
</tr>
<tr>
<td>Total</td>
<td>N = 33</td>
<td>N = 16</td>
<td>N = 49</td>
</tr>
</tbody>
</table>

Chi-square = 0.085, p = 0.771; Factors are Independent

<table>
<thead>
<tr>
<th>Female</th>
<th>Low Physical Activity Knowledge</th>
<th>High Physical Activity Knowledge</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Post-NK</td>
<td>N = 14</td>
<td>N = 15</td>
<td>N = 29</td>
</tr>
<tr>
<td>High Post-NK</td>
<td>N = 27</td>
<td>N = 20</td>
<td>N = 47</td>
</tr>
<tr>
<td>Total</td>
<td>N = 41</td>
<td>N = 35</td>
<td>N = 76</td>
</tr>
</tbody>
</table>

Chi-square = 0.307, p = 0.436; Factors are Independent

Table 28: Chi-square of Association between Post-intervention Nutrition Knowledge and Physical Activity Knowledge for Males and Females

**Nutrition Knowledge Change v. Physical Activity Attitudes, Knowledge, and Behaviors**

Pearson correlation coefficients were calculated for relationships between nutrition knowledge change and attitude toward and knowledge of physical activity as well as physical activity behaviors. For males a moderate, negative correlation was found between hours of physical activity per week and nutrition knowledge change (r = -0.463, p < 0.01), thus those who were reported less physical activity during the week improved to a greater degree than those reporting higher levels of physical activity during the week. There were no statistically significant relationships between
nutrition knowledge change and other factors. For females statistically insignificant correlations were found between nutrition knowledge change and all factors examined (Table 29).

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Physical Activity Opinion</th>
<th>N</th>
<th>Physical Activity Knowledge</th>
<th>N</th>
<th>Activity Units</th>
<th>N</th>
<th>Hours Physical Activity/Week</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Male NK Change</strong></td>
<td>49</td>
<td>r = 0.243, p = 0.093</td>
<td>49</td>
<td>r = 0.205, p = 0.159</td>
<td>48</td>
<td>r = 0.042, p = 0.776</td>
<td>35</td>
<td>r = -0.463, p &lt; 0.01*</td>
</tr>
<tr>
<td><strong>Female NK Change</strong></td>
<td>76</td>
<td>r = 0.171, p = 0.140</td>
<td>76</td>
<td>r = 0.100, p = 0.389</td>
<td>75</td>
<td>r = 0.089, p = 0.342</td>
<td>68</td>
<td>r = 0.089, p = 0.472</td>
</tr>
</tbody>
</table>

Table 29: Nutrition Knowledge Change v. Physical Activity Opinion, Knowledge, and Behaviors. Pearson r and p-values provided. * Statistically Significant

Subjects were divided into two groups based upon their change in nutrition knowledge. Subjects who improved 4 or more points were considered to have a high degree of nutrition knowledge change (High NK), whereas subjects who improved by 3 or fewer points had a low degree of nutrition knowledge change (Low NK).

Chi-square tests of independence were then calculated to compare nutrition knowledge change and attitude toward and knowledge of physical activity for males and females. With regard to physical activity attitude, no significant relationship was found for males (Chi-square = 0.014, p = 0.905) or females (Chi-square = 0.153, p = 0.696). With regard to physical activity knowledge, no significant relationship was found for males (Chi-square = 1.234, p = 0.267) or females (Chi-square = 0.088, p =
0.767). Pre-intervention nutrition knowledge and physical activity attitude and knowledge appear to be independent of each other. See Tables 30 and 31.

<table>
<thead>
<tr>
<th>Male</th>
<th>Low Physical Activity Attitude</th>
<th>High Physical Activity Attitude</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low NK Change</td>
<td>N = 16</td>
<td>N = 9</td>
<td>N = 25</td>
</tr>
<tr>
<td>High NK Change</td>
<td>N = 11</td>
<td>N = 13</td>
<td>N = 24</td>
</tr>
<tr>
<td>Total</td>
<td>N = 27</td>
<td>N = 22</td>
<td>N = 49</td>
</tr>
</tbody>
</table>

Chi-square = 1.633, p = 0.201; Factors are Independent

<table>
<thead>
<tr>
<th>Female</th>
<th>Low Physical Activity Attitude</th>
<th>High Physical Activity Attitude</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low NK Change</td>
<td>N = 23</td>
<td>N = 17</td>
<td>N = 40</td>
</tr>
<tr>
<td>High NK Change</td>
<td>N = 13</td>
<td>N = 23</td>
<td>N = 36</td>
</tr>
<tr>
<td>Total</td>
<td>N = 36</td>
<td>N = 40</td>
<td>N = 76</td>
</tr>
</tbody>
</table>

Chi-square = 3.477, p = 0.062; Factors are Independent

Table 30: Chi-square of the Association between Nutrition Knowledge Change and Physical Activity Attitude for Males and Females
<table>
<thead>
<tr>
<th>Male</th>
<th>Low Physical Activity Knowledge</th>
<th>High Physical Activity Knowledge</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low NK Change</td>
<td>N = 17</td>
<td>N = 8</td>
<td>N = 25</td>
</tr>
<tr>
<td>High NK Change</td>
<td>N = 16</td>
<td>N = 8</td>
<td>N = 24</td>
</tr>
<tr>
<td>Total</td>
<td>N = 33</td>
<td>N = 16</td>
<td>N = 49</td>
</tr>
</tbody>
</table>

Chi-square = 0.010, p = 0.921; Factors are Independent

<table>
<thead>
<tr>
<th>Female</th>
<th>Low Physical Activity Knowledge</th>
<th>High Physical Activity Knowledge</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low NK Change</td>
<td>N = 24</td>
<td>N = 16</td>
<td>N = 40</td>
</tr>
<tr>
<td>High NK Change</td>
<td>N = 17</td>
<td>N = 19</td>
<td>N = 36</td>
</tr>
<tr>
<td>Total</td>
<td>N = 41</td>
<td>N = 35</td>
<td>N = 76</td>
</tr>
</tbody>
</table>

Chi-square = 1.245, p = 0.264; Factors are Independent

Table 31: Chi-square of Association between Nutrition Knowledge Change and Physical Activity Knowledge for Males and Females

Pre-intervention Nutrition Knowledge and Dietary Intakes

A Pearson correlation coefficient was used to determine relationships between pre-intervention nutrition knowledge and number of servings of dietary intakes. Pre-NK of males was not reflected in their (N = 34) daily intakes. Pretest scores moderately, negatively correlated with grain intakes (r = -0.392, p = 0.022). There were no statistically significant correlations between baseline knowledge and other dietary intakes. Likewise, female Pre-NK was only weakly, negatively related to other intakes (N = 59, r = -0.286, p = 0.028). See Table 32.
<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Grain</th>
<th>Veg</th>
<th>Fruit</th>
<th>Meat</th>
<th>Dairy</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Males</strong></td>
<td>34</td>
<td>( r = -0.39 )</td>
<td>( r = 0.11 )</td>
<td>( r = -0.09 )</td>
<td>( r = -0.19 )</td>
<td>( r = -0.26 )</td>
<td>( r = -0.15 )</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( p = 0.022 )</td>
<td>( p = 0.554 )</td>
<td>( p = 0.627 )</td>
<td>( p = 0.281 )</td>
<td>( p = 0.135 )</td>
<td>( p = 0.395 )</td>
</tr>
<tr>
<td><strong>Females</strong></td>
<td>59</td>
<td>( r = -0.04 )</td>
<td>( r = -0.06 )</td>
<td>( r = -0.10 )</td>
<td>( r = -0.08 )</td>
<td>( r = -0.09 )</td>
<td>( r = -0.29 )</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( p = 0.750 )</td>
<td>( p = 0.682 )</td>
<td>( p = 0.450 )</td>
<td>( p = 0.565 )</td>
<td>( p = 0.485 )</td>
<td>( p = 0.028 )</td>
</tr>
</tbody>
</table>

Table 32: Pre-intervention Nutrition Knowledge v. Number of Servings of Dietary Intakes by Group of Males and Females. * Statistically Significant

Subjects were divided into two groups based upon their adherence to Food Guide Pyramid recommendations. Subjects were classified as High Consumers (N = 46) if they had the recommended number of servings for 4 to 6 groups, or Low Consumers (N = 44) if they only had the recommended number of servings for 1 to 3 groups. High and Low groups were compared to previously described nutrition knowledge groups using a Chi-square test of independence. No significant relationship was found for males (chi-square = 2.079, \( p = 0.149 \)) or females (chi-square = 0.124, \( p = .742 \)). Pre-intervention nutrition knowledge and food group consumption appear to be independent of each other. See Table 33.
<table>
<thead>
<tr>
<th>Males</th>
<th>Low Pre-intervention Nutrition Knowledge</th>
<th>High Pre-intervention Nutrition Knowledge</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Consumers*</td>
<td>N = 11</td>
<td>N = 6</td>
<td>N = 17</td>
</tr>
<tr>
<td>High Consumers*</td>
<td>N = 11</td>
<td>N = 4</td>
<td>N = 15</td>
</tr>
<tr>
<td>Total</td>
<td>N = 22</td>
<td>N = 10</td>
<td>N = 32</td>
</tr>
</tbody>
</table>

Chi-square = 0.276, p = 0.599; Factors are Independent

<table>
<thead>
<tr>
<th>Females</th>
<th>Low Pre-intervention Nutrition Knowledge</th>
<th>High Pre-intervention Nutrition Knowledge</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Consumers*</td>
<td>N = 22</td>
<td>N = 11</td>
<td>N = 33</td>
</tr>
<tr>
<td>High Consumers*</td>
<td>N = 20</td>
<td>N = 5</td>
<td>N = 25</td>
</tr>
<tr>
<td>Total</td>
<td>N = 42</td>
<td>N = 16</td>
<td>N = 58</td>
</tr>
</tbody>
</table>

Chi-square = 1.266, p = 0.261; Factors are Independent

Table 33: Chi-square comparison of Pre-intervention Nutrition Knowledge v. Consumption Group for Males and Females. *Low Consumers had the recommended number of servings for 3 or fewer food groups and High consumers had the recommended number of servings for 4 or more food groups.

Nutrition Knowledge Change and Dietary Intakes

Nutrition Knowledge Change (posttest score – pretest score) and Dietary Intakes were compared to determine if students who gained nutrition knowledge reflected this newfound knowledge in their food choices. As above, subjects were divided into High and Low consumption groups based upon their adherence to Food Guide Pyramid recommendations. Then they were divided into two groups based upon their change in Nutrition Knowledge (Posttest score – Pretest score). Subjects who improved 4 or more points were considered to have a high degree of nutrition knowledge change (High NK, N = 42), whereas subjects who improved by 3 or fewer
points had a low degree of nutrition knowledge change (Low NK, N = 48).

Relationships between Dietary Score and Nutrition Knowledge are shown graphically in Figures 18 and 19.

A Chi-square test of independence was calculated comparing High and Low Consumers and nutrition knowledge change for males and females. No significant relationship was found for males (chi-square = 0.000, p>0.05) or females (chi-square = 0.037, p>0.05). Nutrition knowledge change and food group consumption appear to be independent of each other. See Table 34.

<table>
<thead>
<tr>
<th>Males</th>
<th>Low Nutrition Knowledge Change</th>
<th>High Nutrition Knowledge Change</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Consumers*</td>
<td>N = 9</td>
<td>N = 8</td>
<td>N = 17</td>
</tr>
<tr>
<td>High Consumers*</td>
<td>N = 8</td>
<td>N = 7</td>
<td>N = 15</td>
</tr>
<tr>
<td>Total</td>
<td>N = 17</td>
<td>N = 15</td>
<td>N = 32</td>
</tr>
</tbody>
</table>

Chi-square = 0.000, p>0.05; Factors are Independent

<table>
<thead>
<tr>
<th>Females</th>
<th>Low Nutrition Knowledge Change</th>
<th>High Nutrition Knowledge Change</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Consumers*</td>
<td>N = 18</td>
<td>N = 15</td>
<td>N = 33</td>
</tr>
<tr>
<td>High Consumers*</td>
<td>N = 13</td>
<td>N = 12</td>
<td>N = 25</td>
</tr>
<tr>
<td>Total</td>
<td>N = 31</td>
<td>N = 27</td>
<td>N = 58</td>
</tr>
</tbody>
</table>

Chi-square = 0.069, p>0.05; Factors are independent

Table 34: Chi-square comparison of Nutrition Knowledge Change v. Consumption Group for Males and Females. *Low Consumers had the recommended number of servings for 3 or fewer food groups and High consumers had the recommended number of servings for 4 or more food groups.
Figure 18: Male Nutrition Knowledge Change v. Food Group Consumption

Figure 19: Female Nutrition Knowledge Change v. Food Group Consumption
Physical Activity and Dietary Intakes

Pearson correlations were calculated examining the relationship between knowledge of and attitude toward physical activity and dietary intakes. Weak correlations that were not significant were found. See Table 35.

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Grain</th>
<th>Veg</th>
<th>Fruit</th>
<th>Meat</th>
<th>Dairy</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Male PA Attitude</strong></td>
<td>34</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>r =</td>
<td>-0.23</td>
<td>r =</td>
<td>0.128</td>
<td>r =</td>
<td>-0.19</td>
<td>r =</td>
<td>r =</td>
</tr>
<tr>
<td>p =</td>
<td>0.192</td>
<td>p =</td>
<td>0.283</td>
<td>p =</td>
<td>0.767</td>
<td>p =</td>
<td>p =</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Male PA Knowledge</strong></td>
<td>34</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>r =</td>
<td>0.098</td>
<td>r =</td>
<td>-0.11</td>
<td>r =</td>
<td>0.142</td>
<td>r =</td>
<td>r =</td>
</tr>
<tr>
<td>p =</td>
<td>0.584</td>
<td>p =</td>
<td>0.422</td>
<td>p =</td>
<td>0.374</td>
<td>p =</td>
<td>p =</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Female PA Attitude</strong></td>
<td>59</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>r =</td>
<td>0.074</td>
<td>r =</td>
<td>0.018</td>
<td>r =</td>
<td>-0.12</td>
<td>r =</td>
<td>r =</td>
</tr>
<tr>
<td>p =</td>
<td>0.577</td>
<td>p =</td>
<td>0.365</td>
<td>p =</td>
<td>0.708</td>
<td>p =</td>
<td>p =</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Female PA Knowledge</strong></td>
<td>59</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>r =</td>
<td>0.053</td>
<td>r =</td>
<td>0.198</td>
<td>r =</td>
<td>0.181</td>
<td>r =</td>
<td>r =</td>
</tr>
<tr>
<td>p =</td>
<td>0.688</td>
<td>p =</td>
<td>0.133</td>
<td>p =</td>
<td>0.169</td>
<td>p =</td>
<td>p =</td>
</tr>
</tbody>
</table>

Table 35: Correlation of Physical Activity Attitude and Knowledge v. Number of Servings of Dietary Intakes for Males and Females. Pearson r and p-values provided. *Statistically Significant.

Subjects were divided into high and low physical activity knowledge and attitude groups with scores greater than 22.5 were considered high and those below 22.5 were considered low. Chi-square tests of independence were then calculated comparing food group consumption and physical activity attitudes and knowledge.

For attitudes toward physical activity, no significant relationship was found for males.
(chi-square = 0.119, p>0.05) or females (chi-square = 0.023, p>0.05). For knowledge of physical activity, no significant relationship was found for males (chi-square = 0.147, p>0.05) or females (chi-square = 0.580, p>0.05). Attitudes toward and knowledge of physical activity appears to be independent of food group consumption.

See Tables 36 and 37.

<table>
<thead>
<tr>
<th>Male</th>
<th>Low Physical Activity Attitude</th>
<th>High Physical Activity Attitude</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Consumers*</td>
<td>N = 10</td>
<td>N = 9</td>
<td>N = 17</td>
</tr>
<tr>
<td>High Consumers*</td>
<td>N = 7</td>
<td>N = 8</td>
<td>N = 17</td>
</tr>
<tr>
<td>Total</td>
<td>N = 17</td>
<td>N = 17</td>
<td>N = 34</td>
</tr>
</tbody>
</table>

Chi-square = 0.119, p>0.05; Factors are Independent

<table>
<thead>
<tr>
<th>Female</th>
<th>Low Physical Activity Attitude</th>
<th>High Physical Activity Attitude</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Consumers*</td>
<td>N = 17</td>
<td>N = 17</td>
<td>N = 34</td>
</tr>
<tr>
<td>High Consumers*</td>
<td>N = 13</td>
<td>N = 12</td>
<td>N = 25</td>
</tr>
<tr>
<td>Total</td>
<td>N = 30</td>
<td>N = 29</td>
<td>N = 59</td>
</tr>
</tbody>
</table>

Chi-square = 0.023, p>0.05; Factors are Independent

Table 36: Chi-square assessment of Attitude toward Physical Activity v. Consumption Group for Males and Females. *Low Consumers had the recommended number of servings for 3 or fewer food groups and High consumers had the recommended number of servings for 4 or more food groups.
<table>
<thead>
<tr>
<th>Male</th>
<th>Low Physical Activity Knowledge</th>
<th>High Physical Activity Knowledge</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Consumers*</td>
<td>N = 15</td>
<td>N = 4</td>
<td>N = 19</td>
</tr>
<tr>
<td>High Consumers*</td>
<td>N = 11</td>
<td>N = 4</td>
<td>N = 15</td>
</tr>
<tr>
<td>Total</td>
<td>N = 26</td>
<td>N = 8</td>
<td>N = 34</td>
</tr>
</tbody>
</table>

Chi-square = 0.147, p>0.05: Factors are Independent

<table>
<thead>
<tr>
<th>Female</th>
<th>Low Physical Activity Knowledge</th>
<th>High Physical Activity Knowledge</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Consumers*</td>
<td>N = 17</td>
<td>N = 17</td>
<td>N = 34</td>
</tr>
<tr>
<td>High Consumers*</td>
<td>N = 15</td>
<td>N = 10</td>
<td>N = 25</td>
</tr>
<tr>
<td>Total</td>
<td>N = 32</td>
<td>N = 27</td>
<td>N = 59</td>
</tr>
</tbody>
</table>

Chi-square = 0.580, p>0.05: Factors are Independent

Table 37: Chi-square assessment of Knowledge of Physical Activity v. Consumption Group for Males and Females. *Low Consumers had the recommended number of servings for 3 or fewer food groups and High consumers had the recommended number of servings for 4 or more food groups.

Body Image, Self-Esteem, Eating Attitudes Test and Body Mass Index

Pearson correlation coefficients were utilized for comparison of body image, self-esteem, eating attitudes, and body mass index. For male subjects, no statistically significant correlations existed among EAT scores and body image or self-esteem (Table 38). However, there was a significant relationship between self-esteem and body image (r = 0.546, p<0.01) as well as between self-esteem and current body image perception (r = -0.292, p<0.05) and ideal body image perception (r = -0.335, p<0.05). See Table 38. The positive correlation between body image and self-esteem suggests male subjects with higher self-esteem also had more positive feelings about
their body image. Additionally, negative correlations between self-esteem and current and ideal body image perceptions suggest a connection between weight and self-esteem: male subjects who saw themselves as being heavier conveyed lower self-esteem than their lighter peers.

Not surprisingly, very highly significant relationships also existed between male body image, current body image perception, body image perception discrepancy, and body mass index. A negative correlation between body image and current perception ($r = -0.706, p<0.01$) as well as between body image and BMI ($r = -0.0451, p<0.01$) indicates male subjects with low body image selected heavier-appearing images and actually weigh more for their height than those with more positive body images. Similarly, a negative correlation between body image and body image discrepancy ($r = -0.629, p<0.01$) suggests a greater difference between the current and ideal body perceptions among subjects with lower overall body images. Positive correlations between BMI, current and ideal perceptions, and perception discrepancy ($r = 0.666, p<0.01$; $r = 0.481, p<0.01$; and $r = 0.380, p<0.01$) indicate males who were in actuality physically heavier than their peers perceived themselves as heavier, selected heavier ideals, and had greater discrepancy between their current and ideal body perceptions. See Table 38.
<table>
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</tr>
</thead>
<tbody>
<tr>
<td>Self-Esteem</td>
<td>58</td>
<td>r = 0.546</td>
<td>p = 0.0132</td>
<td>55</td>
<td>r = -0.292</td>
<td>p = 0.03*</td>
<td>r = -0.335</td>
<td>50</td>
<td>r = -0.201</td>
</tr>
<tr>
<td>Body Image</td>
<td>58</td>
<td>r = 0.003</td>
<td>p = 0.981</td>
<td>55</td>
<td>r = -0.706</td>
<td>p = 0.01*</td>
<td>r = -0.629</td>
<td>50</td>
<td>r = -0.451</td>
</tr>
<tr>
<td>EAT</td>
<td>55</td>
<td>r = -0.113</td>
<td>p = 0.410</td>
<td>55</td>
<td>r = -0.095</td>
<td>p = 0.489</td>
<td>r = -0.050</td>
<td>50</td>
<td>r = -0.146</td>
</tr>
<tr>
<td>Current Perception</td>
<td></td>
<td>r = 0.607</td>
<td>p = 0.01*</td>
<td>48</td>
<td>r = 0.662</td>
<td>p = 0.01*</td>
<td>r = 0.666</td>
<td>48</td>
<td>r = 0.380</td>
</tr>
<tr>
<td>Ideal Perception</td>
<td></td>
<td>r = -0.193</td>
<td>p = 0.158</td>
<td>48</td>
<td></td>
<td></td>
<td></td>
<td>48</td>
<td></td>
</tr>
<tr>
<td>Perception Discrepancy</td>
<td></td>
<td>r = 0.380</td>
<td>p = 0.01*</td>
<td>48</td>
<td></td>
<td></td>
<td></td>
<td>48</td>
<td></td>
</tr>
</tbody>
</table>

Table 38: Relationships Among Body Image, Self-Esteem, Eating Attitudes Test scores, and Body Mass Index for Male Subjects. Reported as Pearson r and p-values. * Statistically Significant
For females, body image, body image perception, self-esteem, and eating attitudes were more intertwined than for males. A very highly significant correlation existed between self-esteem and body image \( (r = 0.564, p < 0.01) \), indicating that, like males, females with higher self-esteem also feel better about their bodies. Not surprisingly, among females both self-esteem and body image were related to body mass index \( (r = -0.290, p = 0.013 \text{ and } r = -0.540, p < 0.01) \). Thus, females who had weighed more than their peers had lower self-esteem and body image scores. See Table 39.

Unlike their male counterparts, females demonstrated very highly significant correlations between self-esteem and likelihood of an eating disorder as determined by the EAT \( (r = -0.405, p < 0.01) \). This negative correlation indicates increased likelihood of an eating disorder corresponding to decreased self-esteem.

Further, self-esteem was very significantly correlated with current body image \( (r = -0.287, p = 0.01) \) and with body image perception discrepancy \( (r = -0.295, p < 0.01) \). Similarly, BMI correlated with current body image \( (r = 0.668, p < 0.01) \) and body image perception discrepancy \( (r = 0.690, p < 0.01) \). Table 39. Such correlations suggest females with low self-esteem were heavier than their peers and viewed their bodies as being heavier. These females saw a greater distance between their current appearance and their ideal appearance than their peers.

Interestingly, unlike with males, no statistically significant correlations existed between ideal body perception and self-esteem or BMI. This suggests that heavier
females did not adjust their ideal image to be a larger size. Like their thinner peers, they still held onto ideals of a, perhaps unrealistically, thin body.

Accordingly, a very highly significant correlation existed between body image, current body image perception, and body image perception discrepancy (r = -0.525, p<0.01 and r = -0.577, p<0.01, respectively). See Table 39. Female subjects who expressed negative feelings towards their bodies, or poor body image, also saw themselves as larger than their peers, and in their minds a larger gap existed between their appearance and the “ideal” appearance than existed in the minds of their thinner peers.

Not surprisingly, among females body image also very positively correlated with the disordered eating attitudes (r = -0.388, p<0.01). This highly correlated pair indicates females with positive images exhibited few disordered eating patterns, whereas females with negative body images displayed multiple disordered eating patterns. Eating attitudes also significantly correlated with body image perception discrepancy (r = 0.286, p <0.05); thus, females with higher propensity towards disordered eating also noted a greater difference between their current body image and their ideal body image. See Table 39.
<table>
<thead>
<tr>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-Esteem</td>
<td>84</td>
<td>r = 0.564</td>
<td>p &lt;0.01*</td>
<td>79</td>
<td>r = -0.287</td>
<td>p = 0.010*</td>
<td>r = -0.295</td>
<td>72</td>
<td>r = 0.013*</td>
</tr>
<tr>
<td>Body Image</td>
<td>84</td>
<td>r = 0.388</td>
<td>p &lt;0.01*</td>
<td>80</td>
<td>r = -0.089</td>
<td>p = 0.431</td>
<td>r = -0.577</td>
<td>73</td>
<td>r &lt;0.01*</td>
</tr>
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<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>EAT</td>
<td>79</td>
<td>r = -0.152</td>
<td>p = 0.181</td>
<td></td>
<td>r = -0.286</td>
<td>p = 0.011*</td>
<td></td>
<td>72</td>
<td>0.193</td>
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<td></td>
<td></td>
<td>0.104</td>
</tr>
<tr>
<td>Current Perception</td>
<td>69</td>
<td>r = 0.607</td>
<td>p &lt;0.01*</td>
<td></td>
<td>r = 0.662</td>
<td>p &lt;0.01*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ideal Perception</td>
<td>69</td>
<td>r = -0.193</td>
<td>p = 0.158</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.164</td>
</tr>
<tr>
<td>Perception Discrepancy</td>
<td>69</td>
<td>r = 0.690</td>
<td>p &lt;0.01*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.179</td>
</tr>
</tbody>
</table>

Table 39: Relationships Among Body Image, Self-Esteem, Eating Attitudes Test scores, and Body Mass Index for Female Subjects. Pearson r and p-values reported. * Statistically Significant
Pre-intervention Nutrition Knowledge v. Body Image, Self-Esteem, and Eating Attitudes

Pearson correlations and linear regressions were used to determine relationships between baseline nutrition knowledge and Rosenberg Self-esteem Inventory, Body Image Questionnaire, and Eating Attitudes Test scores.

For male subjects, there were no significant correlations between PNK and self-esteem or body image. However, PNK was negatively correlated with EAT scores ($r = -0.339$, $p<0.01$). As knowledge of nutrition increased, incidence of disordered eating behavior decreased. Additionally, baseline knowledge positively correlated with body image perception discrepancy ($r = 0.276$, $p<0.05$), indicating there was a larger difference between current and ideal body image perception among subjects with higher nutrition knowledge. See Table 40.

Among female subjects, a highly significant correlation existed between PNK and self-esteem ($r = 0.286$, $p<0.01$), suggesting subjects with higher self-esteem were more aware of basic nutrition concepts. No statistically significant relationships existed among PNK and body image, body image perception, or eating disorder risk. See Table 40.
<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Self-Esteem</th>
<th>N</th>
<th>Body Image</th>
<th>N</th>
<th>Body Image Perception Discrepancy</th>
<th>N</th>
<th>Eating Attitude Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male BNK</td>
<td>58</td>
<td>r = 0.191</td>
<td></td>
<td>r = -0.106</td>
<td>58</td>
<td>r = 0.276</td>
<td></td>
<td>r = -0.339</td>
</tr>
<tr>
<td></td>
<td></td>
<td>p = 0.151</td>
<td>58</td>
<td>p = 0.430</td>
<td>58</td>
<td>p = 0.041*</td>
<td>58</td>
<td>p = 0.009*</td>
</tr>
<tr>
<td>Female BNK</td>
<td>84</td>
<td>r = 0.286</td>
<td>85</td>
<td>r = 0.061</td>
<td>80</td>
<td>r = -0.074</td>
<td></td>
<td>r = -0.209</td>
</tr>
<tr>
<td></td>
<td></td>
<td>p = 0.008*</td>
<td>85</td>
<td>p = 0.578</td>
<td>80</td>
<td>p = 0.514</td>
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<td>p = 0.056</td>
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</table>

Table 40: Pre-intervention Nutrition Knowledge v. Body Image, Self-Esteem, and EAT scores. Reported as Pearson r and p-values. * Statistically Significant

A multiple linear regression was calculated to predict subjects' baseline nutrition knowledge based on their body image, body image perception, self-esteem, and eating attitudes. For males, a significant equation was found (F(5, 45) = 2.459, p < 0.05), with an R² of 0.215. Male subjects' predicted baseline nutrition knowledge is equal to 6.805 – 0.148(EAT) + 0.108(Self-Esteem) – 0.130(Body Image) + 0.190(Ideal Body Perception) + 0.347(Body Perception Discrepancy). Only EAT was a significant predictor. The regression equation was not significant for female subjects (F(6, 67) = 0.292, p > 0.05) with an R² of 0.101. None of these factors can be used to predict baseline nutrition knowledge.

Nutrition Knowledge Change v. Body Image, Self-Esteem, and Eating Attitudes

There were no statistically significant correlations between change in nutrition knowledge (posttest score – pretest score) and body image, body image perception, self-esteem, or eating attitudes. Thus, such factors did not influence subjects' incorporation of nutrition knowledge into their lives. See Table 41.
Table 41: Correlation of Change in Nutrition Knowledge and Body Image, Self-Esteem, and EAT scores for Males and Females. Pearson r and p-values provided.
* Statistically Significant

Physical Activity v. Body Image, Self-Esteem, and Eating Attitudes

Pearson correlation coefficients were calculated for the relationships between physical activity attitudes and body image, body image perception, self-esteem, and eating attitudes. For males and females, a weak positive correlation was found between attitudes and self-esteem ($r = 0.277, p = 0.035$ and $r = 0.242, p = 0.027$, respectively). Subjects with more positive attitudes toward physical activity had high self-esteem. Specific to females, weak negative correlations existed between attitudes and current and ideal body image perceptions ($r = -0.274, p = 0.014$ and $r = -0.238, p = 0.034$, respectively). Females with more positive attitudes toward physical activity selected thinner figures on the rating scale for their current and ideal body images.

See Table 42.
<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Male Physical Activity Attitude</th>
<th>N</th>
<th>Female Physical Activity Attitude</th>
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<tr>
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<td></td>
</tr>
<tr>
<td>Self-Esteem</td>
<td>58</td>
<td>( r = 0.277 ) p = 0.035*</td>
<td>84</td>
<td>( r = 0.242 ) p = 0.027*</td>
</tr>
<tr>
<td>Body Image</td>
<td>58</td>
<td>( r = 0.030 ) p = 0.822</td>
<td>85</td>
<td>( r = 0.194 ) p = 0.075</td>
</tr>
<tr>
<td>Eating Attitude Test</td>
<td>58</td>
<td>( r = 0.073 ) p = 0.588</td>
<td>84</td>
<td>( r = 0.035 ) p = 0.749</td>
</tr>
<tr>
<td>Current Body Image</td>
<td>55</td>
<td>( r = -0.122 ) p = 0.374</td>
<td>80</td>
<td>( r = -0.274 ) p = 0.014*</td>
</tr>
<tr>
<td>Perception</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ideal Body Image</td>
<td>55</td>
<td>( r = -0.322 ) p = 0.017*</td>
<td>80</td>
<td>( r = -0.238 ) p = 0.034*</td>
</tr>
<tr>
<td>Perception</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Body Image Perception</td>
<td>55</td>
<td>( r = 0.153 ) p = 0.266</td>
<td>80</td>
<td>( r = -0.154 ) p = 0.172</td>
</tr>
<tr>
<td>Discrepancy</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

Table 42: Correlation of Physical Activity Attitudes and Body Image, Self-Esteem, and EAT scores for Males and Females. Pearson r and p-values provided.

* Statistically Significant

Pearson correlation coefficients were calculated for the relationships between physical activity knowledge and body image, body image perception, self-esteem, and eating attitudes. For males weak positive correlations were found between knowledge and self-esteem and body image (\( r = 0.280 \), \( p = 0.033 \) and \( r = 0.269 \), \( p = 0.041 \), respectively). Male subjects with high knowledge of physical activity had a high self-esteem and a positive body image. No significant correlations existed between female physical activity knowledge and self-esteem, body image, body image perception, or eating attitudes. See Table 42.

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Table 43: Correlation of Physical Activity Knowledge and Body Image, Self-Esteem, and EAT scores for Males and Females. Pearson r and p-values provided.
* Statistically Significant

Multiple linear regressions were calculated for males and females to predict attitude toward physical activity based on body image, body image perception, self-esteem, and eating attitudes. Regression equations were not significant for males or females (F(5, 49) = 2.277, p = 0.061 and F(6, 71) = 2.212, p = 0.052, respectively), with $R^2$'s of 0.189 and 0.157, respectively. None of these factors can be used to predict attitude toward physical activity.

Similarly, multiple linear regressions were calculated for males and females to predict knowledge of physical activity based on body image, body image perception, self-esteem, and eating attitudes. Regression equations were not significant for
females ($F(6, 71) = 1.095$, $p = 0.374$), with an $R^2$ of 0.189 and 0.085, respectively. None of the factors considered can be used to predict attitude toward physical activity. For males, a significant equation was found ($F(5, 49) = 3.176$, $p = 0.015$), with an $R^2$ of 0.245. Male subjects' predicted knowledge of physical activity is equal to $9.322 + 0.146(EAT) + 0.0706(Self-Esteem) + 0.269(Body\ Image) + 0.433(Ideal\ Body\ Perception) + 0.899(Body\ Perception\ Discrepancy)$. Eating attitudes, body image, and body image perception discrepancy were all significant predictors.

Summary of Findings

Subjects' nutrition knowledge was significantly improved through a five-day intervention program. This knowledge, however, was not reflected in food consumption patterns. Although subjects reportedly consumed mean intakes within recommended ranges for fruit and dairy groups, they consumed more than recommended servings for the protein and vegetable groups as well as snack foods and others. Additionally, subjects consumed less than recommended servings grains.

Likewise, physical activity knowledge did not significantly correlate with exercise behaviors. Weak correlations were noted between physical activity attitudes and behaviors, however those relationships diminished when subjects were evaluated in terms of high and low attitudes and behaviors. Additionally, knowledge of nutrition was independent of knowledge of and attitudes toward physical activity. Thus, indicating subjects do not view healthy eating as a vehicle through which to improve their physical fitness.
Body image, current body image perception and body image discrepancy, eating attitudes, and self-esteem were very interconnected among females. For males, however, only self-esteem was related to body image, which in turn related to current and ideal body image perceptions. These concepts were not generally related to nutrition or physical activity. See Figures 20 and 21.
Figure 20: Schematic of Study Factors for Males. Relationships significant at p<0.05.
Figure 21: Schematic of Study Factors for Females. Relationships significant at p<0.05.
CHAPTER 5

DISCUSSION AND RECOMMENDATIONS

The purpose of this study was to examine the effectiveness of a five-day nutrition intervention in terms of improving nutrition knowledge among adolescents. Additionally, this study investigated relationships among self-esteem, body image, eating behaviors, self-reported daily food intakes, physical activity behaviors, nutrition knowledge, and attitude toward and knowledge of exercise among adolescents residing in Tuscarawas County, Ohio.

As expected, study findings indicate differences exist among males and females in terms of the interconnectedness of study factors, including nutrition knowledge, physical activity, body image, body image perception, self-esteem, and eating attitudes. Such differences provide insights as to how males and females view their bodies and how best to educate male and female audiences, both concepts which will be addressed further throughout this chapter.

Nutrition Knowledge

Subjects' knowledge of nutrition was significantly improved over the five-day intervention period. Long-term studies, such as the Planet Health intervention study
and the CATCH trial, found increases in nutrition knowledge correlated with positive health outcomes. In these previous studies, researchers tracked subjects over two and three years, respectively (Dwyer et al., 2002 and Gortmaker et al., 1999). Since the present study only consisted of a five-day intervention, it is difficult to extrapolate the effectiveness of the intervention in initiating health-related changes over a long time interval.

Despite a lack of information regarding long-term outcomes of the current intervention, this intervention is more user friendly in that it is concise, flexible, and the materials are readily available. Additionally, in the short term, the nutrition knowledge intervention was effective in that it raised awareness of the importance of healthy eating. The intervention caused students to stop and think about what they were putting into their bodies and possibly consider the impact of their eating habits down the road, even if they were unwilling to change their behaviors at the present time. Students’ knowledge particularly improved with regards to snack/fast foods, calcium consumption, and Food Guide Pyramid specific questions.

The impact of this intervention can be seen in an example involving fast food consumption. Students were asked to list the foods they commonly order at their favorite fast food establishment. They then calculated the fat and calories this meal would provide. Most students were genuinely astonished to learn they were taking in a large number of calories in one sitting. The knowledge stayed with them as evidenced by an increase in correct responses to fast food questions on the nutrition
knowledge questionnaire. There was a 20 percent increase in correct answers among male subjects and a 32 percent increase in correct answers among female subjects.

Physical Activity Attitudes, Knowledge, and Behaviors

Approximately one-third of the subjects indicated strong, positive opinions toward physical activity, and one-fourth of the subjects demonstrated accurate knowledge of physical activity. There were significant correlations between physical activity knowledge and opinion for both males and females ($r = 0.329$, $p < 0.05$ and $r = 0.0242$, $p < 0.05$, respectively). This indicates that subjects who knew more about physical activity had more positive attitudes toward physical activity. In more concrete terms, subjects who knew they could improve strength, endurance, coordination, and balance by working out several times a week were more likely to report that exercise was worthy of their time because it made them feel good.

Highly significant correlations exist between attitudes toward physical activity and behaviors in terms of physical activity units ($r = 0.287$, $p < 0.05$ for males and $r = 0.275$, $p < 0.05$ for females). Units of physical activity represent the number of times a subject reported they participated in physical activities each week. This finding indicates subjects who held more positive views toward physical activity translated these positive attitudes to their actual behaviors. Specific to physical activity, this study has demonstrated a progression from knowledge to attitudes to action. Along these lines, it can be inferred that increasing other students' knowledge of physical
activity will impact their attitudes toward physical activity, and may ultimately manifest in increased activity among children and adolescents.

Interestingly, in this study males and females reported similar hours per week spent taking part in some form of physical activity (3.9 ± 2.1 and 3.6 ± 2.2 hours, respectively). Additionally, males reported taking part in significantly more light activities than females (t = 4.78, p<0.01). These findings differ from results reported by Armstrong et al. (2000), Bradley et al. (2000), and Caspersen et al. (1999) who found males were significantly more physically active than females. Additionally, these researchers found males were more active in moderate and vigorous physical activities, which was not the case in the present study as males and females reported similar levels of strenuous activity.

As in Bradley et al. (2000), the present study asked subjects to report their most common activities. While Bradley et al. (2000) indicated both males and females in the sixth grade were very active in team sports, with a gradual shift towards individual activities among females as they increased in age, results from the present study indicated individual activities were preferred over team sports. Specifically, fishing, biking, swimming, and weight training were the most popular activities reported by males and jogging, swimming, biking, and bowling were the most popular activities reported by females.

This discrepancy may be due to regional variations in team sport emphasis. The CHIC study was conducted in twelve North Carolina counties over a six-year period, which would have allowed for a wide variation of participants as well as
seasonal influence. The present study, on the other hand, was conducted over a two-week period during the spring in a predominantly rural/suburban county in Ohio, thus limiting the variability of participants. The recency effect, or tendency to report recent events rather than past events, likely played a role in subjects' reporting of activities, and since it was track season rather than football, basketball, or volleyball season, individual activities were recalled to a greater degree than team sports.

Daily Dietary Intakes

Adequacy of daily food intakes was analyzed in two ways: the number of Food Guide Pyramid recommendations satisfied and Healthy Eating Index scores. Results from both assessment techniques indicate food intakes among subjects participating in this study were more adequate than those reported in previous research studies. Specific to Food Guide Pyramid adequacy indicators, subjects consumed the recommended number of servings from the fruit and dairy groups and higher than the recommended number of servings from the vegetable and protein groups. Only grains were consumed at less than adequate levels. This outcome differs from previous findings that adolescents under-consumed fruits and vegetables. However, it parallels previous findings that protein and milk intakes among adolescents were adequate (Cusatis and Shannon, 1996). In comparison to Dwyer et al.'s (2002) HEI indicators, subjects in the present study had significantly higher scores for vegetable, fruit, and protein consumption. Scores for grains and milk were similar to Dwyer et al.'s findings. As was noted in previous research, subjects in this study selected many high

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sugar and/or high-fat foods. Soft drinks and high sugar juice consumption contributed unnecessary calories but did not appear to replace more nutritious foods in the adolescents’ diets.

**Relationships Among Study Factors**

Although subjects significantly increased their knowledge of nutrition via the five-day intervention program, this knowledge was poorly reflected by other study measures. Among female subjects, the only significant relationship existing in combination with pre-intervention nutrition knowledge was self-esteem ($r = 0.286, p<0.01$). Higher pre-intervention scores were seen among females with higher self-esteem, however these females did not improve their nutrition knowledge more significantly than females with lower self-esteem. Thus, neither group views nutrition knowledge, or application of this knowledge, as a key to improving their self-esteem.

Relationships were expected between nutrition knowledge and physical activity knowledge and attitudes, however this study did not reveal such relationships. Thus, although good nutrition plays a key role in good athletic performance, students did not recognize nutrition as an avenue by which to improve themselves.

Pre-intervention nutrition knowledge negatively correlated to eating attitudes ($r = -0.339, p<0.01$) and positively correlated to body image perception discrepancy ($r = 0.276, p<0.05$) among male subjects. These findings appear somewhat conflicting in that an individual with a high EAT score would be expected to be less satisfied with his body and thus view a greater discrepancy between their current image of their
body and an ideal. However, among males in this study the two factors were not related. Thus, the positive correlation between body image discrepancy and nutrition knowledge indicates individuals who were more knowledgeable of nutrition perhaps recognized that they weighed more than was appropriate for their body type.

The correlation between nutrition knowledge and EAT scores indicate that males with disordered eating behaviors were less aware of nutrition information than their normal eating comrades. This outcome was different than was initially expected, since individuals with disordered eating behaviors are known for their ability to easily recall calories and/or fat content of a multitude of foods. After consideration, however, this relationship makes sense. Individuals with disordered eating behaviors may be able to recall certain facts about specific foods, but their overall view of food is grossly distorted. This conclusion is further supported in that nutrition knowledge did not improve significantly among disordered eaters. Nutrition knowledge may be available to disordered eaters, however it is not accurately or effectively incorporated into their knowledge base.

As suggested by Pesa (1999), self-esteem and eating behaviors were highly linked among female subjects. Pesa found 43 percent of females had low self-esteem, as determined by the Rosenberg Self-Esteem Scale. In the current study, 45.2 percent of females fell into the low and very-low self-esteem categories as determined by the same research tool. While the incidence of disordered eating behaviors were highly correlated to self-esteem, fewer females displayed disordered eating behaviors in the present study than reported by Pesa (11.9% v. 56%). Not surprisingly, self-esteem
also related to body image, body image perception, and BMI among females. These factors combine to create a vicious cycle of decreasing self-esteem and body image among female adolescents.

Among males, self-esteem was strongly linked to athleticism and body image perception. The connection between exercise and positive attitudes towards oneself was similarly reported by Strauss et al. (2001). These relationships make sense: athletic males are more likely to be more toned and have less body fat, thus improving their body image perception and increasing their self-esteem.

As expected, approximately 8 percent of females and 22 percent of males (13% of all subjects) were classified as overweight based upon age specific BMI’s on CDC growth charts. This corresponds with nationally reported statistics (U.S. Dept. HHS, 2001). The connection between BMI and body image perception among both males and females also met expectations. Subjects who saw themselves as overweight were less satisfied with their bodies, and in their minds a larger gap existed between their appearance and the “ideal” appearance than existed in the minds of their thinner peers.

Strengths and Limitations

This study's primary strength lies within the multiple social and cognitive factors that were examined at one time. While it is well accepted that many factors combine to influence adolescent behavior, studies typically view only two or three of these factors at a time. This study, on the other hand, examined interplay between nutrition, physical activity, and psychological constructs.
While this study offers a multi-faceted look at adolescent beliefs and behaviors, it was limited in that it relied primarily upon questionnaire data, thus data were of a self-reported nature. Individuals were encouraged to answer questions as accurately and as truthfully as possible, however students may have biased their answers to questionnaires dealing with sensitive issues, such as body image and eating behaviors. Additionally, responses to the Food Frequency Questionnaire may have been tainted in that this questionnaire was completed following the five-day intervention. Thus, subjects may have provided answers they felt were “expected” rather than give a true indication of their typical food intakes.

The length of the survey may also be viewed as a limitation to this study. Although the survey packet included standard questionnaires that have been utilized for adolescent audiences in the past, it is uncommon for a survey packet to include as many questionnaires as was used for this study. Subjects may have become fatigued or bored while completing the survey packet, or they may have rushed through the packet to avoid being late for their next class. Most students returned Survey I within 30 minutes and Survey II within 15 minutes. No students required extra time. Rushed completion was viewed as a potential problem, thus to minimize this issue questions were phrased both positively and negatively to ensure all questions were read completely.

A multitude of questionnaires focused on child and adolescent attitudes, knowledge, and behavior are now available. Use of the Youth/Adolescent Food Frequency Questionnaire (Rockett et al., 1997) in place of the Block-based Food
Frequency Questionnaire could have provided a wider range of food common to youth, and thus more accurately estimated daily food consumption. Similarly, an Eating Attitudes Test targeted towards children and adolescents could have produced results superior to those achieved with the standard Eating Attitudes Test. These design improvements should be further considered for future research projects.

Finally, while the pre-test/post-test design with regards to nutrition knowledge allowed for examination of knowledge attained, the restricted time frame of this study limited the scope of study outcomes. Attitudes, beliefs, and behaviors require longer amounts of time to affect a change than knowledge requires. Although nutrition knowledge was impacted by the five-day intervention, the impact of this acquired knowledge upon attitudes and behaviors could not be investigated.

Recommendations

Many leading health organizations place adolescent nutrition and physical activity, as well as other important health messages, on their agendas. Yet, health promotion among this population remains an up-hill battle. Somewhere in the back of every adolescent's mind are important health messages: eat five fruits and vegetables every day, drink milk to decrease your risk of osteoporosis, 30 minutes of daily moderate physical activity can improve your health, smoking causes lung cancer, and buckle-up every time you drive. All of these messages are important, and they may be heard, but they are not translated into action.
As the Surgeon General has suggested (U.S. Dept. HHS, 2001a, 1996), schools play an essential role in dissemination of health information to youth. In an ideal world, males and females would receive separate nutrition and health instruction, all students in kindergarten through the twelfth grade would participate in physical education class daily, and televisions would automatically turn off after one hour of viewing. Unfortunately such a world does not exist, and health problems facing children and adolescents are much more difficult to tackle.

Although a multitude of reports look to the schools for health promotion, there are many barriers to revising the national school agenda. Teachers are already expected to cater their classes to proficiency testing areas, which leaves little time for practical life studies such as the importance of good nutrition and daily physical activity. Suggestions to modify the National School Lunch program similarly meet challenges. The current School Lunch Program infrastructure limits a school’s ability to provide only healthy tray lunches because many schools rely on a la carte revenue to support tray lunch programs (Thurn, 2002).

Even with proposed revisions to school-based health promotion, it remains unrealistic to assume the school alone can change the eating and physical activity behaviors of millions of youth. Communities, and most importantly parents, must take an active role in the education of children and adolescents. A national drug awareness ad campaign exclaims, “Questions, they’re the anti-drug!” A broader campaign could just as easily conclude, “Involvement, it’s the good health promoter!” Studies have shown children and adolescents mimic their parents’ behaviors, and
nutritional decision-making improves when families eat meals together (Koivisto, 1999 and Westenhoefer, 2001). Although other health factors have not been as extensively researched, one can imply family mealt ime involvement can positively impact health.

The solution to the problem of health promotion among adolescents is complex, and certainly cannot be ascertained based upon the findings of one research study. Rather, a multitude of studies are necessary to define this ever-changing, unpredictable population. Future research needs to address not only adolescent behaviors and attitudes, but also further explore the knowledge base currently in place regarding nutrition and physical activity. This research should focus upon single disciplines as well as multi-factorial approaches similar to that used in the study at hand. All types of research, whether cross-sectional or longitudinal, experimental or correlational in nature, help to bring into focus the issues facing America’s youth today. Ultimately, the practical application and dissemination of research findings to health professionals, teachers, involved community members, and parents can help us to slowly but surely restore the good health and well-being of America’s youth.
APPENDIX A

OHIO STATE UNIVERSITY

HUMAN SUBJECTS REVIEW COMMITTEE APPROVAL
Dear Investigator,

Your protocol has been reviewed by the Behavioral and Social Sciences Institutional Review Board (IRB), and has been APPROVED WITH CONDITIONS. The IRB has requested that you make revisions to specific portions of your protocol. Those revisions are detailed on the form that accompanies this letter.

Research cannot begin until your response has been reviewed and approved. The final approval letter will be issued to the Principal investigator.

Your response must be in writing, and should contain the following items:
- Response form (attached) with original signatures of all investigators.
- Responses to each of the items listed.
- Copies of revised documents as requested. Changes to documents should be highlighted for the reviewers.

You do not need to revise your entire protocol or submit a new protocol. You do not need five copies of your response; one copy is sufficient.

Failure to respond to conditions will result in withdrawal of your protocol. If you are not able to respond within three weeks of the meeting date listed on the form, please contact Jane Kelsey, Office of Research Risks Protection by phone (292-6950) or e-mail (kelsey.18@osu.edu).

The information in this letter refers to the investigator’s responses to the conditions of the IRB. If you wish to make changes to the protocol other than those suggested by the IRB, please submit an amendment request for review prior to implementation of the changes.

<table>
<thead>
<tr>
<th>Submit your response to</th>
<th>Chair, Behavioral and Social Sciences IRB</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Office of Research Risks Protection</td>
</tr>
<tr>
<td></td>
<td>Room 310, Research Foundation Building</td>
</tr>
<tr>
<td></td>
<td>1960 Kenny Road</td>
</tr>
<tr>
<td></td>
<td>Columbus OH 43210</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Questions? Please contact</th>
<th>Jane Kelsey</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Administrative Assistant</td>
</tr>
<tr>
<td></td>
<td>Behavioral and Social Sciences IRB</td>
</tr>
<tr>
<td></td>
<td>Phone: 292-6950</td>
</tr>
<tr>
<td></td>
<td>Fax: 688-0366</td>
</tr>
<tr>
<td></td>
<td>E-mail: <a href="mailto:kelsey.18@osu.edu">kelsey.18@osu.edu</a></td>
</tr>
</tbody>
</table>

Revised February 2020

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BEHAVIORAL AND SOCIAL SCIENCES
HUMAN SUBJECTS INSTITUTIONAL REVIEW BOARD (IRB)
THE OHIO STATE UNIVERSITY, Columbus, Ohio 43210

Research Involving Human Subjects

ACTION OF THE INSTITUTIONAL REVIEW BOARD

With regard to the employment of human subjects in the proposed research protocol:

01B0074 EVALUATION OF ADOLESCENT ATTITUDES AND KNOWLEDGE TOWARD NUTRITION AND EXERCISE, Mary C. Mitchell, Christine L. Kendle, Human Nutrition and Food Management

THE BEHAVIORAL AND SOCIAL SCIENCES HUMAN SUBJECTS IRB HAS TAKEN THE FOLLOWING ACTION:

_____ APPROVED  _____ DISAPPROVED

X APPROVED WITH CONDITIONS *  _____ WAIVER OF WRITTEN CONSENT GRANTED

* Conditions stated by the IRB have been met by the investigator and therefore the protocol is APPROVED.

It is the responsibility of the principal investigator to retain a copy of each signed consent form for at least three (3) years beyond the termination of the subject's participation in the proposed activity. Should the principal investigator leave the University, signed consent forms are to be transferred to the Human Subjects IRB for the required retention period. This application has been approved for the period of one year. You are reminded that you must promptly report any problems to the IRB, and that no procedural changes may be made without prior review and approval. You are also reminded that the identity of the research participants must be kept confidential.

Date: March 30, 2001  Signed: [Signature]

(Chairperson)

HS-0258 (Rev. 2/94)

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RESEARCH PROTOCOL:

01B0074  EVALUATION OF ADOLESCENT ATTITUDES AND KNOWLEDGE TOWARD NUTRITION AND EXERCISE, Mary C. Mitchell, Christine L. Kendle, Human Nutrition and Food Management

was presented for review by the Behavioral and Social Sciences IRB to ensure proper protection of the rights and welfare of the individuals involved with consideration of the methods used to obtain informed consent and the justification of risks in terms of potential benefits to be gained, the IRB action was:

- APPROVED
- DEFERRED
- APPROVED WITH CONDITIONS *
- DISAPPROVED
- NO REVIEW NECESSARY

* Research cannot begin until conditions have been met.

* CONDITIONS/COMMENTS:

Subjects were deemed NOT AT RISK and the protocol was unanimously APPROVED WITH THE FOLLOWING CONDITIONS:

1. Provide a letter of support from the New Philadelphia school system.

2. Revise the Dear Parent or Guardian letter as follows, and provide a copy to the IRB.
   - Provide a more clear definition of the activities that are part of the instructional unit and activities that are part of the research study.
   - Paragraph 4, first sentence: define what you mean by “this activity.”

3. Provide a means for obtaining assent (agreement) from persons who are under the age of 18.

If you agree to the above conditions, PLEASE SIGN THIS FORM IN THE SPACE PROVIDED BELOW AND RETURN WITH ANY ADDITIONAL INFORMATION REQUESTED TO THE HUMAN SUBJECTS REVIEW DESK, 310 Research Foundation, 1960 Kenny Road, Campus, within one week. Upon such compliance, the approval form will be mailed to you. (In case of a deferred protocol, please submit the requested information at your earliest convenience. The next meeting of the IRB will be two weeks from the meeting date indicated above.)

Date:

[Signatures]

Signature of principal investigator and all co-investigators

HS-025A (Rev. 2/92) (conditions/comments)
APPENDIX B

SCHOOL ADMINISTRATORS' LETTERS OF SUPPORT
April 30, 2001

To Whom It May Concern:

Welty Middle School Physical Education classes will participate in a Nutrition Unit presented by Christine Kendle. Mrs. Kendle is presenting to the 7th grade physical education students during the week of May 7-11. We are aware that she is collecting data from our students and the proper procedures have been initiated for parental consent. She has met with the physical education staff to plan for this event.

We are very pleased to have Christine assist in our instructional process. Should you have further questions, please feel free to contact me.

Sincerely,

G. Randall Gibbs
Welty Middle School
Assistant Principal
March 19, 2001

To Whom It May Concern:

This is a letter of support for the Nutrition Education Project being presented by Christine Kendle. We, at Claymont, are looking forward to her visit this spring. Her project will fit very nicely into our current program. Our teachers are looking forward to working with Christine to make the program a success. If you have any questions or I can be of further assistance, feel free to contact me at 740-922-5478, extension 203.

Sincerely,

John B. Neighbor
Superintendent

JNB/bs
APPENDIX C

PARENTAL CONSENT FORM
Consent for Participation in Social and Behavioral Research

I consent to my child’s participation in the research study entitled *Evaluation of adolescent attitudes and knowledge toward nutrition and exercise*.

Dr. Mary C. Mitchell or her authorized representative has explained the purpose of the study, the procedures to be followed, and the expected duration of my child’s participation. Possible benefits of the study have been described, as have alternative procedures, if such procedures are applicable and available.

I acknowledge that I have had the opportunity to obtain additional information regarding the study and that any questions I have raised have been answered to my full satisfaction. Furthermore, I understand that my child is free to withdraw consent at any time and to discontinue participation in the study without prejudice to my child.

Finally, I acknowledge that I have read and fully understand the consent form. I sign it freely and voluntarily. A copy has been given to me.

Date: ___________________________  Signed: ___________________________

(Student participant)

Signed: ___________________________  Signed: ___________________________

(Principal Investigator)  (Person authorized to consent for participant)

Witness: ___________________________
Consent for Participation in Social and Behavioral Research

I consent to my child’s participation in the research study entitled Evaluation of adolescent attitudes and knowledge toward nutrition and exercise.

Dr. Mary C. Mitchell or her authorized representative has explained the purpose of the study, the procedures to be followed, and the expected duration of my child’s participation. Possible benefits of the study have been described, as have alternative procedures, if such procedures are applicable and available.

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Finally, I acknowledge that I have read and fully understand the consent form. I sign it freely and voluntarily. A copy has been given to me.

Date: _______________ Signed: ____________________________
(Student participant)

Signed: ____________________________
(Principal investigator)

Signed: ____________________________
(Person authorized to consent for participant)

Witness: ____________________________
APPENDIX D

TEACHERS’ AND RESEARCHER’S LETTERS TO PARENTS
March 21, 2001

Dear Parents of Home Economics Students,

This note is just to inform you that during the last 9-weeks of this year, I will be having a graduate student from Ohio State University in the field of dietetics coming to my classes. She will be doing a unit on nutrition.

I feel this will be a very worthwhile project and am excited to have your son or daughter involved.

Sincerely,

Mrs. Sevier
Dear Parent or Guardian:

Welty Middle School has been selected to participate in nutrition and exercise research conducted by Dr. Mary C. Mitchell and Christine L. Kendle of The Ohio State University. The study's purpose is to evaluate attitudes and knowledge toward nutrition and exercise. To complement the study, as well as on-going classroom instruction, a 5-day series has been developed specifically for the 7th graders. This series will be presented as a normal, classroom activity in Mrs. Bell's and Mr. Korns' physical education classes the week of May 7 – 11, 2001.

Your permission is necessary for you child's participation in the questionnaire portion of the study. This standard questionnaire format addresses nutrition knowledge, self-esteem, body image, and general attitudes toward exercise and nutrition. The questionnaire has been reviewed by teachers and administration at the school, and should not be threatening to the students in any way. Furthermore, your child's identity will remain confidential.

Completion of the questionnaire is optional and will not impact students' grades in any way. We encourage participation, however, due to its potential benefits. By taking part in this study, your child will help to increase the pool of available information pertaining to adolescent nutrition and exercise attitudes and knowledge.

In order for your child to participate in the questionnaire portion of the research project, a consent form must be on file with The Ohio State University Department of Human Nutrition and Food Management. Please complete the attached form and have your child return it to Mrs. Bell or Mr. Korns by Monday, April 30, 2001. If you have any questions, please contact Dr. Mary C. Mitchell at (614) 292-8189 or Christine Kendle at (614) 263-4113.

Sincerely,

Mary C. Mitchell, Ph.D., RD, LD
Professor of Nutrition

Christine L. Kendle
April 6, 2001

Dear Parent or Guardian:

Claymont Middle School has been selected to participate in nutrition and exercise research conducted by Dr. Mary C. Mitchell and Christine L. Kendle of The Ohio State University. The study’s purpose is to evaluate attitudes and knowledge toward nutrition and exercise using standard questionnaire formats. To complement the study, as well as on-going classroom instruction, a 5-day series has been developed specifically for the 7th graders. This series will be presented as a normal, classroom activity in Mrs. Sevier’s life skill classes.

Your permission is necessary for you child’s participation in the questionnaire portion of the study. This standard questionnaire format addresses nutrition knowledge, self-esteem, body image, and general attitudes toward exercise and nutrition. The questionnaire has been reviewed by teachers and administration at the school, and should not be threatening to the students in any way. Furthermore, your child’s identity will remain confidential.

Completion of the questionnaire is optional and will not impact students’ grades in any way. We encourage participation, however, due to its potential benefits. By taking part in this study, your child will help to increase the pool of available information pertaining to adolescent nutrition and exercise attitudes and knowledge.

In order for your child to take part in the questionnaire portion of the research project, a consent form must be on file with The Ohio State University Department of Human Nutrition and Food Management. Please complete the attached form and have your child return it to Mrs. Sevier by Thursday, April 19, 2001. If you have any questions, please contact Dr. Mary C. Mitchell at (614) 292-8189 or Christine Kendle at (614) 263-4113.

Sincerely,

Mary C. Mitchell
Mary C. Mitchell, Ph.D., RD, LD
Professor of Nutrition

Christine L. Kendle
APPENDIX E

ORAL SCRIPT FOR STUDENTS
Script (for 7th Grade Students)

Thank you for your efforts to return parental consent forms allowing you to participate in this research project. The questionnaires you have been given will help me, and fellow researchers at The Ohio State University, to learn more about you and your peers. We are interested in body image, self-esteem, attitudes and knowledge toward physical activity, and knowledge and attitudes toward nutrition during adolescence. We want to know about the group as a whole, so answers on a specific question will not be linked to individuals in any way.

There are no anticipated discomforts involved in filling out this questionnaire, and I encourage you to answer each question to the best of your ability. You have the right to skip questions or to withdraw from participation at any time.

Boys should have received green packets and girls should have received light yellow packets. If you have the wrong color packet, please raise your hand at this time and the correct packet will be given to you.

On the first page of the packet you should see a number in the top, right hand corner and a place for you to print your name toward the center of the page. This sheet will be removed from the rest of the packet and stored apart from your answers. Its purpose is simply to help me match your nutrition test number on this questionnaire to the number on the questionnaire you will take at the end of this presentation. At no time will anyone know what answers you provided for a particular question. Please
print your name on the line as indicated at this time. Remove the top sheet from the rest of the packet, and I will be around to collect them.

Do not write your name on any of the other pages of the questionnaire. Answer each question to the best of your ability. Do not spend too much time on any one question, but rather go with your initial response to a statement. There are no write or wrong answers. If you have any questions or concerns while completing your packet, please raise your hand and I will be around to assist you. You may begin at this time.
APPENDIX F

NUTRITION INTERVENTION CURRICULUM
Nutrition Intervention Curriculum Outline

Day One
Initial Testing and Intro Activity

Administer Test with Complete Directions

Rate Your Plate a
- Those done early will receive a plate and the instructions to list everything they have eaten in the last 24 hours. The activity will be continued Day 2 following discussion of the Food Guide Pyramid

Day Two
Food Guide Pyramid, Serving Sizes, and Finding the Facts in Nutrition Labels

Food Guide Pyramid b and The New American Plate Serving Finder c

The Food Guide Pyramid Essentials
- Variation
- Moderation
- Balance b

Building the Food Guide Pyramid d
- Hand out paper food models e and for each group, kids with the models that go in the group come up and post them on the large food guide pyramid

Food Groups, Servings, and Their Contributions to Health f
1. Grains
   a. 6 – 11 servings
   b. What does a serving look like?
   c. Importance as pyramid base
2. Vegetables
   a. 3 – 5 servings
   b. What does a serving look like?
   c. Importance for providing variety of vitamins and minerals
3. Fruit
   a. 2 – 4 servings
   b. What does a serving look like?
   c. Importance for providing variety of vitamins and minerals
4. Milk, Yogurt, Cheese

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a. 2 – 3 servings  
b. What does a serving look like?  
c. Importance for calcium, fortified with A and D  
d. Calcium content of various milk products  
e. Lactose Intolerance  
f. Osteoporosis  

5. Meat, Poultry, Fish, Dry beans, Eggs, Nut group  
a. 2 – 3 servings  
b. What does a serving look like?  
c. Importance for protein and iron  

6. Other  
a. Choose moderately  

How does your pyramid stack up?  
- Pass out the plates completed on Day 1 and a blank pyramid  
- Ask kids to put the foods on their plates in the appropriate food groups  
- Discuss their daily intakes  

General Eating Recommendations  
1. Eat at least 3 meals per day  
2. Snacks are okay, just choose wisely  
3. Put your food where you’ll be most active  
4. Try to include 4 to 6 groups in each meal  
5. Space meals no further than 4 to 6 hours apart  
6. Remember, preparation and toppings add up  
7. Moderation is the KEY  

Nutrition label activity  
- Pass out various nutrition labels to students  
  o Students guess what food they think it is  
  o Discuss how the students were able to identify the foods  

**Day Three:**  
**Nutrition Labels (The Big Picture) and Fast Food Choices**  

Reading Nutrition Labels  
- What different parts of the nutrition label tell the consumer  
- Discuss the information presented on Good 4 You Cereal  

Health Food Claims  
- Reduced fat, low fat, non-fat  

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Fast Foods
- Comparison of different fast food restaurants
  - Students (or a student representative) names “typical” fast food meal
  - Calculate the nutrient needs met by this meal
  - Ask students for some alternatives that would better meet nutrient needs when eating at a fast food restaurant
- Average fast food meal consumes ½ of female's daily calorie intake and 1/3 of males

Snack Foods
- Hand out snack food list
- If possible, make a healthy snack alternative

Snacking the Way through the Day Activity
- Read “choose-your-own-adventure” style story and see if students are able to healthfully snack their way through the day

Day Four:
Nutrition, Exercise, and Disordered Eating

Exercise Activity
- How many calories does each activity burn?

The Benefits of Physical Fitness
- Defining physical activity
- Recommend 30 minutes of activity every day
- Working physical activity into daily life

Eating Like an Athlete
- Based on Fit Kid Connection materials

Anorexia and Bulimia

Fad Dieting
- Dr. Atkins Diet Revolution
  - High protein, low carbohydrate, high fat

Day Five: Final Testing and Discussion
Curriculum Concept Development References

a Fonarow J. Rate your plate Food Guide Pyramid education activity. Personal communication. Wellness Center, The Ohio State University, 1998.


Physical Activity Opinion and Knowledge

For each statement below, please indicate the extent to which you AGREE or DISAGREE with each of the following statements by circling the ONE response that best expresses your answer.

SA = Strongly Agree   A = Agree   N = Neither   D = Disagree   SD = Strongly Disagree

Example: For the statement, "Eating an apple a day keep the doctor away," circle SA if you strongly agree with the statement; A if you agree; N if you are neutral about the statement; D if you disagree; and SD if you strongly disagree with the statement.

<p>| | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Exercise makes me feel good about me</td>
<td>SA</td>
<td>A</td>
<td>N</td>
<td>D</td>
</tr>
<tr>
<td>2</td>
<td>There is not enough value coming from exercise to justify the time consumed.</td>
<td>SA</td>
<td>A</td>
<td>N</td>
<td>D</td>
</tr>
<tr>
<td>3</td>
<td>I don't have time to exercise</td>
<td>SA</td>
<td>A</td>
<td>N</td>
<td>D</td>
</tr>
<tr>
<td>4</td>
<td>I am always trying to get more exercise</td>
<td>SA</td>
<td>A</td>
<td>N</td>
<td>D</td>
</tr>
<tr>
<td>5</td>
<td>If I eat right, I don't need to exercise</td>
<td>SA</td>
<td>A</td>
<td>N</td>
<td>D</td>
</tr>
<tr>
<td>6</td>
<td>I feel embarrassed when I exercise in front of others</td>
<td>SA</td>
<td>A</td>
<td>N</td>
<td>D</td>
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<tr>
<td>7</td>
<td>To receive any real benefit from aerobic exercise, the exercise must be performed continuously for at least 20 minutes</td>
<td>SA</td>
<td>A</td>
<td>N</td>
<td>D</td>
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<tr>
<td>8</td>
<td>If I can sing during aerobic exercise, then I'm not working hard enough</td>
<td>SA</td>
<td>A</td>
<td>N</td>
<td>D</td>
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<tr>
<td>9</td>
<td>The only way to lose mostly body fat in a weight reduction program is to exercise</td>
<td>SA</td>
<td>A</td>
<td>N</td>
<td>D</td>
</tr>
<tr>
<td>10</td>
<td>Exercise will improve my coordination and balance</td>
<td>SA</td>
<td>A</td>
<td>N</td>
<td>D</td>
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<tr>
<td>11</td>
<td>An exercise program should be performed 2-3 times a week in order to benefit from it</td>
<td>SA</td>
<td>A</td>
<td>N</td>
<td>D</td>
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<tr>
<td>12</td>
<td>Being fit will increase my strength and endurance</td>
<td>SA</td>
<td>A</td>
<td>N</td>
<td>D</td>
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</table>
## Eating Attitudes

Please read each statement carefully and then circle the response that best expresses how you feel about the statement.

<table>
<thead>
<tr>
<th>Always</th>
<th>Very Often</th>
<th>Often</th>
<th>Sometimes</th>
<th>Rarely</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>VO</td>
<td>O</td>
<td>S</td>
<td>R</td>
<td>N</td>
</tr>
</tbody>
</table>

1. I am terrified about being overweight.  
2. I avoid eating when I am hungry.  
3. I find myself thinking about food a lot.  
4. There are times I have felt unable to stop eating.  
5. I cut my food into small pieces.  
6. I am aware of the calorie content of foods that I eat.  
7. I particularly avoid food with a high carbohydrate content (e.g. bread, potatoes, rice).  
8. I feel that others would prefer if I ate more.  
9. I throw up after I have eaten.  
10. I feel extremely guilty after eating.  
11. I spend a lot of time thinking how it would be if I were thinner.  
12. I think about burning up calories when I exercise.  
13. Other people think I am too thin.  
14. I think a lot about having fat on my body.  
15. I take longer than others to eat my meal.  
16. I avoid foods with sugar in them.  
17. I feel that food controls my life.  
18. I have self-control over food.  
19. I feel that other people pressure me to eat.  
20. I give too much time and thought to food.  
21. I feel uncomfortable after eating sweets.  
22. I am often trying a new diet.  
23. I like my stomach to feel empty.  
24. I enjoy trying new rich foods.  
25. I have the urge to throw up after meals.
How You Feel (Rosenburg Self-Esteem Inventory)

Circle the letter that represents the phrase that fits your most immediate response to the following statements. When in doubt, circle the phrase that seems closest to expressing how you feel about the statement. Do not spend a lot of time on any one item.

<table>
<thead>
<tr>
<th></th>
<th>Strongly Agree (SA)</th>
<th>Agree (A)</th>
<th>Neither (N)</th>
<th>Disagree (D)</th>
<th>Strongly Disagree (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>On the whole, I am satisfied with myself.</td>
<td>SA</td>
<td>A</td>
<td>N</td>
<td>D</td>
</tr>
<tr>
<td>2</td>
<td>At times I think I am no good at all.</td>
<td>SA</td>
<td>A</td>
<td>N</td>
<td>D</td>
</tr>
<tr>
<td>3</td>
<td>I feel that I have a number of good qualities.</td>
<td>SA</td>
<td>A</td>
<td>N</td>
<td>D</td>
</tr>
<tr>
<td>4</td>
<td>I am able to do things as well as most other people.</td>
<td>SA</td>
<td>A</td>
<td>N</td>
<td>D</td>
</tr>
<tr>
<td>5</td>
<td>I feel I do not have much to be proud of.</td>
<td>SA</td>
<td>A</td>
<td>N</td>
<td>D</td>
</tr>
<tr>
<td>6</td>
<td>I certainly feel useless at times.</td>
<td>SA</td>
<td>A</td>
<td>N</td>
<td>D</td>
</tr>
<tr>
<td>7</td>
<td>I feel that I am a person of worth.</td>
<td>SA</td>
<td>A</td>
<td>N</td>
<td>D</td>
</tr>
<tr>
<td>8</td>
<td>I wish I could have more respect for myself.</td>
<td>SA</td>
<td>A</td>
<td>N</td>
<td>D</td>
</tr>
<tr>
<td>9</td>
<td>All in all, I am inclined to feel that I am a failure.</td>
<td>SA</td>
<td>A</td>
<td>N</td>
<td>D</td>
</tr>
<tr>
<td>10</td>
<td>I take a positive attitude toward myself.</td>
<td>SA</td>
<td>A</td>
<td>N</td>
<td>D</td>
</tr>
</tbody>
</table>

Body Image

Circle the letter that represents the phrase that fits your most immediate response to the following statements. When in doubt, circle the phrase that seems closest to expressing how you feel about the statement. Do not spend a lot of time on any one item.

<table>
<thead>
<tr>
<th>Agree (A)</th>
<th>Neutral (N)</th>
<th>Disagree (D)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>My weight is appropriate for my height</td>
<td>A</td>
</tr>
<tr>
<td>2</td>
<td>I feel good about my body image</td>
<td>A</td>
</tr>
<tr>
<td>3</td>
<td>I think my thighs are too fat</td>
<td>A</td>
</tr>
<tr>
<td>4</td>
<td>When I look into a full length mirror, I am satisfied with what I see</td>
<td>A</td>
</tr>
<tr>
<td>5</td>
<td>I have too much fat around my waist</td>
<td>A</td>
</tr>
<tr>
<td>6</td>
<td>I am confident that when other people look at me they are favorably impressed</td>
<td>A</td>
</tr>
<tr>
<td>7</td>
<td>I would be happier with my body image if I could redistribute my body fat</td>
<td>A</td>
</tr>
<tr>
<td>8</td>
<td>I wish I could lose some weight</td>
<td>A</td>
</tr>
<tr>
<td>9</td>
<td>Being overweight has nothing to do with being successful</td>
<td>A</td>
</tr>
<tr>
<td>10</td>
<td>You are born with a basic body type that can be changed very little</td>
<td>A</td>
</tr>
</tbody>
</table>
Body Image Perception

Label which of the following drawings most accurately represents

1) your current body size (label with a “C”)
2) your ideal body size (label with an “I”)

---

163
Nutrition Knowledge Questionnaire

1. Foods in the Breads, Cereal, and Other Grain Products group of the Food Guide Pyramid mostly provide
   a) cholesterol
   c) vitamin A
   b) complex carbohydrates
   d) calcium

2. Which of the following equals one vegetable serving?
   a) ½ cup raw carrots
   c) 2 cups raw carrots
   b) 1 cup raw carrots
   d) carrots are not a vegetable

3. Most fruits do not contain which of the following?
   a) cholesterol
   c) vitamin C
   b) vitamin A
   d) fiber

4. Protein, an important contribution of the Meat, Poultry, Fish, and Meat Alternatives group, is needed to
   a) provide most of the body’s energy
   c) build strong bones
   b) build and maintain muscle
   d) insulate the body

5. Today, milk products are fortified with
   a) vitamin D and vitamin A
   c) protein
   b) calcium
   d) zinc

6. The Fats and Sweets group of the Food Guide Pyramid does not have a suggested serving. This is because foods from the group
   a) provide nutrients that are also found in other pyramid groups
   b) are low in calories
   c) are not well liked – this tends to be the group people like least
   d) provide few nutrients and are to be eaten sparingly

7. Overall, the Food Guide Pyramid helps people to create diets that are
   a) colorful, balanced, and nutrient dense
   c) high in calories, varied, and fibrous
   b) varied, moderate, and balanced
   d) moderate, colorful, and fibrous

8. Which of the following is NOT a major nutrient seen on a nutrition label?
   a) water
   c) carbohydrate
   b) protein
   d) fat

9. Ingredients on a nutrition label are listed in
   a) alphabetical order
   c) decreasing order by weight
   b) order by the strongest flavor
   d) increasing order by intensity of color

10. Which of the following fluid milk products has the most calcium?
    a) Whole milks
    c) 2 % milk
    b) skin milk
    d) they all have about the same amount
11. People in which ethnic group are least likely to have lactose intolerance?
   a) Asian                      b) African American
   c) Caucasian                  d) Latino/Hispanic

12. For a food to be labeled “fat free,” it must have
   a) no fat at all             b) less than 0.5 g of fat
   c) less than 1.0 g of fat    d) less than 5.0 g of fat

13. Which of the following is an example of a snack combining the major nutrients, fat, carbohydrate, and protein?
   a) an apple                   b) peanut butter and crackers
   c) carrots and fat free veggie dip
d) a Snickers bar

14. A hamburger, small shake, and large fry would “use up” how much of the average adolescent’s daily calories
   a) 1/3 for males, 1/2 for females
   b) 1/4 for males, 1/3 for females
   c) 1/2 for males, 2/3 for females
   d) 2/3 of males, all of females

15. All of the following are benefits of physical activity EXCEPT
   a) restful sleep               b) decreased muscle strength
   c) ability to resist infection
d) stronger heart and blood flow

16. To obtain healthful benefits, an person needs to
   a) work out until he/she collapses
   b) work out moderately once per week
   c) be physically active 3 times per week
d) be physically active every day

17. ___________ is an eating disorder in which a person has a distorted body image and refuses to maintain minimally normal body weight
   a) bulimia nervosa
   b) anorexia nervosa
   c) binge eating disorder
d) laxatosis

18. ___________ is an eating disorder in which a person eats a lot of food and then cause themselves to vomit to get rid of the food they have eaten
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19. The Atkins, Sugar Busters, and Zone diets are all examples of
   a) low protein, high carbohydrate diet
   b) high fat, high carbohydrate diet
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   d) high protein, low carbohydrate diet

20. To maintain one’s current weight
   a) caloric intake must be less than output
   b) caloric input must equal caloric output
   c) caloric intake must be greater than output
Activity Checklist

Check the box indicating the number of times per week you do each of these activities.

<table>
<thead>
<tr>
<th>ACTIVITY: Light Exercise</th>
<th>Not At All</th>
<th>1-2 Times/Week</th>
<th>3-4 Times/Week</th>
<th>5-7 Times/Week</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bowling</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Golfing</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fishing</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ACTIVITY: Strenuous Exercise</th>
<th>Not At All</th>
<th>1-2 Times/Week</th>
<th>3-4 Times/Week</th>
<th>5-7 Times/Week</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aerobics</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jogging</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biking</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marathon</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Racket Ball</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tennis</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Volley Ball</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Swimming</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseball</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight Lifting</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In total, how much time do you spend every day doing some type of physical activity? ____________

What clubs and activities are you involved in (include sports and activities that you are active in throughout the year, even if they are not currently taking place, i.e.: cross country)

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A Survey of the Nutrition and Exercise Habits of 7th Grade Students

Part II

The following pages contain questions about you. We want to learn about your opinions toward eating a healthy diet, exercise, body image, and your health. Answers may not perfectly describe your opinion, in which case please select the answer that comes the closest. There are no right or wrong answers.

- Please DO NOT write your name anywhere on this survey.
- Please provide ONE answer to each question, unless noted otherwise.
- The answers should reflect your opinion, so please do not discuss any questions with those sitting around you.
General Information about You

Age ____________

Height ____________

Weight ____________

How many people currently live in your home? ____________

How many brothers and sisters do you have (if you have step- or half-brothers/sisters, indicate them separately)? ____________________________________________________________________________

How many meals per week does your family eat together? ____________

What is your ethnic background?

_____ African American  _____ Asian

_____ Caucasian  _____ Hispanic

_____ Native American  _____ Other

Rank the following in terms of their importance for providing you with nutrition information:

_____ Parents  _____ Radio

_____ Teachers  _____ Magazines

_____ Doctor  _____ Newspaper

_____ Television  _____ Other
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   a) caloric intake must be less than output b) caloric input must equal caloric output
   c) caloric intake must be greater than output
Food Frequency Questionnaire

For each of the foods on the following two pages
- place a number in the HOW OFTEN box to indicate how often you usually eat the food
- place a check in the YOUR SERVING SIZE column that best indicates your usual serving size

<table>
<thead>
<tr>
<th>Fruits and Vegetables</th>
<th>Medium Serving</th>
<th>Your Serving Size</th>
<th>How Often?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apples, applesauce, pears</td>
<td>(1) or ½ cup</td>
<td>sm</td>
<td></td>
</tr>
<tr>
<td>Cantaloupe (in season)</td>
<td>½ medium</td>
<td>med</td>
<td></td>
</tr>
<tr>
<td>Oranges</td>
<td>medium</td>
<td>lg</td>
<td></td>
</tr>
<tr>
<td>Orange juice or grapefruit juice</td>
<td>6 oz. glass</td>
<td>day</td>
<td></td>
</tr>
<tr>
<td>Other fruit juices, fortified fruit drink</td>
<td>½</td>
<td>wk</td>
<td></td>
</tr>
<tr>
<td>Beans, such as baked beans, pinto, kidney, lima, or in chili</td>
<td>1 cup</td>
<td>mo</td>
<td></td>
</tr>
<tr>
<td>Tomatoes, tomato juice</td>
<td>¾ cup</td>
<td>yr</td>
<td></td>
</tr>
<tr>
<td>Broccoli</td>
<td>½ cup</td>
<td>rare</td>
<td></td>
</tr>
<tr>
<td>Spinach</td>
<td>½ cup</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mustard, turnip, collard greens</td>
<td>½ cup</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cole slaw, cabbage, sauerkraut</td>
<td>½ cup</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carrots, mixed veg with carrots</td>
<td>½ cup</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Green salad</td>
<td>1 med. bowl</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Salad dressing, mayonnaise</td>
<td>2 Tbsp</td>
<td></td>
<td></td>
</tr>
<tr>
<td>French fries and fried potatoes</td>
<td>¾ cup</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sweet potatoes, yams</td>
<td>½ cup</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other potatoes, including boiled, baked, potato salad, mashed</td>
<td>(1) or ½ cup</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rice</td>
<td>¾ cup</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Dairy Products, Beverages

| Cheese and cheese spreads, not including cottage cheese   | 1 slice or 2 oz. |                   |            |
| Whole milk and beverages with whole milk (not including on cereal) | 8 oz. glass     |                   |            |
| 2% milk and beverages with 2% milk (not including on cereal) | 8 oz. glass     |                   |            |
| Skim milk and beverages with 1% or skim milk (not including on cereal) | 8 oz. glass     |                   |            |
| Regular soft drinks (not diet)                             | 12 oz.          |                   |            |
| Milk or cream in tea or coffee                             | 1 Tbsp          |                   |            |
| Sugar in coffee or tea, or on cereal                       | 2 tsp           |                   |            |

Sweets

<p>| Ice cream                                                  | 1 scoop         |                   |            |
| Doughnuts, cookies, cakes, pastry                          | 1 piece or 3 cookies |                   |            |
| Pies                                                       | 1 med slice      |                   |            |
| Chocolate candy                                            | sm bar. 1 oz    |                   |            |</p>
<table>
<thead>
<tr>
<th>Meat, Mixed Dishes, Lunch Items</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Hamburger, cheeseburger, meatloaf</td>
<td>1 medium</td>
</tr>
<tr>
<td>Beef-steaks, roasts</td>
<td>4 oz.</td>
</tr>
<tr>
<td>Beef stew or pot pie with carrots, other</td>
<td>1 cup</td>
</tr>
<tr>
<td>vegetable</td>
<td></td>
</tr>
<tr>
<td>Liver, including chicken liver</td>
<td>4 oz.</td>
</tr>
<tr>
<td>Pork, including chops, roasts</td>
<td>2 chops or</td>
</tr>
<tr>
<td></td>
<td>4 oz.</td>
</tr>
<tr>
<td>Fried chicken</td>
<td>2 sm or 1 lg piece</td>
</tr>
<tr>
<td>Other chicken</td>
<td>1 sm or 1 lg piece</td>
</tr>
<tr>
<td>Fried fish</td>
<td>2 sm or 1 lg piece</td>
</tr>
<tr>
<td>Other fish, broiled or baked</td>
<td>2 sm or 1 lg piece</td>
</tr>
<tr>
<td>Spaghetti, lasagna, other pasta with</td>
<td>1 cup</td>
</tr>
<tr>
<td>tomato sauce</td>
<td></td>
</tr>
<tr>
<td>Hot dogs</td>
<td>2 dogs</td>
</tr>
<tr>
<td>Ham, lunch meats</td>
<td>2 slices</td>
</tr>
<tr>
<td>Vegetable soup, vegetable beef, minestrone,</td>
<td>1 med bowl</td>
</tr>
<tr>
<td>tomato soup</td>
<td></td>
</tr>
<tr>
<td>Pizza</td>
<td>2 slice</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Bread, Salty Snacks, Spreads</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>White bread (including sandwiches), bagels,</td>
<td>2 slices,</td>
</tr>
<tr>
<td>etc.</td>
<td>1 bagel</td>
</tr>
<tr>
<td>Dark bread, including whole wheat, rye,</td>
<td>2 slices</td>
</tr>
<tr>
<td>pumpernickel</td>
<td></td>
</tr>
<tr>
<td>Corn bread, corn muffins, corn tortillas</td>
<td>1 med piece</td>
</tr>
<tr>
<td>Salty snacks (such as chips, popcorn)</td>
<td>2 handfuls</td>
</tr>
<tr>
<td>Peanuts, peanut butter</td>
<td>2 Tbsp</td>
</tr>
<tr>
<td>Margarine on bread or rolls</td>
<td>2 pats</td>
</tr>
<tr>
<td>Butter on bread or rolls</td>
<td>2 pats</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Breakfast Foods</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>High fiber, bran, or granola cereals,</td>
<td>1 med bowl</td>
</tr>
<tr>
<td>shredded wheat</td>
<td></td>
</tr>
<tr>
<td>Highly fortified cereals, such as Product</td>
<td>1 med bowl</td>
</tr>
<tr>
<td>19, Total, Most</td>
<td></td>
</tr>
<tr>
<td>Other cold cereals, such as Corn Flakes or</td>
<td>1 med bowl</td>
</tr>
<tr>
<td>Rice Krispies</td>
<td></td>
</tr>
<tr>
<td>Dry cereal, excluding fiber/fortified</td>
<td>1 med bowl</td>
</tr>
<tr>
<td>Cooked Cereals, oatmeal</td>
<td>1 med bowl</td>
</tr>
<tr>
<td>Eggs</td>
<td>2 eggs</td>
</tr>
<tr>
<td>Bacon</td>
<td>2 slices</td>
</tr>
<tr>
<td>Sausage</td>
<td>2 patties or links</td>
</tr>
</tbody>
</table>

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REFERENCES


www.ode.state.oh.us/reportcard/archives/default.asp.


Thompson JK, Altabe MN. Psychometric qualities of the Figure Rating Scale. Int J Eat Disord 1991;10:615-619.


Thurn B. Personal communication. Franklin County Board of MR/DD. 2002.


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