THE EFFECT OF LIVING ARRANGEMENT ON DIETARY INTAKE OF ATHLETES WHO PARTICIPATED IN SPECIAL OLYMPICS LIVING IN DELAWARE COUNTY, INDIANA

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ABSTRACT

THESIS: The Effect of Living Arrangement on Dietary Intake of Athletes who Participated in Special Olympics Living in Delaware County, Indiana

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The purpose of this study was to measure and compare athletes' dietary intake to the National Health and Nutrition Examination Survey (NHANES) data that represents individuals without intellectual disabilities (ID), and to determine the effect of living arrangements on dietary intake and diet quality of the athletes. Dietary intakes from the athletes' three-day food records, previously collected in 2009, were analyzed using the Self Administered 24-hr Recall (ASA24). Results indicated individuals with ID have a poorer quality diet than Americans without ID. Overall, the lowest HEI-2005 score (e.g., poorest diet quality) was observed among the subjects who lived in the family home (41.4 ± 7.6) and the highest HEI-2005 score was observed among the subjects who lived in a group home (45.3 ± 6.4). Results show that the more food choice responsibility given to an individual with ID the lower the quality diet, and the less responsibility given to an individual with ID the higher the quality diet ($p \leq 0.01$). Determining the nutrient intake and diet quality of individuals with ID may help identify ways to reduce the rate of obesity in this population, and provide health professionals with information needed to develop appropriate educational efforts.

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GOD IS GOOD!

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CHAPTER I

INTRODUCTION

Background

Nearly 34% of Americans in the United States are obese (Flegal, Carroll, Ogden, & Curtin, 2010). Obesity is a key risk factor for several chronic diseases including diabetes, cardiovascular disease and different cancers (Maaskant, van Knijff-Raeven, van Schrojenstein Lantman-de Valk, & Veenstra, 2009). Obesity rates for adults with disabilities are 57% higher than rates for adults without disabilities. Experts know that obesity is both preventable and treatable through lifestyle modifications including diet and exercise (Moran et al., 2005). People with disabilities are at greater risk of developing health problems associated with lifestyle choices and behaviors, such as diet and physical activity (Melville et al., 2008). Since individuals with disabilities already have special needs, it is important to assess the prevalence of obesity in this at-risk population (Harris, Rosenberg, Jangda, O'Brien, & Gallagher, 2003).

Obesity occurs when an individual's dietary intake is higher than their energy-expenditure (Malina, Bouchard, & Bar-Or, 2004). Unbalanced food preparation by individuals with intellectual disabilities (ID) or by their support staff/caregivers has been shown to result in too much fat consumption and insufficient proportion of vegetables

and fruits in the diet (Maaskant, et al., 2009). Along with diet, exercise plays an important role in weight homeostasis. A large proportion of adults with ID lead physically inactive life styles and are less active than adults without ID (Melville et al., 2009). Adults with disabilities engage in physical activities 12% of the time on a regular basis compared to 22% of adults without disabilities (NCBDDD, 2011).

To encourage physical activity in this population, Special Olympics, a program for individuals with ID, was developed in 1968 (SpecialOlympics, 2007). Special Olympics International is a not-for-profit organization that provides sports training and athletic competition in more than 20 Olympic-type sports for children and adults with ID. Special Olympics reaches more than 2.5 million athletes worldwide and nearly 10,000 individuals across the state of Indiana (SpecialOlympicsIndiana, 2007). The mission of Special Olympics is to provide year-around training and athletic competition in a variety of Olympic-type sports for children and adults with ID, offering them continuing opportunities to develop physical fitness, demonstrate courage, experience joy and participate in a sharing of gifts, skills and friendship with their families, other athletes and the community (SpecialOlympicsIndiana, 2007).

Evidence suggests that regular physical activity and good nutrition provide improved cardiovascular and muscle fitness, enhanced mental health, and a better ability to perform tasks of daily life for people with disabilities (CDC, 2010). In Indiana, 77.1% of the Special Olympics athletes who attended the Healthy Athletes Health Promotion Health Fair were either overweight (26.8%) or obese (50.3%) (Dudoit, 2009). Identifying the nutrient intake of individuals with disabilities is important if we are to adequately address how to reduce obesity in the United States among this population.

Problem

Obesity rates for adults with disabilities are 57% higher than rates for adults without disabilities (NCBDDD, 2011). In Indiana, 77.1% of the athletes who participated in Special Olympics and attended a Healthy Athletes Health Promotion health fair in 2008 (n=257), were overweight (26.8%) or obese (50.3%) (Dudoit, 2009). In populations with ID, being overweight or obesity has been shown to increase mortality rates, shorten life expectancies, and enhance health needs (Melville, et al., 2008). It is important to identify the nutrient intake of individuals with disabilities to adequately address ways to reduce obesity among this population.

Purpose

The purpose of this descriptive study was to determine the dietary intake of 35 athletes who participated in Special Olympics in Delaware County, Indiana, to compare the athletes' daily intake to the National Health and Nutrition Examination Survey (NHANES) data for individuals ID, and to determine what effect, if any, living arrangement (e.g., group home, family home, or independent living) has on dietary intake and diet quality of the athletes. The secondary purpose of this study was to determine the relationship between self-reported dietary intake and obesity prevalence in athletes who participate in Special Olympics.

Research Questions

This study addresses the following research questions:

RQ 1: What is the nutrient intake and diet quality of athletes who participate in Special Olympics living in Delaware County?

A) Total calories

B) Percent of calories from carbohydrate, protein, fat, and alcohol

C) Healthy Eating Index (HEI) score, to represent diet quality

RQ 2: Is there a difference between the nutrient intake and diet quality of athletes who participate in Special Olympics and the general population without intellectual disabilities based on NHANES data?

A) Total calories

B) Percent of calories from carbohydrate, protein, fat, and alcohol

C) HEI score, to represent diet quality

RQ 3: Is there a difference between the nutrient intake and diet quality of athletes who participate in Special Olympic living in a group home, family home, or living independently?

A) Total calories

B) Percent of calories from carbohydrate, protein, fat, and alcohol

C) HEI score, to represent diet quality

RQ 4: What is the relationship between diet quality and an athlete's responsibility given to make his/her own decision regarding food choices?

A) Overall

B) Living in a group home

C) Living in family residence

D) Living independently

RQ 5: What is the relationship between dietary intake and obesity prevalence among athletes who participate in Special Olympics?

A) Overall

B) Living in a group home

C) Living in family residence

D) Living independently

Rationale

Individuals with disabilities are an important subgroup to address in reducing obesity in the United States (NCBDDD, 2011). As such, it is imperative to identify ways to reduce the rate of overweight and obesity among those with intellectual disabilities. Identifying the dietary intake of those with ID will provide health professionals with information needed to develop appropriate, targeted educational efforts.

Assumptions

The researcher made the following assumptions in the implementation of the study and in the interpretation of the data:

1. The athletes or the athletes' caretakers understood the directions when completing the questionnaire.
2. The athletes or the athletes' caretakers gave complete and honest responses on the three-day food records.

3. When serving sizes were indicated incompletely, the standard serving chosen by the research as the unit of measure for a food was an adequate proxy for the actual amount of food consumed.
4. The three-day food records were completed soon after consumption.

Definitions

For the purpose of this study, the following definitions are used:

1. Intellectual disability: Intellectual disability is characterized both by a significant below-average score on a test of mental ability or intelligence, and by limitations in the ability to function in areas of daily life, such as communication, self-care, and getting along in social situations and school activities. (CDC, 2005).
2. Special Olympics: A not-for-profit organization that provides sports training and athletic competition in more than 20 Olympic-type sports for children and adults with intellectual disabilities. Special Olympics reaches more than 2.5 million athletes worldwide offering them continuing opportunities to develop physical fitness, demonstrate courage, experience joy and participate in a sharing of gifts, skills and friendship with their families, other Special Olympic athletes and the community (SpecialOlympicsIndiana, 2007).
3. Caregiver or caretaker: The primary person who takes care of the athlete during Special Olympic events and practices. It could include a family member or a staff member from a group home.

4. Three-day food record: A three-day food record (also referred to as a food diary) is a thorough description of all the foods and beverages an individual consumes over a period of three days.
5. NHANES: The National Health and Nutrition Examination Survey is a program of studies designed to assess the health and nutritional status of adults and children in the United States. It is a nationally representative sample of the United States population (CDC, 2011).
6. Body Mass Index (BMI): According to the World Health Organization, BMI is a simple index of weight-for-height that is used to classify overweight and obesity in adults. It is defined as a person's weight in kilograms divided by the square of height in meters (WHO, 2011).
   A) Normal weight: a BMI of ≥18.5 – 24.9
   B) Overweight: a BMI of ≥25.0 – 29.9
   C) Obese: a BMI greater than 30.0
   D) Obese Class I: a BMI of ≥30.0 – 34.9
   E) Obese Class II: a BMI of 35.0 – 39.9
   F) Obese Class III: a BMI greater than 40.0

Summary

The purpose of this study was to determine the dietary intake of individuals with ID who participate in Special Olympic sports and to determine the effect of living arrangements (group home, family home or independently) on the self-reported dietary consumption of the athletes. Identification of food intake of those with ID may provide

health professionals with information needed to develop appropriate, targeted education efforts.

CHAPTER 2

REVIEW OF LITERATURE

The purpose of this descriptive study was to determine the dietary intake of 35 athletes who participated in Special Olympics in Delaware County, Indiana, to compare the athletes' daily nutrient intake to the National Health and Nutrition Examination Survey (NHANES) data for individuals without intellectual disabilities (ID), and, to determine what effect, if any, living arrangement (e.g., group home, family home, or independent living) had on dietary intake and diet quality of the athletes. The secondary purpose of this study was to determine the relationship between dietary intake and obesity prevalence in athletes who participate in Special Olympics. This literature review examines the prevalence of obesity in persons with ID and in individuals without ID, the dietary habits and influences of persons with ID, and provides an overview of the Special Olympic organization. It also reviews appropriate methods of dietary data collection for specific populations.

Prevalence of Obesity Among Adults

Overweight and obesity are the fifth leading risk for global deaths (WHO, 2011). The fundamental cause of excessive weight is an energy imbalance between calories

consumed and calories expended (Malina, et al., 2004). An increased intake of energy-dense foods that are high in fat, salts, and sugars, but low in vitamins and minerals are leading to the energy imbalance and low nutrient dense dietary pattern (WHO, 2011). Along with poor nutrient intake, there has been a decrease in physical activity due to the increasingly sedentary nature of many forms of work and changing modes of transportation (WHO, 2011).

Research has shown that as weight increases, the risk for disease also increases. These diseases include coronary heart disease, type 2 diabetes, hypertension (high blood pressure), dyslipidemia (high cholesterol or levels of triglycerides), types of cancers, liver and gallbladder damage, respiratory problems, and gynecological problems such as abnormal menses and infertility (Pischon, Nöthlings, & Boeing, 2008).

Prevalence of Obesity: Individuals without Intellectual Disabilities

Over the last 35 years, the prevalence of obesity has greatly increased in the United States (Flegal, Carroll, Ogden, & Johnson, 2002). The estimates of obesity in American adults were updated by Ogden et al. (2006) using 2003-2004 NHANES data. Examination of height and weight measurements from 4,431 adults aged 20 years or older obtained from NHANES 2003-2004 were compared with two data sets from the NHANES obtained in 1999-2000 and in 2003-2004. Results indicated that 32.2% of adults were obese (BMI $\geq$ 30) . The prevalence of obesity among men increased significantly between 1999-2000 (27.5%) and 2003-2004 (31.1%). Among women, no significant increase in obesity was observed between 1999-2000 (33.4%) and 2003-2004 (33.2%). The prevalence of extreme obesity (BMI $\geq$ 40) in 2003-2004 was 2.8% in men

and 6.9% in women. Among adults aged 20 to 39 years, 28.5% were obese, while 36.8% of adults aged 40 to 59 and 31.0% of those aged 60 years or older were obese in 2003-2004.

The prevalence of obesity (e.g., BMI ≥ 30) in the United States exceeds 30% in most gender and age groups (Flegal, Carroll, Ogden, & Curtin, 2010). Flegal et al. (2010) updated trends of overweight (BMI ≥ 25) and obesity (BMI ≥ 30), using measured height and weight data for 5,555 adult men and women aged 20 years or older as a part of the 2007-2008 National Health and Nutrition Examination Survey (NHANES). Results indicated the age-adjusted prevalence of obesity was 33.8% overall, 32.2% among men, and 35.5% among women. The prevalence estimate for overweight and obesity (BMI ≥25) was 68%.

Most recently, Flegal et al. (2012) compared the prevalence of adult obesity from the 2009-2010 NHANES to adult obesity and distribution of BMI from 1999-2008 data. The newest NHANES includes 5,926 men and women from the United States population in 2009-2010 along with 22,847 men and women from 1990-2008. Analysis showed the age-adjusted mean BMI was 28.7 (95% CI, 28.3-29.1) for men and 28.7 (95% CI, 28.4-29.0) for women. The age-adjusted prevalence of obesity was 35.5% (95% CI, 31.9-39.2%) among men and 35.8% (95% CI, 34.0-37.7%) among women. From 1999-2010, obesity showed no significant increase among women overall (age- and race-adjusted annual change in odds ratio, 1.01; 95% CI, 1.00-1.03; p=0.07). However, statistically significant increases were seen for non-Hispanic black women (p=0.04) and Mexican American women (p=.046). For men, there was a significant linear trend (p<0.001) over the 12-year period from 1999-2010. For both men and women, the most recent statistics

did not have a significantly different change (p=0.08 for men and p=0.24 for women) compared with data from 2003-2008.

Prevalence of Obesity: Individuals with Intellectual Disabilties

Researchers studied the weight and weight status of clients in a Dutch service provider for persons with ID called 'Pepign en Paulus' in 2002 and 2007. These individuals with ID were living in either an institutional residential facitily or a community residential facility. Between 2002 and 2007, the mean weight of the study group increased by 2.2 kilograms (64.4 to 66.6kg). The mean BMI rose from 24.0 to 24.8 (paired samples T-test: P<0.01). In 2002, 36% (120/336) of the individuals with ID were overweight or obese and by 2007, it increased to 45% (151/336) (Maaskant, et al., 2009).

Melville and colleagues (2008) measured the prevalence of obesity in adults with ID living in Greater Glasgow, United Kingdom and compared it to the 2003 Scottish Health Survey which monitors the prevalence of health conditions in Scotland. Of the 1,562 potential participants within the strictly defined boundaries, 945 were able to take part in the study. Height and weight were measured, and the World Health Organization (WHO) classification of obesity was used to categorize participants based on BMI. Women had a significantly greater mean BMI (28.8) than men (26.7) and were significantly more likely to be obese than men (OR 1.68, 95% CI; X^2 = 29.6, P<0.001). An estimated 39.9% (n=165) of the women and 27.8% (n=146) of the men with ID in this study were obese, compared with 25.1% of women and 22.7% of men in the Greater Glasgow health board sample from the Scottish Health Survey. This study indicated an

increased prevalence of obesity in adults with ID compared to the prevalence of obesity in adults in the general population (Melville, et al., 2008).

Rimmer & Wang (2005) observed the prevalence of overweight, obesity, and extreme obesity in a predominantly minority group of adults with physical and intellectual disabilities. Height and weight measurements of 306 participants (108 men;198 women) were compared with a non-disabled cohort using the nationally representative 1999-2000 NHANES data. Results indicated the rates of overweight, obesity, and extreme obesity were significantly higher among people with disabilites compared with the NHANES national data set on people without disabilities. Extreme obesity was approximately 4 times higher among people with disabilities than in the general population (OR = 4.08; 95% CI, 3.50-4.66). Eight-four percent of the individuals with disabilities were overweight or obese, 62% were obese, and 22% were extrememly obese. For people without disabilities, 65% were overweight or obese, 31% were obese, and only 5% were extremely obese. Subjects with arthritis and diabetes had the highest prevalence of obesity (>90%) and extreme obesity (50%).

A retrospective observational study was conducted by Moran and collaborators (2005) using participants from two family medicine practices from 1990 to 2003. Six-hundred and eighty individuals with ID and 1,806 comparison patients who did not have an intellectual disability were evaluated in this study. The authors estimated obesity prevalence by age and degree of obesity to better understand the pattern of obesity prevalence. Results indicated a very similar pattern of obesity among both groups. Obesity rates among the participants with mild ID are as follows: 31.3% of those who were 20 to 30 years of age, 35.5% of those 31 to 40 years of age, 37.8% of those 41 to 50

years of age, 38.7% of those 51 to 60 years of age, and 29.7% of those 60 years of age and older. Obesity rates among participants without ID are as follows: 33.1% of those who were 20 to 30 years of age, 37.2% of those 31 to 40 years of age, 40.9% of those 41 to 50 years of age, 40.5% of those 51 to 60 years of age, and 38.1% of those 60 years of age and older.

Harris et al. (2003) examined the anthroprometric data collected from athletes who participated in Special Olympics at the 1999 and 2001 international games. A BMI was computed for each of the 1,749 athletes with ID (37% female; 63% male). Thirty-two percent (n=562) were from the United States and 68% (n=1,187) were visitors from other countries. Adult athletes (18 years and older) from the United States were 3.1 to 4.9 times more likely to be overweight or obese compared with their non-US athlete conterparts. These findings suggest dietary strategies and nutrition education materials and opportunities should be developed for athletes who participate in United States Special Olympics .

Stancliffe and associates (2011) compared the prevalence of obesity for National Core Indicators (NCI) survey participants with ID and the general United States population using NHANES 2007-2008 findings. Research also estimated the prevalence of obesity by living arrangement in the NCI survey participants with ID. The final total NCI sample consisted of 8,911 individuals with ID from 20 states with the mean age of 43.48 years. On most comparisons, the sample in this study with ID did not differ from the nationally representative sample of the U.S. population. However, there was a higher prevalence of obesity among women with ID compared to the general population. Results showed obesity prevalence differed by living arrangement, with institutional

residents having the lowest prevalence (18.6%) and subjects living in their own home the highest (42.8%).

Dietary Guidelines

The *Dietary Guidelines for Americans, 2010* suggest strategies through recommendations to attain and maintain a healthy weight, reduce the risk of chronic diease, and promote overall health (USDA & DHHS, 2010). By law *Dietary Guidelines for Americans,* updated every 5 years, are developed jointly by the United States Department of Agriculture (USDA) and the Department of Health and Human Services (DHHS). The Dietary Guideline recommendations include, among others, the following two concepts: 1) maintain calorie balance over time to achieve and sustain a healthy weight; and 2) focus on consuming nutrient-dense foods and beverages. The Guidelines suggest individuals reduce and monitor their sodium, saturated and trans fats, cholesterol, added sugars, refined grains, and alcohol consumption (USDA & DHHS, 2010).

Psota (2009) conducted a study to determine the effectiveness of the *Dietary Guidelines* for weight loss. Pre-menopausal, overweight/obese women (n=101; BMI: 25-39.9 kg/m²; LDL-cholesterol: 100-189 mg/dL; aged 21-50 years) were randomized to either a lower-fat (20-27.5% calories from fat) or moderate-fat (27.5-35% calories from fat) treatment group based on the *Dietary Guidelines for Americans* which recommends 20-35% calories from fat. After following the diets for one year, both groups' weight loss was significantly different from baseline (-5.0 and -4.3 kg; $p<0.0001$). Results of the study indicated that diets consistent with the *Dietary Guidelines* are effective for weight loss and weight management. Findings from this study support using the *Dietary*

Guidelines for health promotion during weight loss and weight maintenance of a reduced body weight.

Murphy and colleauges observed fruit and vegetable consumption by adults in the United States. The *2010 Dietary Guidelines for Americans* place an increased emphasis on fruits and vegetables as components of a nutrient-dense diet. Researchers compared adult Americans who consume the recommended amount of fruits and vegetables to adults who do not meet the recommendations. Food consumption data from 2003-2006 NHANES were used to estimate usual intakes. Student's t-tests were used to compare mean intake between subpopulations. Significant differences were not seen in BMI between the two groups. However, among the population of all adults eating recommended amounts of fruits and vegetables, mean BMI was 27.9 ± 0.48 compared to 28.4 ± 0.17 among adults not meeting the fruit and vegetable guidance (Murphy et al., 2012).

Healthy Eating Index

The Healthy Eating Index (HEI) is a measure of diet quality that assesses conformance to federal dietary guidance. The original HEI was created by the Center for Nutrition Policy and Promotion (CNPP) in 1995. In 2006, it was revised by members of CNPP from the National Cancer Institute and the USDA Food and Nutrition Service to reflect the 2005 Dietary Guidelines for Americans. This tool is used to monitor the diet quality of populations. The food group standards are based on the recommendations found in MyPyramid. The standards were created using a density approach, therefore

they are expressed as a percent of calories or per 1,000 calories (Guenther et al., 2006). The scoring standards and components of the HEI-2005 are listed in table 1.

Table 1. Healthy Eating Index-2005.

Component	Max. points	Standard for max. score	Standard for min. score of zero
Total Fruit (includes 100% juice)	5	≥0.8 cup equiv. per 1,000 kcal	No fruit
Whole Fruit	5	≥0.4 cup equiv. per 1,000 kcal	No Whole Fruit
Total Vegetables	5	≥1.1 cup equiv. per 1,000 kcal	No Vegetables
Dark Green and Orange Vegetables and Legumes	5	≥0.4 cup equiv. per 1,000 kcal	No Dark Green or Orange Vegetables or Legumes
Total Grains	5	≥3.0 oz equiv. per 1,000 kcal	No Grains
Whole Grains	5	≥1.5 oz equiv. per 1,000 kcal	No Whole Grains
Milk	10	≥1.3 cup equiv. per 1,000 kcal	No Milk
Meat and Beans	10	≥2.5 oz equiv. per 1,000 kcal	No Meat or Beans
Oils	10	≥12 grams per 1,000 kcal	No Oil
Saturated Fat	10	≤7% of energy	≥15% of energy
Sodium	10	≤7 grams per 1,000 kcal	≥2.0 grams per 1,000 kcal
Kcal from Solid Fats, Alcoholic Beverages, and Added Sugars (SoFAAS)	20	≤20% of energy	≥50% of energy

The 12 components of the HEI-2005 are total fruit; whole fruit: total vegetables; dark green and orange vegetables and legumes; total grains; milk; meat and beans; oils; saturated fat; sodium; and calories from solid fat, alcohol, and added sugar (SoFAAS). For each component, the density value is compared with the standard established for the component, and the HEI-2005 component score determined. Depending on the component, the component score may have a maximum value of 5, 10, or 20 points. The new calories from SoFAAS component reflects an important element of diet quality and

was missing from the original HEI. It shows the consumption of energy-dense, nutrient-poor foods and ingredients that create dietary imbalance. Solid fats, alcoholic beverages, and added sugars are not only replacing more nutritious foods, they are also contributing to excessive caloric intakes in the American population (Guenther, Reedy, Krebs-Smith, Reeve, & Basiotis, 2007).

Creators of the HEI-2005 state it can be used together with body mass index to study the effects of both diet quality and quantity. Guenther and colleagues (2007) continue to state the HEI-2005 has several types of construct validity, as shown by the ability to distinguish between groups with known differences in diet quality, the independence of diet quality and diet quantity as measured by energy intake, and the ability to detect differences among individuals as shown by the distribution scores. Most important, the HEI-2005 has content validity, including face validity. It is a valid reflection of the key recommendations of the 2005 Dietary Guidelines for Americans.

The higher each HEI-2005 score, the more the diet corresponds with the 2005 Dietary Guidelines for Americans, and the better the diet quality. The maximum score is 100. A score above 80 indicates a good diet. A score between 51-80 indicates a diet that needs improvement, while a score of less than 50 indicates a poor diet (Basiotis, Carlson, Gerrior, Juan, & Lino, 2002). The total mean HEI-2005 score of diets consumed by the US population is approximately 57 (Ervin, 2011).

A study was conducted to characterize the diet quality of a multiethnic population of older adults (n=635). Data were collected at home visits where dietary intake assessments were completed using a food frequency questionnaire. The data was then converted into Health Eating Index-2005 (HEI-2005) scores used to monitor adherence to

the dietary guidelines. Results showed the mean total HEI-2005 score was 61.9/100 with fewer than 2% of the subjects meeting the recommended score of 80/100. African Americans (n=136) had a higher total HEI-2005 score compared to American Indians (n=195) and non-Hispanic whites (n=304) (64.5 vs 60.1 and 61.1, p=0.001). The overall diet quality of the subjects was not adequate as determined by the HEI-2005 (Savoca et al., 2009).

Dietary Habits of the Individuals with Intellectual Disabilities

Information describing the dietary patterns and eating habits among adults with ID is limited. Adolfsson, Sydner, Fjellstrom, Lwein, & Andersson (2008) described the dietary intake (e.g., consumption of food, energy, and nutrients) of individuals with ID living in community residences. This study used quantitive methods to describe dietary habits and qualitative methods to observe and study food choice and meal situations among people with ID. Thirty-two subjects (14 women and 18 men) from 20 different residences in Sweden completed the study. Subjects ranged from 26 to 66 years of age and had BMIs ranging from 16 to 48. Three-day food records were completed and anaylsized using the dietary calculation software MATs, based on the official Swedish food composition database (version 2.00) which includes about 2,000 food items. The Nordic Nutrition Recommendations were used as a comparison regarding the observed meal pattern, intake of micronutrients and dietary fiber as well as proportions of macronutrients. A variation was seen in the total energy intake (4.9- 14 MJ) with an average of 26% of the energy coming from in-between-meals. The highest amounts of energy came from milk products, bread, meat products, buns and cakes. Water and

different kinds of fruit drinks including syrup and juices were more typical than milk and soft drinks as mealtime beverages. The daily intake of fruit and vegetables (320 ± 221 g) as well as dietary fiber (21 ± 9.6 g) was generally low. These results for fruit and vegetable consumption are in agreement with those from the study among people with ID from North America conducted by Draheim, Stanish, Williams, and McCubbin (2007). However, the subjects in this study did not report high fat intake like the subjects from North America .

Draheim et al. (2007) analyzed and compared the dietary intake of 325 adults between the ages of 19 and 65 years who lived in three different community residential settings. All of the subjects had been diagnosed with mild to moderate ID. Participants were categorized into one of three residential settings: group homes, providing 24-hour assistance; with family member(s); or semi-independent, residences where there was less than 24-hour supervision. In the group homes there were 169 subjects, 48 resided with family members, and 108 resided in semi-independent living settings. The Block Screening Questionnaire for fat intake was used to calculate a diertary fat score and estimate the percentage of total caloric intake comprised of fat. The Behavioral Risk Factor Surveillance System's Fruit and Vegetable Module was used to calculate the fruit and vegetable score and estimate the mean number of fruits and vegetables eaten per day. Results indicated the prevalence of high fat diets (>30% of calories from fat) was 71.4 to 85.6% for men and 70.1 to 79.2% for women. Only 4.4% of men and 6.4% of women consumed the recommended five fruits and vegetables per day.

Factors Influencing Dietary Choices of Individuals with ID

Melville and associates (2009) surveyed 63 care-givers of adults with ID to determine their training needs related to diet and physical activity (PA). A cross-sectional questionnaire was given to the care-givers to establish their knowledge and perceptions of diet and PA needs to support the individuals with ID. An interviewer administered a survey regarding the care-givers: 1) knowledge of public health recommendations on diet and PA, 2) knowledge of the advantages to consuming a healthy diet and being physically active, and 3) attitudes on the ability to make changes by the individuals with ID. Results indicated that the care-givers had a low level of knowledge regarding public health recommendations, but a better understanding of the health benefits from diet and PA. The care-givers identified that knowledge, skill, and motivation were the main barriers to change; interpersonal and external barriers (e.g., support, encouragement, and finances) were not identified as barriers. The care-givers were unaware of the Scottish Office (1996) recommendations for daily intake of breakfast cereal, 93.4% did not know the average intake of fat should be less than 35% of total calories, and 88.5% did not know the average intake of saturated fat should be less than 11% of total calories consumed. The authors concluded that care-givers have a key impact on facilitating and supporting healthier lifestyles for adults with ID. This study demonstrates the need to promote healthy living by the development and implementation of effective training programs for care-givers of individuals with ID.

Not only do care-givers impact the health status of individuals with ID, but also the individual's living arrangement plays a role. Moran et al. (2005) examined obesity rates between individuals living in a "most restrictive environment" and "least restrictive

environment". A most restrictive environment included settings with 24-hour supervision, health, and rehabilitative services such as community training homes and intermediate care facilities for persons with mental retardation. A least restrictive environment included family home, private boarding home, supervised apartment living, and supervised living in a private home contracted through the state disability agency. Significant differences were seen in obesity based on the residential type. Among those with ID, the ones living in the most restrictive environments had a lower prevalence rate of obesity between 30 to 40 (12.8%) and 40 to 50 (17.9%) years of age compared to those living in the least restrictive environments (33.0% and 37.7%). Even though the prevalence rates of obesity were still higher for individuals living in least restrictive environments, there was no significant difference between residential type before the age of 30 and after the age of 50.

Different living settings for individuals with ID will have different levels of control for the individual's diet and physical activity. Rimmer, Braddock, & Fujiura (1993) examined the affects of residential settings on the health among adults with ID. Subjects were recruited from four residential settings in a large Midwestern state. Each subject resided at one of four sites: state-operated institution (more than 100 residents); privately operated community-based Intermediate Care Facility for the Mentally Retarded (ICF/MR) (more than 15 residents but less than 100); privately operated group home (less than 16 residents); and family (lives at home with one or more family members). Skinfold measurements were taken from each subject to measure body fat percentages by a trained investigator using a Lange skinfold caliper. The mean body fat percent for males was 21.5% and 31.2% for females. The lowest percent body fat values

for the males and females groups were from the institutional setting, and the highest values were from the family and ICF/MR settings for males and the family setting for the females. Subjects from the institutional setting were significantly less obese than subjects in the ICF/MR, group home, and family settings, X^2 (3, N=364) = 39.005, p<.001.

McGuire, Daly, & Smyth (2007) carried out a questionnaire survey with 155 caregivers of individuals with ID in the west of Ireland. This cross-sectional postal questionnaire survey was designed to examine a range of health and lifestyle factors, demographic variables, and decision-making opportunities in people with ID. The subjects were compared to a community sample of individuals with ID. Sixty-four subjects lived in a home with their family members, 88 lived in a community group home, and 3 subjects were classified as "other" living arrangements. BMI was calculated (n=130) and nearly 70% of the subjects were overweight or obese with an average BMI of 27.67 (SD 5.69; range 15.79-59.94). The nutrition results indicated the intellectual disability sample compared well with the community sample on sugar and fat intake, but consumed less than the recommended daily intake of fruit and vegetables, carbohydrates, dairy and protein. Level of choice was determined using a measure of choice. A higher score denoted greater level of choice for the individual with ID. Results concluded that the level of choice diminished as the severity of the ID increased. The level of resident choice and decision-making did not have a significant relationship to health behaviors or living arrangements.

George, Shacter, & Johnson (2011) conducted a study to evaluate the beliefs, attitudes, and behaviors associated with nutrition and physical activity of parents with

adolescents with ID. Researchers wanted to investigate if the parents' perception of their child's weight status was accurate. Information on BMI and attitudes and beliefs regarding nutrition and activity from 207 parents' of individuals with ID was collected using a survey. All subjects attended a school that was participating in the Best Buddies program. Approximately 45% of the individuals were overweight or obese and over two-thirds of the parents were either overweight or obese. Significant differences were seen in the adolescents' BMI by parents' description ($p<0.001$). The BMI of the adolescents significantly correlated with parental role and parental activity. The study concluded that efforts need to be made to provide parents of individuals with ID tailored information about how they can assist their child in managing their weight. Parents and care givers of individuals with ID play an important role as providers for healthy choices for physical activity as well as nutrition.

Methods of Collecting Dietary Intake

Traditionally, there are two methods to collect dietary intake: retrospective approaches (e.g. 24-hour recall, food frequency questionnaire, and diet histories) and prospective approaches (e.g. food records or journals). The retrospective methods rely on the individual's memory of what, when, and how much was eaten. On the other hand, the prospective methods, where a person records what and how much he ate at the time of consumption tend to be a more precise reflection of what was actually consumed. The ability to recall, document, and correctly describe what one eats fluctuates from person to person. Various supports have been developed to assist individuals in either recalling or recording their dietary intake. Some of these include newer methods where data

collection is assisted by electronic devices such as those with pictures and audio-taped food records. These supports have been used with varying degrees of success among adults with disabilities, however they are not practical for non-research funded settings (Humphries, Traci, & Seekins, 2008).

Currently, there is no validated method for obtaining dietary intake assessment for individuals with ID due to significant barriers to collecting valid data. Nutrition researchers have stated that adults with intellectual disabilities are unlikely to provide accurate dietary intake data via traditional prospective or retrospective approaches. Problems with memory, comprehension, dexterity, literacy skills and communication make recalling, recording and estimating quantities of dietary intake a challenge in this population (Humphries, et al., 2008).

Humphries, et al. (2008) conducted 24-hour recalls on nine adult volunteer participants with ID who lived in a group home or in semi-independent living arrangements. All subjects ages 35-61 were able to communicate verbally without assistive devices. The experimental method of collection in this study was the *Food on Film* dietary intake recording. Subjects were given a *Food on Film* research kit with instructions and a camera. Participants were asked to photograph food before and after each meal and snack. At the end of the day, the researcher collected the research kits to have the film developed. The next day, researchers interviewed the subjects. Results showed the subjects had difficulty remembering all of the food they had eaten the previous day. However, once the researchers provided the photographs the subjects had taken of their food, they were able to provide reliable responses to the time and amounts of food consumed. In conclusion, the pictures did provide memory aids for the subjects

even though they did not improve the 24-hour recalls. Further testing on the reliability and validity of this method of measuring intake with this population is needed.

Elinder et al. (2012) tested the validity of personal digital photography as a method of assessing dietary intake in individuals with ID. Eighteen adults with ID were recruited from community residences between the ages of 23 and 60. Participants were instructed to photograph all foods and beverages consumed during one day, while at the same time, they were observed by a rater. Photographs were coded based on identification of foods and beverages. Evaluation of inter-rater reliability and validity of digital photography as a method of food quality assessment was performed by calculating the intra-class correlation (ICC). A value in the range of 0.5-0.6 indicates moderate agreement, 0.7-0.8 indicates strong agreement, and >0.8 indicates almost perfect agreement. For all variables, the correlations between raters was interpreted as almost perfect (ICC≥0.88). Researchers concluded personal digital photography appears to be a feasible, reliable, and valid method for assessing dietary quality in people with ID, who have daily staff support in community residences.

National Health and Nutrition Examination Survey

The U.S. Department of Agriculture's Automated Multiple Pass Method (AMPM) instrument collects 24-hours dietary recall data for "What We Eat in America", the dietary interview component of the National Health and Nutrition Examination Survey (NHANES). AMPM contains over 2,400 questions and more than 21,000 responses about food with each response determining the next appropriate question. Each year, AMPM is used in approximately 9,000 interviews which ask individuals to recall the

foods and beverages that were consumed the day before the interview. On average, 13 foods are reported for each recall and 10 questions are asked about each food individually. The 24-hour recalls collected using the AMPM require multiple memory cues with standardized wording to extract all of the possible foods consumed. This method requires 5 precise steps: 1) quick list, 2) forgotten foods list, 3) time and occasion, 4) detail and review, and 5) final probe (Steinfeldt, Clemens, & Anand, 2009).

The use of AMPM started in January of 2002 and over the years has conducted over 100,000 dietary interviews. Large updates are completed at the beginning of each two-year survey period. Questions, response values, and programming are updated to assure validity and completeness of the dietary data. The continual review of the AMPM is required to reflect the changes in the U.S. food market such as new foods, ethnic foods, and new package sizes (Steinfeldt, et al., 2009).

Moshfegh and colleagues tested the validity of the Automated Mulitple-Pass Method (AMPM) used by the USDA for collecting 24-hour recalls for NHANES data. The accuracy was evaluated by comparing reported energy intake with total energy expenditure by using the doubly labeled water technique, which has been shown to provide an accurate measure of the total energy expenditure in free-living subjects. The study cohort consisted of 524 volunteers, ages 30-69 years, from the Washington, D.C. metropolitan area. Data collection was conducted in 5 cohorts for approximately 7 weeks each. A total of three 24-hour dietary recall interviews were conducted with each subject using the AMPM. Subjects were instructed to follow their usual eating and activity patterns. Overall, results showed that subjects underreported energy intake by 11% compared with total energy expenditure. Normal weight subjects (BMI<25)

underreported by <3%. Approximately 78% of men and 74% of women were classified as acceptable energy reporters (within 95% CI of energy intake to total energy expenditure). Subjects classified as obese (BMI>30) were the highest percentage by which energy intake was underreported. In conclusion, the AMPM accurately reported energy intakes in normal-weight subjects, however research is necessary to enhance its accuracy in overweight and obese persons (Moshfegh et al., 2008).

Automated-Self Administered 24-hour Recall

A modified version of the USDA's Automated Multiple Pass Method (AMPM) is the Automated Self-Administered 24-hour recall (ASA24), an interviewing tool for 24-hour dietary recalls. The steps in the 24-hour interview process include 1) quick list, 2) meal gap review, 3) detail pass, 4) forgotten foods, 5) final review, 6) last chance, 7) usual intake question, and supplement module (if selected by the researcher). ASA24 allows respondents to report foods and drinks by browsing the category or searching from a list of food and drink terms derived from the NHANES. It asks detailed questions about food preparation, portion size, and additions so that food codes from the USDA's Food and Nutrition Database for Dietary Studies (FNDDS) can be assigned for analysis. When a subject does not know the amount of food he or she consumed there is an option to choose "don't know". "Don't know" responses default to either the default food code used by the FNDDS or the food code reported most often in the NHANES data (NCI, 2010). Since ASA24 is a newly created tool for assessing dietary intake, to date studies using this specific methodology have not been published. However, the methods are similar to the recalls previously described in this section.

Special Olympics Background

The Special Olympics was founded in 1968 by Eunice Shriver to create a better world by fostering the acceptance and inclusion of all people. This empowering program is a not-for-profit organization that provides sports training and athletic competition in more than 20 Olympic-type sports for children and adults with ID (SpecialOlympics, 2007). Special Olympics reaches more than 2.5 million athletes worldwide and nearly 10,000 individuals across the state of Indiana. The mission of Special Olympics is to provide year-around training and athletic competition in a variety of Olympic-type sports for children and adults with ID, offering them continuing opportunities to develop physical fitness, demonstrate courage, experience joy and participate in a sharing of gifts, skills and friendship with their families, other athletes and the community (SpecialOlympicsIndiana, 2007).

Special Olympics Healthy Athlete® initiative was designed to help Special Olympic athletes improve their health and fitness. The ultimate goal of Healthy Athletes® is to improve each athlete's ability to train and compete in the Special Olympics Program, as well in their own lives. The Healthy Athletes® initiative has been implemented in more than 100 countries around the world. In 2010, Special Olympics served over 3.7 million athletes worldwide, an increase of more than 315,000 athletes from 2009. The adult population (22 years of age and older) constitutes 33% of all the athletes who participate in Special Olympics and 66% of the athletes are of school age (8-21). A total of 929 Healthy Athlete® Events took place in 2010 (SpecialOlympics, 2010).

At the 2003 World Summer Games in Dublin, Ireland, 3,531 athletes participated in nearly 11,000 individual health screenings across six disciplines (e.g. vision, dental,

and health promotion). The Health Promotion venue alone screened 1,000 athletes. The screening consisted of height and weight measurement to calculate BMI. Results of the screening revealed 45% of the athletes had an abnormal BMI, with 40% above normal and 5% below the normal range. Separation by age indicated more than half of the adults (52%) age 20 years and above had a BMI>25, with 23% in the obese category and 30% in the overweight category (Corbin, Malina, & Shepherd, 2005).

Summary

Adults with ID have a high prevalence of obesity. For this unique population to reach its fullest potential, it is important to understand their dietary habits and lifestyle needs. Health professionals and caregivers of individuals with ID need information to determine and develop interventions and education for these unique individuals.

CHAPTER THREE

METHODOLOGY

The purpose of this descriptive study was to determine the dietary intake of individuals who participated in Special Olympics in Delaware County, Indiana, using self-reported three-day dietary records, to compare the athletes' dietary intake to the National Health and Nutrition Examination Survey (NHANES) data for individuals without intellectual disabilities, and to determine the effect of living arrangements (group home, family home, or living independently) on the self-reported dietary intake of the athletes. The secondary purpose of this study was to determine the relationship between self-reported dietary intake and obesity prevalence in athletes who participate in Special Olympics. This chapter describes the methods utilized to conduct this study including the data collection, data analysis, and instruments that are used.

Institutional Review Board

The data analyzed in this study was approved by the Ball State University (BSU) Institutional Review Board, #128316-2 on July 29, 2009 as part of a former study. The study protocol for this thesis was approved by the Ball State University Institutional Review Board and granted exempt status (Appendix A-1). The researcher conducting this

research successfully completed the Collaborative Institutional Training Initiative training (Appendix A-2).

Subjects

A total of 55 Delaware County Athletes who participated in Special Olympics initially signed up to take part in the 2009 study. Of these, five did not meet age inclusion criteria of age 19 years or older, and another 13 dropped out before data collection began for a variety of reasons (e.g., some due to becoming disinterested in the study, others due to extraordinary situations). An additional two athletes were unable to provide the three-day records or the *Caregiver Questionnaire.* Thus, 35 athletes (64%) were included in the study (Harmeson, 2009).

Of the 35 athletes, 21 were male and 14 were female. Each subject participated in the Delaware County sporting practices in the fall of 2009. Three-fourths of the subjects practiced bowling, while the remaining athletes played golf, flag football, track, softball and/or walked. The athletes ranged in age from 20 to 68 years. Nineteen of the athletes lived in their family's home, 9 lived in group homes, and the remaining 7 lived independently.

Methods

Dietary intake data were previously collected in 2009 from athletes participating in Special Olympics and their caregivers (Harmeson, 2009). Each athlete who consented to participate in the study was asked to provide a three-day food record. If an athlete was unable to complete the food record on their own, the athlete's caregiver was asked to

assist in the completion of this task. The subjects were asked to write down everything they ate or drank for three days on the Food and Beverage Log sheet provided to each participant. The athletes were instructed to be as specific as possible when recording their food and beverage intake (Harmeson, 2009).

Previously completed three-day food records, height, and weight of the athletes who participated in Special Olympics were obtained in 2011. These data were used to calculate body mass index (BMI) using the following formula: body mass (pounds) x 703 divided by height (feet) squared. In Indiana, standard protocol dictates that the athlete's height be measured in inches to the nearest 0.25 inch using a SECA stadiometer model 225 and the athlete's weight be measured in pounds to the nearest 0.1 pound using a Health-o-meter scale model 320KL.

The three-day food records were analyzed to determine caloric intake, macronutrient composition, and diet quality of the athletes who participated in Special Olympics, both overall and by gender, using the Automated Self-Administered 24-Hour Dietary Recall (ASA24) Beta version (NCI, 2010). The ASA24 provided 12 weighted components needed to calculate the Healthy Eating Index (HEI-2005) score to determine the diet quality of the athletes. Statistical Analysis System (SAS), version 8.1 was used to create the HEI-2005 score as described by Guenther et al (2007). calculate the HEI-2005 score (Guenther et al., 2007). For the purpose of this study, the HEI-2005 formula was translated from the SAS code into SPSS syntax for analysis. The HEI-2005 score was evaluated overall, by gender, and by place of residence (e.g. group home, family home, independent living).

NHANES data was used as the basis for comparison between persons with ID and the general population. Total caloric intake, macronutrient composition, and HEI-2005 scores were compared. The relationship between the athlete's BMI and total caloric intake was used to correlate obesity prevalence and dietary intake, both overall and by place of residence (e.g. group home, family home, and independent living).

Instruments

The data analyzed in this study was previously collected in the fall of 2009 by Alisha Harmeson (2009) using the three-day food record forms (Appendix B-1) and the Lifestyle and Health Behaviors Questionnaire (B-2). The three-day food record and only two questions on the Lifestyle and Health Behaviors Questionnaire that pertain to the athletes' type of residence and decision making process were used for analysis. Subjects were asked to indicate how much responsibility he or she was given in the decision making process regarding food intake. Four self-defined options were provided on the Lifestyle and Health Behaviors Questionnaire. The options were "has no part in the decision making process", "expresses a preference, but is helped to make a decision", "makes some decisions regarding diet choices", or "fully responsible for making diet choices" (Harmeson, 2009).

The ASA24 was used to analyze each athlete's intake and diet quality from the three-day food record. This nutrient analysis program provided the mean intake of each macronutrient consumed by the subject. The ASA24 also provided the components needed to calculate the HEI-2005 score for each athlete. The ASA24 is a web-based software tool that enables automated and self-administered 24-hour dietary recalls. It

asks detailed questions about food preparation, portion size, and additions in order for food codes from USDA's Food and Nutrient Database for Dietary Studies (FNDDS) to be assigned. The format and design of the ASA24 were based on a version of the Automated Multiple Pass Method (AMPM) recall developed by the USDA (NCI, 2010).

Data Analysis

The nutrient analysis data for each athlete was downloaded from the ASA24 into an Excel spreadsheet and merged with the pertinent information from the Lifestyle and Health Behaviors Questionnaire. The spreadsheet was uploaded into SPSS v.19.0 for Windows for analysis (SPSS, 2011). Descriptive statistics and frequency counts (number and percent) were run on all variables. Frequency distribution and the mean values for height, weight, body mass index, and macronutrients were examined overall and by gender.

Unpaired t-tests were run to determine the differences in nutrient intake and diet quality between the 35 subjects and NHANES data used for comparison with the general population. A one-way ANOVA was used to determine the difference in diet quality (HEI-2005 score) and place of residence and to determine the relationship between diet quality and the amount of responsibility given to an athlete in regards to food choice. Pearson's correlation coefficient was used to determine the relationship between BMI and total caloric intake. Statistical significance was set at a p-value of ≤ 0.05.

Summary

This section described the procedures and methods used to collect and analyze data for this study. The previously collected three-day food records, completed in 2009, were analyzed, described, and examined by gender and place of residence, and analyzed with NHANES data used for comparison between persons with ID and the general population

CHAPTER FOUR

RESULTS

The purpose of this descriptive study was to determine the dietary intake of athletes who participated in Special Olympics in Delaware County, Indiana, using self-reported three-day dietary records, to compare the athletes' dietary intake to the National Health and Nutrition Examination Survey (NHANES) data for individuals without intellectual disabilities (ID), and to determine the effect of living arrangements (e.g. group home, family home, or living independently) on the self-reported dietary intake of the athletes. The secondary purpose of this study was to determine the relationship between self-reported dietary intake and obesity prevalence in athletes who participated in Special Olympics. This chapter describes the results and statistical analysis of the data.

Subjects

A total of 35 athletes who participated in Special Olympics living in Delaware County completed the three-day food records and the Caregiver Questionnaire in the fall of 2009. The mean age of the 35 participating athletes was 39.9 ± 13.8 years. The ages of the subjects ranged from 20-68 years. Of those, 60% (n=21) were male and 40%

(n=14) were female. Overall, the mean weight of the athletes who participated in Special Olympics was 182.2 ± 34.8 pounds, the mean height was 64.7 ± 4.8 inches, and the average BMI was 31.4 ± 5.3. The majority of the participating athletes (54%; n=19) lived in a family home, while 20% (n=7) lived independently, and 26% (n=9) lived in a group home.

Nutrient Intake and Diet Quality of Athletes

The first research question in this thesis examined the analysis of the self-reported dietary intakes of athletes who participated in Special Olympics in Delaware County.

Nutrient Intake

The mean total caloric intake was 1745.6 ± 548.0 kcal (n=35) per day. Descriptive statistics indicated the percent of kcal from carbohydrate was 49.5 ± 9.9%, percent of kcal from protein was 17.1 ± 4.1%, percent of kcal from fat was 35.0 ± 6.6%, and percent of kcal from alcohol was 0 ± 0.2% (Table 1).

Table 1. Athletes: Kcal and Percent Kcal from Carb, Pro, Fat, and Alcohol (n=35).

	Minimum	Maximum	Mean	Std. Deviation
Energy (kcal)	897.6	3154.5	1745.6	548
%Carbohydrate	24	71	49.5	9.9
%Protein	7.9	29.3	17.1	4.0
%Fat	22.5	52.1	35.0	6.5
%Alcohol	0.0	1.1	0.0	0.2

Diet Quality

The Healthy Eating Index-2005 (HEI-2005) score was used to represent the subject's diet quality. The mean HEI-2005 score was 43.0 ± 7.4 (n=35). The components of the HEI-2005 score and the mean of each of the subjects' recalls are shown in Table 2.

Table 2. HEI-2005: Descriptive Statistics (n=35).

HEI Component	Minimum	Maximum	Mean	Std. Deviation
Total Fruit	0.0	5.0	2.7	2.0
Whole Fruit	0.0	5.0	2.5	2.0
Total Grains	1.0	5.0	4.2	0.9
Whole Grains	0.0	4.2	1.1	0.9
Milk	0.0	10.0	6.5	2.9
Meat & Beans	4.1	10.0	8.7	1.5
Total Vegetables	0.8	5.0	2.9	1.2
Dark Green & Orange Veg & Legumes	0.0	2.7	0.7	0.8
Oils	0.4	10.0	4.5	2.5
Saturated Fat	0.9	9.5	5.5	2.3
Sodium	0.0	9.5	3.5	2.3
Kcal from Solid Fat, Alcohol & Added Sugar (SoFAAS)	0.0	2.9	0.2	0.7
Total HEI-2005 Score	26.0	54.9	43.0	7.4

Nutrient Intake and Diet Quality of Athletes compared to NHANES

The second research question addressed the comparison between the diets of the athletes, representing individuals with intellectual disabilities (ID), to NHANES data, representing the diet for individuals without intellectual disabilities. An unpaired t-test was used to compare the subjects in this study to NHANES data.

Nutrient Intake

As indicated in Table 1, the mean total caloric intake of the athletes was 1745.6 ± 548.0 kcal (n=35) per day. The percent of kcal from carbohydrate was 49.5 ± 9.9%, percent of kcal from protein was 17.1 ± 4.1%, percent of kcal from fat was 35.0 ± 6.6%, and percent of kcal from alcohol was 0 ± 0.2%. The NHANES data for individuals without ID (n=8529) indicated the average American, age 2 and older, consumed 2070 kcal per day: 50% from carbohydrates, 15% from protein, 33% from fat, and 2% from alcohol. The unpaired t-test revealed no significant differences between the dietary intake of the 35 athletes in this study and NHANES subjects (1745 kcal vs. 2070 kcal, df=8,562; t=0.9; $p \geq 0.40$).

By gender, NHANES males (n=2662) consumed 2507 kcal per day: 48% from carbohydrates, 16% from protein, 34% from fat, and 4% from alcohol. In the present study, the male athletes (n=21) consumed an average intake of 1867 kcal per day: 48% from carbohydrate, 17% from protein, 36% from fat, and 0% from alcohol. NHANES females (n=2758) consumed an average of 1766 kcal per day: 50% from carbohydrate, 16% from protein, 34% from fat, and 2% from alcohol. No significant differences were seen between the two groups of males ($p>0.09$; $p=1.00$; $p>0.77$; $p>0.48$; $p>0.08$). The

female athletes (n=14) consumed an average intake of 1563 kcal: 52% from carbohydrate, 17% from protein, 33% from fat, and 0% from alcohol (Table 3). The unpaired t-test indicated no significant difference in all categories between the dietary intake between the study's female subjects and NHANES data for females ($p>0.58$; $p>0.59$; $p>0.48$; $p>0.48$; $p>0.48$).

Table 3. Athletes and NHANES: Kcal and Percent Kcal from Carbohydrates, Protein, Fat, and Alcohol, by Gender.

Gender	N	Energy kcal (SE)	CHO %kcal (SE)	Protein %kcal (SE)	Fat %kcal (SE)	Alcohol %kcal (SE)
NHANES: M	2662	2507 (35.3)	48 (0.4)	16 (0.1)	34 (0.3)	4 (0.2)
Athletes: M	18	1836 (122.4)	48 (2.3)	17 (0.9)	37 (1.4)	0 (0.1)
NHANES: F	2758	1766 (24.6)	50 (0.4)	16 (0.1)	34 (0.2)	2 (0.2)
Athletes: F	11	1573 (125.5)	53 (2.0)	17 (1.0)	32 (1.3)	0 (0.0)

Diet Quality

The mean HEI-2005 score for the athletes (n=35) was 43.0 out of 100. The mean HEI-2005 score for the average American without ID (n=4,448) was 57.2. Using an unpaired t-test, there was no significant difference between the HEI-2005 score from NHANES compared to the HEI-2005 score of the athletes who participated in Special Olympics ($df=4,481$; $t=1.7$; $p\geq0.10$).

For NHANES males (n=2,135), the mean HEI-2005 score was 54.8, and for male athletes (n=21), the mean HEI-2005 score was 42.1. An unpaired t-test revealed no significant difference between the two groups ($df=2,154$; $t=1.6$; $p\geq0.11$). For NHANES females (n=2,313), the mean HEI-2005 score was 60.3, and for females athletes (n=14),

the mean HEI-2005 score was 44.3. An unpaired t-test showed no significant difference between the groups (df=2325; t=1.1; p≥0.27).

Nutrient Intake and Diet Quality of Athletes by Place of Residence

The third research question addressed the effect of living arrangement on nutrient intake and diet quality of the subjects. The majority of the participating athletes 54% (n=19) lived in a family home, while 20% (n=7) lived independently, and 26% (n=9) lived in a group home.

Nutrient Intake

The total caloric intake overall was 1745.6 ± 548.0 kcal. The mean caloric intake of athletes living in a family home (n=19) was 1802.2 ± 607.3 kcal, 1673.5 ± 649.7 kcal for the athletes living independently (n=7), and 1682.3 ± 336.6 kcal for the athletes living in a group home (n=9). For athletes living in a family home, the percent of kcal from carbohydrate was 49 ± 11%, percent of kcal from protein was 17 ± 5%, percent of calories from fat was 35 ± 7%, and percent of kcal from alcohol was 0%. The subjects living independently consumed diets with the percent of kcal from carbohydrate of 51 ± 6%, percent of kcal from protein of 17 ± 4%, percent of kcal from fat of 33 ± 6%, and 0% of kcal from alcohol. For athletes living in a group home, the percent of kcal from carbohydrate was 50 ± 10%, percent of kcal from protein was 18 ± 3%, percent of kcal from fat was 35 ± 7%, and percent of kcal from alcohol was 0%. A one-way ANOVA revealed no significant difference in nutrient intake by place of residence ($F(2,34)=0.21$; $p\geq0.81$).

A one-way ANOVA revealed no significant difference between percent of kcal from carbohydrate consumed by place of residence ($F(2,23)=.14$; $p\geq0.87$). There was no significant difference between percent of kcal from protein consumed by place of residence ($F(2,23)=0.14$; $p\geq0.87$). A significant difference was not seen between percent of kcal from fat consumed by place of residence ($F(2,23)=0.25$; $p\geq0.78$). A one-way ANOVA showed there was no significant difference between percent of kcal from alcohol consumed by place of residence ($F(2,23)=2.13$; $p\geq0.14$).

Diet Quality

The HEI-2005 score for subjects living in the family home (n=19) was 41.4 ± 7.6. For the subjects living independently (n=7), the HEI-2005 score was 43.9 ± 8.0. The remaining subjects (n=9) living in a group home had a HEI-2005 score of 45.3 ± 6.4. A one-way ANOVA revealed that individuals with ID who lived in a group home have the highest diet quality, and individuals with ID who lived with the family have the lowest diet quality, however differences were not significant ($F(2,26)=0.0.89$; $p\geq0.42$).

Diet Quality and Amount of Athletes' Input into Food Choices

The fourth research question in this thesis examined the relationship between the athletes' diet quality and the amount of responsibility given to the athlete regarding making food choices. A total of 28 athletes answered the question, "Please indicate the extent to which the athlete is responsible for making his/her own decision regarding their diet." Of these, 10.7% (n=3) indicated the athlete was fully responsible for making decisions regarding food choices, 42.9% (n=12) said the athlete makes some decisions

regarding food choices; 46.4% (n=13) indicated the athlete expresses a preference, but is helped to make a decision regarding food choices, and none of the subjects indicated he or she has no part in the decision making process.

A one-way ANOVA was used to determine if diet quality, represented by the HEI-2005 score, was associated with the athlete's reported level of responsibility to make decisions regarding food choices, overall and by place of residence (e.g. group home, family home, or independent living). Homogeneity of variance showed there was no violation of statistical rules ($p \geq 0.60$). A one-way ANOVA displayed a significant difference in HEI-2005 scores across the four levels of responsibility the athlete has to make decisions ($F(2,25)=5.58$; $p \leq 0.01$) (Table 4).

Table 4. One-way Analysis of HEI-2005 Score by Amount of Responsibility (n=28).

Amount of Responsibility	**N**	**Mean ± SD**	**F**	***P***
Expresses a preference, but helped to make decision	13	48.1 ± 5.1	5.58	0.01
Makes some decisions	12	41.6 ± 6.4		
Fully responsible for making decisions	3	38.7 ± 4.9		
No decision	0			

Tukey's post hoc test was performed and revealed a significant difference between subjects' HEI-2005 scores who reported expressing a preference, but needing help to make a decision compared to subjects who make some decisions regarding food

choices ($p \leq 0.02$). There was a significant difference between subjects' HEI-2005 scores who reported needing help to make a decision compared to subjects who were fully responsible for making decision regarding food choices ($p \leq 0.04$). A significant difference was not seen between subjects' HEI-2005 scores who made some decisions and subjects who are fully responsible ($p \geq 0.72$). These results show that individuals with ID who have less responsibility making decisions regarding food choices have a higher diet quality than individuals who have more responsibility.

Table 5. One-way Analysis of HEI-2005 Score by Amount of Responsibility (n=28).

Amount of Responsibility		Mean Difference	df	p
Expresses a preference, but helped to make decision	Makes some decisions	6.4	24	0.02
Makes some decisions	Fully responsible for making decisions	2.9	14	0.70
Fully responsible for making decisions	Expresses a preference, but helped to make decision	9.3	15	0.04

Among the athletes (n=3) who responded he/she was fully responsible, one (3.6%) lived in the family home, one (3.6%) lived independently, and one (3.6%) lived in a group home. Among the athletes (n=12) who indicated he/she makes some decisions regarding food choices, 10 (35.7%) lived in the family home, one (3.6%) lived independently, and one (3.6%) lived in a group home. Among the athletes (n=13) who responded he/she expresses a preference, but is helped to make a decision regarding food

choices, 5 (17.9%) lived in the family home, 1 (3.6%) lived independently, and 7 (25%) lived in a group home. A two-way ANOVA was not able to be conducted due to a low number of subjects in each group.

Dietary Intake and Obesity Prevalence among Athletes

The fifth and last research question addressed the relationship between dietary intake and obesity prevalence among athletes who participate in Special Olympics by comparing the athletes' BMI to their estimated caloric intake, overall and by place of residence (e.g. group home, family home, or independent living). Heights and weights were obtained from 29 of the subjects.

Height, inches

The mean height of the athletes (n=29) who participated in Special Olympics was 63.9 ± 4.2 inches. By gender, the mean height for males (n=18) was 64.7 ± 4.8 inches and the mean height for females (n=11) was 62.7 ± 2.9 (Table 6). There was no significant difference in height by gender ($t=1.23$, $p\geq0.22$).

Weight, pounds

The mean weight of the athletes who participate in Special Olympics was 182.2 ± 34.8 pounds. By gender, the mean weight for males was 189.9 ± 38.1 pounds and the mean weight for females was 169.7 ± 25.3 pounds (Table 6). There was no significant difference in weight by gender ($t=1.57$, $p\geq0.13$).

Table 6. Athletes: Mean Height, Weight, and BMI Overall and by Gender (n=29).

Height, Weight, and BMI	Males (n=18)	Females (n=11)	Total (n=29)	t	p
Height, in.	64.7 ± 4.8	62.7 ± 2.9	63.9 ± 4.2	1.25	0.22
Weight, lb.	189.9 ± 38.1	169.7 ± 25.3	182.2 ± 34.8	1.56	0.13
BMI	32 ± 5.7	30.4 ± 4.5	31.4 ± 5.3	0.79	0.44

Body Mass Index (BMI)

The mean BMI overall (n=29) was 31.4 ± 5.3. For males (n=18), the mean BMI was 32.0 ± 5.7, and for the female subjects (n=11), the mean BMI was 30.4 ± 4.5. A significant difference was not seen in BMI by gender ($t=0.79$, $p \geq 0.44$). Based on the BMI standard classifications, none of the athletes were underweight, 3% (n=1) was a normal weight for height, 45% (n=13) were overweight, and more than half of the athletes (52%; n=15) were classified as obese.

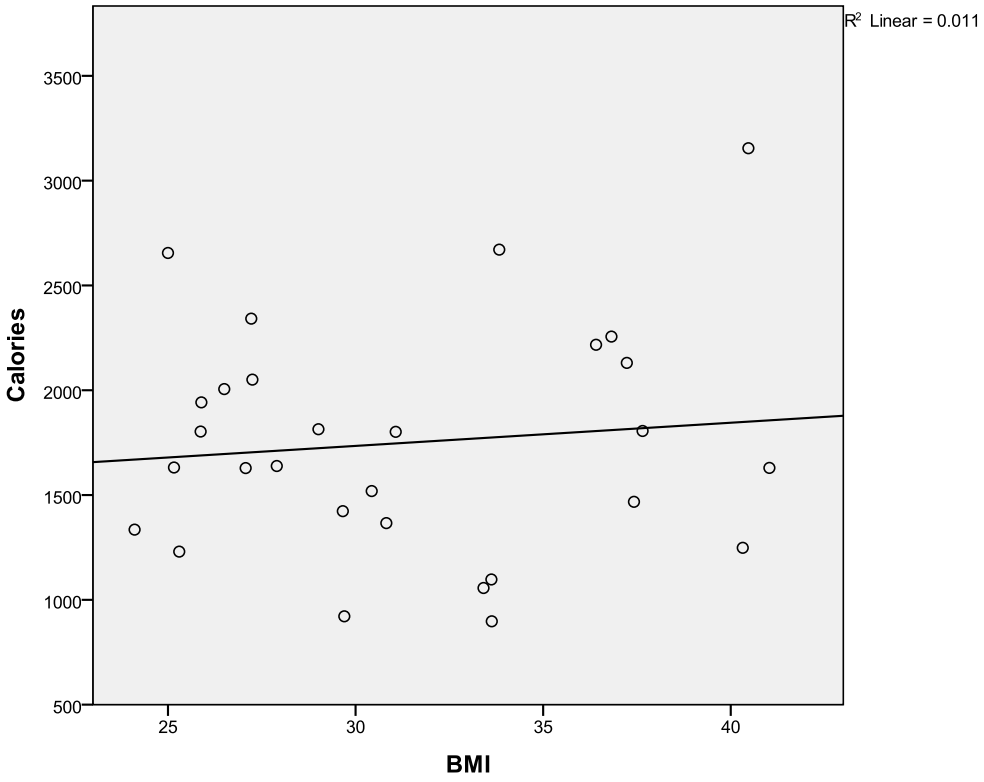

Figure 2: Athlete's Relationship between Dietary Intake and Obesity Prevalence (n=29)

Pearson's correlation coefficient was used to determine the relationship between dietary intake and obesity prevalence in the athletes. No relationship (Figure 2) was seen between the athletes' daily caloric intake and BMI (n=29; r=0.11; p≥0.58). Among those who live in the family home, there was no relationship between daily caloric intake and BMI (n=19; r=0.28; p≥0.29). Among those who live independently, there was no relationship between daily caloric intake and BMI (n=7; r=-0.16; p≥0.80). Among the athletes who live in a group home, no relationship was shown between daily caloric intake and BMI (n=9; r-0.15, p≥0.73).

Summary

Based on the results in this study, nutrient intake and diet quality of the athletes with ID do not differ significantly from individuals without ID, represented by NHANES data. The mean HEI-2005 score of the subjects indicated poor diet quality which needs improvement. Results showed there is no significant difference in nutrient intake and diet quality based on living arrangement of the subjects; however, individuals who lived in the family home had a lower HEI-2005 score than individuals who lived in a group home. In addition, there was no relationship between dietary intake and obesity prevalence among the athletes who participated in Special Olympics.

Overall, the diet quality was significantly different based on the amount of responsibility an athlete was given regarding food choices. Athletes who reported having full responsibility had significantly lower HEI-2005 scores compared to athletes who reported expressing a preference but needing help to make decisions. Athletes who reported having some decision also had a significantly lower HEI-2005 score compared to athletes who reported expressing a preference but needing help. This indicates that the more responsibility given to the athlete regarding food choices, the lower the quality of the diet. By contrast, athletes who had less choice regarding diet have a higher diet quality score.

CHAPTER 5

DISCUSSION

Introduction

The purpose of this descriptive study was to determine the dietary intake of 35 athletes who participated in Special Olympics in Delaware County, Indiana; to compare the athletes' daily nutrient intake to the National Health and Nutrition Examination Survey (NHANES) data for individuals without intellectual disabilities (ID); and, to determine what effect, if any, living arrangement (e.g., group home, family home, or independent living) had on dietary intake and diet quality of the athletes. The secondary purpose of this study was to determine the relationship between dietary intake and obesity prevalence in athletes who participate in Special Olympics. A discussion of the results is presented in this chapter.

Nutrient Intake and Diet Quality of Athletes

The mean self-reported total caloric intake of the 35 subjects with ID was 1745.6 ± 548.0 calories: 49.5 ± 9.9% from carbohydrate, 17.1 ± 4.1% from protein, and 35.0 ± 6.6% from fat, which illustrates consumption of a high fat diet (>30% of calories from fat). Draheim and colleagues (2007) similarly, reported a prevalence of high fat diets

(>30% of calories from fat) among 325 adults with ID. The 2007-2008 NHANES data for individuals without ID (n=8529) indicated the average American, age 2 and older, consumed 2070 calories per day: 50% from carbohydrates, 15% from protein, 33% from fat, and 2% from alcohol. Adults with ID in the Special Olympic sample had a slightly lower caloric intake compared with the 2007-2008 nationally representative sample of the general adult population. Percent of calories from carbohydrate, fat, protein, and alcohol of the sample group were similar compared to *What We Eat in America*, NHANES 2007-2008 populations. The findings were surprising as it was expected that individuals with ID would consume more calories than the general population because individuals with ID have greater overweight and obesity rates compared to the general population as evidenced by Rimmer and Wang (2005), Yamaki (2005), and Stancliffe et al (2011). The accuracy of the three-day food records may not be as reliable as that of direct observation. The self-reported intake from the three-day foods records may also be incomplete and inaccurate. Self-reported dietary records in general are not accurate; furthermore, in this special population, it is even more exacerbated due to the level of ID. It may be that the sample used in this study was not large enough to be representative of the wider ID population. These findings suggest that further investigation into reporting dietary intake for individuals with ID is needed.

By gender, the subjects' caloric intakes in this study were comparable, with no significant differences, to the average American's diet. The national data set for males (n=2662) reported an average consumption of 2507 calories per day: 48% from carbohydrates, 16% from protein, 34% from fat, and 4% from alcohol. NHANES females (n=2758) consumed an average of 1766 calories per day: 50% from

carbohydrate, 16% from protein, 34% from fat, and 2% from alcohol. In the present study, the male athletes (n=21) consumed an average intake of 1867 calories: 48% from carbohydrate, 17% from protein, 36% from fat, and 0% from alcohol. The female athletes (n=14) ingested a mean intake of 1563 calories: 52% from carbohydrate, 17% from protein, 33% from fat, and 0% from alcohol. As expected, the female athletes' total caloric intake was lower than the males just as the NHANES females intake was less than the males (USDA, 2010).

To determine diet quality, the Healthy Eating Index-2005 (HEI-2005) was used. The mean HEI-2005 score for the athletes (n=35) was 43 out of 100. A HEI-2005 score of 50 or less indicates a poor diet, 51 and 80 represents a diet that is better but needs improvement, while a score of 80 or higher indicates a good diet that corresponds with the 2005 *Dietary Guidelines for Americans*. The mean HEI-2005 score for the average American without an ID (n=4,448) is 57 (Ervin, 2011). Despite the fact that the HEI-2005 score of the athletes was much lower than the average American, no significant differences were revealed. Savoca et al (2009) showed similar results with the mean HEI-2005 score of 62 out of 100 (n=635). The overall diet quality of the subjects was not adequate as determined by the HEI-2005. Unfortunately, few studies are published describing the dietary intake of the ID population. Adolfsson and colleagues (2008) along with Draheim and colleagues (2007) found comparable results by revealing that individuals with ID did not consume the recommended amounts of fruits and vegetables per day. Results from McGuire, Daly, and Smyth's (2007) survey indicated that individuals with ID consumed, on average, 1.6 servings of dairy products and 3.6 servings of fruits and vegetables per day. Inadequate dairy, fruit, and vegetable intakes

correlate with a lower HEI-2005 score. This suggests that individuals with ID need to consume more whole grains, fruits, vegetables, low-fat dairy products, and lean meats to increase the quality of the diet.

Nutrient Intake and Diet Quality of Athletes by Place of Residence

The mean caloric intake of athletes who lived in the family home (n=19) was 1802.2 ± 607.3 calories: 49 ± 11% from carbohydrate, 17 ± 5% from protein, 35 ± 7% from fat, and 0% from alcohol. For the athletes living independently (n=7), the average caloric intake was 1673.5 ± 649.7 calories: 51 ± 6% from carbohydrate, 17 ± 4% from protein, 33 ± 6% from fat, and 0% from alcohol. The athletes who lived in a group home (n=9) consumed an average intake of 1682.3 ± 336.6 calories: 50 ± 10% from carbohydrate, 18 ± 3% from protein, 35 ± 7% from fat, and 0% from alcohol. A significant difference was not seen by place of residence; however, individuals who lived in the family home consumed more calories on average compared to those living independently or in a group home. No other studies have specifically examined the nutrient intake and diet quality of individuals with ID. A similar study by Stancliffe et al. (2011) showed that individuals with ID who lived in supervised settings (e.g. group home) had moderate caloric intakes and lower levels of obesity. This may be due to the use of dietary planning and controlled food intakes as a formal element of the residential programs. By contrast, individuals living independently or with the family experienced greater caloric intakes and higher levels of obesity. This may be due to the limited supervision and regulations provided to the individuals.

The HEI-2005 score for subjects who lived in the family home (n=19) was 41.4 ± 7.6. For the subjects living independently (n=7), the HEI-2005 score was 43.9 ± 8.0. The remaining subjects (n=9) who lived in a group home had a HEI-2005 score of 45.3 ± 6.4. Outcomes showed that living in a group home resulted in the highest diet quality. By contrast, athletes who lived in the family home resulted in the lowest diet quality. However, differences among HEI-2005 and living arrangements were not significant. To date, this is believed to be the first study specifically evaluating the quality of an individual's diet with ID using the HEI-2005. A higher diet quality score for individuals living in a group home could correlate with the use of dietary planning and controlled food intake as evident by Stancliff and colleagues' (2011) study. By contrast, a lower diet quality score for individuals living independently or in the family home could be related to the limited supervision and regulations the individuals experience in these settings. Bhaumik and colleagues (2008) also found that individuals with ID who were living independently or with family were more likely to be obese and have poorer diets than those in residential care. A more structured environment such as a group home may enable closer supervision of food intake and stricter monitoring of weight. Caregivers in supervised setting (e.g. group homes) may have also had nutrition education training which could play a role in monitoring the intakes of individuals with ID.

Individuals with ID who live in the family home may also experience overprotection. Some family members or caregivers may overprotect the individual with ID by restricting involvement in community activities and may overcompensate with overfeeding. When individuals with ID have challenging behaviors, it may be difficult to resist their demands for food which could lead to a poor quality diet. Family caregivers

may also have limited knowledge about healthy eating and the risks of obesity. Many lack the education and practical support that they need to improve the lifestyle of the individual with ID (Bhaumik et al, 2008). Melville and colleagues found that care-givers have a key impact on facilitating and supporting healthier lifestyles for adults with ID.

Diet Quality and Amount of Athletes' Input into Food Choices

A total of 28 athletes answered the question, "Please indicate the extent to which the athlete is responsible for making his/her own decision regarding their diet." Of these, 10.7% (n=3) indicated the athlete was fully responsible for making decisions regarding food choices, 42.9% (n=12) said the athlete makes some decisions regarding food choices; 46.4% (n=13) indicated the athlete expresses a preference, but is helped to make a decision regarding food choices, and none of the subjects indicated he or she has no part in the decision making process. The HEI-2005 score of the athletes who reported expressing a preference, but was helped to make a decision was 48.1 ± 5.1. For the athletes who responded making some decisions, the HEI-2005 score was 41.6 ± 6.4. Those athletes who reported being fully responsible for making decisions had a mean HEI-2005 score of 38.7 ± 4.9. Significant differences were detected in HEI-2005 scores across the four decision levels of responsibility of the athletes.

The results indicated that individuals with ID who have less responsibility making decisions regarding food choices have a higher diet quality. By contrast, individuals who have more responsibility have a lower diet quality. Both studies by McGuire et al. (2007) and Stancliffe et al. (2011) support the current results. The level of responsibility an individual had relates to dietary intake and obesity. Individuals with ID who have the

least amount of responsibility were less likely to be obese compared to individuals with ID who have more responsibility.

Dietary Intake and Obesity Prevalence Among Athletes

Heights and weights were obtained from 29 of the subjects. The mean BMI overall (n=29) was 31.4 ± 5.3. For males (n=18), the mean BMI was 32.0 ± 5.7, and for the female subjects (n=11), the mean BMI was 30.4 ± 4.5. A significant difference in BMI was not seen, by gender. Based on the BMI standard classifications, none of the athletes were underweight; 3% (n=1) had a normal weight for height, 45% (n=13) were overweight, and more than half of the athletes 52% (n=15) were classified as obese. The only athlete who was in the normal category (BMI=18.6-24.9) was a male who lived in a group home and reported having less choice when it came to making decisions regarding food (e.g. expresses a preference, but is helped to make decisions). The prevalence of obesity (52%) in this study is much higher than the prevalence of obesity (34%) across the United States according to NHANES (2010), used for comparison between individuals with ID and the general population. Rimmer and Wang (2005), Yamaki (2005), and Stancliffe et al. (2011) all reported this same trend with obesity rates higher among those with ID than without ID. Data from the present study supports the results in the literature that indicate individuals with ID have a greater rate of obesity than the general population.

Pearson's correlation coefficient was used to determine the relationship between dietary intake and obesity prevalence in the athletes. No relationship was seen between the athletes' daily caloric intake and BMI, overall and by place of residence. The

findings were surprising as they contrasted both with the general population and with past studies using the ID population. It may be that the sample used in this study was not large enough to be representative of the wider ID population or it may be that the self-reported intake was incomplete or inaccurate. These findings suggest that further investigation into reporting dietary intake for individuals with ID is needed to better understand the most reliable way to collect dietary intake from this special group.

There seems to be a disconnect between the self-reported dietary intake of the athletes and their corresponding BMI. Based on established scientific method, a BMI status of overweight and obesity should be associated with higher caloric intakes. Other factors may play a role in the subjects' lives such as the amount of involvement in Special Olympics, the individuals' social life, the degree of ID, and the sport(s) which the athletes participate (e.g. track, flag football, golf, softball, bowling, walking). Three-fourths of the athletes in this study participated in bowling which is a low calorie-burning sport. According to Disability Rights Commission (2006) individuals with ID with limited incomes are less likely to eat healthier and have less opportunity to engage in physical activities. All of these aspects could influence the individuals' dietary intake and physical activity.

Methods of Collecting Dietary Intake

To date, there have been no convenient, inexpensive, and reliable methods for conducting dietary intake assessments for individuals with ID. Due to errors inherent of all dietary recall methods, the values of the three-day food records may not be accurate and should not be taken as an exact reflection of long-term nutrient status. Basiotis and

colleagues (1987) found that the average number of days required to estimate the true average intake of energy for an individual is 27 days for males and 35 days for females. However, other nutrients need to be observed over a longer period of time. Although a weighted diet record is considered the gold standard and the most precise method available for estimation of nutrient intake, a food record of more than three days would have increased the precision of the estimation.

Methods used for measuring food intake rely on the participants' ability to accurately record what was eaten and how much was eaten. Nutrition researchers have stated that adults with intellectual disabilities are unlikely to provide accurate dietary intake data via traditional prospective or retrospective approaches. Problems with memory, comprehension, dexterity, literacy skills and communication make recalling, recording and estimating quantities of dietary intake a challenge in this population (Humphries, et al., 2008). Unfortunately, self-reported dietary intake protocols are frequently biased towards underestimation of dietary intakes. This may explain the discrepancy between energy intake and BMI observed in the present study. Based on established scientific method, a BMI status of overweight and obesity should be associated with higher caloric intakes.

Summary

This study gives a preliminary overview of the dietary intake and diet quality of individuals with ID. Results show that individuals with ID who lived in a group home with more restrictions and regulations have a higher diet quality than individuals who have more freedom by living independently or in the family home. Higher obesity

prevalence exists among individuals with ID compared to the general population without ID. This data supports the need to identify ways to reduce overweight and obesity among individuals with ID. Improving obesity rates can be tackled through better adherence to the *Dietary Guidelines* to improve individuals' dietary intake and diet quality. Implementation of appropriate, targeted educational materials for individuals with ID and their care-givers are needed to decrease obesity in this special population.

CHAPTER 6

CONCLUSION AND RECOMMENDATIONS

The purpose of this descriptive study was to determine the dietary intake of 35 athletes who participated in Special Olympics in Delaware County, Indiana; to compare the athletes' daily nutrient intake to the National Health and Nutrition Examination Survey (NHANES) data for individuals without intellectual disabilities (ID); and, to determine what effect, if any, living arrangement (e.g., group home, family home, or independent living) had on dietary intake and diet quality of the athletes. The secondary purpose of this study was to determine the relationship between dietary intake and obesity prevalence in athletes who participate in Special Olympics. The following chapter includes the overall conclusion of the study and provides recommendations for future research.

Conclusion

Determining the nutrient intake and diet quality of individuals with intellectual disabilities (ID) may help to identify ways to reduce the rate of obesity in this population, and provide health professionals with information needed to develop appropriate educational interventions. The data in this study indicates individuals with ID have a

poorer quality diet than Americans without ID. Overall, the subjects living in the various arrangements (e.g. group home, family home, or independently) reported poor quality diets with the lowest HEI-2005 score among the subjects who lived in the family home and the highest HEI-2005 score among the subjects who lived in a group home (41.4 ± 7.6 vs. 45.3 ± 6.4). Results show that the more food choice responsibility given to an individual with ID the lower the quality diet, and the less responsibility given to an individual with ID leads to a higher quality diet ($p \leq 0.01$). The data suggest education is needed to enhance the health and nutrition knowledge of individuals with ID. Furthermore, the data suggest family and caregivers of individuals with ID may also benefit from nutrition intervention and education to improve the diet and lifestyle of the individuals with ID. It is also imperative that individuals with a family history of obesity recognize the importance to change their behaviors since genetics can play a role in the obesity factor of off-spring.

Limitations

The limitations for this thesis included:

1. The participants were not randomly selected but volunteered to partake in the study. There could be a selection bias associated with volunteers participating in a research project because individuals who are inclined to volunteer may be more or less likely to consume high energy diets than those who are not.
2. Sampling only a small population of athletes in one county in the state of Indiana warrants caution to rationalize the findings of this study to the larger Special Olympics population.

3. The athletes and/or athletes' caregivers may not have provided, or have the capability to accurately recall, true responses to study questions and intake documents. The subjects may have not provided, or have the capability to complete, an accurate 3 day food record for verification of the athlete's normal diet.
4. For a portion of the athletes sampled in this study, the caregiver who signed the consent form and filled out the caregiver questionnaire was not always with the athlete during all meals, reducing the chances that the *Caregiver Questionnaire* provided a true representation of the athlete's normal dietary habits. This occurred with athletes in community group home settings, where multiple staff helped care for the athlete.
5. Some study materials were incomplete, possibly due to a misunderstanding of how to fill out the documents, or possibly due to an oversight on the part of the caregiver and/or athlete.

Recommendations for Future Research of Individuals with Intellectual Disabilities

Based on the results of this study, the following recommendations are made for future research:

1. Increase the sample size by finding more participants to partake in the study at varies Special Olympics practices.
2. More detailed directions on how to properly fill out a food record and the *Caregiver Questionnaire* should be given to all subjects. Showing subjects food models and providing handouts with pictures of different sized portions could aid

in the completion of more detailed and accurate food records by the athlete/caregiver pair. The providing of a completed food record example might also have been helpful.

3. Providing lines (more like a notebook page format) on the food records would have allowed for easier interpretation of food items and their specific portion sizes during analysis of the records.
4. Modify the question regarding the amount of responsibility given to an athlete. The distinction between "makes some decisions" and "expresses a preference, but is helped to make a decision" seems to be unclear. This will help clarify who has more responsibility and choice.
5. Need for more research to better determine the factors (e.g. activity level, living arrangement, family dynamics, employment, social circle, environmental surroundings) that lead to the dietary habits of athletes who participate in Special Olympics. This will allow education to be directed more toward these underlying factors.

Recommendations for Collecting Dietary Intake

Based on the result of this study, the following recommendations are made for future research using dietary recalls:

1. Increase the number of days which records are collected to obtained more accurate dietary information.

2. Use skilled professionals who have experience collecting dietary recalls such as a Registered Dietitian (RD). This will allow for more complete food records because RDs are trained in this area.
3. Show participants examples of completed food records so subjects better understand how to document each item consumed and the amount.
4. Include an exercise log with the food records to better understand the amount and type of physical activity the individual is doing.

Summary

It is imperative to identify ways to reduce the rate of overweight and obesity among individuals with ID. The current study indicates athletes who participated in the Special Olympics who lived in more restricted environments with less food choices have better quality diets. In order to help develop optimal interventions and education strategies, further research is needed to determine why differences in dietary intake exist among living arrangements.

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APPENDIX A

INSTITUITONAL REVIEW BOARD DOCUMENTS

A-1: Institutional Review Board Letter of Approval

A-2: Collaborative Institutional Training Initiative Completion

APPENDIX A-1: Institutional Review Board Letter of Approval

BALL STATE UNIVERSITY

Institutional Review Board

DATE:	June 27, 2011
TO:	Alison Sorg
FROM:	Ball State University IRB
RE:	IRB protocol # 241912-1
TITLE:	The Effect of Living Arrangement on Dietary Intake of Athletes who Participate in Special Olympics Living in Delaware County, Indiana
SUBMISSION TYPE:	New Project
ACTION:	DETERMINATION OF EXEMPT STATUS
DECISION DATE:	June 27, 2011

The Institutional Review Board reviewed your protocol on June 27, 2011 and has determined the procedures you have proposed are appropriate for exemption under the federal regulations. As such, there will be no further review of your protocol, and you are cleared to proceed with the procedures outlined in your protocol. As an exempt study, there is no requirement for continuing review. Your protocol will remain on file with the IRB as a matter of record.

Editorial notes:

1. Exempt Review- Category 7

While your project does not require continuing review, it is the responsibility of the P.I. (and, if applicable, faculty supervisor) to inform the IRB if the procedures presented in this protocol are to be modified or if problems related to human research participants arise in connection with this project. **Any procedural modifications must be evaluated by the IRB before being implemented, as some modifications may change the review status of this project.** Please contact please contact John Mulcahy at (765) 285-5106 or jmulcahy@bsu.edu if you are unsure whether your proposed modification requires review or have any questions. Proposed modifications should be addressed in writing and submitted electronically to the IRB (http://www.bsu.edu/irb) for review. Please reference the above IRB protocol number in any communication to the IRB regarding this project.

Reminder: Even though your study is exempt from the relevant federal regulations of the Common Rule (45 CFR 46, subpart A), you and your research team are not exempt from ethical research practices and should therefore employ all protections for your participants and their data which are appropriate to your project.

APPENDIX A-2: Collaborative Institutional Training Initiative Completion

CITI Collaborative Institutional Training Initiative

Social & Behavioral Research - Basic/Refresher Curriculum Completion Report
Printed on 2/7/2011

Learner: Alison Sorg (username: acsorg)
Institution: Ball State University
Contact Information Department: Family and Consumer Sciences
Email: acsorg@bsu.edu

Social & Behavioral Research - Basic/Refresher: Choose this group to satisfy CITI training requirements for Investigators and staff involved primarily in Social/Behavioral Research with human subjects.

Stage 1. Basic Course Passed on 02/02/11 (Ref # 5444182)

Required Modules	Date Completed	Score
Belmont Report and CITI Course Introduction	01/12/11	3/3 (100%)
Students in Research - SBR	01/19/11	9/10 (90%)
History and Ethical Principles - SBR	01/19/11	4/4 (100%)
Defining Research with Human Subjects - SBR	01/25/11	5/5 (100%)
The Regulations and The Social and Behavioral Sciences - SBR	01/25/11	5/5 (100%)
Assessing Risk in Social and Behavioral Sciences - SBR	01/25/11	5/5 (100%)
Informed Consent - SBR	01/25/11	5/5 (100%)
Privacy and Confidentiality - SBR	01/25/11	5/5 (100%)
Research with Prisoners - SBR	01/25/11	4/4 (100%)
Research with Children - SBR	01/26/11	4/4 (100%)
Research in Public Elementary and Secondary Schools - SBR	02/02/11	4/4 (100%)
International Research - SBR	02/02/11	3/3 (100%)
Internet Research - SBR	02/02/11	4/4 (100%)
Research and HIPAA Privacy Protections	02/02/11	10/11 (91%)
Workers as Research Subjects-A Vulnerable Population	02/02/11	4/4 (100%)

Conflicts of Interest in Research Involving Human Subjects	02/02/11	2/2 (100%)
Ball State University	02/02/11	no quiz

For this Completion Report to be valid, the learner listed above must be affiliated with a CITI participating institution. Falsified information and unauthorized use of the CITI course site is unethical, and may be considered scientific misconduct by your institution.

Paul Braunschweiger Ph.D.
Professor, University of Miami
Director Office of Research Education
CITI Course Coordinator

APPENDIX B

DATA COLLECTION FORMS

B-1: Three-Day Food Record (Food and Beverage Log)

B-2: Special Olympic Dietary Intake Caregiver Questionnaire

B-1: Three-Day Food Record (Food and Beverage Log)

Name:

Day/Date:

3 DAY FOOD AND BEVERAGE LOG

Day 1

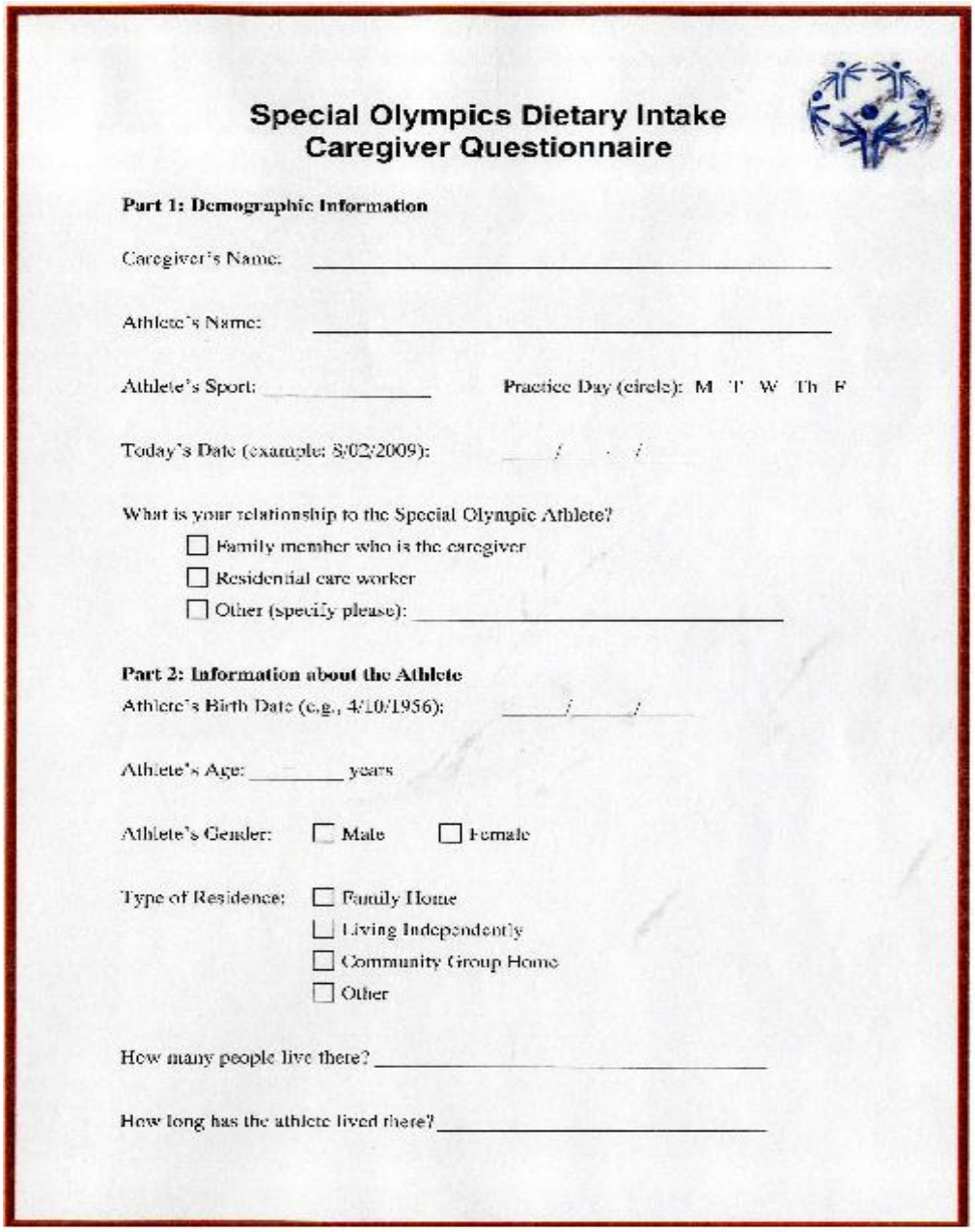
TIME	FOODS AND DRINK INTAKE	PORTIONS (cup, Tablespoon, slice)

Did you take a vitamin pill today? ☐ No ☐ Yes

If "Yes", Name of pill _____

Additional Comments:

APPENDIX B-2: Special Olympic Dietary Intake Caregiver Questionnaire



Special Olympics Dietary Intake Caregiver Questionnaire

Part 1: Demographic Information

Caregiver's Name: _____

Athlete's Name: _____

Athlete's Sport: _____ Practice Day (circle): M T W Th F

Today's Date (example: 8/02/2009): ____/____/____

What is your relationship to the Special Olympic Athlete?

- ☐ Family member who is the caregiver
- ☐ Residential care worker
- ☐ Other (specify please): _____

Part 2: Information about the Athlete

Athlete's Birth Date (e.g., 4/10/1956): ____/____/____

Athlete's Age: _____ years

Athlete's Gender: ☐ Male ☐ Female

Type of Residence:

- ☐ Family Home
- ☐ Living Independently
- ☐ Community Group Home
- ☐ Other

How many people live there? _____

How long has the athlete lived there? _____

Part 3: Food Patterns

1. Please indicate the average number of times the athlete typically consumes the following types of food each month. Mark the box with an "X" like this ☒.

Fruit & Vegetables	Never	1-3 per month	1 per week	2-4 per week	5-6 per week	1 per day	2-3 per day	4-5 per day	6+ per day
Fruit (fresh, frozen or dried)	☐	☐	☐	☐	☐	☐	☐	☐	☐
Vegetables (fresh, frozen or canned	☐	☐	☐	☐	☐	☐	☐	☐	☐

Carbohydrates	Never	1-3 per month	1 per week	2-4 per week	5-6 per week	1 per day	2-3 per day	4-5 per day	6+ per day
Cereal/Oatmeal	☐	☐	☐	☐	☐	☐	☐	☐	☐
White bread	☐	☐	☐	☐	☐	☐	☐	☐	☐
Brown bread	☐	☐	☐	☐	☐	☐	☐	☐	☐
Potatoes	☐	☐	☐	☐	☐	☐	☐	☐	☐
Rice	☐	☐	☐	☐	☐	☐	☐	☐	☐
Pasta	☐	☐	☐	☐	☐	☐	☐	☐	☐

Meat, Fish, Poultry	Never	1-3 per month	1 per week	2-4 per week	5-6 per week	1 per day	2-3 per day	4-5 per day	6+ per day
Beef	☐	☐	☐	☐	☐	☐	☐	☐	☐
Pork	☐	☐	☐	☐	☐	☐	☐	☐	☐
Chicken	☐	☐	☐	☐	☐	☐	☐	☐	☐
Fish/seafood	☐	☐	☐	☐	☐	☐	☐	☐	☐
Lamb	☐	☐	☐	☐	☐	☐	☐	☐	☐

Dairy & Fats	Never	1-3 per month	1 per week	2-4 per week	5-6 per week	1 per day	2-3 per day	4-5 per day	6+ per day
Yogurt	☐	☐	☐	☐	☐	☐	☐	☐	☐
Cheese	☐	☐	☐	☐	☐	☐	☐	☐	☐
Eggs	☐	☐	☐	☐	☐	☐	☐	☐	☐
Mayonnaise or salad dressing	☐	☐	☐	☐	☐	☐	☐	☐	☐
Low fat butter or margarine	☐	☐	☐	☐	☐	☐	☐	☐	☐
Full fat butter or margarine	☐	☐	☐	☐	☐	☐	☐	☐	☐
Milk (low fat)	☐	☐	☐	☐	☐	☐	☐	☐	☐
Milk (full fat)	☐	☐	☐	☐	☐	☐	☐	☐	☐

Sweets & Snacks	Never	1-3 per month	1 per week	2-4 per week	5-6 per week	1 per day	2-3 per day	4-5 per day	6+ per day
Chocolate	☐	☐	☐	☐	☐	☐	☐	☐	☐
Sweet bread/cake	☐	☐	☐	☐	☐	☐	☐	☐	☐
Ice cream	☐	☐	☐	☐	☐	☐	☐	☐	☐
Chips, peanuts	☐	☐	☐	☐	☐	☐	☐	☐	☐
Cookies	☐	☐	☐	☐	☐	☐	☐	☐	☐
Chips	☐	☐	☐	☐	☐	☐	☐	☐	☐

Drinks	Never	1-3 per month	1 per week	2-4 per week	5-6 per week	1 per day	2-3 per day	4-5 per day	6+ per day
Tea/Coffee	☐	☐	☐	☐	☐	☐	☐	☐	☐
Soft Drinks	☐	☐	☐	☐	☐	☐	☐	☐	☐
Fruit Juices	☐	☐	☐	☐	☐	☐	☐	☐	☐
Water	☐	☐	☐	☐	☐	☐	☐	☐	☐
Sports Drinks	☐	☐	☐	☐	☐	☐	☐	☐	☐

2. Has the athlete taken any vitamins, minerals or other food supplements during the past year? (e.g., multivitamins, protein supplements, sports/nutrition bars)

☐ No ☐ Yes

3. Does the athlete take a vitamin, mineral or other food supplement weekly?

☐ No ☐ Yes If "Yes", number of days a week _____

Decision Making

Please indicate the extent to which the athlete is responsible for making his/her own decisions in relation to the following areas:

	Fully responsible for this area	Makes some decisions in this area	Expresses a preference, but is helped to make a decision	Has no part in the decision making process
Diet	☐	☐	☐	☐
Physical Activity	☐	☐	☐	☐

Please return this form with the athlete's 3-Day Food Record at your next practice.

If you have questions, please call Alisha at (937) 417-8241. Thank you!

Questions adapted from the Lifestyle and Health Behaviour Questionnaire developed by Brian McGuire, Pamela Daly and Frances Smyth (2005)