AN EVALUATION OF THE VALIDITY AND RELIABILITY OF THE HEALTHY ATHLETES® HEALTH PROMOTION QUESTIONNAIRE USED TO ASSESS THE DIETARY INTAKE OF DELAWARE COUNTY SPECIAL OLYMPICS ATHLETES

A THESIS

SUBMITTED TO THE GRADUATE SCHOOL

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS

FOR THE DEGREE

MASTERS OF SCIENCE IN DIETETICS

BY

ALISHA M. HARMESON

ADVISOR-CAROL FRIESEN, PHD, RD, CD

BALL STATE UNIVERSITY

MUNCIE, INDIANA

DECEMBER 2009
ABSTRACT

THESIS: An Evaluation of the Validity and Reliability of the Healthy Athletes® Health Promotion Questionnaire Used to Assess the Dietary Intake of Delaware County Special Olympics Athletes

STUDENT: Alisha M. Harmeson

DEGREE: Master of Science in Dietetics

COLLEGE: Applied Sciences and Technology

DATE: December 2009

PAGES: 142

The purpose of this correlational study was to evaluate the validity and reliability of the Healthy Athlete® Health Promotion questionnaire as an instrument to assess the true dietary habits of Delaware County, Indiana, Special Olympics Athletes. A total of 35 Delaware County Special Olympics athletes completed this study. The athletes’ true dietary habits were estimated using a three-day food record and the Caregiver Questionnaire (CQ). Results indicated the Healthy Athletes Software (HAS) nutrition questions lacked statistical strength in both reliability and validity. The test-retest indicated only one-third of the questions were identified as reliable (Kappa ranged from 0.347 to 0.773; r ranged from 0.356 to 0.794). When compared to the standard, only three of the 15 food items on the HAS questionnaire had a significant relationship to the standard (r coefficients ranged from 0.458 to .777). In contrast, 11 of the 15 food items on the CQ were highly correlated with the three-day food record. The results of this study indicate the need for improvement to make to the HAS nutrition questions more reliable and valid in the assessment of Special Olympics athletes’ dietary habits.
ACKNOWLEDGEMENTS

First and foremost, I need to give a gigantic THANK YOU to my whole family for all your love and support throughout my academic career. Mom and Dad I love you both, thank you for always believing in me and my dreams. Whitney, my little sis, I love you so much. I know you are going to do great things at The Ohio State University. Just keep on believing! I know I can count on your continued love and support of my future academic pursuits, even if those pursuits take me across the country!

I would like to give a big THANK YOU to my committee chair, Dr. Carol Friesen, for taking time out of your busy and crazy life to help guide me with my thesis, and for allowing me the opportunity to enrich my knowledge and experiences working with such a unique group. I admire your ability to be both a great professor and devoted mother and wife. To the rest of my wonderful committee members: Dr. James A. Jones, Dr. Jay Kandiah, and Dr. Amy J. Leahy, thank you for your flexibility and input. Without all of you, this thesis would not have happened.

To my girls, Amanda Bolin and Laura Bollinger, I am so grateful to you both for volunteering your time to help me at the SO practices. You both were great! To my dear friends and my wonderful boyfriend, RJ, thank you! You all have been such a great support system to me over the course of this Master’s degree and thesis. I know I could not have made it this far without each and every one of you.

Finally, to Barbara Cox and the Delaware County Special Olympics athletes and caregivers, THANK YOU ALL SO VERY MUCH for letting me be part of your family these past couple of months. I have greatly enjoyed my time with you all; this experience has enriched my life in ways words cannot describe. Keep living out the SO mission!
# TABLE OF CONTENTS

**PAGE**

ABSTRACT ................................................................................................................................. i  
ACKNOWLEDGEMENTS ................................................................................................... ii  
TABLE OF CONTENTS ................................................................................................... iii  
  List of Appendices ................................................................. vii  
  List of Tables ......................................................... viii  
CHAPTER 1: INTRODUCTION ........................................................................................1  
  Purpose .............................................................................. 3  
  Research Questions .......................................................... 3  
  Rationale ........................................................................... 4  
  Definitions ........................................................................ 6  
  Assumptions ...................................................................... 8  
  Limitations ........................................................................ 9  
  Summary ........................................................................... 11  
CHAPTER 2: REVIEW OF LITERATURE .....................................................................12  
  Special Olympics International Overview ........................................... 12  
  Healthy Athletes® Initiative ...................................................... 14  
  Dietary Habits of Intellectually Impaired Population ...................... 16  
    Food Preferences of those with Intellectual Disabilities .................. 17  
    Dietary Consumption of those with Intellectual Disabilities .......... 18  
    Dietary Habits from Previous HAS Data .................................. 21  
  Factors Influencing Dietary Choices of the Intellectually Impaired ....... 25  
  Ways of Measuring Dietary Intake among the Intellectually Disabled ... 27
Validity and Reliability .................................................................29

Establishing Validity of Research Instruments .......................35

Capacity of Individuals with ID to Answer Health-Related Questions ..........51

Summary ..........................................................................................52

CHAPTER 3: METHODOLOGY .................................................................53

Institutional Review Board .................................................................53

Subjects ..........................................................................................54

Data Collection Forms .....................................................................54

Methods ..........................................................................................55

Food Record and Caregiver Questionnaire ..................................56

HAS Health Promotion Questionnaire ...........................................57

HAS Health Promotion Questionnaire Retest ...............................58

Data Entry ........................................................................................59

Reliability and Validity Analysis ....................................................62

Statistical Procedures ......................................................................63

Summary ..........................................................................................63

CHAPTER 4: RESULTS .................................................................64

Subjects ..........................................................................................64

RQ #1: Self-Reported Dietary Status of Delaware County Special Olympics Athletes ........65

Frequency of Consumption for Calcium Sources .......................66

Frequency of Consumption for Fruits and Vegetables ..................66

Frequency of Consumption for Snack Foods .................................67

Frequency of Consumption for Sweeten Beverages .....................68
CHAPTER 6: CONCLUSIONS AND RECOMMENDATIONS

Conclusion

Recommendations to Improve the HAS® Health Promotion Nutrition Questions

Recommendations of Areas of Improvement to Current Study Protocol

Recommendations for Future Research

Summary

REFERENCES
# LIST OF APPENDICES

## APPENDIX A: DATA COLLECTION FORMS

| Appendix A.1 Healthy Athletes® Health Promotion Form | .................................110 |
| Appendix A.2 Healthy Athletes® Health Promotion Nutrition Questions | .................................113 |
| Appendix A.3 Informed Consent Document | .......................................................115 |
| Appendix A.4 Instructions for Take-Home Data Collection Forms | .......................................................118 |
| Appendix A.5 Sample page of 3-day Food Record | .......................................................120 |
| Appendix A.6 Special Olympics Dietary Intake Caregiver Questionnaire | .................................122 |

## APPENDIX B

| Appendix B.1 Institutional Review Board Letter of Approval | .......................................................127 |
| Appendix B.2 Institutional Review Board Letter of Approval for Modifications to Study Protocol | .......................................................129 |
| Appendix B.3 NIH Certification for Alisha Harmeson | .......................................................131 |
| Appendix B.4 NIH Certification for Laura Bollinger and Amanda Bolin | .......................................................133 |

## APPENDIX C: RECRUITMENT SPEECH

| .......................................................135 |

## APPENDIX D: PERMISSION TO OBTAIN DATA

| Appendix D.1 Permission for Use of the Lifestyle and Health Behaviors Questionnaire | .......................................................139 |
| Appendix D.2 Permission to Sample Delaware Co. Special Olympics Athletes | .......................................................141 |
LIST OF TABLES

Table 1: Frequency of Consumption for Calcium Sources (n=37) ....................................66
Table 2: Frequency of Consumption for Fruits and Vegetables (n=37) ............................67
Table 3: Frequency of Consumption for Snack Foods (n=37) ..........................................67
Table 4: Frequency of Consumption of Sweetened Beverages (n=37) .............................68
Table 5: Frequency of Consumption of Fortified Grains, Breads, and Cereals (n=36) ....69
Table 6: Use of Nutritional Supplements (n=37) ...............................................................70
Table 7: Overall Intake by 3-day Food Records (n=35)............................................................73
Table 8: Gender Differences in Intake by 3-day Food Records ........................................74
Table 9: Frequency of Fruits and Vegetables Consumption (Caregivers) .........................75
Table 10: Frequency of Carbohydrates Consumption (Caregivers) ................................76
Table 11: Frequency of Meats Consumption (Caregivers) ................................................76
Table 12: Frequency of Dairy and Fat Consumption (Caregivers) ......................................77
Table 13: Frequency of Sweets and Snacks Consumption (Caregivers) ............................77
Table 14: Frequency of Beverages Consumption (Caregivers) .........................................78
Table 15: Frequency of Vitamins Consumed (Caregivers) ...............................................78
Table 16: Validity Coefficients Between the 3-day Food Record to the Equivalent Caregiver Questionnaire and HAS Items (n=35) ..............................................81
Table 17: Test-Retest Reliability for HAS Questionnaire (n=37) .......................................83
CHAPTER 1

INTRODUCTION

Special Olympics International (SOI) is a nonprofit organization devoted to changing lives by promoting understanding, acceptance, and inclusion between people with and without intellectual disabilities (Special Olympics, 2009a). The mission of Special Olympics is to provide year-round sports training and athletic competition in a variety of Olympic-type sports for children and adults with intellectual disabilities, giving the athletes 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 Olympics athletes, and the community (Special Olympics, 2009a).

The impact Special Olympics has on its athletes is extraordinary. The children and adults who participate develop improved physical fitness and motor skills, greater self-confidence, and a more positive self-image. They grow mentally, socially, and spiritually and, through their activities, exhibit boundless courage and enthusiasm, enjoy the rewards of friendship and ultimately discover new abilities and talents as well as “their voices” (Special Olympics, 2009a). In July of 2009, this international organization that serves almost 3 million athletes in more than 180 countries worldwide, celebrated its 40th anniversary (Special Olympics, 2009b).
Over time, SOI leaders realized quality health care for people with intellectual
disabilities was lacking. In 1997, in an attempt to educate both the athletes and the health
care providers who serve the special needs population, SOI launched the Healthy
Athletes® initiative. Through the Healthy Athletes initiative, SOI engages local health
care providers to provide a variety of free health screenings at Special Olympics
competitions. To date, Healthy Athletes® events have been held in more than 100
countries worldwide, with more than 700,000 athletes receiving screenings.

The Healthy Athletes® initiative includes seven distinct components: 1) Fit Feet
(podiatry), 2) FUNFitness (physical therapy), 3) Health Promotion (better health and
well-being), 4) Healthy Hearing (audiology), 5) MedFest (sports physical exam),
6) Opening Eyes (vision), and 7) Special Smiles (dentistry) (Special Olympics, 2009c).
The screenings provide information about each athlete’s lifestyle choices and help
identify health problems which may need additional follow-up. Volunteers for the
Healthy Athletes® events are health care professionals and students who are trained by
SOI to provide screenings in their area of expertise. In this way, SOI uses the Healthy
Athletes® program as means to train the professional community about the health needs
and care of people with intellectual disabilities (Special Olympics 2009c). The data
obtained from the Healthy Athletes® venues is entered into the electronic Healthy
Athletes® Software system (HAS), created by Health One Global (Special Olympics
2009d). HAS is the world’s largest and highest quality health database on individuals
with intellectual disabilities (Special Olympics, 2009e).

Obtaining data from Indiana Special Olympics athletes is necessary to help the
Indiana Special Olympics identify and prioritize where their limited funds should be
spent. To be useful, data must be accurate. Knowing that the instruments used to obtain this data are both valid and reliable is one way of ensuring the data is accurate and that funds are being spent on the most-needed programs. Unfortunately, the Healthy Athletes® Health Promotion Questionnaire used at all Health Promotion venues, both in the United States and throughout the world, has not been validated. Of particular concern to this research study are the dietary intake questions currently included in the Healthy Athletes® Health Promotion questionnaire.

**Purpose**

The purpose of this research study was to evaluate the validity and reliability of the Healthy Athlete® Health Promotion questionnaire as an instrument to assess the true dietary habits of Indiana Special Olympics Athletes. A secondary purpose of this study was to compare the results of an adapted version of the *Lifestyle and Health Behavior Questionnaire*, developed by Dr. Brian McGuire (McGuire, Daly, & Smyth, 2007), to the Indiana athletes’ true dietary habits as measured by a 3-day food record

**Research Questions**

This thesis addresses the following research questions:

1. What is the self-reported dietary status of Delaware County Special Olympics athletes?
   a. Frequency of consumption of sources of calcium
   b. Frequency of consumption of fruits and vegetables
   c. Frequency of consumption of snack foods
d. Frequency of consumption of sweetened beverages

e. Frequency of consumption of fortified grains, breads, and cereals

f. Use of nutritional supplements

2. What are the normal dietary intakes of Delaware County Special Olympics athletes aged 19 years or older as indicated by a 3 day food record, both overall and by gender?

3. What are Delaware County Special Olympics caregivers’ views of the athletes’ normal dietary intake as indicated by the Caregiver Questionnaire, both overall and by gender?

4. Is the Healthy Athlete® Health Promotion questionnaire a valid tool that accurately depicts the normal dietary habits and health behaviors of Indiana Special Olympics athletes?

5. Is the Healthy Athletes® Health Promotion Questionnaire a reliable (e.g., consistent) tool?

Rationale

The launch of the Healthy Athletes® initiative in 1997 was an effort by Special Olympics International to help bridge the gap in quality health care for its athletes and others with intellectual disabilities. Findings have shown people with intellectual disabilities are at a 40 percent greater risk for health issues, with many health care professionals not being trained or having quality experience in the caring of this population (Special Olympics, 2009c). Therefore, there is a great need for appropriate
screening programs by the Special Olympics and a great need to advocate for an increased awareness of this population’s health care needs.

It is well known that nutrition plays an important role in the health status of a person. So, just as it is important to screen for vision and hearing problems in the athletes, it is equally important to correctly screen the athletes’ dietary intake. The knowledge obtained from a proper dietary screening can help detect nutrient deficiencies and/or inadequacies which could potentially lead to major health issues. Data collected at past Special Olympics World Games Health Promotion venues indicate many athletes are overweight or obese; at risk for osteoporosis or osteopenia; and consume less than the recommended servings of dairy foods, and fruits and vegetables (Special Olympics, 2007). Identifying deficiencies or dietary excesses early, and providing the education to aid in behavior change, can lead to positive impacts on the person’s health and wellbeing.

In 2005, the Office of the Surgeon General released a “Call to Action” to improve the health and wellness of persons with disabilities. In this document, the Surgeon General advocates the importance of providing the tools and knowledge to persons with disabilities which will help them enjoy and maintain a full, healthy life—the same as is provided to those without a disability (DHHS, Office of Surgeon General, 2005). Appropriate health care on all levels should not be limited to only those with a normal intellect; further attempts need to be made to improve the health of this special population.

Leaders of Special Olympics International have encouraged this researcher to validate the Healthy Athletes® Health Promotion questions (A. Lenihan, SOI Director of Healthy Athletes®, personal communication, May 3, 2009). According to Lenihan,
goal of the nutrition questions asked on the questionnaire is to learn the key habits of the athletes. By learning these key habits, Special Olympics International will be able to better define the population and use the information for education and open dialogue with athletes who are interested in discussing various nutrition issues and in learning behavior change techniques to address these issues. Having this insight into what SOI anticipates obtaining from these nutrition questions further illustrates the importance of asking questions that will provide valid and reliable information about the athlete’s daily dietary habits.

**Definitions**

The following definitions are used for the purpose of this thesis:

1. **Special Olympics**: Special Olympics International (SOI or SO) is an international nonprofit organization devoted to changing lives by promoting understanding, acceptance, and inclusion between people with and without intellectual disabilities. Through year-round sports training and athletic competition for more than 3 million children and adults with intellectual disabilities in more than 180 countries, Special Olympics has created a community that celebrates people’s diverse talents (Special Olympics, 2009a; Special Olympics, 2009b).

2. **Intellectual Disability**: An intellectual disability (ID) is characterized both by having a significantly 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. ID sometimes can be referred to as a cognitive disability or mental retardation as well (CDC, 2005).

3. **Caregiver:** An individual who accompanies the athlete through the Health Promotion venue booths and Special Olympics events/practices. This is to be the primary person in charge of the care of the Special Olympics athlete. It could include a family member or a member of a group home’s staff.

4. **Validity:** For something to be valid, it must be able to measure what it purports to measure (e.g., the “truth”). With instrumentation, it is the degree of knowing that a prediction or inference of the data obtained by the instrument is accurate and true to what the instrument is measuring (Mehrens and Lehmann, 1984).

5. **Reliability:** Reliability can be defined as the degree of consistency between two measures of the same thing. The degree of consistency is determined by how much variation exists in a specific individual’s score or responses. For good reliability, it is hoped that the measures of the same thing, even under slightly different conditions, would be similar if not the same (Mehrens and Lehmann, 1984).

6. **3-day food record:** A food record (or sometimes called a food diary) is a detailed description of all the foods and beverages a person consumes over a period of time, here specified as three days.

7. **Sensitivity:** The sensitivity of a test refers to how many cases of the item in question a particular test can find. A numerical value can be calculated for a test’s sensitivity that represents the probability of it returning a “true” value for samples (i.e., patients) from the population of interest (i.e., samples from patients
who do in fact have the disease in question, or who display a certain dietary habit) (Medpedia, 2007-2009).

8. Specificity: The specificity of a test refers to how accurately it diagnoses a particular item in question without giving a false-positive result, or saying a person is positive for having or doing the item in question when really they do not have or participate in the item. A numerical value can be calculated for a test’s specificity that represents the probability of it returning a “false” values for samples (i.e., patients) from the population of interest (i.e., samples from patients who are in fact healthy, or who display healthy dietary habits) (Medpedia, 2007-2009).

Assumptions

The following assumptions for this thesis included:

1. The athletes were able to understand the verbal and non-verbal cues from the researcher or researcher’s helpers who administered the Healthy Athletes® Health Promotion questionnaire.

2. The athletes and athletes’ caregivers provided honest responses to all study questionnaires and food intake documents.

3. The eating habits of the athletes did not change during the course of the study, specifically during the time between the administrating of the test/retest of the HAS nutrition questions.
4. The athletes and athletes’ caregivers provided complete records of what the athlete ate during the course of three days.

5. The 3 day food records were completed the day and time the food/beverage was consumed and were not based off of memory days later.

6. The 3 day food record by the athlete and athlete’s caregiver was a valid representation of the athlete’s normal diet.

7. The Caregiver Questionnaire results provided by the athlete’s caregiver were a valid representation of the athlete’s normal dietary habits.

Limitations

The limitations for this thesis included:

1. 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.
   - may have been inclined to give answers to the researcher they felt the researcher wanted to see/hear related to probing or to the nature of the study.
   - did not provide, or have the capability to complete, an accurate 3 day food record for verification of the athlete’s normal diet.

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. 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 help care for the athlete.

4. 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.

5. Not all athletes and caregivers were able to attend the annual banquet on August 1, 2009, therefore, missing out on the introductory speech given by the researcher about the study.

6. Cancellations of practices and strict guidelines for involvement of members of some community group homes lead to a loss of many potential subjects for this study.

7. Cancellations of practices, or athletes missing a practice, led to a time lag greater than one week between the asking of the HAS nutrition questions which could affect the reliability of these athletes’ responses.

8. The shorter length of the study’s data collection period did not allow all Delaware County Special Olympics athletes the chance to be involved in the study, as some athletes are only involved in spring sports and the study took place in the fall.
Summary

The purpose of this investigation was to evaluate the validity and reliability of the Healthy Athletes® Health Promotion questionnaire as an instrument to assess the true dietary habits of a Special Olympics Athlete. The results of this study will help to identify areas where improvement can be made within the dietary intake component of the Health Promotion venue. As a result, the Healthy Athletes® program can use this information to provide the athletes with the best possible suggestions to improve their dietary intake in an effort to maximize their health. Only if accurate information is collected, can health care professionals provide the best health care treatment and education to athletes for an overall improved health status.
CHAPTER 2

LITERATURE REVIEW

This literature review examines the background of the Special Olympics International (SOI) organization and the dietary habits of persons with intellectual disabilities. It also examines how research instruments are validated. Finally, it looks at the ability of adults with an intellectual disability (ID) to answer or respond to health care questions.

**Special Olympics International Overview**

Special Olympics International (SOI) is an international nonprofit organization devoted to changing lives by promoting understanding, acceptance, and inclusion between people with and without intellectual disabilities. The organization was founded by the late Eunice Kennedy Shriver in 1968. The first International Special Olympics Games were held at Soldier Field, Chicago, Illinois, USA. Shriver developed the concept of Special Olympics in the early 1960s after observing a day camp for people with intellectual disabilities where she saw that people with intellectual disabilities were far more capable in sports and physical activity than thought by many experts at the time.
Thus, Special Olympics was born and has been growing ever since (Special Olympics, 2007).

The sole mission of Special Olympics to provide year-round sports training and athletic competition in a variety of Olympic-type sports for children and adults with intellectual disabilities, giving 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 Olympics athletes, and the community. The children and adults who participate in Special Olympics events develop improved physical fitness and motor skills, greater self-confidence, and a more positive self-image. The athletes grow mentally, socially, and spiritually, and through their activities, exhibit boundless courage and enthusiasm, enjoy the rewards of friendship and ultimately discover new abilities and talents as well as “their voices” (Special Olympics, 2009a). The skills and benefits the athletes take from their involvement in Special Olympics carries over into their daily lives at home, on the job, in the classroom, and in the community. The families who participate become stronger and learn to have a greater appreciation of their athlete’s talents. Community volunteers also benefits from Special Olympics involvement. They find good friends in the athletes and everyone learns more about the capabilities of people with intellectual disabilities (Special Olympics, 2007). In essence, Special Olympics is helping create a more inclusive and accepting world for all.

There are seven regions of Special Olympics: Africa, Asia Pacific, East Asia, Europe/Eurasia, Latin America, Middle/East/North Africa and North America. Each regional office is responsible for the direction of Special Olympics Programs within that region. Local, state/provincial, and national Special Olympics Programs organize their
respective events (e.g., specific sporting events, Healthy Athletes®, Young Athletes). Special Olympics is the only organization authorized by the International Olympic Committee to use the term “Olympics” worldwide (Special Olympics, 2007).

To be eligible to participate in the Special Olympics, the athlete must be at least eight years of age and have been identified by an agency or professional as having one of the following conditions: intellectual disability; cognitive delays as measured by formal assessment; or have significant learning or vocational problems due to cognitive delay that requires or has required specially designed instruction. Recently, a new program, The Special Olympics Young Athletes™, has been developed for children ages two through seven years with intellectual disabilities (Special Olympics, 2009a). There are also opportunities for individuals without intellectual disabilities to take part in Unified Sports®, which are teams with a mix of people with and without intellectual disabilities. Once an individual is deemed eligible for the Special Olympics and they indicate their wish to participate, the individual must register with an accredited program in his/her area. Each Special Olympics program has its own athlete registration form. All Special Olympics athletes and Unified Sports® partners must agree to a code of conduct that outlines expectations for sportsmanship, training and competition, and personal responsibility. Special Olympics athletes currently have 30 official sports from which to choose (Special Olympics, 2009f).

Healthy Athletes® Initiative

In 1997, the Special Olympics launched the Healthy Athletes® initiative which provides health screening free of charge at Special Olympics competitions (Special
Olympics, 2009c). Special Olympics Healthy Athletes® was designed to help Special Olympics 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 (Special Olympics, 2007). The Healthy Athletes® initiative has been implemented in more than 100 countries around the world. To date, more than 76,000 healthcare professionals have been trained and free health screenings have been provided to more than 700,000 athletes (Special Olympics, 2009c).

The Healthy Athletes® initiative includes seven components: 1) Fit Feet (podiatry), 2) FUNFitness (physical therapy), 3) Health Promotion (better health and well-being), 4) Healthy Hearing (audiology), 5) MedFest (sports physical exam), 6) Opening Eyes (vision), and 7) Special Smiles (dentistry). The screenings provide the athlete information on healthy lifestyle choices and can help to identify problems that may need additional follow-up. Volunteers for the Healthy Athletes® events are health care professionals and students who are trained to provide screenings in their area of expertise. In this way, Special Olympics is able to train individuals in the professional community about the health needs and care of people with intellectual disabilities (Special Olympics, 2009c). Healthy Athletes® also allows for the collection, analysis, and dissemination of data on the health status and needs of people with intellectual disabilities. This data can be used to advocate for improved health policies and programs for this special population, as well as to enhance available information for global research (Special Olympics, 2007). The data obtained during the Healthy Athletes® venues is entered into the electronic Healthy Athletes® Software system (HAS), created by Health One Global (Special Olympics, 2009d). This software system was officially launched at
the 2003 Special Olympics World Summer Games in Dublin, Ireland and has been used at all events since then (Special Olympics, 2007). HAS is currently the world’s largest health database on individuals with intellectual disabilities (Special Olympics, 2009e).

The Health Promotion venue of the Healthy Athletes® initiative is the primary focus of this current study. The mission of Special Olympics Health Promotion is to improve the quality and length of life for Special Olympics athletes through the adoption of healthy behaviors. The Health Promotion area focuses on healthy lifestyles and the facilitation of healthy choices in the areas of height and weight (overall BMI), waist circumference, blood pressure, bone mineral density (BMD), smoking cessation, nutrition, and sun safety. Due to the higher incidence of medical conditions in persons with intellectual disabilities, there is an increased importance for relaying appropriate information to this population on ways to reduce these health risks and improve their performance. The goal of the nutrition component of Health Promotion, in particular, is to improve the athlete’s ability to train and compete in Special Olympics events and to develop an awareness of good nutrition and its impact on the life cycle (Special Olympics, 2007).

Dietary Habits of Intellectually Impaired Population

Information describing the dietary patterns and eating habits among adults with intellectual disabilities (ID) is limited. The only dietary guidelines available for every American, including those healthy adults with intellectual disabilities, are the *Dietary Guidelines for Americans 2005*. This document, intended for the general population, is updated every five years by the Departments of Agriculture (USDA) and the Department
of Health and Human Services (DHHS). The Dietary Guidelines provide authoritative advice for people two years of age and older about how good dietary habits can promote health and reduce the risk for major chronic diseases (USDA, 2009). The Dietary Guidelines for Americans 2005 recommends that individuals consume a variety of nutrient-dense foods and beverages within and among the basic food groups, while choosing foods that limit the intake of saturated and trans fats, cholesterol, added sugars, salt and alcohol. The guidelines also encourage the consumption of key food groups, including fruits and vegetables, adequate whole-grain products, and the consumption of three cups per day of fat-free or low-fat milk or equivalent milk products, all while staying within one’s energy needs (DHHS/USDA, US Dietary Guidelines Advisory Committee, 2005). These guidelines are currently under revision and are scheduled to be updated in 2010 (USDA, 2009).

Food Preferences of those with Intellectual Disabilities

Research documenting the dietary habits and preferences of the intellectually impaired population dates back as far as 1955. Potgieter, Morse, and Walker (1955) conducted research on a group of 33 women ranging in ages from 21 to 56 years old who were working in a state training institution in Connecticut. Food intake was recorded for fourteen days each month during the five month study. On three days at the end of each month, two representative servings of each food were collected and analyzed. Between-meal snacks and refreshments eaten on occasion were reported by each subject. Food acceptance and preferences of the women were based on the number of women eating the food rather than on the number of servings eaten by the group. Favorite breakfast foods
were ready-to eat cereals (cold cereals), hot oatmeal, and eggs which were preferred by three-quarters of the women. Fruit (applesauce, bananas, canned peaches, canned pears, mixed fruit juice, pineapple juice, and stewed dried fruits), buttered bread, and coffee were consumed by most of the women. Lunch meals containing beef or pork with either potatoes or noodles were liked by all women. Other vegetables served and liked in order of preference include, peas, corn, wax beans, coleslaw, green beans, succotash, cabbage, onions, carrots, rutabagas, beets, sauerkraut, mixed vegetable salad, and spinach.

Desserts, consisting of canned or fresh fruits, custard, gelatin, ice cream pies, and puddings, were served everyday and were eaten by everyone. Ice cream was the favorite dessert. Supper favorites, in order of preference, were: spaghetti, cold cuts, macaroni, hash, chipped beef, scrambled eggs, and cheese. Breads were served at every meal and were seldom refused.

Dietary Consumption of those with Intellectual Disabilities

In 2008, Adolfsson and colleagues assessed the dietary intakes and key habits of a group of individuals with intellectual disabilities (ID) living in community residences. Food records and leftovers were analyzed over a three-day period for 32 participants (14 females, 18 males) from group homes and service apartments in Sweden that accommodated people with ID. Results indicated the mean intake of total vegetables and fruits was 320 ± 221g/day (1.3 cups), with a median consumption of 240g/day (1 cup). For seven of the 32 subjects, daily consumption was above 500g (2 cups); more than half of the subjects had a daily consumption below 250g (1 cup). The mean intake of dietary fiber was below the recommended level of 21 g per day (± 9.6 g). Milk products, bread,
meat products, buns, and cakes were the foods from which the subjects obtained most of their calories. Water and different fruit drinks, made from both syrup and juices, were more common than either milk or soft drinks as mealtime beverages. Dietary supplements were used by only six subjects; these included either vitamin supplements or nutrient supplements, such as nutrition enrichment in food or supplemental nutrition instead of food.

McGuire, Daly, and Smyth (2007) examined a range of health and lifestyle factors, demographic variables, and decision making opportunities in a group of individuals with ID in western Ireland through a cross-sectional postal survey. The survey was distributed to 250 caregivers of people with ID in west Ireland. Of the 250 questionnaires sent out to residential and family settings, 157 were completed (63%); of these, 67 were from family caregivers and 90 were from residential caregivers. Almost half (46.5%) of the adults with ID were female and 53.5 percent were male. The mean number of carbohydrate foods consumed was 4.76 with 25.9 percent of the ID sample complying with ideal intake. The mean fruits and vegetables portion intake per day was 3.57, with 42.4 percent meeting the ideal. The mean number of portions of dairy consumed was 1.64 servings per day, with only 9.5 percent meeting the standard. Finally, sugar and fat mean intake was 1.77 portions per day with 72.5 percent of the ID sample complying with the ideal intake of these foods.

Bertoli et al (2006) tested their hypothesis that impairment in nutritional status, consequent to quantitative and qualitative inadequacy of the diet, is one of the first steps in the development of disability-associated pathologies. To test this hypothesis, Bertoli and colleagues compared anthropometric, biochemical parameters, and dietary intake of
both physically and mentally disabled persons to that of a control group representing a healthy Italian population. Dietary intake was measured by seven day food records collected for all subjects. Results showed 48 percent of the disabled (especially among those with a mental disability), consumed a higher quantity of dietary fat than recommended. In addition, the mean intake of saturated fat (SFA) and monounsaturated fat (MFA) were above recommended intakes, while the consumption of polyunsaturated (PFA) was below the recommended levels. The overall distribution of dietary fatty acid was 3:1(SFA):4:1(MFA):1:0(PFA). Protein intake was adequate; however, energy derived from total carbohydrate intake was only $50 \pm 7.1$ percent of absolute energy intake (EI), an amount much lower than recommended by the researchers’ standards. Simple carbohydrates provided $17.5 \pm 4.9$ percent of the total energy intake. The average fiber intake was also lower than the recommended amount. Phosphate was the only mineral to be consumed in adequate amounts. In contrast, calcium, potassium, zinc, and iron were all well below the recommended intake level. Vitamin D was the only vitamin consumed below the recommended level. The researchers concluded the higher intake of fat and simple carbohydrates among the disabled, at the expense of more complex carbohydrates and fiber, could contribute to a higher risk of cardiovascular disease. In addition, the low intake of calcium and Vitamin D could contribute to the higher prevalence of osteopenia and osteoporosis among the disabled (Bertoli et al, 2006).

Jobling and Cuskelly (2006) used a semi-structured interview, *Health Knowledge and Behaviour Interview* (HKBI), developed by the researchers, to examine the health knowledge and behaviors of young people with Down syndrome. Both the individual with Down syndrome and their parents completed two separate interviews, allowing the
researcher to compare responses. The researchers looked at hygiene practices, appropriate substance use, exercise, and healthy eating. With regard to healthy eating, most individuals with Down syndrome reported their favorite foods were high in fat and sugar (58%); 81 percent of the subjects reported they consumed these types of foods daily. Most subjects (71%) reported eating cereal for breakfast; 48 percent selected foods for lunch that were high in sugar or fats. Both the parents and the young individuals with Down syndrome agreed the parents were primarily the ones preparing lunches.

Dietary Habits from Previous HAS Data

At the February 2009 Special Olympics World Winter Games held in Boise, Idaho, 595 athletes were screened at the Health Promotion venue using the HAS data collection form. Of those screened, 71.3 percent (n=424) were male and 28.7 percent (n=171) were female. Data from the nutrition questions indicated 70.4 percent (n=419) of the athletes consumed calcium sources “daily;” 19.2 percent (n=114) of athletes responded they consumed calcium sources “more than once per week,” and 1.8 percent (n=11) responded they “never” consume calcium-rich foods. Almost two-thirds (65.7%; n=391) of athletes indicated they ate fruits and vegetables “daily,” while 24.5 percent (n=146) reported consuming them “more than once per week,” and only 1.2 percent (n=7) of athletes screened indicated they “never” ate fruits and vegetables. Slightly more than one-fourth (26.1%; n=155) of athletes indicated they consumed snack foods “daily,” while 48.1 percent (n=286) reported eating snacks “more than once per week,” and 17.3 percent (n=103) of the athletes screened reported they “never” consume snack foods. One-third (33.9%; n=202) of the athletes reported they consumed sweetened beverages
“daily,” 39.8 percent (n=237) reported they consumed sweetened beverages “more than once per week,” and 15.8 percent (n=94) of the athletes screened reported they “never” consume sweetened beverages. With regard to fortified foods (grains, breads, cereals), 72.8 percent (n=433) of athletes reported they consumed them “daily,” while 14.3 percent (n=85) reported “more than once per week,” and only 3.4 percent (n=20) of all the athletes screened reported they never consumed fortified grains, breads or cereals. When asked “What do you drink when you are feeling thirsty?,” more than three-quarters (78.0%; n=464) of the athletes indicated they drink water, while 38.3 percent (n=228) drink fruit juice, 22.9 percent (n=136) drink soft drinks, 8.7 percent (n=52) drink sports drinks, and 31.4 percent (n=187) of athletes drink milk or soy products (athletes can choose more than one answer). When asked, “Do you eat other foods or take special nutrition pills?” 37.8 percent (n=225) of athletes indicate they eat sports bars, enriched gruel, or sports drinks, while 5.7 percent (n=34) of athletes eat nutrition supplement products. Less than one in five athletes (16.1%; n=96) indicated they take a vitamin, mineral, or protein supplement (Special Olympics, personal communication, July 1, 2009).

Recent data published in a master’s thesis by Dudoit (2009) examined the dietary intake of Indiana Special Olympics athletes as recorded on the HAS form during Health Promotion events in 2008. Dudoit compared the Indiana data to that of non-Indiana Special Olympics athletes’ dietary intake recorded from 2006-2008 Health Promotion venues across the United States. The data used in this causal-comparative study was obtained from the HAS database by permission from Special Olympics International through Indiana Healthy Athletes® Health Promotion Clinical Director, Dr. Carol
Friesen, PhD, RD, CD. A total of 257 Indiana Special Olympics athletes participated in at least one Health Promotion venue in 2008. Of these, 58.0 percent (n=149) were males and 42.0 percent (n=108) were females. Results for 239 Indiana athletes who answered the question “How often do you eat sources of calcium?” indicated over three-fourths (79%; n=190) of the athletes responded “daily,” another 19.7 percent (n=47) responded “more than once a week,” and less than one percent (0.8%; n=2) of the athletes responded “never.” Three-fourths of the 238 Indiana athletes (74.8%; n=178) indicated they ate fruits and vegetables “daily,” 23.9 percent (n=57) responded “more than once a week,” and 1.3 percent (n=3) responded they “never” eat fruits and vegetables. Almost one-half of the 239 Indiana athletes (44.8%; n=107) indicated they eat snack foods “daily,” with an identical number (44.8%; n=107) reporting they only consume snack foods “more than once a week.” Slightly more than ten percent (10.5%; n=25) of the Indiana respondents indicated they “never” eat snacks. Slightly more than half (55.0%; n=131) of the Indiana athletes indicated they drank sweetened beverages “daily,” while 34.9 percent (n=83) responded “more than once a week,” and 10.1 percent (n=24) of the athletes responded they “never” drank sweetened beverages. Finally, data for 238 Indiana athletes who answered the question “How often do you eat fortified foods?” indicated almost all of the athletes (81.9%; n=195) consumed fortified grain products “daily,” with the remaining athletes responding either “more than once per week” (17.2%; n=41) or “never” (0.8%; n=2).

Non-Indiana Special Olympics athletes data was obtained from 486 athletes who had participated in some aspect of the Special Olympics Healthy Athletes® Health Promotion venue during 2006-2008 in one of five states: California (20.0%; n=97
athletes), Connecticut (14.4%; n=70), Florida (26.1%; n=127), Louisiana (33.3%; n=162), and Montana (6.2%; n=30). Results from the 386 non-Indiana athletes who answered the question “How often do you eat sources of calcium?” indicated well over three-fourths (83.4%; n=322) of the athletes responded “daily,” another 13.7 percent (n=53) responded “more than once a week,” and just under three percent (2.8%; n=11) responded “never.” A total of 426 non-Indiana SO athletes answered the question of “How often do you eat fruits and vegetables?” Of these 426 athletes, 84.0 percent (n=358) responded “daily,” 14.3 percent (n=61) responded “more than once a week,” and 1.6 percent (n=7) responded “never” to the question on fruits and vegetables. Data for 321 non-Indiana athletes who responded to the question “How often do you eat snack foods?” indicated 59.5 percent (n=191) of the athletes responded “daily,” 28.7 percent (n=92) responded “more than once a week,” and just over eleven percent (11.8%; n=38) responded that they “never” eat snacks. Only 232 non-Indiana SO athletes answered the question, “How often do you drink sweetened beverages?” Slightly more than half (51.7%; n=120) of the athletes responded they drank sweetened beverages “daily,” another 32.8 percent (n=76) responded “more than once a week,” and 15.5 percent (n=36) of the athletes responded they “never” drank sweetened beverages. Finally, data for 382 non-Indiana athletes who answered the question “How often do you eat fortified foods?” indicated almost all of the athletes (88.0%; n=336) consumed fortified grain products “daily,” with the remaining athletes responding either “more than once per week” (9.9%; n=38) or “never” (2.1%; n=8) (Dudoit, 2009).
Factors Influencing Dietary Choices of the Intellectually Impaired

It has been suggested that the lack of adherence to a balanced and proper diet among the intellectually impaired population could be contributed to their caregiver. Melville and colleagues (2009) assessed caregiver knowledge and perceptions of dietary habits and physical activity lifestyles of the intellectual disability adults they cared for. All caregivers in this study were paid and had known the person with the ID for at least one month. The research group developed an interviewer-administered questionnaire to examine the caregiver’s knowledge and beliefs around dietary intake and physical activity. Results indicated that, of the 63 participants in the study, most had generally poor dietary knowledge. The only measure for which any caregiver had full knowledge was the public health recommendation for the amount of fruits and vegetables to be consumed each day. Most caregivers had no knowledge of Scottish Office (1996) recommendations for daily intake of breakfast cereal (100% did not know), average intake of total fat \( \leq 35\% \) of total food energy (93.4% did not know), daily intake of bread (91.8% did not know), and average intake of saturated fat \( \leq 11\% \) of total food energy (88.5% did not know). When the caregivers were asked what they felt the greatest benefit of a better diet would be to the adult with ID in their care, all responded a reduction in the risk of disease. The authors reported the biggest barriers the caregivers felt the person with ID they support would perceive were the intrapersonal barriers of knowledge and skills, motivation for change, and the interpersonal barriers of lifestyle choices of others.

Another major source of influence on persons with ID and their dietary habits is whether or not they live in a group home setting. Individuals with ID who live in
community group homes sometimes have little to no choice as to what they will eat and when the meals will be offered. In addition, many direct-care staff members have little training about nutrition and proper menu planning. In two separate studies by Humphries and colleagues, one in 2004 and one in 2008, the researchers reported a tremendous lack in proper training and knowledge of menu planning among staff in group home settings where individuals with ID resided.

Humphries, Traci, and Seekins (2004) found the menus from two group homes in Montana, one housing eight individuals and the other housing six individuals, to not conform to the Food Guide Pyramid. The diets were found to be excessive in energy-dense, nutrient-poor foods, and dietary fats. The multiple deficits found in the residents’ diets put them at risk for chronic diseases.

In 2008, Humphries, Traci, and Seekins developed an educational program (MENU-AIDDs) to help staff in group homes prepare and provide nutritionally acceptable meals for their residents. Once the group homes in this study complied with the program, the residents reported they enjoyed the smaller portions of more nutritious foods just as much as they did the old meals. The group homes also reported providing more nutritious food did not cause extra expenses in the long run. Some complaints by the staff were reported initially, including not wanting to change their work habits. This seemed to be the only potential barrier to the program. At the end of the study, all of the group homes that had participated in MENU-AIDDs indicated they planned to continue the program once the study concluded.
Ways of Measuring Dietary Intake among the Intellectually Disabled

Traditional ways of assessing one’s dietary intake include such approaches as the 24-hour recall, food frequency questionnaires, diet histories, and food records. Despite inherent flaws in each method, each of these methods has been shown to provide adequate information about a person’s normal dietary habits. However, because most of these methods rely on memory and others on compliance, these methods might not be appropriate for individuals who are intellectually disabled (Humphries et al., 2004; Humphries et al, 2008).

To date, there has been no validated method for obtaining dietary intake assessment for adults with intellectual or developmental disabilities due to the significant barriers to collecting valid data. The use of support by a proxy reporter has been shown to work in some dependent populations. However, the reliability of the method depends on the constant presence of the proxy during all eating times, and the proxy’s ability to accurately record the foods the individual is eating. This type of assessment only allows for those individuals with continuous support for all food-related needs be included, severely limiting available, obtainable data for the whole population of adults with intellectual disabilities. Even the dietary components of the National Health and Nutrition Examination Survey (NHANES) and the Behavioral Risk Factor Surveillance System (BRFSS) are not truly capable of assessing individuals with intellectually disabilities and should be used with caution when generalizing these surveys’ findings to individuals with intellectual disabilities. Adults with intellectual or developmental disabilities are a nutritionally vulnerable population who could greatly benefit from dietary monitoring, but many researchers agree these individuals are least likely to
provide accurate dietary intake data via any of the traditional methods (Humphries et al.
2009).

Humphries, Traci, and Seekins (2008) examined a new methodology of having individuals with intellectual and developmental disabilities complete a food record with pictures. Nine adults with intellectual and developmental disabilities volunteered to participate in this pilot study. Each participant was given a *Food on Film* research kit and was asked to take pictures of all food and beverages before and after consumption during a 24-hr period. The researchers then completed 24-hr recall interviews with the subjects. The subjects were interviewed the day after they had photographed their food. Results indicated the subjects had difficulty remembering all of food they had consumed the previous day. However, when the researchers provided the subjects with the pictures they had taken and asked the subject to recall time and amounts eaten, the subjects were able to provide more reliable responses. In essence, although the researchers did not find that the act of taking the pictures improved recall, the pictures did provide memory aids and functioned as communication support between the interviewer and interviewee.

Further testing on the reliability and validity of this new method of measuring dietary intake with this population is needed, but it does stand to show there might be other ways of assessing this population’s dietary habits and intake that can produce accurate findings.
Validity and Reliability

The most important aspect of any test or instrument is its degree of validity. In order for something to be valid, it must be able to measure what it purports to measure. With instrumentation, validity is the degree of knowing that a prediction or inference of the data obtained by the instrument is accurate and true to what the instrument is measuring. For an instrument to be valid or true, it must first be reliable. Reliability can be defined as the degree of consistency between two measures of the same thing. The degree of consistency is determined by how much variation exists in a specific individual’s score or responses. For good reliability, it is hoped that the measures of the same thing, even under slightly different conditions, would be similar if not the same. However, just because there is consistency, does not mean there is validity. A test or instrument can consistently give an incorrect or false measure, therefore, not providing a true picture and giving an invalid conclusion (Mehrens and Lehmann, 1984).

Many types of errors can occur during the use of an instrument that can affect the reliability of the instrument. One type of error, trait instability, occurs when there is a change in a particular characteristic being measured over time. A second type of error that can occur is called sampling error. For example, the specific questions that are selected to infer a person’s knowledge of something could affect the score. Administrator error is a third type of error that can reduce the reliability and validity of an instrument. Any change in directions, timing, or rapport with the test administrator could cause score variability and therefore influence the reliability. Finally, things such as the health, motivation, degree of fatigue of a person can also affect and cause
variability in the score of the instrument. The fewer the errors in measurement, the more consistent or reliable is the instrument (Mehrens and Lehmann, 1984).

The methods used to estimate reliability differ in that each considers a different source of error. For purposes of this study, the measure of stability, or otherwise known as test-retest, was the type of estimate of reliability used. With this type of estimate of reliability, it can be determined how confident one can generalize the score a person receives at one time to what he/she would receive on the same test at a different time.

The estimate will vary with the length of the time interval between the tests, and thus the interval length must be considered when interpreting the reliability coefficients. The interval of time length should always be specified. Any changes seen between tests are to be treated as an error, with the assumption that the trait being measured is stable. The type of error cannot be isolated in this type of estimate. The consistency over time of the person’s performances is what is really being testing in a test-retest estimate. The factor of memory effects or strong recall is also high in this type of estimate and can significantly effect the reliability seen. This factor has been proven troublesome in tests in the cognitive and affective domains. With regard to test length, the longer the test, the more reliable the score, as the random positive and negative errors within the test have a better chance of cancelling each other out.

Other factors (not used in this study) that can influence the strength of the instrument’s estimate include: equivalent forms, difficulty of items, group homogeneity, and objectivity. Equivalent forms estimate of reliability is obtained by giving two forms (with equal content, means, and variances) of a test/instrument to the same group on the
same day and correlating the results. Difficulty of the items within an instrument or test occurs if most of the items are so easy most anyone can get them correct, or the items are so hard most get them wrong, the test will have a lower reliability. These extreme ends of difficulty of an instrument lead to little variability between scores, resulting in a lower reliability. An instrument or test with a good mixture of hard and easy questions will result in an instrument with better reliability. Group homogeneity is a third factor that can influence reliability. The more heterogeneous a group is, the higher the reliability seen in the test. Group dynamics should stay similar when administering tests. Finally, with regard to objectivity, the more subjectively a measure is scored, the lower the reliability of the measure (Mehrens and Lehmann, 1984).

The question that often arises with a study, including the current one, is “How reliable should the instrument be in order to be useful?” As Mehrens and Lehmann (1984, p. 285) state: “If the decisions the scores will help make are extremely important and/or irreversible, then the reliability of the measure is of more concern than if the decision is not quite so important.” If little information is available on which to base a decision, it may be helpful to use an instrument with low reliability instead of no instrument at all. On the other hand, if a good decision or accurate prediction could be made without the instrument data, it is probably not worth using the instrument for its little reliability (Mehrens and Lehmann, 1984).

Validity can be defined as the extent to which inferences can be made from test scores or other measurement. When instruments are used to make an inference about a property or behavioral domain of the person being measured, the score from the test can
be thought of as representing the property of the person. Tests or instruments that actually do represent can be further defined as samples and signs. Samples describe the domain being measured, while signs help to explain the domain. For tests/instruments to serve as sample, high content validity is needed, whereas, to serve as a sign, high construct validity is needed. Since a single instrument may be used for several purposes, there is no single validity index for the instrument. It could have some validity for one purpose and be invalid for another (Mehrens and Lehmann, 1984).

When looking at validity, both external and internal validity should be examined. External validity refers to the extent to which results are generalized or transferable, much like with reliability. External validity is the ability to use the results of a study in multiple context of similar nature. It also allows outside readers to make connections between elements in the study with elements in their own experiences. Internal validity is both the rigor of the study design and the extent to which the designers of the study have taken alternative explanations for any causal relationships into account (Colorado State University, 1993-2009).

There are many types or ways of determining internal validity of a test or instrument. Content validity is related to how adequately the content of, and responses to, the test demonstrates a real or hypothetical representation of the domain about which inferences are to be made. This type of validity is especially important in achievement tests, with the hope that the test is a representative sample of the intended domain. In judging content validity, the subject matter and type of behavior or test desired must be considered. Content validity is usually determined by a thorough inspection of the items
of the specified domain. This inspection is subjective and does not show any quantitative expression. Judging of content validity also involves how adequately an inference from a particular score can be made to a larger domain, or what kind of generalization can be made to a larger population. This type of validity can be situation-specific. There also needs to be a proper balance among any possible subcategories of the domain, or one might have high content validity and another low with the same test (e.g., Achievement tests). Criterion-related validity examines the relationship between the test scores or other predictors and some independent external criteria. Just as in content validity, criterion-related validity is looking to generalize from one score to other scores. It differs in that it looks at how confidently generalizations or predictions can be made on how well a person will do on a different task. One of the hardest tasks in a study of criterion-related validity is to obtain adequate criterion data. First, all data must be relevant to what is trying to be measured. Second, the criterion must be reliable. Lastly, the criterion measures are to be free from bias or contamination. Contamination is usually influenced by predictor scores, and should be avoided. Construct-validity is a degree to which one can infer certain constructs in theory from the test scores. If an instrument has this type of validity, scores will vary as the theory underlying the construct would predict. This type of validity is important for measuring such characteristics (or constructs) as intelligence, motivation, assertiveness, compulsiveness, and paranoia. Lastly, face validity is simply whether an instrument or test appears to look valid on the surface. That means, could an untrained person look at and take the test and know what the test in likely to be measuring as claimed by the author. This is often an important aspect of a test in that the test seems useful to a public standpoint and the users will want to take it
more seriously, or find the results more useful than if the face validity was low (Mehrens and Lehmann, 1984).

Many factors affect the validity of an instrument. The major factor is the actual relationship between the two variables being measured. It could be two variables are actually highly related, but measures between them in a particular sample indicate the contrary. Factors such as reliability and criterion measures could cause this effect. Group heterogeneity can also affect validity similarity to the way it can in reliability. The more heterogeneous a group, the higher the validity coefficient will be. There is also the problem of interpreting validity coefficients on groups already selected. A good use of a test has a lower validity coefficient which sometimes incorrectly is inferred as the test being invalid. Just as with reliability and the coefficient size being affected by many variables, the same can happen with validity measures. Finally, the shape of the relationship between the predictor and the criterion variables can affect the validity (Mehrens and Lehmann, 1984).

In order for an instrument or test to be valid it must be reliable. For validity to be calculated, the actual relationship between variables needs to be measured. The validity of an instrument needs to be specific to the appropriateness of the overall purpose of its use. Instruments can consistently find similar results or responses over time; however, they could consistently be false. In order to have a good study, one must use a good instrument or test. This must be done through reliable and valid means of measurement (Mehrens and Lehmann, 1984).
Establishing Validity of Research Instruments

Establishing validity of a research instrument can be viewed through two approaches: logic and statistical evidence. When establishing validity through logic, each question must be justified in relation to the overall objectives of the study. Statistical procedures provide hard evidence through calculating the coefficient of correlations between the questions and outcome variables (Kumar, 2005).

Finding a logical link between the questions and objectives of a study can be both simple and difficult. The simple part is that the researcher themselves can usually see the link, but may have trouble convincing others without strong statistical evidence to back the justification being made (the difficult part). This can be made easier when the questions relate to tangible manner, like age, income, weight instead of effectiveness of a program or a person’s attitude about a certain issue. In these situations, more questions need to be raised and analyzed in order to cover all aspects of the concept to show actual validity of the questions being asked (Kumar, 2005).

For a research instrument to be valid, it should be developed in a way that will allow for valid measures to be obtained from the underlying construct. This happens during the development of the scale of the instrument. It is very important that there be a clear view of the target construct for the instrument. The initial item pool (or content of the instrument) needs to be over inclusive. The item pool should also be tested, along with other variables that assess closely related constructs, on a heterogeneous sample representing the entire range of the target population for the instrument. Finally, the scale items should be moderate in magnitude (Clark and Watson, 1995).
Neuhouser and colleagues recently (2009) conducted a study that developed and validated a questionnaire for use of evaluating school nutrition policies. The objective of the study was to develop such a questionnaire which could be used for young adolescents that would look at their beverage and snack consumption both in and out of school. Subjects for this study were 46 seventh grade students in metropolitan Seattle, WA. The research group tested the reliability of the questionnaire by administrating the same BSQ (Beverage and Snack Questionnaire) on two separate occasions four-six weeks apart. The validity of the BSQ was assessed by having the participating adolescents complete a four-day food record, which was used for comparison against the test-retest of the BSQ.

For analysis of the food records, each item recorded was coded into one of 19 binary food categories which matched up to those on the questionnaire. Student t tests were used to compare mean frequency of items reported on each instrument for each location of consumption (school or home). Pearson correlations looked at the reliability and validity of the instruments. The mean frequency was calculated for the week based on the four-day food record. The goal of the analysis was to demonstrate whether a food or beverage item and its location (at school or home) were also captured on the BSQ, thus indicating a relationship between the two instruments and therefore, validity of the BSQ.

Results of the study showed mean frequency of consumption of foods did not differ between the BSQ and the food records. The test-retest reliability of the BSQ was high, with coefficients ranging from $r=0.72$ to $r=0.85$. There were no major differences between reliabilities of those foods consumed at home ($r=0.67$) or at school ($r=0.70$). Validity correlations between the BSQ and the food record on location and type of food to be $r=0.71$, 0.70, and 0.69 for beverages, snacks and sweets, and fruits and vegetables.
respectively when consumed at school. Estimates were very similar for foods consumed at home ranging from $r=0.63$ for fruits and vegetables to $r=0.70$ for beverages. The researchers reported that the coefficients for the BSQ were similar in magnitude to those reported elsewhere, and concluded that overall the BSQ is a simple, quick, and reliable method of obtaining dietary behaviors of young adolescents to evaluate the impact of school nutrition policies. Many studies cited in the Neuhouser study that examined test-retest of dietary intake questionnaires to food records or 24 hour recalls, found this type of method of assessing validity to be effective. The current study did not ask about portion sizes of the food consumed by the adolescents in the study. The authors warrant caution that this type of information could potentially add an additional source of measurement error, which could potentially lead to lower correlations values than those seen with the current study of the BSQ. The authors also note the caution that all self-reporting dietary assessment instruments are subject to some misrepresenting and therefore measurement error and should be taken into consideration when performing studies such as this (Neuhouser, et al, 2009).

A food frequency questionnaire (FFQ) is the instrument of choice for assessing diet in relation to development of disease in large epidemiologic studies, because of its ease of administration, relative low cost, and ability to rank individuals based on their dietary intake. Due to the importance of cultural sensitivity, all FFQs require some adjustments and validation when used for a select cultural group. Thus, validation is considered critical to the success of FFQs in accurately measuring dietary intake in subgroups of the population. The objectives of validation studies are also to compare a new instrument against an accepted measure, and to quantify the measurement error.
Validation of a FFQ then is the degree to which the questionnaire measures the aspect of diet it was designed to measure. Factors that can affect validity include: respondent characteristics, questionnaire design and quantification, quality control, and the adequacy of the reference data. Since there is truly no golden standard in nutrition assessment instruments, FFQs are usually compared to multiple 24 hour dietary recalls or diet records as the reference (Carithers et al. 2009).

Carithers and colleagues (2009) conducted a validation study to look at two food frequency questionnaires (FFQ) which were developed and used during a large study of Southern United States African Americans called the Jackson Heart Study. The study design was a cross-sectional analysis of dietary nutrient intake data, compared to four 24 hour recalls with the long (Delta NIRI FFQ) and short (Delta NIRI Jackson Heart Study FFQ) versions of food frequency questionnaires used in the Jackson Heart Study in Jackson, Mississippi. Administration of the shorter FFQ was given during the initial clinic visit with the men and women involved in the study. This was followed by the four 24 hour dietary recalls that were scheduled one month apart from one another. Information was collected for two weekdays and two weekend days for each subject. After the last dietary recall was collected the original and longer FFQ was administrated. A total of 436 individuals completed all aspects of the study design. Pearson correlations were used to assess associations between nutrient intakes as assessed by each of the FFQs and the mean of the 24 hour dietary recalls. Correlations between nutrients across dietary instruments have been well accepted as a method for establishing relative validity in FFQs. Intra- to interperson variance for the nutrient intakes as estimated by the 24 hour recalls was calculated and reviewed. Finally, attenuation factors were also calculated for
the energy adjusted transformed nutrients. Attenuation coefficients range between zero and one, with those closer to zero indicating maximum attenuation and those closer to one indicating minimum attenuation. These were used to quantify the amount by which the relative risk between the dietary exposure and disease outcome would be distorted because of measurement error in the FFQ.

Results of Carithers and colleagues (2009) study indicated both FFQs appeared to overestimate vitamins C and B-12 intake for men and women compared to the 24 hour recalls. For men, calcium was higher for both FFQs, vitamin A and folate was higher by the short FFQ and vitamin D by the long FFQ. For women, both FFQs estimated higher intakes of polyunsaturated fat, vitamin D, and sodium intakes. The long FFQ estimated higher calcium, iron and zinc, and folate was lower in the short FFQ than in the dietary recalls. For women, long FFQ correlations were stronger than short FFQ correlations for all macronutrients except polyunsaturated fat. The contrast was true for men, with the exception of protein, cholesterol, and dietary fiber being stronger still in the longer than the shorter FFQ. In general, for both men and women, the long FFQ exhibited higher correlations with recalls for most micronutrients than did the short FFQ. The attenuation coefficients tended to be higher for the long FFQ than for the short FFQ. Energy-adjusted and deattenuated correlations for comparisons ranged from 0.20-0.70 for the short FFQ and from 0.23-0.75 for the long FFQ. The range of attenuation coefficients seen in this study were reported to be similar to those found in previous studies of the same nature.

The FFQs used as part of the Jackson Heart Study appeared to provide valid estimates of most macro and micronutrients. Concerns have been raised in this study,
and in others before it, that comparisons with self-reported methods are prejudiced with bias at the individual level. The use of biomarkers is an important dietary assessment method that could be used for validation, though is not always feasible, and was not for the current study due to design and cost issues. The main limitation the researchers of this study expressed was the lack of ability to generalize the findings of the study to other populations (Carithers et al. 2009).

Presse, Shatenstein, Kergoat, and Ferland (2009) conducted a study to validate a semi-quantitative food frequency questionnaire for the measurement of dietary vitamin K intake. Prior to the current study, very few food frequency questionnaires (FFQ) even look at just a specific nutrient, yet alone vitamin K, found in only a limited number of foods. A 50-item semi-quantitative FFQ was administered to look at vitamin K intake over the past 12 months and compared to data previously obtained from 5-day food records. The subjects were thirty nine women and men who were among healthy hospital volunteers enrolled as controls in the Nutrition-Memory Study and had agreed to also be part of the present study. Current diet was assessed using food records collected twice a month during the Nutrition Memory Study. The current researchers used five nonconsecutive days of records. Five days was chosen, because it largely improved the accuracy of individual’s usual vitamin K intake. Two forms of vitamin K exist in the human diet: phylloquinone and menaquinone. Phylloquinone is the more primary food source in North America, and so vitamin K intakes were determined by this form. The vitamin K FFQ contained food lists which included all items identified to be important contributors to phylloquinone intake in North American studies. The final vitamin K FFQ had 62 food items listed in 50 line items. A research dietitian administered the
vitamin K FFQ. For absolute agreement between-method comparisons were conducted by Student’s paired *t* test. Measurement error was investigated according to the Bland-Altman method. Relative agreement between-method comparisons were conducted by Pearson’s correlation analysis on the log_{10} transformed data. The weighted kappa was calculated to provide a chance-corrected measure of cross-classification.

Results showed daily dietary vitamin K intakes assessed by both methods were above the Canadian and United States recommendations of 90 µg/day for women and 120 µg/day for men. For absolute agreement, vitamin K intake estimates were 64% higher with the FFQ than the food records, with this difference being statistically significant (*P*<0.0001). The Bland-Altman plot showed the difference in the means was not correlated with mean intake (*r*=0.059, *P*=0.72), indicating the measurement errors were not systematic. The poor absolute agreement observed in the study was likely due to the inability of food records to adequately account for foods consumed episodically, especially those rich in vitamin K. It was seen that 74 percent of those foods reported as consumed “once to three times per month” to not be on the food records. This raises the question as to the ability of food records to accurately assess an individual’s intake of a specific nutrient found in such limited numbers of dietary sources like vitamin K. The relative agreement between the instruments was strong (*r*=0.83) and statistically significant at *P*<0.001. This strong correlation was found to be in good agreement with previous validation studies (*r*=0.53 and 0.67). The cross-classification suggested good relative agreement between the methods, with the weighted kappa statistic at 0.60 (*P*<0.001). Overall, the vitamin K FFQ showed good relative agreement with food records and is, therefore, a valid tool for ranking individuals’ vitamin K intake as
reported by the researchers. The findings do limit generalization due to the use of a small convenience sample (Presse et al, 2009).

Framson and colleagues (2009) wanted to develop an instrument that would look at the concept of “mindful eating.” Mindful eating is described as a nonjudgmental awareness of physical and emotional sensations associated with eating (Framson et al, 2009). Mindfulness is a learned skill linked to many positive health outcomes. The researchers wanted to develop an instrument to test this concept to see how this skill is acquired and how it is associated with healthful dietary behavior and the related health outcomes of healthy eating. The questionnaire was developed around seven eating behavior and mindfulness constructs and piloted before being used in the present study. Cronbach’s $\alpha$ was used to measure internal consistency reliability and Pearson correlation coefficients were used to describe relations among subscales.

A total of 314 participants returned the mailed questionnaire. Individuals were targeted from multiple locations, with a majority from one particular local yoga studio, since the practice of yoga promotes the concept of mindfulness being studied here. 73% of the subjects involved in the study were involved in the local yoga studio. Results showed the MEQ (Mindful Eating Questionnaire) to have good internal consistency reliability, ranging from 0.64-0.83. The summary score for the MEQ reliability was also good at 0.64. Higher MEQ scores were seen in those subjects who practice yoga. This finding confirms the thought that the practices taught in yoga of mindfulness could enable individuals to successfully get through difficult food environments and better judge their motivations for eating. The internal consistency of the cognitive eating subscale was good (0.73), suggesting the construct was measured reliably. The study
overall confirmed many of the researchers hypotheses regarding the nature of mindful eating, which supports the construct validity of the MEQ (with this sample). The scale did not look at a test-retest reliability of the questionnaire and will need to be done in future studies before the instrument can be used in applied research settings (Framson et al, 2009). When an instrument agrees with, or confirms the researcher’s original hypothesis or questions, there is said to be good validity of the instrument. It is measuring what it was intended to measure.

An Eating Stimulus Index that identifies primary motivations to eat in overweight/obese low-income, minority women in early postpartum was developed and validated by Cahill and colleagues (2009). Several questionnaires had been developed prior to the current, but lacked validation for this population. The researchers recruited 179 women for the validation part of the study, and 31 women for the test-retest portion. A length of two weeks of time was set between the test and retest of the index. The Eating Stimulus Index was designed around the environmental, biological, and psychological constructs shown to influence food intake by past literature. The scale of the index was reviewed for content validity by a panel of experts before the final revised index was used for the study protocol. Internal consistency reliability analysis was conducted using the Cronbach’s α coefficient.

Results of the study show the mean Eating Stimulus Index scores were 72.3±2.4 with no difference seen from the validation study. Total scale scores were strongly associated between both time points (Pearson’s $r=0.84$; $P<0.001$) with single measures intraclass correlation coefficient value of 0.83 showing a good test-retest for the entire scale. The content validity for the final instrument was 0.90. Breaking the scale down by
the different constructs the researchers were interested in, a good internal consistency
(Cronbach’s $\alpha=0.75$) was seen in all subscales ($\alpha>0.60$) except Taste and Hunger. The
results showed constructs environmental and psychological stimuli to be the best
indicators of weight status among the women sampled. Women with lower scores on the
entire scale also had significantly higher BMI, which confirm with other studies that
illustrated positive relationships between BMI and environmental eating, emotional
eating and dietary restraint.

This study is faulted in that questions with low variability and skewed
distributions were eliminated due to the questions having little discriminatory power
between subjects. This may have lead to the introduction of some bias that may have
construct relevance in a different sample and should be noted. Validation with other
populations is needed to show the true strength of the index (Cahill et al., 2009).

Burden and colleagues (2001) conducted a study at the South Manchester
University Hospitals Trust in Manchester, UK to validate a nutrition screening tool being
used at the hospital. The purpose of the screening tool is to identify patients who are
malnourished on admission to the hospital or at risk of becoming malnourished during
their stay. The tool needed to be quick, easy to complete, and cost effective making it
practical in every ward of the hospital, with little to no training needed on how to
complete the tool. The study included 100 patients from medical, surgical, and elderly
care wards. Both nurses and dietitians completed the tool on the same patients. This was
done to look for inter-observer error, and if the instrument could be used by different
people and produce the same results. Four additional measurements were taken, Body
Mass Index (BMI), mid upper arm circumference (MUAC), percentage weight loss, and
energy intake expressed as a percentage of the patient’s estimated average requirements (EAR). These measurements were to confirm that the screening tool was accurately identifying malnutrition in the patients. The results showed a 95 percent level of agreement between the nurses and the dietitians within ± 3 percent. The screening tool had a sensitivity level of 78 percent and a specificity of 52 percent. This association was found to be statistically significant at p<0.005. The screening tool did place 8 percent of the patients into a different category, affecting nutritional support that would have been given.

The authors (Burden et al, 2001) explained the reliability of this screening tool to be important and that unless a tool can produce consistent results, it cannot be valid and thus needs to be free of error. A demonstration of an acceptable level of inter-observer agreement adds to the validity of a tool. The validity of this screening tool was compromised by the fact that it was being used on such a large-scale implementation and that it was primarily being used by staff with minimal training in nutrition and limited time to make a complete assessment of nutritional risk. The validity of the tool was also hampered by the lack of a gold standard to assess nutritional status for every individual. Overall, this screening tool did achieve its primary purpose of identifying patients who require nutritional support intervention in a hospital setting due to malnutrition.

Roumelioti and Leotsinidis (2009) conducted a study in western Greece to evaluate the validity of their newly created food frequency questionnaire (FFQ). Validation studies on the use of food frequency questionnaires have usually demonstrated the reliability and suitability of this tool in the ranking of nutrient intake of individuals, although there have been exceptions. With the increased use of FFQs in epidemiologic
studies, it is important to know this nutritional tool for assessing and evaluating dietary intake is a valid representation of a person’s normal dietary intake. The subjects of this study were 200 school-aged children and their parents. The children were asked to complete a semi-quantitative FFQ at school. The authors confirmed that the number of food items used in nutritional studies does not necessarily contribute as a major factor in the reliability measurements. In fact, the more items there are the more missing values there tends to be. The parents of the children who completed the FFQ at school were interviewed by phone during which time they were asked demographic questions along with questions about their child’s food consumption. The results show a strong correlation ($r>0.69$) between the childrens’ and the parents’ responses. These include food items such as: boiled vegetables, fruit juices, souvlaki, breakfast, eggs, fresh vegetables, potato chips, pies, dairy, and milk. When assessing the validity of the FFQ, the foods that scored the highest in strength of agreement between the child and parent were: pizza, dairy, sausages, pies, fish, legumes, cheese, and milk. The authors concluded that the FFQ developed for this Greek population was appropriate and provided a reasonably reliable and valid measure of the dietary intake of the schoolchildren.

Wilson, Magarey, and Mastersson (2008) developed a child nutrition questionnaire to assess the effectiveness of a community program *Eat Well Be Active* in South Australia. The questionnaire was designed to measure dietary patterns that promote the risk of positive energy balance and food behaviors, attitudes, environments, and knowledge in school-aged children participating in the community program. The subjects for the study were 10-12 year old children. The questionnaire was given twice,
once for baseline measures and again for comparison. A seven-day food diary was administered to the children upon completion of the second questionnaire. From a potential of 243 children, 141 (58%) consented to participate in the study. Of these, 134 (95%) completed both of the questionnaires and are included in the reliability portion of this study. In addition, 117 of the 141 subjects (83%) returned the seven-day food diary; these subjects are included in the validity portion of the study. For the reliability results, the authors reported a correlation between 0.47 and 0.66 (p<0.001) for the different categories of questions, including intake, healthy behavior, attitude, environment, and knowledge. Scores for fruit and vegetable knowledge were lowest among all categories (coefficient <0.4).

To measure the validity of the instrument, the authors used the Spearman rank correlation test. Results indicated a mean bias between baseline and the seven-day diaries ranging from -1.2 to 0.6 (p<0.01). The scores with the greatest bias were sweetened beverages, sweetened beverages minus diet drinks, and fruit intake. The child nutrition questionnaire tool was found to have good internal consistency with the exception of knowledge about fruits and vegetables where the validity of the instrument was found to be lower, but still determined acceptable based on comparisons to results in similar studies. One limitation to the study was the complexity of the questionnaire made it difficult for the researchers to develop a food diary template that would be sensitive to all the questionnaire was testing. In the same vein, the food diary might have been too complex for the children, making the validity of the instrument lower than it might have been had a different format been used. Due to lack of similar tools in published
literature, this study can provide researchers with excellent feedback with regard to how to further develop nutrition assessment tools.

Hacker-Thompson, Robertson, and Sellmeyer (2009) conducted a study to validate two publicly available calcium-intake questionnaires against a three-day food record. Prior to the study, no studies had been done to validate simple calcium assessment tools that could be widely available and designed specifically for the lay public to self-administer. The food frequency questionnaires used by Hacker-Thompson et al included an online FFQ and a written calcium FFQ in a lay educational brochure. There were three main differences in the questionnaires: 1) the route of administration; 2) the inclusion of a calcium-fortified foods section on the online questionnaire; and 3) the online questionnaire did not require calculations by the participant, they were computer-generated for the participant automatically.

One hundred and forty women 18 years of age and older in self-reported good health took part in the study. Each subject attended a one-time study visit in which they completed the two questionnaires in randomized order. The written questionnaire was provided in a booklet while the online quiz was completed on a laptop open to the web link. After the completion of the questionnaires, a registered dietitian instructed each woman on how to keep a three-day food record. Each subject was asked to keep a record for two weekdays and one weekend day. The subjects were taught how to record all food and beverages consumed during the three days. They were instructed to use measuring devices to assess the portion sizes of each item and to record foods such as bread by number of slices. Plastic food models and handouts were used to educate on portion sizes. Detailed instructions were sent home with each woman to help in the completion
of the records. Once the women completed the three-day food records, they were mailed back to the researchers. Upon receiving the completed records, telephone calls were used to correct any missing data. The records were entered into Food Processor Plus software (ESHA Research, Salem, OR) to determine the nutrient content. Mean intakes among the instruments were compared by 2-tailed $t$ tests. Pearson’s correlation was used to determine the correlation coefficient for each type of questionnaire and food record. Bland-Altman plots, a graphical technique to compare two methods of quantifying the same variable were also constructed for comparison.

Results of the study indicated subjects’ mean calcium intakes did not differ significantly between the online quiz and the food record. Results from the printed questionnaire, however, reported a significantly lower amount of calcium than was obtained from the food records ($P<0.001$). There was significant correlation between each questionnaire and the three-day food record ($r=0.37$, $P<0.001$). The Bland-Altman comparisons indicated the printed questionnaire had a systematic bias and underestimated dietary calcium intake by 182mg/day (95% CI, -268 to -97mg/day). No bias was identified using the online calcium quiz, with calcium intake estimated slightly less than the food record (-67mg/day [95% CI, -157 to +22 mg/day]). Correlations between the differences in the two methods and the average calcium intake were significant with $r=0.39$, $P<0.001$ for the booklet, and $r=0.44$, $P<0.001$ for the quiz.

The two questionnaires estimated dietary calcium intake well, with correlations similar to ranges found in previous studies of limited-item calcium FFQs. It was not surprising the questionnaires indicated a lower calcium intake than the more extensive food record since they contain a limited number of food items for the purpose of enabling
their quick completion. Overall, the underestimation of calcium intake by the booklet questionnaire was still relatively small in that it accounted for less than one serving of calcium-rich food difference compared to the food record. Larger differences were seen between the questionnaires and the food record as the subjects’ intake increased, with the questionnaires tending to overestimate intake when intakes exceeded 1,500 mg/day. This probably due to the lack of portion sizes on the questionnaires. The accuracy of the questionnaires can still be seen as providing useful dietary information, especially in a population that consumes less than 1,500 mg of calcium per day.

The researchers pointed out several additional limitations to their study. First, the two questionnaires were administrated on the same day. Second, participants knew they were participating in a study looking at calcium intake, which may have altered their intake and recording of calcium-containing foods. The questionnaires asked participants to record based on the previous day’s intake of calcium, which may not be a typical or normal intake of calcium for this person, which is more likely to be captured on a food record. Having the three-day food records being completed in the same week as the questionnaires was another way the researchers tried to limit any effects to the subject’s normal dietary intake of calcium (e.g. seasonal or travel variations). Finally, supplementation was not assessed on any instrument used. Overall, however, the questionnaires did seem to be suitable for their intended purposes of screening for insufficient dietary calcium intake, designed specifically for layperson use. They are considerably shorter than other calcium questionnaires that have shown much higher correlations with food records worth noting (Hacker-Thompson et al, 2009).
Capacity of Individuals with ID to Answer Health-Related Questions

Wong and colleagues (2000) examined the ability of individuals with a mental disability to provide consent for health care procedures. The authors looked at four groups of individuals: 1) a control group (n=20) of ‘general population’ subjects showing to be mentally well; 2) a group (n=21) of individuals with a ‘mental illness’ either schizophrenia or schizoaffective disorder; 3) a third group (n=20) of individuals who had a ‘learning disability;’ and 4) a group (n=21) comprised of individuals with diagnosed ‘dementia.’ All four groups went through the same procedure as the researchers examined the subjects’ ability to give consent to a blood test. The authors looked at the subjects’ capacity to understand, decision-making abilities, understanding of the purpose of the test, the nature of the procedure, the risks of having the test, the risks of not having the test, and the voluntariness. This was done through semi-structured interviews with a four staged approach including spontaneous account, uninterrupted disclosure, element disclosure, recognition, and as a last resort, non-verbal demonstration. Results indicated a satisfactory level of agreement on overall capacity of the subjects at $\kappa=0.87$ ($\kappa=$kappa).

As expected, there were a significantly smaller number of subjects in the ‘learning disability’ and ‘dementia’ groups who were judged as having capacity to make a decision about a blood test compared to the ‘general population’ group. However, there was no significant differences found between the ‘mental illness’ group and the ‘general population’ group. It was found the ‘learning disability’ and ‘mental illness’ groups were able to understand and retain elements of information in the following pattern of best to least: procedure, purpose, voluntariness, risks of procedure, and risks of not having the procedure. The pattern for the ‘dementia’ group was slightly different at: procedure,
voluntariness, purpose, risks of procedure, and risks of not having the procedure.

Overall, capacity improved when the decision-making task was simplified. Uninterrupted disclosure proved to be the most effective strategy. All subjects were able by second assessment to give consent for the blood test (Wong et al, 2000).

**Summary**

Understanding the normal dietary habits and the nutritional needs of the people with ID is important for this unique population to reach its full potential and have a better overall health status. Screening and testing for this population’s needs and habits requires a valid tool that can be used time and time again by multiple observers and still obtain a reasonably close result. More attention needs to be placed on the nutrition questions of the Healthy Athlete® Health Promotion Questionnaire used at the Special Olympics Healthy Athlete® venues. If this organization that brings so many intellectual impaired persons together cannot provide accurate assessment of this population’s dietary habits and needs, than who can? Awareness needs to be brought to health care professionals, Special Olympics staff, and volunteers for the need for a validated instrument to be used at the Special Olympics Healthy Athlete® venues.
CHAPTER 3

METHODOLOGY

The primary purpose of this research study was to evaluate the reliability and validity of the Healthy Athlete® Health Promotion questionnaire as an instrument to assess the dietary habits of Indiana Special Olympics Athletes. Responses collected from the Healthy Athlete® Health Promotion questionnaire were compared to the data collected from food records and the Caregiver Questionnaire completed by the athletes and their caregivers. This chapter describes the methods used to collect the Delaware County Indiana Special Olympics data for this study.

Institutional Review Board

This thesis was approved by the Ball State University (BSU) Institutional Review Board (IRB) as an expedited study (Appendix B.1). The researcher successfully completed the National Institute of Health’s Human Subjects Module (Appendix B.3). An amendment to the original study protocol to have two Ball State University graduate students from the Department of Family and Consumer Sciences help in the collection of data was also approved by IRB (Appendix B.2). Both graduate students successfully completed the National Institute of Health’s Human Subjects Module before volunteering for the study (Appendix B.4).
Subjects

A total of 35 Special Olympics athletes successfully completed every component of this study. The subjects included both male and female athletes and the athletes’ caregivers who participate in Special Olympics in Delaware County, Indiana. Only data from athletes 19 years of age and older was used in the analysis of data. For purposes of this study, a “subject” has been defined as both the athlete and the athlete’s caregiver.

Data Collection Forms

The instrument validated in this study was the Healthy Athletes® Software (HAS) Health Promotion form developed in 2005, and revised in 2009, by Special Olympics International (Appendix A.1). This form is used at all Special Olympics events, both nationally and internationally. Other instruments used in this study included a 3-day food record (Appendix A.5) and the Lifestyle and Health Behaviors Questionnaire developed by researchers Drs. McGuire and Daly from the Department of Psychology of the National University of Ireland and Dr. Smyth of The Galway Association in Galway, Ireland (McGuire et al. 2007). The Lifestyle and Health Behaviors Questionnaire has been determined to be a reliable instrument for gathering nutrition information about persons with intellectual disabilities’ dietary habits from their caregivers. Permission was obtained from the developers of this instrument for use in the current study (Appendix D.1). Modifications were made to the original questionnaire to fit the needs of this study (e.g., this study only included questions related to nutrition habits). For the purposes of this study, the questionnaire was renamed Special Olympics Dietary Intake Caregiver Questionnaire or Caregiver Questionnaire for short (Appendix A.6). A 3-day food
record was used as the “gold standard” to identify the athlete’s normal dietary intake. The results of the 3-day record were compared to the results from both the HAS form and the Caregiver Questionnaire to determine the validity of the nutrition-related questions of the HAS Health Promotion form used by the Special Olympics Incorporation.

Methods

The researcher was invited by Barbara Cox, the Delaware County Special Olympics Coordinator (Appendix D.2), to attend the Delaware County Special Olympics annual banquet on August 1, 2009. At the banquet, the researcher gave a recruitment speech (Appendix C) that described the purpose of the study and the time commitment required of the athletes and their families/caregivers for participating in the study. Any interested athlete/caregiver who was willing to participate signed a joint letter of informed consent document (Appendix B.3) and was given take-home packets which included the forms for the 3-day food record and the Caregiver Questionnaire. Additional recruitment of subjects took place at the individual sports practices of the athletes. If an athlete had been unable to attend the annual banquet, the researcher explained the study to them and asked if they were willing to participate. Informed consent documents were signed by the athlete and caregiver prior to starting the study.

The researcher began attending weekly individual sports practices beginning on August 10, 2009 and ending on October 19, 2009. The specific days of week and time of practice changed slightly over the course of the study. The athletes who participated at the beginning of the data collection period were either involved in softball/unified softball, golf, or both. The athletes who participated during the middle and end of the
data collection period were either involved in walking, flag football, and/or bowling. Two Ball State graduate students, Laura Bollinger and Amanda Bolin, assisted the researcher in the data collection process during the bowling practices. Bollinger and Bolin volunteered for the study for three weeks in September and October. These students were asked to help with bowling practices due to the large number of athletes who attend these practices (e.g., almost three-fourths of the total participating athletes in Delaware County’s program participate in bowling).

**Food Record and Caregiver Questionnaire**

All subjects who consented to participate in the study were administered a copy of the *Caregiver Questionnaire* and the 3-day food record to be completed at home. An instruction sheet included in the packet of forms to be taken home explained how to fill out each form and provided the researcher’s contact information in case the athlete or caregiver had questions while filling out the forms (Appendix A.4).

Each athlete was to provide the 3-day food record on their own, if able. If the athlete was unable, the caregiver was to assist in the completion of the 3-day food record. The athletes/caregivers were asked to record everything the athlete ate or drank for 3-days on the specified form. The subject pairs were asked to be as specific as possible as they recorded all foods and beverages consumed throughout the entire day. The athlete/caregiver was asked to indicate the approximate time the food was consumed as well as an estimate of the portion consumed. The pair was to complete the record for three days in the same week if possible. They were encouraged to record the food as soon as possible after consumption to aid in providing a more accurate record.
The caregiver was asked to complete the Caregiver Questionnaire separately from the athlete, and to provide the most accurate and truthful responses to the questions based on their perception of the true dietary and health behaviors of the athlete. The researcher asked for the records to be completed within one week from the time they were obtained from the researcher. The athletes were asked to bring the completed 3-day dietary intake records and the Caregiver Questionnaire to the researcher at their next regularly scheduled practice. If subject pairs forgot to bring their forms to practices, the researcher used the phone number given by the pair to place reminder calls one day prior to the athlete’s next scheduled practice. Phone numbers were used for no other purpose than to place reminder calls about data collection forms.

The Caregiver Questionnaire was used along with the 3-day food record to verify the athlete’s true dietary habits. Only those athlete/caregiver pairs who completed the questionnaires and food records were used in the validity analysis of data.

HAS Health Promotion Questionnaire

At the first practice after the athlete and caregiver signed the informed consent document and agreed to participate in the study, the researcher (or graduate assistants during bowling) would individually ask the athletes the nutrition questions from the Healthy Athletes® Software (HAS) Health Promotion form. This was done either before or after the practice sessions or during session breaks. Each encounter with an athlete lasted approximately five to ten minutes. Each participating athlete was asked about their normal beverage and food consumption using the HAS Health Promotion nutrition questions. The specific questions include: “What do you drink when you are feeling
thirsty?” (e.g., water, fruit juice, soft drink, sports drink, and milk products [include soy milk]) and “Do you eat other foods or take special nutrition pills (e.g., sports bar, sports drink, food supplement product like ensure, vitamin supplement, protein supplement)?”

The HAS questionnaire administrator was to check each item that applied to every athlete. A picture book depicting a variety of food choices was used as a visual aid for the athlete to help them identify how frequently (e.g., daily, more than once a week, or never) the athlete ate food sources of calcium, fruits and vegetables, snack foods, sweetened beverages, and fortified grains, breads, or cereals. The answers to the athlete’s responses were recorded on the HAS data collection form. The picture book used as a prompt for the athletes was an identical copy of the picture book used at the Indiana State Special Olympics Games Health Promotion venues.

**HAS Health Promotion Questionnaire Retest**

One week after the first administration of the HAS Health Promotion form, the researcher (or graduate student assistants during bowling only) repeated the process with the participating athletes, re-asking the HAS nutrition questions. The researcher who asked the questions the first time also asked the athlete the retest questions to ensure the procedure was done in exactly the same way as it had been done the previous week. These steps were taken to keep the interactions as consistent as possible, thus allowing us to more effectively measure the reliability of the instrument. This test/retest occurred until all participating athletes had turned in a completed 3-day food record, their *Caregiver Questionnaire*, and had answered the HAS Health Promotion nutrition
questions two times, with at least one week lapse between answering the HAS nutrition questions.

After the successful completion of all aspects of the study by the athlete and caregiver, the athlete was given either a water bottle or mini-Frisbee donated by Open Door/BMH Health Centers of Muncie, Indiana, as a thank-you for participating. In addition, the researcher has contacted Delaware County coordinator, Barb Cox, to schedule a nutrition education session in the upcoming months for the Delaware County Program participants. If an interest is expressed, the researcher will provide a general nutrition education session for ALL interested Delaware County Special Olympics athletes and caregivers, regardless whether or not they participated in the study. The presentation will occur at a convenient location and time for the interested athletes/caregiver pairs.

**Data Entry**

All collected data was entered into Excel spreadsheets. A master copy of all participating athletes and caregivers was saved to a flash drive by the researcher. The researcher assigned each athlete/caregiver pair a personal unique identification number. The personal identification number matched the code on the front of each informed consent document. The unique identifier also had a corresponding letter to indicate whether the subject was the athlete or the caregiver (e.g. John Doe-athlete, 01A; Sally Smith-caregiver 01C). The unique identifier assigned to each pair was used for data entry; subjects’ names were never entered into the data base. All data was matched by
these numbers for the analysis of the data. The researcher entered all data. The data was checked by the researcher for accuracy.

Only the researcher has access or knowledge of which subject corresponded to which assigned number. Once the final paper has been approved by the thesis committee and the Ball State University Graduate School, the master copy of names to assigned numbers will be destroyed. During the course of the study, all collected data was kept in separate manila folders in a locked file drawer in the researcher’s home. At the conclusion of the study, all data will be turned over to Dr. Carol Friesen, thesis advisor to the principle researcher and supervisor over the study; who will secure all collected forms (data and consent documents) until the study has been published, at which time they will be shredded.

Data for the food records were recorded into Excel spreadsheets by day (e.g., Day 1, Day 2, and Day 3). The food items listed on the records were categorized into the specific food groupings used on the HAS form (e.g., dairy, fruits, vegetables, fats, grains, and meats), so as to allow for a one-to-one comparison with the HAS Health Promotion questionnaire form. Within each food group, foods reported on the three-day food record were further divided into categories within the overlying group, allowing for more detailed descriptions of the types of foods athletes consume most often. Specifically, the “dairy food group” was divided into the sub-categories of “milk,” “cheese,” “yogurt,” and “all others” (e.g., cottage cheese); the fruit group was divided into “juices” and “non-juices” (e.g., solid fruits); the vegetable group was divided into “French fries” and “non-French fries” (e.g., all other vegetables); the fat group was divided into the subcategories of “condiments/toppings”, “dressing,” and “all other fats” (e.g., snack foods); foods from
the grain group were divided into “whole grains” and “non-whole grains”; and the meat group was divided into “meats,” “nuts,” and “eggs.” Beverage consumption was also examined from the food records. Beverages were divided up into subcategories to match the HAS form (e.g., water, juice, soft drinks, sports drinks, milk products). One additional category, “other beverages” (e.g., coffee, tea, and beer) was added. If a vitamin or mineral supplement or another nutrition product was recorded on the three-day food records, this item was recorded in the spreadsheet sheet as a “1” for intake for that day’s record. The numbers of servings consumed from each food group were calculated based on their frequency of consumption and portion sizes in relation to MyPyramid standards. For example, a serving of cooked vegetables is one cup. If an athlete reported having two cups of a cooked vegetable in one day, the researcher recorded this as an intake of “2” “vegetable.” Some foods such as pizza were recorded for one slice as one grain and a half serving of cheese. These calculations are based on the standards reported on www.MyPyramid.gov.

The Caregiver Questionnaire data was entered into an Excel spreadsheet using the number corresponding to the frequency of consumption. Each frequency was given a number (never=1, 1-3 per month=2, and so on). If a caregiver indicated an athlete consumed “low fat milk” one or more times per day, the number “6” was recorded for that athlete for that particular food item. Analysis of the data was conducted so as to match these numbers to the corresponding frequency for comparative purposes.

Data from the HAS form was also entered into a spreadsheet. If an athlete responded “no” to a question (“What do you drink when thirsty?” “water” response=no) a “0” was placed in that location. A “1” was placed for “yes.” For the questions with
responses of “daily,” “more than once per week,” or “never,” corresponding numbers for data entry were 1, 2, and 3 respectively. These numbers were then compared to determine the percent agreement between the test-retest of the HAS questionnaire.

**Reliability and Validity Analysis**

The reliability of the HAS nutrition questions was determined by calculating the correlation between the test-retest responses obtained from the HAS questionnaire during the two separate occasions when the athlete was asked the same questions. The validity of the HAS Health Promotion form as a means of assessing the dietary intake of the athletes was determined by comparing the results obtained from both the *Caregiver Questionnaire* and the 3-day food record to the results obtained from the HAS form for each food group. Since the HAS Health Promotion questionnaire form asks questions of dietary intake by food grouping, data from the *Caregiver Questionnaire* and the food records were likewise categorized into matching food groups. The food group data obtained from the averages of the 3-day food records was then compared to the food group data obtained from the *Caregiver Questionnaire*. Lastly, the food group data obtained from the averages of the 3-day food records was compared against the food group data obtained from the first HAS Health Promotion questionnaire. By using the 3-day food record as the “gold standard” of accuracy for the athletes’ diets, the results of this comparison will indicate if the HAS form is a valid instrument to identify an athlete’s normal dietary habit. If the *Caregiver Questionnaire* is found to be valid, the argument could be made that it could be a stand-alone instrument for assessing Special Olympics athletes’ dietary intake.
Statistical Procedures

The purpose of this casual comparative study was to examine the reliability and validity of the HAS Health Promotion questionnaire nutrition questions used by the Special Olympics International. The independent samples t-test was used to determine if there were gender differences in the level of consumption for the foods reported in the 3-day food records by the athletes. A chi square test of association was used to determine if gender was associated with the frequency of consumption of food items in the Caregiver Questionnaire. Kappa and Pearson’s r correlation coefficients were used to determine the test-retest reliability of the HAS questionnaire. Pearson’s r correlation coefficients were also used in comparing the 3-day food records to the Caregiver Questionnaire and the HAS questionnaire for validation of the instruments against this standard. Statistical significance was set at a p-value of less than or equal to 0.05. SPSS version 17 software was used for the statistical analysis.

Summary

This chapter describes the methods used to collect and analyze the data in this research study. The comparison of the two responses to the HAS Health Promotion nutrition questions by the Delaware County Special Olympics athletes was used to measure the reliability of the HAS Health Promotion questionnaire with regard to nutritional information obtained from the questionnaire. The 3-day food records and Caregiver Questionnaire administered to the athlete/caregiver pairs of Delaware County, Indiana, helped illustrate the true dietary intake of Indiana Special Olympics athletes compared to data obtained from the HAS Health Promotion data form.
CHAPTER 4

RESULTS

The purpose of this investigation was to evaluate the validity and reliability of the Healthy Athlete® Health Promotion questionnaire as an instrument to assess the true dietary habits of Indiana Special Olympics Athletes. The following chapter presents the results obtained from the test-retest of the HAS questionnaire (reliability) as well as a comparison of the HAS food group results to the food group results obtained from both the 3-day food records and the Caregiver Questionnaires (validity).

Subjects

A total of 55 Delaware County Special Olympics Athletes initially signed up to participate in this study. Of these, 5 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 2 athletes completed the test-retest portion of the study but were unable to provide the research with the three-day records or the Caregiver Questionnaire. Thus, 37 athletes (67%) completed the reliability (test-retest) portion of this study, and 35 athletes (64%) completed all aspects of this research study.
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 these, 60 percent (n=21) were male and 40 percent (n=14) were female. The majority of the participating athletes (57.1%; n=20) lived in a family home, while 17.1 percent (n=6) lived independently, 11.4 percent (n=4) lived in a community group home, and 14.3 percent (n=5) lived in other assisted living housing. The average household size was 2.7±1.3 people. There was a range of 1-8 total people residing in housing with the athletes. The average length of time at a residence was 15.7±12.9 years. The range for the length of time at a residence was anywhere from 1 week to 47 years. In regards to reported residence lengths, there was concern that some of the reported times might not have included the total time an athlete lived in a particular housing arrangement (e.g., with family, or in a group home), but the time at the current residence address instead (e.g., if the family had moved homes in past couple of years).

RQ #1: Self-Reported Dietary Status of Delaware County Special Olympics Athletes

Research Question #1 addresses the self-reported dietary status of the Delaware County Special Olympics Athletes from the Healthy Athletes® Health Promotion Questionnaire. Frequency of consumption of calcium sources, fruits and vegetables, snack foods, sweetened beverages, fortified grains, and use of nutritional supplements will be examined for the 37 athletes who completed the HAS questionnaire. In every case, the results obtained during the FIRST HAS questionnaire will be analyzed.
Frequency of Consumption for Calcium Sources

A total of 37 athletes completed the question: “How often do you eat calcium sources?” Of these, 70.3 percent (n=26) of athletes reported to have a calcium food source daily. Another 29.7 percent (n=11) of athletes reported having a calcium food source more than once per week. Every athlete (100%; n=37) indicated they have at least some source of calcium each week (Table 1).

Table 1: Frequency of Consumption for Calcium Sources (n=37)

<table>
<thead>
<tr>
<th>How often do you eat calcium sources?</th>
<th>Frequency</th>
<th>Valid Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daily</td>
<td>26</td>
<td>70.3</td>
</tr>
<tr>
<td>More than once per week</td>
<td>11</td>
<td>29.7</td>
</tr>
<tr>
<td>Never</td>
<td>0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

Frequency of Consumption for Fruits and Vegetables

A total of 37 athletes answered the question, “How often do you eat fruits and vegetables?” Of these, 56.8 percent (n=21) reported having a fruit or vegetable daily. Another 40.5 percent (n=15) reported having a fruit or vegetable more than once per week. One athlete (2.7%) reported never eating fruits or vegetables. A total of 97.3 percent (n=36) of the athletes have a fruit or vegetable each week (Table 2).
Table 2: Frequency of Consumption for Fruits and Vegetables (n=37)

<table>
<thead>
<tr>
<th>How often do you eat Fruits and Vegetables?</th>
<th>Frequency</th>
<th>Valid Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daily</td>
<td>21</td>
<td>56.8</td>
</tr>
<tr>
<td>More than once per week</td>
<td>15</td>
<td>40.5</td>
</tr>
<tr>
<td>Never</td>
<td>1</td>
<td>2.7</td>
</tr>
</tbody>
</table>

Frequency of Consumption for Snack Foods

A total of 37 athletes completed the question, “How often do you eat snack foods?” Of these, 35.1 percent (n=13) reported having snack foods daily. Another 59.5 percent (n=22) reported having a snack food more than once per week. Finally, 5.4 percent (n=2) of the athletes reported never having snack foods. A total of 94.6 percent (n=35) of the athletes reported having snack foods every week (Table 3).

Table 3: Frequency of Consumption for Snack Foods (n=37)

<table>
<thead>
<tr>
<th>How often do you eat snack foods?</th>
<th>Frequency</th>
<th>Valid Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daily</td>
<td>13</td>
<td>35.1</td>
</tr>
<tr>
<td>More than once per week</td>
<td>22</td>
<td>59.5</td>
</tr>
<tr>
<td>Never</td>
<td>2</td>
<td>5.4</td>
</tr>
</tbody>
</table>
Frequency of Consumption for Sweeten Beverages

A total of the 37 athletes answered the question, “How often do you drink sweeten beverages?” Of these, 62.2 percent (n=23) reported having a sweeten beverage daily. Another 24.3 percent (n=9) reported having a sweeten beverage more than once per week. Finally, 13.5 percent (n=5) of the athletes reported never having any sweeten beverages. A total of 86.5 percent (n=32) of the athletes reported have sweeten beverages every week (Table 4).

Table 4: Frequency of Consumption for Sweeten Beverages (n=37)

<table>
<thead>
<tr>
<th>How often do you drink sweeten beverages?</th>
<th>Frequency</th>
<th>Valid Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daily</td>
<td>23</td>
<td>62.2</td>
</tr>
<tr>
<td>More than once per week</td>
<td>9</td>
<td>24.3</td>
</tr>
<tr>
<td>Never</td>
<td>5</td>
<td>13.5</td>
</tr>
</tbody>
</table>

Frequency of Consumption for Fortified Grains, Bread, and Cereals

A total of 36 athletes completed the question: “How often do you eat fortified foods?” Of these, 80.6 percent (n=29) reported having a fortified grain, bread or cereal daily. Another 19.4 percent (n=7) reported having a fortified grain, bread, or cereal more than once per week. No athlete reported never having a fortified grain, bread, or cereal. A total of 100 percent (n=36) of the athletes reported they consumed fortified grains, breads, or cereals every week (Table 5).
Table 5: Frequency of Consumption for Fortified Grains, Breads, and Cereals (n=36)

<table>
<thead>
<tr>
<th>How often do you eat fortified foods?</th>
<th>Frequency</th>
<th>Valid Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daily</td>
<td>29</td>
<td>80.6</td>
</tr>
<tr>
<td>More than once per week</td>
<td>7</td>
<td>19.4</td>
</tr>
<tr>
<td>Never</td>
<td>0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

Use of Nutritional Supplements

Thirty-seven athletes answered the question: “Do you eat other foods or take special nutrition pills?” This question was sub-divided into three categories: “Sports Bars or Sports Drinks,” “Nutrition Supplement Products,” and “Vitamin, Mineral, or Protein Supplement.” The athletes were asked to respond “yes” or “no” to whether or not they eat or take any of the foods or products. Less than half (45.9%; n=17) of the athletes indicated they eat or drink “Sports Bars or Sports Drinks,” fewer than 11 percent (n=4) of the athletes reported taking any “Nutrition Supplement Products,” and fewer than one-third of the athletes (32.4%; n=12) indicated they consumed any “Vitamin, Mineral, or Protein Supplements” (Table 6).
Table 6: Use of Nutritional Supplements (n=37)

<table>
<thead>
<tr>
<th>Do you eat other foods or take special nutrition pills?</th>
<th>Frequency</th>
<th>Valid Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sports Bars or Sports Drinks</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>20</td>
<td>54.1</td>
</tr>
<tr>
<td>Yes</td>
<td>17</td>
<td>45.9</td>
</tr>
<tr>
<td>Nutrition Supplement Product</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>33</td>
<td>89.2</td>
</tr>
<tr>
<td>Yes</td>
<td>4</td>
<td>10.8</td>
</tr>
<tr>
<td>Vitamin, Mineral, or Protein Supplement</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>25</td>
<td>67.6</td>
</tr>
<tr>
<td>Yes</td>
<td>12</td>
<td>32.4</td>
</tr>
</tbody>
</table>

RQ#2: Normal Dietary Intakes as Indicated by 3-day Food Record

A total of 35 athletes completed the 3-day food records. Calculated servings for the records were based on MyPyramid.gov recommendations for what constitutes a “serving” for each of the food groups/foods listed.

The average number of servings of water for the 3 days reported was 0.4±0.8, with a range of 0-3 servings of water per day. The average number of servings for juice over the 3 days was 0.5±0.7, with a range of 0-3 servings of juice per day. The average number of servings of soft drinks over the 3 days was 1.1±0.9, with a range of 0-3 servings of soft drinks per day. The average number of serving of sports drinks over the 3 days was 0.02±0.08, with a range of 0-0.33 servings of sports drinks per day. The average number of servings of milk over the 3 days was 0.9±0.8, with a range of 0-3 servings.
servings of milk per day. For other beverages recorded which did not fit into one of the above mentioned categories, athletes reported consuming 1.1±1.1 servings per day, with a range of 0-4 servings of ‘other beverages’ per day (e.g., coffee, tea, beer). These data indicate the beverages of choice for the athletes were soft drinks, “other beverages,” and milk (Table 7).

The self-reported average intake of vitamins over the 3 days was 0.4±0.5, with a range of 0-1. Similarly, the average intake for other nutrition products was 0.06±0.24, with a range of 0-1, indicating either athletes take, or do not take, another nutrition product (Table 7).

The average number of servings of cheese consumed over the 3 days reported was 0.8±0.6, with a range of 0-2.3 servings of cheese per day. The average number of servings of yogurt reported over the 3 days was 0.2±0.3, with a range of 0-1.3 servings of yogurt per day. The average serving of all other dairy products (not including milk) reported over the 3 days was 0.3±0.4, with a range of 0-1.2 servings per day (Table 7).

The average number of servings of fruits consumed over the 3 days was 0.7±0.7, with a range of 0-2.8 servings per day. The average number of servings of vegetables consumed over the 3 days was 1.0±0.7, with a range of 0-2.7 servings per day (Table 7).

The average number of servings of foods classified by the researcher as “fats/snack foods” (e.g., chips, cookies, cake) over the three days was 1.0±1.1, with a range of 0-4.7 servings of “fat/ snack foods” per day (Table 7).

The average number of servings of whole grains reportedly consumed over the 3 days was 0.6±1.0, with a range of 0-4.7 servings per day. In contrast, the average number of servings of non-whole grains consumed over the 3 days was 3.6±1.5, with a range of
0.7-6.7 servings, indicating the athletes consumed significantly more non-whole grain sources than their healthier whole-grain counterparts (Table 7).

Finally, with regard to protein, the average number of servings of meat reportedly consumed over the 3 days was 3.0±1.6, with the range of 0-8 servings per day. The average number of servings of nuts reported over the 3-days was 0.2±0.4, with a range of 0-1.7 servings per day. The average number of servings of eggs consumed over the 3 days was 0.3±0.4, with a range of 0-1.3 servings per day (Table 7).

The independent samples t-test was run to determine if the respondents’ gender produced different rates of consumption for food items within the 3-day food records (Table 8). No significant differences were found in the mean number of servings consumed for any food item by gender (males=21; females=14), although the difference in the number of servings of meat approached statistical significance (p=0.052).
Table 7: Overall Intake by 3-day Food Record (n=35)

<table>
<thead>
<tr>
<th>Food Category</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>.00</td>
<td>3.00</td>
<td>.4095</td>
<td>.78834</td>
</tr>
<tr>
<td>Juice</td>
<td>.00</td>
<td>3.00</td>
<td>.4857</td>
<td>.67322</td>
</tr>
<tr>
<td>Soft Drinks</td>
<td>.00</td>
<td>3.00</td>
<td>1.1286</td>
<td>.88014</td>
</tr>
<tr>
<td>Sports Drinks</td>
<td>.00</td>
<td>.33</td>
<td>.0190</td>
<td>.07850</td>
</tr>
<tr>
<td>Milk</td>
<td>.00</td>
<td>3.00</td>
<td>.9000</td>
<td>.75753</td>
</tr>
<tr>
<td>Other Beverages</td>
<td>.00</td>
<td>4.00</td>
<td>1.0714</td>
<td>1.14994</td>
</tr>
<tr>
<td>Vitamin/Mineral</td>
<td>.00</td>
<td>1.00</td>
<td>.3810</td>
<td>.47926</td>
</tr>
<tr>
<td>Other nutrition</td>
<td>.00</td>
<td>1.00</td>
<td>.0571</td>
<td>.23550</td>
</tr>
<tr>
<td>Dairy: Cheese</td>
<td>.00</td>
<td>2.33</td>
<td>.7619</td>
<td>.55023</td>
</tr>
<tr>
<td>Dairy: Yogurt</td>
<td>.00</td>
<td>1.33</td>
<td>.1714</td>
<td>.33452</td>
</tr>
<tr>
<td>Dairy: All Others</td>
<td>.00</td>
<td>1.17</td>
<td>.2833</td>
<td>.35940</td>
</tr>
<tr>
<td>Fruit: Juices</td>
<td>.00</td>
<td>3.00</td>
<td>.4190</td>
<td>.63480</td>
</tr>
<tr>
<td>Fruit: Non-juice</td>
<td>.00</td>
<td>2.83</td>
<td>.6714</td>
<td>.73929</td>
</tr>
<tr>
<td>French Fries</td>
<td>.00</td>
<td>1.00</td>
<td>.1429</td>
<td>.23271</td>
</tr>
<tr>
<td>Vegetables</td>
<td>.00</td>
<td>2.67</td>
<td>1.0071</td>
<td>.74326</td>
</tr>
<tr>
<td>Fat: Condiments</td>
<td>.00</td>
<td>5.33</td>
<td>.5714</td>
<td>1.07503</td>
</tr>
<tr>
<td>Fat: Dressing</td>
<td>.00</td>
<td>.67</td>
<td>.1048</td>
<td>.21038</td>
</tr>
<tr>
<td>Fat: Snack Foods</td>
<td>.00</td>
<td>4.67</td>
<td>1.0286</td>
<td>1.14224</td>
</tr>
<tr>
<td>Whole Grains</td>
<td>.00</td>
<td>4.67</td>
<td>.5714</td>
<td>1.00187</td>
</tr>
<tr>
<td>Non-whole Grains</td>
<td>.67</td>
<td>6.67</td>
<td>3.5786</td>
<td>1.54361</td>
</tr>
<tr>
<td>Meats</td>
<td>.00</td>
<td>8.00</td>
<td>3.0500</td>
<td>1.56350</td>
</tr>
<tr>
<td>Nuts</td>
<td>.00</td>
<td>1.67</td>
<td>.2000</td>
<td>.43686</td>
</tr>
<tr>
<td>Eggs</td>
<td>.00</td>
<td>1.33</td>
<td>.2952</td>
<td>.40237</td>
</tr>
<tr>
<td>Food Category</td>
<td>MALES Mean</td>
<td>SD</td>
<td>FEMALES Mean</td>
<td>SD</td>
</tr>
<tr>
<td>-------------------</td>
<td>------------</td>
<td>------</td>
<td>--------------</td>
<td>------</td>
</tr>
<tr>
<td>Water</td>
<td>0.2540</td>
<td>0.57643</td>
<td>0.6429</td>
<td>1.00821</td>
</tr>
<tr>
<td>Juice</td>
<td>0.4127</td>
<td>0.71418</td>
<td>0.5952</td>
<td>0.61573</td>
</tr>
<tr>
<td>Soft Drinks</td>
<td>1.0397</td>
<td>0.87227</td>
<td>1.2619</td>
<td>0.90750</td>
</tr>
<tr>
<td>Sports Drinks</td>
<td>0.0159</td>
<td>0.07274</td>
<td>0.0238</td>
<td>0.08909</td>
</tr>
<tr>
<td>Milk</td>
<td>0.9762</td>
<td>0.87287</td>
<td>0.7857</td>
<td>0.55249</td>
</tr>
<tr>
<td>Other Beverages</td>
<td>1.0397</td>
<td>0.94561</td>
<td>1.1190</td>
<td>1.44179</td>
</tr>
<tr>
<td>Vitamin/Mineral</td>
<td>0.3333</td>
<td>0.48305</td>
<td>0.4524</td>
<td>0.48229</td>
</tr>
<tr>
<td>Other nutrition</td>
<td>0.0476</td>
<td>0.21822</td>
<td>0.0714</td>
<td>0.26726</td>
</tr>
<tr>
<td>Dairy: Cheese</td>
<td>0.8651</td>
<td>0.56426</td>
<td>0.6071</td>
<td>0.50893</td>
</tr>
<tr>
<td>Dairy: Yogurt</td>
<td>0.1905</td>
<td>0.32183</td>
<td>0.1429</td>
<td>0.36314</td>
</tr>
<tr>
<td>Dairy: All Others</td>
<td>0.3294</td>
<td>0.40007</td>
<td>0.2143</td>
<td>0.28815</td>
</tr>
<tr>
<td>Fruit: Juices</td>
<td>0.3492</td>
<td>0.67681</td>
<td>0.5238</td>
<td>0.57404</td>
</tr>
<tr>
<td>Fruit: Non-juice</td>
<td>0.6270</td>
<td>0.60531</td>
<td>0.7381</td>
<td>0.92615</td>
</tr>
<tr>
<td>French Fries</td>
<td>0.1746</td>
<td>0.27119</td>
<td>0.0952</td>
<td>0.15627</td>
</tr>
<tr>
<td>Vegetables</td>
<td>1.0357</td>
<td>0.61721</td>
<td>0.9643</td>
<td>0.92491</td>
</tr>
<tr>
<td>Fat: Condiments</td>
<td>0.6032</td>
<td>0.82239</td>
<td>0.5238</td>
<td>1.40642</td>
</tr>
<tr>
<td>Fat: Dressing</td>
<td>0.1270</td>
<td>0.24667</td>
<td>0.0714</td>
<td>0.14194</td>
</tr>
<tr>
<td>Fat: Snack Foods</td>
<td>1.0397</td>
<td>1.29626</td>
<td>1.0119</td>
<td>0.90927</td>
</tr>
<tr>
<td>Whole Grains</td>
<td>0.5717</td>
<td>0.82424</td>
<td>0.5714</td>
<td>1.25697</td>
</tr>
<tr>
<td>Non-whole Grains</td>
<td>3.7897</td>
<td>1.84421</td>
<td>3.2619</td>
<td>0.90515</td>
</tr>
<tr>
<td>Meats</td>
<td>3.4484</td>
<td>1.63861</td>
<td>2.4524</td>
<td>1.27338</td>
</tr>
<tr>
<td>Nuts</td>
<td>0.2857</td>
<td>0.53005</td>
<td>0.0714</td>
<td>0.19298</td>
</tr>
<tr>
<td>Eggs</td>
<td>0.3651</td>
<td>0.40695</td>
<td>0.1905</td>
<td>0.38596</td>
</tr>
</tbody>
</table>
RQ#3: Dietary Intakes as Indicated by the Caregivers

Research Question #3 addresses the normal dietary intake for Delaware County Special Olympics athletes as recorded by their caregivers (for those athletes who had a caregiver) by way of the Caregiver Questionnaire. Frequency of consumption of food was analyzed by food groups. Each caregiver was asked to rate how often their athlete ate the corresponding foods listed among the different foods groups. Frequency choices included: “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,” and “6+ per day.” No caregiver reported consumption by an athlete of 6 or more servings per day for any foods (Tables 9-15).

The chi-square test of association was used to determine if gender was associated with the frequency of consumption of items in the Caregiver Questionnaire. No significant differences were noted with the exception of chicken and crisps/peanuts. Results indicate more females consumed chicken 2-4 times per week than would be expected (8 observed compared to 4.7 expected; $\chi^2 = 8.028$, df=3, p=0.045) and fewer than the expected number of females consumed crisps/peanuts 1-3 times per month (1 observed compared to 4.2 expected; $\chi^2 = 8.469$, df=3, p=0.037). (Data not shown)

Table 9: Frequency of Fruit and Vegetable Consumption (Caregivers)*

<table>
<thead>
<tr>
<th>Fruit &amp; Vegetables</th>
<th>Never</th>
<th>1-3 per month</th>
<th>1 per week</th>
<th>2-4 per week</th>
<th>5-6 per week</th>
<th>1 per day</th>
<th>2-3 per day</th>
<th>4-5 per day</th>
<th>6+ per day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fruit (fresh, frozen or dried)</td>
<td>0</td>
<td>4.2</td>
<td>0</td>
<td>29.2</td>
<td>16.7</td>
<td>12.5</td>
<td>37.5</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Vegetables (fresh, frozen or canned)</td>
<td>0</td>
<td>4.2</td>
<td>0</td>
<td>16.7</td>
<td>12.5</td>
<td>29.2</td>
<td>37.5</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

*Percentages listed for available data for those athletes with caregivers only
### Table 10: Frequency of Carbohydrate Consumption (Caregivers)*

<table>
<thead>
<tr>
<th>CHO</th>
<th>Never</th>
<th>1-3 per month</th>
<th>1 per week</th>
<th>2-4 per week</th>
<th>5-6 per week</th>
<th>1 per day</th>
<th>2-3 per day</th>
<th>4-5 per day</th>
<th>6+ per day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cereal/ Oatmeal</td>
<td>8.0</td>
<td>4.0</td>
<td>4.0</td>
<td>24.0</td>
<td>12.0</td>
<td>44.0</td>
<td>4.0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>White bread</td>
<td>31.8</td>
<td>22.7</td>
<td>4.5</td>
<td>22.7</td>
<td>4.5</td>
<td>9.1</td>
<td>4.5</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Brown bread</td>
<td>17.4</td>
<td>13.0</td>
<td>4.3</td>
<td>21.7</td>
<td>8.7</td>
<td>21.7</td>
<td>13.0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Potatoes</td>
<td>3.8</td>
<td>3.8</td>
<td>30.8</td>
<td>46.2</td>
<td>11.5</td>
<td>3.8</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Rice</td>
<td>17.4</td>
<td>39.1</td>
<td>34.8</td>
<td>0</td>
<td>4.3</td>
<td>4.3</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Pasta</td>
<td>4.3</td>
<td>17.4</td>
<td>30.4</td>
<td>39.1</td>
<td>4.3</td>
<td>0</td>
<td>4.3</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

*Percentages listed for available data for those athletes with caregivers only

### Table 11: Frequency of Meat Consumption (Caregivers)*

<table>
<thead>
<tr>
<th>Meat, Fish, Poultry</th>
<th>Never</th>
<th>1-3 per month</th>
<th>1 per week</th>
<th>2-4 per week</th>
<th>5-6 per week</th>
<th>1 per day</th>
<th>2-3 per day</th>
<th>4-5 per day</th>
<th>6+ per day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beef</td>
<td>7.7</td>
<td>7.7</td>
<td>23.1</td>
<td>46.2</td>
<td>11.5</td>
<td>0</td>
<td>3.8</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Pork</td>
<td>4.0</td>
<td>16.0</td>
<td>44.0</td>
<td>28.0</td>
<td>8.0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Chicken</td>
<td>0</td>
<td>8.0</td>
<td>24.0</td>
<td>52.0</td>
<td>16.0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Fish/shellfish</td>
<td>4.3</td>
<td>34.8</td>
<td>47.8</td>
<td>4.3</td>
<td>8.7</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Lamb</td>
<td>100</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

*Percentages listed for available data for those athletes with caregivers only
### Table 12: Frequency of Dairy and Fat Consumption (Caregivers)*

<table>
<thead>
<tr>
<th>Dairy &amp; Fats</th>
<th>Never</th>
<th>1-3 per month</th>
<th>1 per week</th>
<th>2-4 per week</th>
<th>5-6 per week</th>
<th>1 per day</th>
<th>2-3 per day</th>
<th>4-5 per day</th>
<th>6+ per day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yogurt</td>
<td>16.7%</td>
<td>25.0%</td>
<td>8.3%</td>
<td>25.0%</td>
<td>8.3%</td>
<td>12.5%</td>
<td>4.2%</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>Cheese</td>
<td>12.0%</td>
<td>4.0%</td>
<td>8.0%</td>
<td>24.0%</td>
<td>24.0%</td>
<td>20.0%</td>
<td>8.0%</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>Eggs</td>
<td>0%</td>
<td>26.9%</td>
<td>15.4%</td>
<td>46.2%</td>
<td>11.5%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Mayonnaise</td>
<td>8.0%</td>
<td>12.0%</td>
<td>8.0%</td>
<td>32.0%</td>
<td>32.0%</td>
<td>0%</td>
<td>8.0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>LF butter/mg</td>
<td>12.0%</td>
<td>8.0%</td>
<td>8.0%</td>
<td>36.0%</td>
<td>20.0%</td>
<td>12.0%</td>
<td>4.0%</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>FF butter/mg</td>
<td>54.2%</td>
<td>12.5%</td>
<td>16.7%</td>
<td>8.3%</td>
<td>4.2%</td>
<td>4.2%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Milk, LF</td>
<td>7.7%</td>
<td>3.8%</td>
<td>3.8%</td>
<td>7.7%</td>
<td>19.2%</td>
<td>19.2%</td>
<td>38.5%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Milk, FF</td>
<td>91.3%</td>
<td>4.3%</td>
<td>0%</td>
<td>4.3%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
</tbody>
</table>

*Percentages listed for available data for those athletes with caregivers only

### Table 13: Frequency of Sweets and Snack Consumption (Caregivers)*

<table>
<thead>
<tr>
<th>Sweets &amp; Snacks</th>
<th>Never</th>
<th>1-3 per month</th>
<th>1 per week</th>
<th>2-4 per week</th>
<th>5-6 per week</th>
<th>1 per day</th>
<th>2-3 per day</th>
<th>4-5 per day</th>
<th>6+ per day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chocolate</td>
<td>11.5%</td>
<td>38.5%</td>
<td>11.5%</td>
<td>26.9%</td>
<td>3.8%</td>
<td>7.7%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Sweet bread/cake</td>
<td>7.7%</td>
<td>53.8%</td>
<td>7.7%</td>
<td>15.4%</td>
<td>11.5%</td>
<td>3.8%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Ice cream</td>
<td>8.0%</td>
<td>32.0%</td>
<td>24.0%</td>
<td>16.0%</td>
<td>16.0%</td>
<td>4.0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Crisps, peanuts</td>
<td>33.3%</td>
<td>41.7%</td>
<td>16.7%</td>
<td>8.3%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Cookies</td>
<td>0%</td>
<td>19.2%</td>
<td>23.1%</td>
<td>38.5%</td>
<td>11.5%</td>
<td>3.8%</td>
<td>3.8%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Chips</td>
<td>0%</td>
<td>20.8%</td>
<td>20.8%</td>
<td>29.2%</td>
<td>20.8%</td>
<td>8.3%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
</tbody>
</table>

*Percentages listed for available data for those athletes with caregivers only
**Table 14: Frequency of Beverage Consumption (Caregivers)**

<table>
<thead>
<tr>
<th>Drinks</th>
<th>Never</th>
<th>1-3 per month</th>
<th>1 per week</th>
<th>2-4 per week</th>
<th>5-6 per week</th>
<th>1 per day</th>
<th>2-3 per day</th>
<th>4-5 per day</th>
<th>6+ per day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tea/Coffee</td>
<td>44.0</td>
<td>8.0</td>
<td>0</td>
<td>20.0</td>
<td>0</td>
<td>20.0</td>
<td>8.0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Soft Drinks</td>
<td>4.0</td>
<td>4.0</td>
<td>4.0</td>
<td>20.0</td>
<td>16.0</td>
<td>12.0</td>
<td>32.0</td>
<td>8.0</td>
<td>0</td>
</tr>
<tr>
<td>Fruit Juices</td>
<td>0</td>
<td>8.0</td>
<td>0</td>
<td>12.0</td>
<td>16.0</td>
<td>52.0</td>
<td>8.0</td>
<td>4.0</td>
<td>0</td>
</tr>
<tr>
<td>Water</td>
<td>0</td>
<td>4.0</td>
<td>16.0</td>
<td>20.0</td>
<td>8.0</td>
<td>24.0</td>
<td>16.0</td>
<td>12.0</td>
<td>0</td>
</tr>
<tr>
<td>Sports Drinks</td>
<td>41.7</td>
<td>25.0</td>
<td>16.7</td>
<td>12.5</td>
<td>4.2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

*Percentages listed for available data for those athletes with caregivers only

**Table 15: Frequency of Vitamins Consumed (Caregivers)**

<table>
<thead>
<tr>
<th>Vitamins</th>
<th>No</th>
<th>Yes</th>
<th>Number of Days</th>
</tr>
</thead>
<tbody>
<tr>
<td>Past yr</td>
<td>42.3</td>
<td>57.7</td>
<td>NA</td>
</tr>
<tr>
<td>Weekly</td>
<td>42.3</td>
<td>57.7</td>
<td>7</td>
</tr>
</tbody>
</table>

*Percentages listed for available data for those athletes with caregivers only
RQ#4: Degree of Validity of HAS Questionnaire

Research Question #4 addresses the validity of the HAS questionnaire for Indiana Special Olympics Athletes. Results obtained from the Delaware County Special Olympics athletes, a sub-sample of all participating SO athletes in the state of Indiana, were used for the validity portion of this study. A total of 35 athletes completed all documentation needed for the validation study. Pearson’s r validity coefficients were calculated for each of the food groups, comparing the results of the athlete’s 3-day food records (the “gold standard” that depicts each athlete’s normal dietary habits) to the results obtained from both the HAS questionnaire and the Caregiver Questionnaire. For some of the food items, more than one coefficient was calculated because there were multiple food choices on the questionnaire that could be matched and categorized together (e.g. milk (low fat), milk (full fat) = milk). If one of the matched coefficients was statistically significant for any food item, then the food item itself was said to have a statistically significant relationship with the standard.

When the results of the three-day food record were compared with the results obtained from the Caregiver Questionnaire, 11 of the 15 total food items were statistically correlated (Table 16). The highest correlation was found for vitamin usage (r=0.749), followed by fats/snack foods (r=0.735), yogurt (r=0.713), soft drinks (r=0.699), cheese (r=0.654), fruits (r=0.618), fruit juices (r=0.517), sports drinks (r=0.499), water (r=0.478), and milk (r=0.447) (Table 16). Results from the Caregiver Questionnaire that did not correlate statistically with the three-day food record included whole grains (r=0.345), “other drinks” (r=0.333), vegetables (r=0.316), other nutritional supplements (r=0.247), and non-whole grains (r varied from 0.044 to 0.261 to 0.022).
In contrast, when the HAS questionnaire results were compared to the results of the three-day food record, only three of the 15 food items showed a statistically significant relationship with the standard, significantly fewer than occurred with the Caregiver Questionnaire, indicating poor validity. The highest correlation was found for vitamin usage ($r=0.777$), followed by some fats/snack foods ($r=0.632$), and fruit juices ($r=0.458$) (Table 16). Results from the HAS Questionnaire that did not correlate statistically with the three-day food record included, in order from lowest to highest: soft drinks (correlations ranged from -0.134 to 0.036 to 0.183), “other drinks” ($r=-0.057$), other nutrition supplements ($r=-0.088$), soft drinks ($r=0.006$; $r=0.185$), cheese ($r=0.053$), vegetables ($r=-0.093$), non-whole grains ($r=0.096$), fruits ($r=0.112$), yogurt ($r=0.265$), whole grains ($r=0.292$), milk ($r=0.311$), and water ($r=0.316$) (Table 16).

It can be said then, that in the present study, the Caregiver Questionnaire provided a more valid representation of the athlete’s true dietary habits than the HAS questionnaire when results from both were compared to the gold standard. The food items that showed a significant relationship for both questionnaires to the standard were fruit juices (CQ: $r=0.517$, $p=0.008$, HAS: $r=0.458$, $p=0.006$), vitamins (CQ: $r=0.749$, $p=0.001$, HAS: $r=0.777$, $p=0.001$), and fat/snack foods (CQ: $r=0.549$, $p=0.004$, $r=0.452$, $p=0.020$, $r=0.735$, $p=0.001$, $r=0.520$, $p=0.009$, HAS: $r=0.0632$, $p=0.001$).
Table 16: Validity Coefficients Between the 3-day Food Record to the Equivalent Caregiver Questionnaire and HAS Items (n=35)

<table>
<thead>
<tr>
<th>Food Items</th>
<th>Caregiver Q.</th>
<th>HAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>0.478*</td>
<td>0.316</td>
</tr>
<tr>
<td>Fruit Juices</td>
<td>0.517**</td>
<td>0.458**</td>
</tr>
<tr>
<td>Soft Drinks</td>
<td>0.699***</td>
<td>0.006, 0.185</td>
</tr>
<tr>
<td>Sports Drinks</td>
<td>0.499*</td>
<td>-0.134, 0.036, 0.183</td>
</tr>
<tr>
<td>Milk</td>
<td>0.447*,-0.247, -0.074</td>
<td>0.311</td>
</tr>
<tr>
<td>Other Drinks</td>
<td>0.333</td>
<td>-0.057</td>
</tr>
<tr>
<td>Vitamins</td>
<td>0.749***</td>
<td>0.777***</td>
</tr>
<tr>
<td>Other Nutrition Supplement</td>
<td>0.247</td>
<td>-0.088</td>
</tr>
<tr>
<td>Cheese</td>
<td>0.654***</td>
<td>0.053</td>
</tr>
<tr>
<td>Yogurt</td>
<td>0.713***</td>
<td>0.265</td>
</tr>
<tr>
<td>Fruits</td>
<td>0.618**</td>
<td>0.112</td>
</tr>
<tr>
<td>Vegetables</td>
<td>0.316</td>
<td>-0.093</td>
</tr>
<tr>
<td>Fats/Snack Foods</td>
<td>0.549**, 0.452*, 0.735***, 0.360, 0.520**, -0.303</td>
<td>0.632***</td>
</tr>
<tr>
<td>Whole Grains</td>
<td>0.345</td>
<td>0.292</td>
</tr>
<tr>
<td>Non-Whole Grains</td>
<td>0.044, 0.261, 0.022</td>
<td>0.096</td>
</tr>
</tbody>
</table>

*P<0.05, **P<0.01, ***P<0.001

When more than one coefficient is listed, there was more than one category this food item could have been categorized into with the questionnaires
Research Question #5: Reliability of HAS Questionnaire

Research Question #5 addresses the reliability of the Healthy Athletes® Health Promotion Questionnaire. A test-retest of the HAS questionnaire was performed and the reliability of the instrument was assessed by Pearson’s correlation and the Kappa coefficient. Of the 13 different nutrition-related items on the HAS questionnaire, only five were found to have statistically significant agreement between the test and retests. The question was “When you are thirsty what do you drink?,” the answer “water” had a 67.5 percent agreement (Kappa=0.347, p=0.31) and the response “Fruit juice,” had a 78.4 percent agreement (Kappa=0.415, p=0.011). For the question: “Do you eat other food or take special nutrition pills?,” both “sports bar” or “sports drink” (percent agreement=67.5, Kappa=0.358, p=0.026) and “vitamin, mineral or protein supplement” (percent agreement=89.2, Kappa=0.773, p<0.001) were significant between the test and retest. Finally, in response to the question of “How often do you have a fruit or vegetable, daily, the answer “more than once per week, or never” had an 83.7 percent agreement (Kappa=0.684, p<0.001) (Table 17). Although five of the HAS items were found to be reliable in the test-retest, almost two-thirds of the HAS questionnaire items were found not to be reliable.
Table 17: Test-Retest Reliability for HAS Questionnaire (n=37)

<table>
<thead>
<tr>
<th>Question</th>
<th>Kappa</th>
<th>r</th>
<th>Percent Agreement</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>When you are thirsty what do you drink?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water</td>
<td>0.347</td>
<td>0.356</td>
<td>67.5</td>
<td>0.031*</td>
</tr>
<tr>
<td>Fruit Juice</td>
<td>0.415</td>
<td>0.420</td>
<td>78.4</td>
<td>0.011*</td>
</tr>
<tr>
<td>Soft Drink</td>
<td>0.194</td>
<td>0.197</td>
<td>59.4</td>
<td>0.231</td>
</tr>
<tr>
<td>Sports Drink</td>
<td>0.004</td>
<td>0.004</td>
<td>59.5</td>
<td>0.983</td>
</tr>
<tr>
<td>Milk (or Soy) Product</td>
<td>0.224</td>
<td>0.224</td>
<td>67.6</td>
<td>0.173</td>
</tr>
<tr>
<td>Do you eat other food or take special nutrition pills?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sports Bar or Sports Drink</td>
<td>0.358</td>
<td>0.367</td>
<td>67.5</td>
<td>0.026*</td>
</tr>
<tr>
<td>Nutrition Supplement</td>
<td>-0.045</td>
<td>-0.058</td>
<td>86.5</td>
<td>0.724</td>
</tr>
<tr>
<td>Vitamin, Mineral, Protein Supplement</td>
<td>0.773</td>
<td>0.794</td>
<td>89.2</td>
<td>&lt;0.001***</td>
</tr>
<tr>
<td>How often do you have…?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calcium Sources</td>
<td>0.290</td>
<td>0.313</td>
<td>64.8</td>
<td>0.57</td>
</tr>
<tr>
<td>Fruits and Vegetables</td>
<td>0.684</td>
<td>0.732</td>
<td>83.7</td>
<td>&lt;0.001***</td>
</tr>
<tr>
<td>Snack Foods</td>
<td>0.041</td>
<td>0.165</td>
<td>54.0</td>
<td>0.769</td>
</tr>
<tr>
<td>Sweeten Beverages</td>
<td>0.067</td>
<td>0.063</td>
<td>51.3</td>
<td>0.605</td>
</tr>
<tr>
<td>Fortified Foods (Grains, etc)</td>
<td>0.161</td>
<td>0.165</td>
<td>69.4</td>
<td>0.321</td>
</tr>
</tbody>
</table>

*P<0.05, **P<0.01, ***P<0.001

Summary

Based on the results of this study, both male (n=21) and female (n=14) Special Olympic athletes from Delaware County consume fairly similar kinds and amounts of foods as determined by the Caregiver Questionnaire and by the 3-day food records (used
as the gold standard in this study). The validity coefficients obtained from the comparison of the standard to the *Caregiver Questionnaire* and the Healthy Athletes® Health Promotion Questionnaire, indicated results obtained from the *Caregiver Questionnaire* were more similar to those obtained from the gold standard than the results from the HAS questionnaire. Although the HAS questionnaire, in general, had little validity when compared to both the *Caregiver Questionnaire* and the gold standard, three items had a significant relationship to the standard and are worth noting. Specifically, the consumption of fruit juices, vitamins, and snacks obtained from the HAS survey were highly correlated to the results obtained from the gold standard. Nonetheless, because the HAS questionnaire is currently the only questionnaire of its kind used to measure the dietary habits of Special Olympics athletes worldwide, it is disappointing that the validity and reliability of the instrument, overall, was so poor.

With regard to reliability, the test-retest of the Healthy Athletes® Health Promotion Questionnaire indicated minimal reliability, with almost two-thirds of the items on the HAS questionnaire found to have no statistically significant agreement between the test and retest.

Overall, the results of this study clearly indicate improvements to the HAS questionnaire are necessary to make it a more reliable and valid instrument to assess Special Olympics athletes’ dietary habits. However, before specific changes are made, further testing of the questionnaire among a larger, more diverse population is recommended.
The purpose of this causal-comparative study was to evaluate the validity and reliability of the Healthy Athlete® Health Promotion questionnaire as an instrument to assess the true dietary habits of Indiana Special Olympics Athletes. This analysis was conducted using a 3-day food record and an adapted version of the *Lifestyle and Health Behavior Questionnaire* developed by Dr. Brian McGuire (McGuire, Daly, & Smyth, 2007), presented in the current study as the *Caregiver Questionnaire*. A group of 35 Delaware County, Indiana, Special Olympics athletes participated as subjects in this study. This chapter discusses the results of this study.

**Self Reported Dietary Status of Delaware County Special Olympics Athletes**

A total of 35 Delaware County Special Olympics athletes participated in the current study. Of these, 60 percent (n=21) were male and 40 percent (n=14) were female. Data from 257 Indiana SO athletes who participated in Health Promotion venues in 2008 showed a very similar distribution of males (58%) and females (42%) as the current study. A slightly higher male population was screened at the 2009 World Winter Games in Boise, Idaho, where 71.3 percent (n=424) of the 575 athletes were male, and only 28.7
percent (n=171) of the screened population were female. This is to be expected,
however, as the “elite athlete” who represent their state and/or country at the World
Games tends to be male.

**Frequency of Consumption for Calcium Sources**

Overall, 70.3 percent of Delaware County athletes reported consuming sources of
calcium “daily.” No difference was observed between the percent of athletes who
reported consuming calcium sources “daily” for Delaware County athletes and SOI
World athletes (70.3% vs. 70.4%, respectively). Previously analyzed HAS data indicated
Indiana athletes (79.0%) and non-Indiana athletes (83.4%) detected a higher percent of
athletes who reported consuming calcium sources “daily” compared to Delaware County
athletes (70.3%) (Dudoit, 2009). The Delaware County athletes in this study were more
likely to report consuming calcium sources “more than once a week” (29.7%) compared
to all other groups (19.2% for SOI World athletes, 19.7% for Indiana athletes, and 13.7%
for non-Indiana athletes).

**Frequency of Consumption for Fruits and Vegetables**

Overall, 56.8 percent of Delaware County athletes reported consuming fruits and
vegetables “daily.” This is lower than percents reported for SOI World athletes, Indiana
athletes, and non-Indiana athletes (65.7%, 74.8%, and 84.0% respectively) for the same
question, “How often do you eat fruits and vegetables?” Delaware County athletes were
more likely (40.5%) to report consuming fruits and vegetables “more than once per
week” than all other groups (24.5% for SOI World athletes, 23.9% for Indiana athletes,
and 14.3% for non-Indiana athletes). Delaware County athletes also were more likely to report “never” to the eating of fruits and vegetables compared to all other groups (2.7% vs. 1.2% SOI World athletes, 1.3% Indiana athletes, and 1.6% non-Indiana athletes).

**Frequency of Consumption for Snack Foods**

Overall, 35.1 percent of the Delaware County athletes reported consuming snack foods “daily.” This percent is higher than that reported by SOI World athletes (26.1%) for the same response. However, the Delaware County rate (35.1%) was lower than the percentage of Indiana (44.8%) and non-Indiana athletes (59.5%) who reported consuming snack foods “daily.” Over half (59.5%) of the Delaware County athletes reported consuming snack foods “more than once per week,” while slightly lower percent responses came from SOI World athletes and Indiana athletes (48.1% and 44.8% respectively), and significantly lower responses from non-Indiana athletes (28.7%). Delaware County athletes were also less likely than all other groups to respond that they “never” consuming snack foods (5.4% vs. 17.3% SOI World athletes, 10.5% Indiana athletes, and 11.8% non-Indiana athletes).

**Frequency of Consumption for Sweetened Beverages**

Overall, 62.2 percent of Delaware County athletes reported “daily” consumption of sweetened beverages, almost double that reported for SOI World athletes (33.9%). Despite the fact that more than half of the Indiana and non-Indiana athletes reported “daily” consumption of sweetened beverages (55.0% and 51.7%, respectively), these
percentages were still lower than that reported by Delaware County athletes for “daily” consumption.

**Frequency of Consumption for Fortified Grains, Breads, and Cereals**

Overall, 80.6 percent of Delaware County athletes reported they consumed fortified grains “daily.” No difference was detected in the percent of athletes reporting “daily” consumption of fortified foods between Delaware County athletes and Indiana athletes (80.6% and 81.9%). Delaware County athletes were more likely to report a higher percent of “daily” intake of fortified grains than SOI World athletes (80.6% vs. 72.8%), but a lower percent than non-Indiana athletes (80.6% vs. 88.0%). No Delaware County athlete reported “never” consuming fortified foods. No difference was detected in the percent of athletes reporting “never” to consuming fortified foods between Delaware County athletes and Indiana athletes (0.0% and 0.8%). Slightly higher percents of “never” were reported for both SOI World athletes and non-Indiana athletes (3.4% and 2.1% respectively).

**Use of Nutritional Supplements**

When asked, “Do you eat other foods or take special nutrition pills?,” almost half (45.9%) of the Delaware County athletes reported eating/drinking sports bars and sports drinks compared to slightly more than one-third (37.8%) of SOI World athletes. Only 10.8 percent of Delaware athletes indicated they took a nutrition supplement product, while only half that amount of SOI World athletes (5.7%) reported taking a nutrition supplement product. Approximately one-third (32.4%) of the Delaware County athletes
reported they took a vitamin/mineral or protein supplement, while only half that percent (16.1%) of SOI World athletes reporting intake of these nutritional products.

Normal Dietary Intake via 3-day Food Records

Little information is available that describes the dietary patterns and eating habits of those with intellectual disabilities (ID). The primary source of dietary guidelines for all Americans, including healthy adults with intellectual disabilities, is the *Dietary Guidelines for Americans 2005*. Results from the current study indicate that, while some of the participating athletes were getting the recommended 2 cups of fruits per day, the average participant from Delaware County was consuming significantly less fruit (0.7±0.7 servings) than currently recommended by the Dietary Guidelines (a minimum of 2.0 cups per day). Healthy adults are recommended to eat at least 2.5 cups of vegetables every day. Although a few athletes in the current study met this recommendation, the majority of Delaware County Special Olympic athletes consumed significantly fewer servings (1.0±0.7 servings per day) than recommended. With regard to whole grain products, although a few athletes exceeded the recommendations of consuming 3 or more ounces of whole grain products daily (where one serving is equal to one ounce), the average among the athletes (0.6±1.0 servings) was far below the recommendation. Most of the athletes’ grain consumption (3.6±1.5 servings) came from non-whole grain sources. Many of the athletes did meet the *Dietary Guidelines for Americans 2005* recommendation of three cups of fat-free or low-fat milk or equivalent milk products per day. The mean sum of all milk products totaled just at or below the recommendation (0.9±0.8 servings for milk, 0.8±0.6 servings cheese, 0.2±0.3 servings yogurt, and 0.3±0.4
servings for all other dairy products). Food records were not analyzed by the type of fats consumed (e.g. saturated vs. trans fat) and were not detailed enough to estimate the intake of added sugars or salt to compare these findings to the recommendations by the Dietary Guidelines.

Adolfsson and colleagues (2008) reported the mean intake of fruits and vegetables for a group of 32 individuals with ID living in community residences studied to be 1.3 cups per day. More than half of the 32 subjects in this study had daily consumption of fruits and vegetables below 1 cup. McGuire, Daly, and Smyth (2007) reported the mean intake of fruits and vegetables to be 3.57 portions per day, with 42.4 percent of the adult ID sample meeting ideal intake. This reported intake is greater than found in the current study. In comparison, the intake of fruits and vegetables among the Delaware County study was slightly higher than the mean intake reported by Adolfsson (1.7 cups fruits and vegetables vs. 1.3 cups fruits and vegetables, respectively), but lower than that of McGuire et al (3.57 portions per day). Only 6 of the 32 individuals (18.8%) in the Adolfsson study reported taking a dietary supplement, compared to 45.7 percent (16 of 35 athletes) of the Delaware County Special Olympic athletes. Mean total carbohydrate intake reported by McGuire et al (4.76 servings) was comparable to that reported in the current study (0.6±1.0 servings of whole grains and 3.6±1.5 servings of non-whole grains). Milk, soft drinks, and other beverages (e.g. lemonades, teas, etc) were found to be the most commonly drank beverages among the athletes in the current study, while water and fruit drinks were more common in the Adolfsson et al study.

Adolfsson and colleagues (2008), Bertoli and colleagues (2006) and Jobling and Cuskelley (2006) reported milk products, simple carbohydrates, meats products, and those
foods higher in fat to be consumed at a higher intake level among individuals with intellectual disabilities. These findings mimic the findings of average consumption of these foods in the current study, with the mean intake considerably higher among these foods than others.

**Gender Differences**

No significant gender differences were detected in the average number of servings for any of the food items compared between males (n=21) and females (n=14) in the present study, although differences in the servings of meat approached statistical significance (p=0.052). No other studies identified in the literature examined differences in the consumption of various food groups between male and female subjects with ID.

**Caregiver’s View of Normal Dietary Intake**

Caregivers of approximately half of the athletes in the present study reported their athlete ate fruits at least one or more time per day. Approximately two-thirds (66.7%) of the caregivers reported their athletes ate vegetables at least one or more time per day. If it can be assumed that consumption of one fruit or vegetable to be the size of a cup, than only 37.5 percent of athletes would have met the Dietary Guidelines for Americans 2005 recommendations of 2 cups of fruits and 2.5 cups of vegetables per day. Caregivers reported that 34.7 percent of the athletes consumed brown bread at least one or more times per day. Just over half of the caretakers (57.7%) indicated their athlete consumed at least one serving of low fat milk per day. With the assumption that one serving of milk here is equal to a cup, then only 38.5 percent of the athletes would have met the Dietary
Guidelines for Americans 2005 recommendation of 3 cups of low fat or fat-free milk per day. Soft drinks, fruit juices and water were reported to be the more common beverages consumed daily. The caretakers indicated just over half (52%) of the athletes consumed soft drink and water at least one time per day and 64 percent of the athletes consumed fruit juices at least one or more times per day. This finding is similar those by Adolfsson et al (2008), who reported water and fruit drinks were the more common mealtime beverages. Caregivers of just over half (57.7%) of the athletes reported vitamin intake daily, which is comparably higher than the 19 percent reported by Adolfsson et al (2008).

Caretakers in the current study reported approximately half (48%) of the athletes ate cereal at least once per day and that the majority of athletes had to limit their intake of sweets and snacks to less than one per day. These findings sharply contrast with those reported by Jobling and Cuskelly (2006), who reported 71 percent of the subjects in their study regularly ate cereal for breakfast and another 81 percent consumed foods high in fat and sugar on a daily basis.

Gender Differences

According to the results of the Caregiver Questionnaire, the only food items for which a statistically significant gender difference was observed were chicken and crisps/peanuts. For chicken, more than the expected number of females consumed chicken 2-4 times per week than would have been expected (8 observed compared to 4.7 expected; \( \chi^2 = 8.028, \text{df}=3, p=0.045 \)). For crisps/peanuts, fewer than the expected number of females consumed crisps/peanuts 1-3 times per month than would have been expected (1 observed compared to 4.2 expected; \( \chi^2 = 8.469, \text{df}=3, p=0.037 \)). The authors (McGuire,
Daly, and Smyth 2007) of the original caregiver questionnaire from which the current form was adapted did not analyze for differences among genders in their study, therefore no data is available for comparison of findings of that to the current study.

**Validity of Healthy Athletes® Health Promotion Questionnaire**

Pearson’s r validity coefficients presented in the current study were used to assess the relationships between the reported consumption of foods items by comparing the results from the gold standard (a 3-day food record) to the results obtained from the *Caregiver Questionnaire* and the HAS questionnaires. When compared to the standard, 11 of the 15 food items on the *Caregiver Questionnaire* were statistically significant with correlation coefficients ranging from \( r=0.447 \) to \( r=0.749 \), with most food items having a correlation coefficient at or above 0.54. In contrast, only three of the 15 food items on the HAS questionnaire were statistical significant when compared to the standard with correlation coefficients ranging from \( r=0.458 \) to \( r=0.777 \).

Studies by Neuhouser and colleagues (2009), Carithers and colleagues (2009), Presse and colleagues (2009), and Hacker-Thompson, Robertson, and Sellmeyer (2009) all used food records to validate Food Frequency Questionnaires (FFQs). Just as in the current study, all of these studies used Pearson’s r correlations to determine the validity of the FFQ instrument compared to the food records (gold standard). Validity coefficients from the *Caregiver Questionnaire* in the current study were comparable to those found in Neuhouser (\( r=0.63 \) to 0.71) and in Carithers (\( r=0.20 \) to 0.70 and \( r=0.23 \) to 0.75), and were higher than those reported by in Hacker-Thompson, Robertson, and Sellmeyer (2009) in their validation study of a FFQ for calcium (\( r=0.37 \) for the written
booklet and $r=0.44$ for the online quiz). Presse et al (2009) reported an overall validity coefficient at $r=0.83$, a value higher than any single item coefficient in the current study. Wilson, Magarey, and Mastersson (2008) and Roumelioti and Leotsinidis (2009) all used food records to validate food frequency questionnaires. These studies used Spearman’s correlations to assess validity. Wilson (2008) reported correlations at 0.34-0.48, while Roumelioti (2009) found most items on the FFQ to be at $r>0.69$.

Factors mentioned as possibly affecting the validity include: 1) measurement error by portion sizes which leads to lower correlation values (Neuhouser et al, 2009); 2) introduction of bias at the individual level with self-reporting instruments (Neuhouser et al, 2009 and Carithers et al, 2009); and 3) generalizations made from the findings on small convenience samples are limited in expression to larger populations (Presse et al, 2009; Carithers et al, 2009; and Cahill et al, 2009). Each of these could be factors that affected the validation results of the current study.

The generally high $r$ coefficients of the adapted Caregiver Questionnaire were in good comparison with those coefficients found in other validation studies, promoting the conclusion that the questionnaire is a fairly valid instrument for assessing Special Olympics athletes’ dietary habits. Though some of the HAS questionnaire food items were found to be statistical valid, the majority of the food items were not. With no other instrument of this kind to assess the dietary habits of Special Olympics athletes, the results of the present study should be enough to encourage Special Olympics International to conduct further testing of the HAS form in an attempt to identify the most valid, reliable instrument possible with which to assess the health and dietary habits of this unique population.
Reliability of Healthy Athletes® Health Promotion Questionnaire

The reliability of the Healthy Athletes® Health Promotion questionnaire was conducted using a test-retest model. Kappa and Pearson’s r correlation coefficients were calculated to determine the test-retest reliability of the HAS questionnaire. Of the 13 different items on the HAS questionnaire, only five were found to have statistically significant agreement between the test and retests. The range of significant values for the Kappa coefficients were Kappa=0.347 to Kappa=0.773 with Pearson’s r values ranging from $r=0.356$ to $r=0.794$. The highest $r$ and Kappa coefficients were for the questions: “Do you eat other food or take special nutrition pills?” “Vitamin, mineral or protein supplement” (Kappa=0.773, $r=0.794$, p<0.001), and “How often do you have a fruit or vegetable, daily, more than once per week, or never?” (Kappa=0.684, $r=0.732$, p<0.001). Although some of the items of the HAS questionnaire were found to be reliable in the test-retest, almost two-thirds of the HAS questionnaire items were found not to be reliable.

Studies by Neuhouser and colleagues (2009), Cahill and colleagues (2009), and Wilson, Magarey, and Mastersson (2008) all used the test-retest method of to assess the reliability of their respective nutrition instruments. Neuhouser (2009) gave the test-retest with 4-6 weeks between each test. Pearson’s r correlation coefficients for the study were $r=0.72$ to $r=0.85$, significantly higher than the most significant r coefficients found in the current study. Cahill (2009) gave the test-retest with two weeks between each test. Crohbach’s $\alpha$ and Pearson’s r correlation coefficients were used to assess reliability. Pearson’s r of 0.84 was found for associations between time points. The range of intra class correlation for the subscales of the instrument was from 0.50 to 0.76. Wilson et al
(2008) also used Cronbach’s $\alpha$ coefficient to look at internal consistency. Values ranged from 0.50 to 0.80, similar to those reported by Cahill et al (2009). The current study did not look at internal consistency of the food items of the HAS form.

A number of errors could have affected the reliability found in the current study. The length of time between the test and retest of the HAS form (one week) was shorter than any length of time between retests in recently published reliability studies. The effect of strong recall could have been seen with the shorter time frame, even when studying this unique population, especially since the current study used a picture book to help the athletes in the answering of the HAS form questions. This visual aid could have allowed for some memory effect in some athletes with milder ID. Mehrens and Lehmann (1984) reported the longer the test length the more reliable the scores; they hypothesized this was due to the positive and negative errors having a better chance of cancelling each other out over time. Other factors that could have influenced the reliability of the instrument include the motivation of the subject, degree of fatigue of the subject, and timing by the administrator of the test (Mehrens and Lehmann 1984). Any of these factors or a number of others could have affected the way the athletes answered the HAS form questions. Many distractions were usually going on at practices which could have affected responses by the athletes in the present study and should be considered when trying to interpret the results.

**Summary**

Information collected in the current study indicates most Special Olympics athletes do not meet the dietary recommendations set for healthy adults. While Delaware
County athletes excelled in some areas of nutrition above other Special Olympics athlete groups, they fell significantly short in other areas. All SO athletes should strive to meet and excel in all areas of nutrition so that each individual can live and play to their highest ability, both in and out of SO competitions.

The validity and reliability coefficients found in the current study were to be fairly comparable to those in previous studies of similar nature. The *Caregiver Questionnaire* was found to be a more valid representation of the athlete’s true dietary habits than was the HAS questionnaire. Though the HAS questionnaire had little validity when compared to the *Caregiver Questionnaire* against the standard, some individual food items were found to be statistical valid and is worth noting. Because the HAS questionnaire is the only questionnaire of its kind currently being used to measure the dietary habits of the Special Olympics athletes, one could suggest that a little validity is better than none. However, as a result of the low validity observed in this study, information collected from the HAS questionnaire should be used with caution. In addition, the HAS questionnaire was minimally reliable, with only one-third of the questionnaire items having significant agreement with one another after performing the test-retest of the questionnaire.

In sum, the results of this study indicate the nutrition questions on the HAS are not highly valid or reliable as a means to assess the dietary habits of Special Olympics athletes. This study is the first time the validity and reliability of the HAS form has been assessed. As such, there appears to be a great need for further testing of these variables among a larger, more diverse population. The current study provides the blueprint for future research in this area.
CHAPTER 6

CONCLUSIONS AND RECOMMENDATIONS

The purpose of this correlational study was to evaluate the validity and reliability of the Healthy Athlete® Health Promotion questionnaire as an instrument to assess the true dietary habits of Indiana Special Olympics Athletes. Athletes from the Delaware County, Indiana, Special Olympics Program were the participating subjects. The following chapter includes the overall conclusion for this research study and provides the researcher’s thoughts and recommendations for future research.

Conclusion

Results of this research study clearly demonstrate that the nutrition questions on the Healthy Athletes® Health Promotion questionnaire lack statistical strength in both reliability and validity. Analysis of the test-retest of the HAS questionnaire indicated only one-third of the food items were in significant agreement with one another (Kappa=0.347 to Kappa=0.773; \( r = 0.356 \) to \( r = 0.794 \)). When compared to the standard (a 3-day food record), only three of 15 food items on the HAS form had a statistically significant relationship to the standard (r coefficients ranged from \( r = 0.458 \) to \( r = 0.777 \) for these three items). The Caregiver Questionnaire used in the current study was found to
be a more valid representation of the athlete’s true dietary habits than the HAS questionnaire.

Results from this study also clearly illustrated that many Delaware County Special Olympics athletes are not meeting the most basic of dietary recommendations set for healthy adults. As such, it seems even more critical that the HAS nutrition questions be improved in order to more accurately and reliably assess the dietary intake of the Special Olympics athletes and to identify appropriate nutrition education messages for this special population.

As this study was the first of its kind to assess the validity of the Healthy Athletes® Health Promotion nutrition questions, the need for more testing of this nature is needed in order to affirm the findings and to make the necessary improvements to the questions. Special Olympics International is the largest provider of data on the health status and behaviors of the intellectually impaired. As such, it is the opinion of this researcher that Special Olympics International should take every step possible to improve the quality of life of the population they serve. The need for valid, reliable instruments to assess the health and dietary habits of this unique population is critical in order to provide better health and nutrition services to this high risk group of individuals.

**Recommendations to Improve the HAS® Health Promotion Nutrition Questions**

Based on the results of this study, and the researchers’ experience with using the HAS nutrition questions, the following recommendations are made to improve the Healthy Athletes® Health Promotion nutrition questions:
1. Data obtained from the nutrition questions could be more consistent with the adding of directions such as: “best answer only” or “check all that apply.” This would be especially helpful with the question “What do you drink when you are feeling thirsty?” and “Do you eat other foods or take special nutrition pills?” In the current study, the researcher included all answers given by the athlete, while other Health Promotion staff may only include the athlete’s first response, making results difficult to compare.

2. Rewording the question: “What do drink when you are feeling thirsty?” to “What do you normally drink when you are feeling thirsty?” or “What do you usually drink when you are feel thirsty and are not exercising?”

3. Addition of a question such as “What do you like to drink when you are exercising or participating in a Special Olympics event?”

4. For the question “What do you drink when you are feeling thirsty?” add “diet” and/or “regular” as a choice beside the “soft drink.” From the researcher’s experience, many athletes stated they only drink diet soft drinks.

5. Change the regional food questions to one that more clearly indicates actual frequency of consumption. Adding in frequencies such as: “1-3 per month,” “3-4 per week,” or “2-3 per day” would be more helpful in understanding the athlete’s dietary habits. It is the researcher’s experience that many athletes do not understand what a frequency of “more than once per week” means. The rewording or addition of more frequency categories could alleviate this problem.

6. Adding more frequency categories would also allow for more consistency in the data. For example, when an athlete reports having a food “once a week,” this can
lead some Health Promotion staff to report this as “never” and others to report this as “more than once per week,” when actually neither are correct.

7. Need for questions that indicate approximate portion sizes. Knowing an athlete is having fortified grains daily does not help the researcher understand whether or not the athlete is meeting current dietary guidelines. With food items such as “snack foods,” it is important to understand just how much of these foods the athlete is eating “daily” or “more than once per week.”

8. The Caregiver Questionnaire used in current study was shown to be a valid representation of the athlete’s dietary habits. Incorporation of this instrument, or a similar instrument, could be helpful in obtaining more accurate and reliable information about SO athletes’ dietary habits. The frequencies used in this instrument are good examples of those that could be adapted into the HAS form.

9. Guidelines for the sort of pictures to be included in the picture books should be set. The current study used the picture book used at Indiana State SO Health Promotion events. Though the pictures were a good representation of many different types of foods, it did not provide a complete representation of all choices (e.g., there were no pictures of “other nutrition supplements/products” such as Ensure).

10. Providing guidelines for all who utilize this form could help to provide consistency in what the athletes see. These guidelines, of course, would still need to take into account the regional foods of the different areas.
Recommendations of Areas for Improvement to Current Study Protocol

Based on the results of this study, the following recommendations are made to improve the current study’s protocol:

1. Starting recruitment for the study at the annual Delaware County Special Olympics Program Banquet in August of 2009 was a good idea in theory; however, the atmosphere was not conducive to obtaining a good sample of subjects for the study, nor were all athletes and caregivers in attendance.

2. True recruitment for the study needed to take place at the practices. Time at the beginning of each practice should have been coordinated with the director of the Delaware County program to be set aside for introduction of the study to all athletes at once, thus, ensuring all potential athletes received the exact same message about study involvement. This would lead to a better understanding of the “what’s” and “why’s” the researcher was in attendance at all of the practices.

3. Providing lines (more like a notebook page format) on the food records would have allowed for easier interruption of food items and their specific portion sizes during analysis of the records.

4. Some food items listed in the Caregiver Questionnaire should have been reworded or eliminated. The original form [Lifestyle and Health Behavior Questionnaire developed by Dr. Brian McGuire (McGuire, Daly, & Smyth, 2007)] from which the current questionnaire was adapted, included food terms conducive to the region the form was created for (Ireland). These few food items were overlooked prior to admission of the questionnaire, and might have caused some misrepresentation of intake by some of the caregivers.
5. With regard to testing for reliability, the time length between the test/retest of the questionnaire should be extended. More recent studies in the literature are showing longer time lengths to be producing good reliability. Statistical tests should also be run to look at the internal consistency of the questionnaire items.

6. 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.

**Recommendations for Future Research**

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

1. Need for panel of experts to assess the content validity of the Healthy Athletes® Health Promotion questionnaire.

2. Need for similar testing to be done to analysis the validity and reliability of the HAS nutrition questions. A larger, more diverse group of athletes should be used to eliminate sources of error that could be present in the current, small-scale convenience sample.

3. Need for studies that examine all the other Health Behavior questions on the Healthy Athletes® Health Promotion questionnaire (e.g., smoking, sun safety),
since no study of this kind has been done before now to the researcher’s knowledge.

4. Need for more nutritional research in searching for the best method(s) for assessing the dietary habits of individuals with intellectual disabilities.

5. Need for more research to better determine the factors the lead to the dietary habits of Special Olympics athletes, so education can be directed more toward these underlying factors.

Summary

The current research study indicates the nutrition questions included on the Healthy Athletes® Health Promotion questionnaire lack statistical strength in both validity and reliability. The need for valid, reliable questions is great; especially as many of the Special Olympics athletes in this study did not consume a diet that met basic dietary guidelines for healthy adults. More research is needed to affirm these findings in a larger, more diverse international population and, if these results are replicated, to improve the validity and reliability of the questions. Special Olympics International is encouraged to seek ways to obtain more accurate information about the dietary habits of the unique population they serve.
REFERENCES


Dudoit, Josette M.K. (2009). *Analysis of Health Promotion Data Obtained During the 2008 Indiana Special Olympics Games: A Comparison of Indiana and Non-Indiana Data* (Master’s Thesis). Ball State University, Muncie, IN.


APPENDIX A

DATA COLLECTION FORMS

A.1 Healthy Athletes® Health Promotion Form
A.2 Healthy Athletes® Health Promotion Nutrition Questions only
A.3 Informed Consent Document
A.4 Instructions for Take-Home Data Collection Forms
A.5 3-day Food Record
A.6 Special Olympics Dietary Intake Caregiver Questionnaire
APPENDIX A.1

Healthy Athletes® Health Promotion Form
<table>
<thead>
<tr>
<th>Firstname</th>
<th>Lastname</th>
<th>HAS ID</th>
<th>Date</th>
<th>O Male</th>
<th>O Female</th>
<th>DoB</th>
<th>Age (years)</th>
<th>O Not sure</th>
<th>Event</th>
<th>Location</th>
<th>O Athlete</th>
<th>O Unified partner</th>
<th>Sport</th>
<th>Delegation</th>
<th>SO Program</th>
</tr>
</thead>
</table>

**Nutrition Assessment**

- Height ___ cm
  - Measure up to .01 cm
- Weight ___ kg
  - Measure up to .01 kg
- Blood Pressure
  - Left Arm ___/
  - Right Arm ___
- Bone Mineral Density Test
  - T-score ___
  - 9.9 to + 9.9
- Waist Circumference ___ cm
  - Measure up to .01 cm
- BMI
  - _____ BMI (individuals 18 years of age and over)
  - _____ BMI Percentile (individuals under 18 years of age)

**Smoking cessation**

- Do you use tobacco products?
  - O Yes
  - O No
- If yes, ask which products
  - O Cigarettes
  - O Cigars
  - O Pipe
  - O Chewing Tobacco
- Is it OK to smoke in your home?
  - O Yes
  - O No

**Health Promotion**

- Have you smoked more than 5 packs of cigarettes (100) or more in your life?
  - O Yes
  - O No
  - (1 pack of cigarettes = 20 cigarettes)
- How many times do you use tobacco products?
  - Per day ___
  - Per week ___
  - Per month ___
  - Per year ___
- Does someone in your family smoke a tobacco product? (cigarettes, cigars, pipes)
  - O Yes
  - O No
- In the past year, have you stopped smoking for one day or longer because you were trying to quit smoking?
  - O Yes
  - O No

**Nutrition - Beverages**

- What do you drink when you are feeling thirsty?
  - O Water
  - O Fruit juice
  - O Soft drink
  - O Sport drink
  - O Milk product (include soy milk)
Nutrition – Other Food

Do you eat other foods or take special nutrition pills (i.e., sport bar, enriched gruel, sport drink, food supplement product like ensure, vitamin supplement, protein supplement)?

☐ sports bar, enriched gruel, sports drink
☐ nutrition supplement product
☐ vitamin, mineral or protein supplement. Other________________________

Regional Food Questions (Insert 5 key food and nutrition questions that represent the needs and food habits of the region)

Sources of Calcium
☐ daily
☐ more than once a week
☐ never

Fruits and Vegetables
☐ daily
☐ more than once a week
☐ never

Snack Foods
☐ daily
☐ more than once a week
☐ never

Sweetened Beverages
☐ daily
☐ more than once a week
☐ never

Fortified Foods (grains, breads, cereals)
☐ daily
☐ more than once a week
☐ never

Sun Safety

Your hair color is
☐ blond/red
☐ brown
☐ black

Do you know how to protect your skin in the sun?
☐ Yes ☐ No

Please check all that apply
☐ use of sunscreen
☐ wear a hat
☐ seek shade
☐ wear sunglasses

Your eye color is
☐ blue/green
☐ hazel
☐ brown

When exposed to the sun in the summer do you
☐ burn
☐ burn and sometimes blister
☐ burn then tan
☐ tan

Do you use sunscreen in the winter months?
☐ Yes ☐ No
APPENDIX A.2

Healthy Athletes® Health Promotion Nutrition Questions
Nutrition - Beverages

What do you drink when you are feeling thirsty?

- ☐ Water
- ☐ Fruit juice
- ☐ Soft drink
- ☐ Sport drink
- ☐ Milk product (include soy milk)

Nutrition - Other Food

Do you eat other foods or take special nutrition pills (i.e., sport bar, sport drink, food supplement product like ensure, vitamin supplement, protein supplement)?

- ☐ sports bar, or sports drink
- ☐ nutrition supplement product
- ☐ vitamin, mineral or protein supplement Other: ________________________

Regional Food Questions (Insert 5 key food and nutrition questions that represent the needs and food habits of the region)

<table>
<thead>
<tr>
<th>Source</th>
<th>Daily</th>
<th>More than once a week</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sources of Calcium</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fruits and Vegetables</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Snack Foods</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sweetened Beverages</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fortified Foods (grains, breads, cereals)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX A.3

Informed Consent Document
An Evaluation of the Health Athletes® Health Promotion Questionnaire
Informed Consent Document

Dear Delaware County Special Olympic Athlete and Caregiver,

I would like to invite you and your caregiver to participate in a project to help Special Olympics. We are trying to find out if the form we use during the Healthy Athletes events is the best way to check the food habits of Special Olympics athletes. Your answers will help us find out if the questions tell us what you really eat.

If you choose to help us with this study, you will be asked the nutrition questions from the Healthy Athletes® Health Promotion questionnaire two times. We will ask the questions at your sports practices. You will be asked to fill out a food diary where you and your caregiver will write down everything you eat and drink for three days. Your caregiver will be given another form that asks about what you (the athlete) usually eat and drink.

There are no foreseeable risks to you or to your caregiver if you take part in this study. You should eat and drink as you normally do. Taking part in this study is voluntary. You may stop participating at any time and for any reason. It is OK if you do not want to take part or if you do not finish this project. Your role as a Special Olympics athlete will not be affected in ANY WAY if you choose not to participate.

The information we collect in this study will be kept private. No one will be able to know who you are or what you have said during this study except the researcher.

This study is being done by Alisha Harmeson, a graduate student in the Department of Family and Consumer Sciences at Ball State University. If you have questions about this study, you can contact Alisha by email amharmeson@bsu.edu, or cell phone (937) 417-8241, or you can contact her advisor, Dr. Carol Friesen, at (765) 285-5925. Dr. Friesen is the Clinical Director for the Healthy Athletes® Program for the Indiana Special Olympics. For questions about your rights as a research subject, please contact Research Compliance, Sponsored Programs Office, Ball State University, Muncie, IN 47306, 765-285-5070, irb@bsu.edu.

27/29/2009
Remember, you can choose whether or not you want to participate in this study!

My signature indicates I agree to participate in this study and have read this letter and:

- I understand the study and what is expected as it has been explained to me
- I have had a chance to ask questions, and have had my questions answered to my satisfaction
- I understand that I can withdraw participation at any time without penalty
- A copy of the body of this document has been given to me for future reference

Athlete Participant Name (print) ________________________________

Signature_________________________________ Date____________________

Caregiver Participant Name (print) ________________________________

Signature_________________________________ Date____________________

Host phone number to reach the athlete and caregiver: ____________________

07/23/2009
APPENDIX A.4

Instructions for Take Home Data Collection Forms
Instructions for Completing the Study Forms

Thank you for agreeing to participate in this study. To complete the study, you will need:

1. A Caregiver’s Questionnaire and
2. Three blank 3-day food diary forms.

Instructions for the Caregiver

The caregiver should fill out the Caregiver’s Questionnaire as true and complete as possible. Please answer the questions based on your perception of the ATHLETE’S NORMAL dietary habits. The completed questionnaires should be returned to the researcher one week after getting this packet and/or at the athlete’s next scheduled practice.

Instructions for the Athlete

The athlete is to complete the 3-day food diary forms. If the athlete is unable to write down the foods they eat, the caregiver may help. The goal is for the athlete/caregiver to write down everything the athlete eats and drinks for three days. Provide as much detail as possible (e.g., “2 slices of brown bread with margarine” rather than ‘bread’ or “12 ounce glass of 2% milk” rather than “glass of milk”). The three days should all be within the same week if possible. Food records are most accurate if the food and beverages are recorded right after the meal or snack was eaten.

Instructions for Returning the Forms

The Caregiver’s Questionnaire and the three food diaries should be returned to Alisha Harmeson at the athlete’s usual Special Olympics practice. Please try to return the forms one week after you first received the forms.

Contact the Researcher

If at any time you have any questions or concerns about what to do, please feel free to contact Alisha Harmeson, Department of Family and Consumer Sciences at Ball State University by calling her at (937) 417-8241 or her major professor, Dr. Carol Friesen, Department of Family and Consumer Sciences, advisor for this study, at (765) 285-5925.

THANK YOU FOR TAKING PART IN THIS IMPORTANT STUDY!! ©
APPENDIX A.5

Sample Page of 3-Day Food Records
3 DAY FOOD AND BEVERAGE LOG

**Day 1**

<table>
<thead>
<tr>
<th>TIME</th>
<th>FOODS AND DRINK INTAKE</th>
<th>PORTIONE (cup, Tablespoon, slice)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Did you take a vitamin pill today?  □ No  □ Yes
If “Yes”, Name of pill ________________________________

Additional Comments:
APPENDIX A.6

Special Olympics 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 (circles): M W T Th F

Today’s Date (example: 3/02/2009): __/__/____

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., 4/18/1956): __/__/____

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.

<table>
<thead>
<tr>
<th>Fruit &amp; Vegetables</th>
<th>Never</th>
<th>1-3 per month</th>
<th>1 per week</th>
<th>2-4 per week</th>
<th>5-6 per week</th>
<th>1 per day</th>
<th>2-3 per day</th>
<th>4-5 per day</th>
<th>6+ per day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red &amp; Green Fruit</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vegetables</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Carbohydrates</th>
<th>Never</th>
<th>1-3 per month</th>
<th>1 per week</th>
<th>2-4 per week</th>
<th>5-6 per week</th>
<th>1 per day</th>
<th>2-3 per day</th>
<th>4-5 per day</th>
<th>6+ per day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cereal/Graham</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corn meal</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brown Bread</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pasta</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rice</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Noodles</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Meat, Fish, Poultry</th>
<th>Never</th>
<th>1-3 per month</th>
<th>1 per week</th>
<th>2-4 per week</th>
<th>5-6 per week</th>
<th>1 per day</th>
<th>2-3 per day</th>
<th>4-5 per day</th>
<th>6+ per day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beef</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pork</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chicken</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poultry</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sausage</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dairy &amp; Fats</th>
<th>Never</th>
<th>1-3 per month</th>
<th>1 per week</th>
<th>2-4 per week</th>
<th>5-6 per week</th>
<th>1 per day</th>
<th>2-3 per day</th>
<th>4-5 per day</th>
<th>6+ per day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yogurt</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Milk</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eggs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Winter Green</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cheese</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Veggies</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Milk Fat</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Milk Fat</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sweets &amp; Snacks</td>
<td>Never</td>
<td>1-3 per months</td>
<td>1 per week</td>
<td>2-4 per week</td>
<td>5-6 per week</td>
<td>1 per day</td>
<td>2-3 per day</td>
<td>4-5 per day</td>
<td>6+ per day</td>
</tr>
<tr>
<td>-----------------</td>
<td>-------</td>
<td>----------------</td>
<td>------------</td>
<td>--------------</td>
<td>--------------</td>
<td>-----------</td>
<td>------------</td>
<td>------------</td>
<td>-----------</td>
</tr>
<tr>
<td>Chocolate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sweets</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ice Cream</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crackers</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cookies</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chips</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Drinks</th>
<th>Never</th>
<th>1-3 per months</th>
<th>1 per week</th>
<th>2-4 per week</th>
<th>5-6 per week</th>
<th>1 per day</th>
<th>2-3 per day</th>
<th>4-5 per day</th>
<th>6+ per day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tank/Cola</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Soft Drinks</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fruit Juices</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sport Drinks</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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:

<table>
<thead>
<tr>
<th></th>
<th>Fully responsible for this area</th>
<th>Makes some decisions in this area</th>
<th>Expresses a preference, but is helped to make a decision</th>
<th>Has no part in the decision making process</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diet</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical Activity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

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

Questions adapted from the Lifestyle and Health Behaviour Questionnaire developed by Brant McGuire, Pamela Daly and Francesaby It (2005)
APPENDIX B

Appendix B.1 Institutional Review Board Letter of Approval

Appendix B.2 Institutional Review Board Letter of Approval for Modifications to Study Protocol

Appendix B.3 National Institute of Health’s Human Subjects Module Certification for Alisha Harmeson

Appendix B.4 National Institute of Health’s Human Subjects Module Certification for Laura Bollinger and Amanda Bolin
APPENDIX B.1

Institutional Review Board Letter of Approval
Institutional Review Board

DATE: July 29, 2009
TO: Alisha Harmeson
FROM: Ball State University IRB
RE: IRB protocol # 120316-2
TITLE: An Evaluation of the Validity and Reliability of the Healthy Athletes® Health Promotion Questionnaire to Assess the Dietary Intake of Delaware County Special Olympics Athletes
SUBMISSION TYPE: Revision
ACTION: APPROVED
DECISION DATE: July 29, 2009
EXPIRATION DATE: July 28, 2010
REVIEW TYPE: Expedited Review

The Institutional Review Board has approved your Revision for the above protocol, effective July 29, 2009 through July 28, 2010. All research under this protocol must be conducted in accordance with the approved submission.

As a reminder, it is the responsibility of the P.I. and/or faculty sponsor to inform the IRB in a timely manner:

- when the project is completed,
- if the project is to be continued beyond the approved end date,
- if the project is to be modified,
- if the project encounters problems, or
- if the project is discontinued.

Any of the above notifications should be addressed in writing and submitted electronically to the IRB (http://www.bsu.edu/irb). Please reference the IRB protocol number given above in any communication to the IRB regarding this project. Be sure to allow sufficient time for review and approval of requests for modification or continuation. If you have questions, please contact Amy Boos at (765) 285-5034 or akboos@bsu.edu.
APPENDIX B.2

Institutional Review Board Letter of Approval for Modifications to Study Protocol
Institutional Review Board

DATE: October 7, 2009
TO: Alisha Harmon
FROM: Ball State University IRB
RE: IRB protocol # 126316-3
TITLE: An Evaluation of the Validity and Reliability of the Healthy Athletes® Health Promotion Questionnaire to Assess the Dietary Intake of Delaware County Special Olympics Athletes
SUBMISSION TYPE: Amendment/Modification
ACTION: APPROVED
DECISION DATE: October 7, 2009
EXPIRATION DATE: July 28, 2010
REVIEW TYPE: Expedited Review

The Institutional Review Board has approved your Amendment/Modification for the above protocol, effective October 7, 2009 through July 28, 2010. All research under this protocol must be conducted in accordance with the approved submission.

As a reminder, it is the responsibility of the P.I. and/or faculty sponsor to inform the IRB in a timely manner:

- when the project is completed,
- if the project is to be continued beyond the approved end date,
- if the project is to be modified,
- if the project encounters problems, or
- if the project is discontinued.

Any of the above notifications should be addressed in writing and submitted electronically to the IRB (http://www.bsu.edu/irb). Please reference the IRB protocol number given above in any communication to the IRB regarding this project. Be sure to allow sufficient time for review and approval of requests for modification or continuation. If you have questions, please contact Amy Boos at (765) 285-5034 or akboos@bsu.edu.
APPENDIX B.3

National Institute of Health’s Human Subjects Module Certification for Alisha Harmeson
Certificate of Completion

The National Institutes of Health (NIH) Office of Extramural Research certifies that Alisha Harmeson successfully completed the NIH Web-based training course “Protecting Human Research Participants”.

Date of completion: 06/24/2009

Certification Number: 249355
APPENDIX B.4

National Institute of Health’s Human Subjects Module Certification for Laura Bollinger and Amanda Bolin
Certificate of Completion

The National Institutes of Health (NIH) Office of Extramural Research certifies that **Laura Bollinger** successfully completed the NIH Web-based training course “Protecting Human Research Participants”.

Date of completion: 09/22/2009

Certification Number: 299075

Certificate of Completion

The National Institutes of Health (NIH) Office of Extramural Research certifies that **Amanda Bolin** successfully completed the NIH Web-based training course “Protecting Human Research Participants”.

Date of completion: 09/22/2009

Certification Number: 294795
APPENDIX C

RECRUITMENT SPEECH
RECRUITMENT SCRIPT

Hello, my name is Alisha Harmeson. I am a graduate student in the Department of Family and Consumer Sciences at Ball State University. I am working with Dr. Carol Friesen, a faculty member at Ball State and the Clinical Director for the Healthy Athletes® Program for the Indiana Special Olympics on a project to help the Special Olympics. We need your help as well! We are trying to determine if the Healthy Athletes® Health Promotion Questionnaire used at the Healthy Athletes® events at your Special Olympics games is the best way to check the food habits of Special Olympics athletes like you. Your answers will be very important because they will help us find out if the nutrition questions really tell us what you usually eat. I am so grateful to Mrs. Barb Cox, your Delaware County Special Olympics Coordinator, for allowing me to talk to you tonight. She has agreed to work with us on this project. And because you are a member of the Delaware County program, I am inviting each of you to participate in this project.

Here is what the project will involve. First, once you have given me permission, I will ask you the six nutrition questions from the Healthy Athlete® Health Promotion questionnaire two different times, one week apart. I will ask you the questions while you are at your sports practices so you will not have to be inconvenienced at all. The second thing I will ask you or your caregiver to do is to write down everything you eat and drink for three days. This is called a food diary. Lastly, your caregiver will asked to answer some questions about your usually eating and drinking habits.

If you want to participate, in the center of your table you will find a packet of forms. The top form is the consent form that you and your caregiver must sign before you can participate. It would be great if you could sign the consent form tonight. You could give it to me, to Mrs. Cox, or leave it on the table. The next two forms are the instructions for the Food Diary and the Caregiver Questionnaire. The packet also includes our contact information if you have any questions. Please take the packet home with you, fill out the information, and bring the completed questionnaire and your Food Diary to your next practice anytime after August 10th. When you bring the completed forms back to me, I will give you a small token of our thanks (e.g., a Frisbee or a football from Papa John’s or some other token of appreciation that costs less than $2).

I will start coming to your weekly practices beginning on Monday August 10th to collect your Food Diary and the Caregiver’s Questionnaire. And then, when there is a break in the action, I will ask you the HAS nutrition questions! I will use a picture book of different foods to help you answer the questions about the foods you usually eat. I promise not to interfere with your practice time! I will continue to come to the practices until everyone who wants to participated has been able to – hopefully by the middle of
October. When all the information is collected, I am going to offer a nutrition class for anyone who is interested, even if you couldn’t help us out with the project.

I want to assure you there are no risks to you or to your caregiver if you take part in this project. You should eat and drink as you normally do. Taking part in this project is voluntary. You may quit at any time and for any reason. It is OK if you do not want to take part or if you do not finish. Your role as a Special Olympics athlete will not be affected in ANY WAY if you choose not to participate. I also want to promise you that the information we collect will be kept private. No one will be able to know who you are or what you have said during this study, except for Dr. Friesen and me. I will not share your information by name with anyone else.

How many of you think you would like to participate? Do you have any questions now?!!?
APPENDIX D

PERMISSION TO OBTAIN DATA

D.1 Permission for Use of the Lifestyle and Health Behaviors Questionnaire

D.2 Permission to Sample Delaware Co. Special Olympics Athletes
APPENDIX D.1

Permission for Use of the Lifestyle and Health Behaviors Questionnaire
Hello carol, many thanks for your message. I'm delighted to hear of your interest in the questionnaire and you are very welcome to use it without restriction (I ask just that you reference it appropriately). I'm away from my base on sabbatical so I need to locate an electronic (Word) copy - I'll send it on asap. Feel free to remind me if you don't hear back from me in the next week.

Best wishes

Brian

Dr. Brian McGuire
2009 Sabbatical Addresss:
Honorary Senior Lecturer in Clinical Psychology
School of Psychology
The University of Queensland
St. Lucia
QLD 4072
Australia

Dr. Brian McGuire, Senior Lecturer in Clinical Psychology
Director, Clinical Psychology Training Programme
Joint Director, Centre for Pain Research
National University of Ireland, Galway, Ireland
Tel. +353 (0)91 492954
Fax +353 (0)91 495545
brian.mcguire@nuigalway.ie
Clinical Psychology Secretary +353 (0)91 493266
http://www.nuigalway.ie/centre_pain_research
http://www.nuigalway.ie/psychology/d_clin_psych.htm

Dear Dr. McGuire,

It is such a pleasure to write to you! I read with great interest your article entitled Lifestyle and Health Behaviors of Adults with Intellectual Disabilities in the Journal of Intellectual Disability Research. I have a graduate student interested in using your questionnaire with our Special Olympics population here in Indiana (the heartland of the US). Would you be willing to grant us your permission to use your questionnaire? Would it be possible to obtain an electronic copy of the questionnaire you used?

I am so looking forward to hearing from you.

Sincerely,

Carol A. Friesen, PhD, RD
Associate Professor
Family and Consumer Sciences
Ball State University
Muncie, IN 47306
cfriesen@bsu.edu
(765) 285-5925
APPENDIX D.2

Permission to Sample Delaware County Special Olympics Athletes
July 27, 2009

Dear Alisha Harrieson,

My writing of this letter is to grant you permission to come and work with our group for your study. I do not have a problem with your coming to our practices to collect data. I can introduce you to many parents and the staff of several group homes that would be willing to assist you in your studies.

I am at every practice so setting aside a few minutes to talk with you and introduce you is no problem.

Going forward we will be practicing on Mondays at Westside Park from 5:30-6:30, Tuesdays at Players Club in Yorktown from 5-5:45 and Wednesday at Westside Park from 5-5:45. This is our schedule until the end of August. This would be 3 separate groups of athletes as these are different teams and sports. Monday and Wednesday is softball with the lower ability athletes participating on Mondays. Wednesday is unified. These athletes are typically a little higher functioning as many live on their own and are able to drive.

Tuesday is golf practice. There is some overlap of athletes in this sport but there are also about 10 that you would not see on Monday or Wednesday.

If you have any further questions or concerns please let me know. You may email me at the address below, or call me anytime at 254-4517.

Also if there is a question concerning the weather and the cancellation of practice you can call 765-287-1148 for an update on the day’s activities.

I look forward to having you work with our group of Special Olympics athletes and their caregivers.

Sincerely,

[Signature]

Barbara Cox
Delaware County Special Olympics Coordinator
Barb.Cox@olddinational.com