# Assessment of a Nutrition Education Intervention on the Nutrition Knowledge, Attitudes, Beliefs, Habits and Anthropometric Data in Adolescent Academy Male Soccer Players

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## Abstract

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Assessment of a Nutrition Education Intervention on the Nutrition Knowledge, Attitude, Belief, Habits and Anthropometric Data in Adolescent Academy Male Soccer Players.

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Adolescent obesity in the United States has been increasing since the last two decades creating detrimental effects on the health and well-being of the individual and the society. National and population-based surveys have found that adolescents often fail to meet dietary recommendations which increases the risk of chronic diseases like type 2 diabetes, obesity, coronary heart diseases, certain types of cancer and stroke. In addition to allowing for optimal growth and development, proper nutrition is believed to be an important part for sports performance of young athletes.

The purpose of the study was to assess the effectiveness of a nutrition education intervention on the nutrition knowledge, attitudes, beliefs, habits and anthropometric data of adolescent academy male soccer athletes. 57 male athletes and members of U13, U14, U15, U17 and U19 team of the Columbus Crew Academy participated in the study. Three validated questionnaires: The Nutrition Knowledge and Attitudes Questionnaire, the General and Sports Nutrition Knowledge Questionnaire and the Healthy Heart Score were used to measure the general and sports nutrition knowledge of the subjects. A five month-long nutrition education intervention program was implemented which aimed to improve not only the general and sports nutrition knowledge but also improve the dietary habits in these adolescent athletes. Data collected at the baseline was compared to the

data collected after the intervention using the same validated questionnaires for any significant changes in the nutrition knowledge scores of the athletes.

The findings of this study showed that the adolescent soccer athletes lacked adequate nutrition knowledge especially in the areas of macronutrient consumption. U19 showed an increase in the knowledge scores in the category of knowledge about consumption of fats ($p=0.015$). U14 showed improvement in the category of knowledge about consumption of carbohydrates ($p=0.000$). U19 showed a significant reduction in the red meat and processed meat consumption after the intervention ($p= 0.037$ and $p=0.048$). The nutrition education intervention as a whole could not significantly change the nutrition knowledge scores of the adolescent athletes. A longer intervention with more details on topics related to protein consumption and supplements use would perhaps positively change the concepts about sports nutrition in the athlete population and help them choose healthy foods to maximize their sports performance.

## Dedication

*To my parents who love me, support me and stand by me for every step I take in my life.*

*Thank you to Almighty for the gift of such a lovely family!*

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## Preface

This manuscript has been formatted to meet the guidelines set forth by Thesis and Dissertation Services at Ohio University.

# Chapter 1: Introduction

## Background

Since the last two decades, adolescent obesity in the United States has been increasing and having detrimental impacts on both the health and well-being of the individual and society (Schwarz & Peterson, 2010). It has certain specific impacts on health which include increased risk of chronic health disorders, psychological disorders and premature death (Schwarz & Peterson, 2010). A combination of obesity, poor nutrition, mental health disorders, emotional problems, violence and unintentional injury, and substance abuse creates a barrier to an adolescent's health, emotional and physical development (Rodrigues et al., 2017).

The percentage of children and adolescents with obesity in the United States has tripled since the 1970s (Fryar, 2014). According to the Centers for Disease Control and Prevention, the data from 2015-2016 shows that, 1 in 5 school-aged children and young people between the age of 6-19 years in the United States has obesity (Hales, 2017). As encouraged by the Dietary Guidelines for Americans, children and adolescents should maintain a calorie balance for promoting normal growth and development and without excess weight gain (2015-2020 Dietary Guidelines, 2015).

Although several scientific researches have focused on developing and testing school-based obesity prevention and nutrition or physical activity promotion programs, very few schools (less than 3%) reported implementing these programs Kenney (2017). In the same study, less than half of the schools reported opting to implement any kind of nutrition, physical activity or prevention strategy at all.

In addition to allowing for optimal growth and development, nutrition is an important part for sports performance of young athletes (Bingham et al., 2015). According to the study, young athletes need to learn what, when and how to eat and drink before, during and after physical activity in order to optimize performance. But there may be many reasons for not following nutritional advice by the athletes Ozdoğan & Ozcelik (2011). They may have lack of knowledge or information regarding sports nutrition, interest of making changes in one's diet or certain perceived or encountered barriers that may prevent the athletes from eating healthier diets like lack of time or money. The study mentions that sports nutrition can be conveyed to an athlete through regular nutrition educational programs as well as individual training.

Research studies done previously focused on the dietary consumption patterns of collegiate athletes but not specifically on the effect of intervention programs on the diet and lifestyle of adolescent male soccer athletes (Croll et al., 2006; Hawk, 2014). Findings from a study (Patton-Lopez et al., 2018b), showed that 2-year sport and nutrition education and life-skill intervention among High School soccer players supported the fact that adolescent soccer players are viable target groups for interventions and to promote healthy eating behaviors. Nutrition education intervention, in a study done previously, was successful in increasing the nutrition knowledge of adolescent athletes specifically in the areas of energy intake, macronutrients, calcium, iron and zinc (Sundar et al., 2018).

**Statement of the Problem**

Adolescent athletes lack adequate general and sports nutrition knowledge regarding concepts of different macro and micronutrient consumption along with proper

knowledge of hydration, which in turn affects their performance. Though nutrition education intervention is one of the possible ways of educating adolescents about the proper food intake and healthy dietary habits, there is limited research that exists on its effectiveness in adolescent soccer players. Assessing the nutrition knowledge, attitudes and dietary habits of adolescents becomes essential to evaluate their concepts regarding the consumption of different macro and micronutrients, the right time and quantity of consumption (Tamiru et al., 2016). Also, nutrition education programs are not always implemented into the sports curriculum which results in poor sports nutrition knowledge among the athletes. This ultimately affects their food choices and, in the long run, health status of these individuals, giving rise to chronic diseases like obesity, hypertension and other cardiovascular diseases (2015-2020 Dietary Guidelines, 2015).

**Research Questions**

1. How do the adolescent soccer athletes respond to questions on general nutrition and sports nutrition?
2. How effective is a nutrition education intervention in increasing the nutrition knowledge of adolescent soccer athletes?

**Hypothesis**

1. Increase in general and sports nutrition knowledge of the adolescent athletes, post intervention compared to pre-intervention. This hypothesis is based on the previous nutrition education intervention studies that were conducted within adolescent populations.

2. Positive changes in the dietary consumption patterns by the adolescent athlete's post intervention compared to pre-intervention. Generally, nutrition education interventions done previously have been successful in positively changing the dietary consumption patterns of the target populations.

**Purpose of the Study**

The purpose of the study was to firstly, assess the concepts about general nutrition and sports nutrition knowledge and in adolescent soccer players, including specific knowledge about macronutrients consumption and importance of hydration, using three validated questionnaires. The second purpose of this research was to compare the nutrition knowledge, attitudes, behavior and anthropometric measurements in adolescent academy soccer players, before and after a nutrition education intervention using the same questionnaires, to see any significant improvement in the nutrition knowledge scores of these athletes.

**Significance/Benefit of the Study**

Since adolescence is the time for maximum development of an individual, it is a key time for implementation of nutrition education intervention to help them optimize their sports performance but also to help them stay fit and healthy into adulthood (Burkhart, 2010). Among the effective methods of preventing obesity and optimizing sports performance, both at the practice sessions as well during the matches depend to great extent on the education about correct lifestyles, reducing the use of unhealthy foods, increase in physical activities, and problem-solving training (Rahimi et al., 2018). Individual motivation, good attitude in weight reduction and peer influence are some of

the major aspects of a successful obesity prevention intervention program (In-Iw et al., 2012). Nutrition strategies learned through the intervention program would be effective in avoiding and healing severe injuries of the athletes. It would be help them recover fast from any kind of injury and return to the game. Through nutrition education intervention, we hope to increase the knowledge of the adolescent athletes which would help them make healthy choices throughout their sports career and for life (Trakman et al., 2017).

**Delimitations and Limitations of the Study**

Delimitations of the study were that the participants were all members of one soccer academy (The Columbus Crew). The questionnaires provided to the participants were in English only, so the language barrier might have been a problem for the participants in answering the questions.

For some athletes the anthropometric measurements by the Tanita scale were taken before the practice while for some athletes it was taken after the practice which might have been a potential limitation for the study. Another possible limitation could be the weight status of the participants which might have been affected by the type of clothing that they wore during the measurements. The third limitation would be the level of education that had been a barrier for the participants because the questionnaires were too advanced for the younger athletes. The Healthy Heart Score questionnaire used for data collection is mainly designed for individuals between 20 years to 40 years of age. Therefore, the online calculator used for risk for cardiovascular disease development might not have provided correct results for the adolescent athlete population as they were between 12 years to 19 years, making it a major limitation for this research study.

**Definition of Terms**

- Adolescence: A period of transition between childhood and adulthood. This period includes early adolescence (10years to 13 years), middle adolescence (14 years to 17 years) and late adolescence (18 years to 21 years). This is a time period for maximum changes to the body of an individual including physical development, cognitive changes, social and emotional changes (American Academy of Pediatrics, 2020).
- Anthropometric Measurements: Assessment of size, shape and composition of the human body. These include the measurements such as BMI, waist-to-hip ratio, skin-fold test and bioelectrical impedance (Sánchez-García et al., 2007).
- Cardiovascular Diseases (CVD): The name given to a group of disorders for the heart and blood vessels and include, hypertension, coronary heart disease, cerebrovascular disease and peripheral vascular disease (Word Health Organization, 2016).
- Nutrition Education Intervention: The combination of education strategies designed to facilitate voluntary adoption of food choices and other food and nutrition related behaviors, that improves health and well-being of an individual (Galanti et al, 2014).
- Sports Nutrition Knowledge: Nutrition-related knowledge of concepts and processes for optimal athletic performance, including knowledge of weight management, strategies for hydration and fueling, before during and after training, with knowledge of supplementation and alcohol use (Trakman et al., 2017).

# Chapter 2: Review of Literature

## Introduction

According to the American Academy of Child and Adolescent Psychiatry (2019), childhood obesity within the United States has grown considerably in recent years. The source reports that approximately 12.7 million or 17% of children and adolescents are obese. Over 300,000 deaths occur each year in the United States as a result of unhealthy weight gain due to poor diet and lack of exercise (American Academy of Child and Adolescent Psychiatry, 2019). The Centers for Disease Control and Prevention (CDC) states that adolescent obesity may be caused by various factors which include improper eating habits, lack of physical activity, genetics and various behavioral and cultural factors (Causes and Consequences of Childhood Obesity, 2016). The same source suggests that poor eating habits, like overeating or binging and lack of exercise are more predominant causes of adolescent and childhood obesity. Improper eating habits in adolescents can be the result of physiological causes like endocrine problems, neurological problems or stressful life events such as separations, divorce, moves, deaths, abuse, peer problems, low self-esteem, depression or other emotional problems (American Academy of Pediatrics,2020). A few of the many risks and complications with obesity include increased risk of heart disease, high blood pressure, diabetes, breathing problems, sleep apnea and other hormonal problems (Sahoo et al., 2015).

Adolescence is considered as a period of transition where the adolescents learn to take the responsibility of their own eating habits. Acquiring proper nutrition knowledge is

one of the essential factors that is considered necessary for a healthy transition of this responsibility (Patton-Lopez et al., 2018b). When it comes to the health and well-being of an adolescent athlete, there are several important factors to be considered in relation to nutrition for growth as well as sports performance (Webb & Beckford, 2014). Lifestyle and dietary habits have a tremendous impact on health status and sports performance of adolescents, as such, knowledge about the importance of good nutrition would help improve their sports performance (Przysławski, Stelmach, Grygiel-Górniak, Mardas, & Walkowiak, 2011).

## Adolescents

**Nutritional requirements for the adolescents.** Growth spurts due to puberty during the adolescent years creates a surge in appetite around the age of ten in girls and twelve in boys (American Academy of Pediatrics, 2016). It is important to eat healthy during the adolescent years as bodily changes during this time affect an individual's nutritional and dietary needs (Stanford Children's Health, 2019). Increase in energy and nutrient requirements coincides with factors which influence an adolescent's food choices and nutrient intake (Coulthard et al., 2017). Some of these factors include quest for independence, acceptance by peers, increased mobility, more time spent at school, time spent for physical activities or sports and pre-occupation with self-image (Coulthard et al., 2017). According to the same source, adolescents tend to eat more meals away from home than younger children, due to reasons like lack of knowledge about healthy eating, less adequate nutritious food options to choose from or lack of access to grocery stores.

National and population-based surveys show that adolescents often fail to meet dietary recommendations that are required for maintaining overall nutritional status and meet the demand for specific nutrient requirements (Neumark-Sztainer et al., 2002). Research studies have shown that many adolescents consume a lower than the recommended daily intake for certain essential micronutrients like vitamin A, folic acid, fiber, iron, calcium, vitamin D and zinc, while they receive a higher proportion of their energy from intake of fat or added sugars (Moreno et al., 2010). Low intake of calcium by adolescents has been associated with decreased bone density which increases fracture risk during adolescence and risk of developing osteoporosis during late adulthood (Moreno et al., 2010).

**Obesity in adolescents.** Child Health Obesity USA (2014), states that the prevalence of obesity among adolescents has quadrupled in the past 30 years. A report from the US Department of Health and Human Services shows that between 2011-2012, 20.5% of youth between ages 12-19 years were obese, 14.0 % were overweight and 61.9% were normal weight or underweight (Adolescent Overweight and Obesity, Child Health USA, 2014). Being overweight or obese during adolescent years has often resulted in obese adults, most of whom were affected by severe health conditions, including high blood pressure, prediabetes, bone and joint problems, cancer and other social and psychological outcomes (Child Health USA, 2014).

Obesity in adolescents results from an imbalance between energy intake and expenditure with an increase in positive energy balance (Sahoo et al, 2015). This balance is closely associated with aspects of the lifestyle adopted, such as the dietary preferences.

Mayo Clinic (2018) has identified an array of causes of childhood obesity. They found consumption of high-calorie foods on a regular basis, such as fast foods, baked goods and vending machine snacks can be an inevitable reason of weight gain. Also, sugar-sweetened beverages, including fruit juices, often contribute to obesity in young people. According to the same source, there are more chances of weight gain in adolescent population who do not exercise much and do not burn as many calories. Research studies have shown that children have more chances of putting on weight if they come from a family of overweight and obese people (Kann et al., 2016). The risk of obesity increases for adolescents suffering from personal, parental and family stress, as they lack the capability to deal with emotions such as stress, or to fight boredom and may end up overeating (Mayo Clinic, 2018). Socio-economic factors play a vital role in the cause of obesity in adolescents. People of some communities may have limited access to supermarkets, as a result they might buy convenience foods that do not spoil easily such as frozen meals, canned food items, crackers and cookies (Causes and Consequences of Childhood Obesity, 2016). People living in lower income neighborhoods also might not have access to a safe place to exercise.

**Physical activity in adolescents.** The CDC states that regular physical activity during adolescent years is important for promoting lifelong health and well-being. Sixty minutes or more of physical activity each day is suggested for children and adolescents aged 6 to 18 years (Child Health Obesity USA, 2014). Evidence based studies have shown that physical activity has several health and behavioral outcomes in young people (Strong et al., 2005). Cross-sectional and longitudinal observational studies have

suggested youths engaged in high levels of physical activity generally have less adiposity than youth who are less active (Mintjens et al., 2018; Strong et al., 2005). In fact, thirty to sixty minutes of moderately intense exercise 3 to 7 days per week leads to a reduction in total body and visceral adiposity in overweight and obese children (Strong et al 2005).

A moderate to high positive relationship exists between physical activity and maximal and sub-maximal indicators of aerobic fitness (Mintjens et al., 2018). Children and adolescents who are habitually active show better aerobic fitness than children who are less active. Higher physical activity in youth has shown fewer signs of anxiety and depression, better ways of dealing with problems and good perceptions about oneself. Adolescence is the period of improvement of muscular strength and endurance which depends on the level of physical activity an individual performs (Daniels et al., 2011a). Experimental studies showed that resistance training 2 to 3 times per week is associated with improvements in muscular strength and endurance during childhood and adolescence.

## Adolescent Athletes

**Nutritional requirements for adolescent athletes**. In adolescent athletes, nutrition plays a major role in both optimal growth and development as well as in preventing injuries, and in overall performance during a match (Ruiz et al., 2011). Since adolescents are moving through a period of rapid growth and maturation, their bodies require special nutritional implications. The higher the rate of physical activity performed by an adolescent, the more that individual meets their nutritional requirements (Ruiz et al., 2011).

Adolescent athletes, in addition to energy requirements arising from exercise, should also learn appropriate dietary habits which will be carried on to adulthood (Galanti et al, 2014). Physically active adolescents generally do not need supplements in addition to a normal diet if they follow specific guidelines developed for athletes (Galanti et al, 2014). A systematic review showed that adolescent athletes do not adjust their nutrient intake or food choice to the demands of the training sessions (Noll et al, 2017). Out of the 21 articles included in the review, 95.2% of the studies were concentrated on the nutrient analysis, but very few articles included the eating patterns of the adolescent athletes.

- Total energy intake: A total energy intake high enough to meet the daily needs for growth, maturation and physical activity is essential for adolescent athletes (Purcell, 2013). Lack of adequate energy to the adolescent body may cause the athlete feeling fatigued, lose weight and fail to perform well both mentally and physically. In case of low consumption of energy, the body utilizes protein from lean muscle mass as a source of energy. Energy requirements in adolescents depend on variables like age, activity level, growth rate and stage of physical maturity (Purcell 2013).
- Carbohydrates: Carbohydrates being the major source of glucose, athletes need it as fuel source for providing them energy (Ruiz et al., 2011). Approximately four kilocalories of energy are generated from 1 gram of carbohydrate. During exercise or during extensive physical activity, glycogen, which is the stored form of glucose in muscle and liver, is released faster than other energy sources. In

adolescents, about 45%-65% of the total calorie intake should come from sources of carbohydrates such as whole grains, vegetables, fruits, milk and yogurt (Ruiz et al., 2011).

- Protein: During long exercise hours proteins, help to maintain blood glucose through liver gluconeogenesis. One gram of protein is a source of approximately four kilocalories of energy. Athletes require more protein to alleviate the risk of its deficiency and to generate more muscle protein (Purcell, 2013). Research studies suggest that among all the essential amino acids, leucine may be the limiting factor in initiating muscle protein synthesis, so athletes are suggested to consume leucine-rich proteins to boost muscle protein after intense physical activity. Approximately, 10%-30% of the total energy intake should come from protein sources such as lean meat, poultry, fish, eggs, dairy products, etc.
- Fats: Fats play a crucial role in the athlete body. Fats are required not only for absorption of vitamins A, D, E and K in the body, but also it helps in the formation of joint structures, cell membranes, and fat-based steroid hormone for muscle growth. Fat intake for an athlete should range between 20%-35% of the total daily calories, with approximately 10% of the fat intake should come from monounsaturated sources and no more than 10% from saturated fat sources.
- Micronutrients: Athletes should have proper consumption of calcium, vitamin D and iron. The daily consumption of calcium for 9 to 18- year-olds is 1300 mg/day and is important for bone health, normal enzyme activity and muscle contraction. Vitamin D is an essential component for bone health, enhancing the absorption

and regulation of calcium. 600 IU/day of Vitamin D is recommended for children and adolescents. Athletes living in northern latitudes or who practice indoor sports are likely to require more vitamin D rich food. Iron is required during adolescence to support growth as well as increasing blood volume and lean muscle mass. Athletes may have iron depletion due to increased iron losses through urine, feces, sweat or menstrual blood and because of diets poor in meat, fish and poultry.

- Hydration: Performance of the athletes can be affected by the type, time and amount of fluids consumed by them throughout the day. Not only do fluids help regulate body temperature, it also helps in retention of sweat loss during exercise. It is essential that the athlete is well hydrated before, during and after exercise or physical activity. Athletes are required to consume 400mL to 600mL of cold water 2 hours to 3 hours before and 150mL to 300mL of fluid for every 15 to 20 minutes of sporting activities. Sports events occurring in hot, humid weather, athletes need to drink sports drink containing 6% carbohydrates and 20mEq/L to 30mEq/L of sodium chloride which could replace fluid/electrolyte losses.
- Typical game day menu: According to (Banfield et al., 2016), teenage boys and girls engaged in any type of sports activity require 3000 to 4000 kcal and 2200 to 3000 calories, respectively. The same source suggests whole-grain cereal with low-fat milk and fruit or whole-grain waffles with peanut-butter, banana and fruit juice are great for breakfast menus. Bean and beef burritos topped with salsa or grilled chicken sandwiches with coleslaw for lunch delivers the essential nutrients needed during afternoon practice sessions. Spaghetti with meat sauce coupled

with salad or vegetables and whole-grain Italian bread with olive oil or canola oil spread is suggested to be a great recovery meal for dinner. Along with these foods, snacks such as fresh fruit, veggies, hummus, low-fat cheese and yogurt would be both nutritious and handy for the young athletes.

**Adolescent athlete's knowledge, attitude, beliefs regarding nutrition.** As adolescents grow older, the level of physical activity decreases and they become independent in making food choices (Manore et al., 2017). A positive reinforcement is necessary to make healthy food choices and increase physical activity, so that the risk of being overweight or becoming obese decreases. Adolescence is the period of cultivating skills that support life-long health and obesity preventions such as grocery shopping and cooking skills, healthy eating behaviors and the importance of daily physical activity.

Since adolescent athletes do not always make healthy food choices or may not have the best food options at sporting events, it is also essential to teach youth athletes how to fuel and hydrate their bodies for physical activity. A review report based on seven studies which compared the dietary intake of adolescents involved in sports to the non-sport participants found that adolescents involved in some kind of sports had the likelihood of consuming fruits, vegetables and milk, but also consumed fast foods and sugar-sweetened beverages compared to the non-sport participants (Hawk, 2014). Healthy dietary behaviors learnt by adolescent athletes will continue with them until adulthood and would be a great step forward in preventing chronic diseases.

## Assessment of Nutrition Knowledge, Attitudes and Habits among Adolescent Athletes

Nutritional intake plays an important role in the health and well-being of adolescents. It has a direct effect on adolescent's health related to physical and mental growth as well as cognitive development (Naeeni et al., 2014). It is often seen that food intake patterns and overweight are associated with health complications and major long-term consequences such as diabetes, hypertension, atherosclerosis, stroke, cancer and other cardiovascular diseases (Naeeni et al., 2014).

**Nutrition knowledge questionnaires.** An individual's cognitive process related to information on food and nutrition which effects an individual's food selection and succeeds in non-communicable disease prevention is defined as nutrition knowledge (Barbosa et al., 2016). It also includes knowledge on what should be consumed and the awareness of the importance of healthy food habits which are considered first steps in altering eating behavior(Barbosa et al., 2016). In order to maximize athletic performance both athletes and coaches should have adequate nutrition knowledge (Heikkilä et al., 2018). Only validated nutrition knowledge questionnaires can reliably assess the nutrition knowledge of young athletes (Heikkilä et al., 2018). Nutrition knowledge questionnaires are not only effective tools of assessing the knowledge about macronutrients and micronutrient consumption, they are also effective in predicting the misbeliefs that young athlete's knowledge related to energy density, dietary supplements and proteins.

A cross-sectional study assessed the nutritional knowledge of 4700 adolescents through validated questionnaires (Naeeni ,2014). Five distinct aspects of nutritional

knowledge were compared based on total mean scores. The findings of the study showed that students from urban areas seemed to have significantly higher knowledge compared to their rural counterparts ($P<0.001$) and junior high school students had significantly higher scores than the younger ones ($P<0.001$). Another study assessed the knowledge of adolescent rugby players of Ireland through a questionnaire specifically designed for the study (Walsh et.al. 2011). The questionnaire consisted of 40 questions which included five sections: position of play and training, schedules, dietary and hydration practices and nutrition knowledge. The mean nutritional knowledge score was 59.6% and there was no significant difference between the nutrition knowledge scores of the players from different age groups. The findings showed that the questions were most accurately answered in the hydration section (mean score 76.4%) but no significant improvement was observed in the knowledge about macronutrients.

**Determination of cardiovascular disease risks in adolescents.** It is an inevitable fact that regular physical exercise improves cardiovascular health, reducing the risk of coronary artery disease and myocardial infarction by 50% (The American Heart Association, 2015). Daniels, Pratt, & Hayman, (2011), studied the risk factors for development of cardiovascular disease during childhood and adolescence results from both genetic and environmental factors. The timing of the development of CVD is critical because it determines when interventions should occur as prevention of risk factors and its modification are both equally important.

- Diet*:* Healthy dietary patterns is one of the important factors for primordial and primary prevention of risk factors related to development of CVD from childhood

and adolescence through adulthood. Data from previous research studies suggest that specific dietary macronutrients like dietary fat, carbohydrates and micro-nutrients like sodium and calcium have an impact on the risk of CVD (Center for Nutrition Policy and Promotion, 2015).

- Obesity: Association exists between obesity and adolescence and the different adverse health outcomes such as hypertension, type 2 diabetes, metabolic syndrome, sleep apnea, left ventricular hypertrophy and abnormal lipid profiles. A research study showed that 80% of the adolescents who were overweight at age range 10-15 years became obese adults at 25 years while 25% of the obese adults were overweight as children (Daniels et al., 2011a).
- Physical activity: Regular physical activity has been associated with health-related benefits and epidemiological studies have been shown to improve cardiovascular fitness, increased bone mass, improved psychological well-being, lower risk of obesity and low elevation of blood pressure (Strong et al., 2005). Tracking of levels of physical activity from childhood to young adulthood showed that higher level of physical activity for adolescents aged 9-18 years had more likelihood of high physical activity during adulthood (Gidding et al., 2006). Evidence from intervention studies designed to increase physical activity and reduce sedentary time showed reduction in systolic and diastolic blood pressure and improved cardiorespiratory fitness (Gidding et al., 2006).
- Smoking or exposure to tobacco: Studies have shown that more than 80% of adult smokers begin smoking before 18 years of age and in view of this report,

prevention of smoking initiation and cessation interventions are considered essential components of cardiovascular health promotion in children and adolescents (Gidding et al., 2006).

The Department of Nutrition at Harvard School of Public Health created the Healthy Heart Score for estimating the cardiovascular disease risk in seemingly healthy individuals (Sotos-Prieto et al., 2017). Though this tool is mainly designed for middle-aged adults who do not have elevated clinical risk factors, like high blood pressure or high cholesterol, the Healthy Heart Score can be used for predicting cardiovascular disease risk in young individuals as well. This new calculator includes factors like smoking status, height and weight, level of physical activity and alcohol intake. A diet score is also calculated based on the consumption of fruits and vegetables, nuts, cereals fiber, red meat or processed meat and sugar-sweetened beverages.

**Data Collection through Anthropometric Methods**

United States having high prevalence of comorbidities due to obesity, type 2 diabetes, makes it essential to regularly monitor and treat them (Duren et al., 2008). The study of the measurements of the human body in terms of the dimensions of bone, muscle and adipose tissue is termed anthropometry. The most common measurements of anthropometry include weight, stature, abdominal circumferences and skinfolds (Duren et al., 2008). Several indexes can be derived from various anthropometric measurements the most known indicator being the Body Mass Index (BMI) which is used to assess weight status in children, adolescents and adults (*Anthropometry Procedures Manual*, 2017). The data collected are used to evaluate dietary status, disease risk and body composition

for various researches in the field of nutrition, cardiovascular health or other health related fields of study.

**Body composition**. Body composition is used to describe the percentages of fat, bone, water, and muscle in human bodies. A lot of factors that depend on body composition include age, gender, activity level, genes, and caloric intake. The importance of knowing the body composition is for creating fitness programs because it considers the individual's segmented muscle and body fat analysis. Also, body composition is a quick and effective indicator of the current health status of an individual (Kacev, 2016). Some of the common techniques of assessment of body composition include:

- Hydrostatic weighing: Also known as underwater weighing or densitometry, hydrostatic weighing is based on Archimedes' principle (Borga et al., 2018). In order to compute body density, the difference of the body weight in air and water is used. The total body fat percentage can be estimated assuming a two-component model with different densities for fat mass and fat-free mass, correcting the volume of air in lungs.
- Bioelectrical impedance analysis (BIA): It is used to estimate the total body water and the body fat mass using electrical properties (Borga et al., 2018). For this purpose, the body is modelled as five cylindrical compartments and the impedance is assumed to be proportional to the height and inversely proportional to the cross-sectional area of each compartment. Different model parameter are required for BIA depending on the age, gender, level of physical activity and amount of body fat in order to be reliable.

- Air displacement plethysmography (ADP): Known by its commercial brand name BOD POD, this technique measures the overall body density, total body fat and lean tissue but not their distributions (Borga et al., 2018). The individual whose body composition is to be measured is put inside an enclosed chamber and by changing the chamber's volume, the volume of the displaced air can be determined from the changes in the air pressure. The volume of the displaced air is equal to the volume of the body of the individual.
- Dual-energy X-ray absorptiometry (DEXA or DXA): A two-dimensional imaging technique that uses X-rays with two different energies (Borga et al., 2018). X-ray attenuation is dependent on the thickness of the tissue and the tissue's attenuation coefficient, which is dependent on X-ray energy. The two different energy levels helps in separating the images into two components (example, bone and tissue). DEXA or DXA can be used to measure the total body composition and fat content with a high degree of accuracy. According to latest researches, DXA is highly accurate when compared to most other methods for determining the body composition which is useful for tracking the change in muscle and fat overtime (DXA/DEXA beats BMI, 2015).

**Effectiveness of a Nutrition Education Intervention for Adolescent Soccer Athletes**

Nutrition education intervention has been shown to enhance nutrition knowledge which may be reflected through healthy dietary choices overtime (Baskale and Bahar 2011). Proper food and dietary habits cultivated during the adolescent life would help to improve future eating habits during adulthood. Hawk (2014), assessed the sports nutrition

knowledge of adolescent athletes and its effect on their dietary intake overtime showed that sports nutrition education overtime improved general nutrition knowledge scores of the participants in the intervention group (P=0.008) as well as for their parents (P<0.0001). But these athletes failed to show improvement in areas like fluid recovery and weight control part of the questionnaire.

Partida et al (2018), investigated the effectiveness of nutrition education in Active Adolescents in a private school setting. The researchers found that active high school and high school athletes stated desire to learn more about nutrition. They also found that neither educational posters nor social media were effective methods for delivering nutrition education. According to these researchers, the most effective method of delivering nutrition education was through classroom lecture. The participants showed maximum improvement in the hydration section with 77.9% score received by high-school students and 69.4% score received by the middle-school students. The least improvement was shown in the section of protein and exercise. The findings demonstrate that active middle school and high school students acknowledge the connection between nutrition and exercise.

# Chapter 3: Methodology

## Design and Setting for the Study

Nutrition education intervention is believed to be an effective way of increasing the knowledge about the consumption of different nutrients in young individuals. The objective of this study was to test the efficacy of a nutrition education intervention on the knowledge, attitudes, beliefs and habits of adolescent soccer players. The general nutrition and sports nutrition knowledge of adolescent soccer players were compared pre and post intervention. The anthropometric measurements of the players were taken before and after intervention and three validated questionnaires were used to measure the nutrition knowledge of the adolescents.

## Ethical Considerations

Approval from the Institutional Review Board (IRB) was obtained before the start of the study and post intervention through the Ohio University Office of Research and Compliance. The participants above the age of 18 years were required to provide signed consent and were assured confidentiality in terms of their identity and data collected. For the participants below the age of 18 years, parental consent was obtained. The consent form included all the details of the study, the IRB approval and how the data would be collected pre and post nutrition education intervention. The data collected were solely used for the purpose of this research study and would not be used for any other research purposes. The data were handled only by the researchers and were kept secure.

**Study Participants**

Players of a soccer academy in Columbus, Ohio between the ages 12 and 19 years were included for the study. Recruited participants were current members of the U13, U14, U15, U17 and U19 teams from the Columbus Crew soccer academy. A total of approximately 90 members were enrolled initially for the study from the five teams mentioned above. Due to some participants dropping out during the course of the research or incomplete responses from some participants, 57 participants were included for this research.

**Nutrition Intervention designed for the Coaches, Athletes and their Parents**

Parents/guardians and athletes participated in the nutrition education intervention. The nutrition interventions described below were designed by Ohio University combined Master of Science and Dietetic Interns under supervision of a Registered Dietitian, the project leader and the Columbus Crew academy staff. Electronic nutrition handouts, a nutrition workshop and a 1-hour nutrition session in the form of a jeopardy game were arranged as part of the intervention for the players and their parents. Nutrition lessons in the education included topics on carbohydrates, fats, proteins and importance of hydration (Appendix C). The intervention consisted of a nutrition education workshop (Appendix D) and monthly nutrition education newsletters which were aimed at increasing the nutrition knowledge and improving the dietary habits of the athletes. In order to encourage healthy eating behaviors in these athletes and maximize their performance, examples of healthy snacks and typical game day diet were also included in the intervention.

**Nutrition handouts**. Six nutrition education handouts that included topics of carbohydrate, protein, fat, hydration, typical game day diet and training day diet were provided to the academy players and their parents. The handouts were reviewed by the research study coordinator and primary investigator and finally completed by the Crew Academy team's high- performance director. These approved handouts were distributed to the athletes and their parents at the nutrition workshops presentation and through emails.

- Carbohydrate handout: This handout included what carbohydrates are, their functions inside the human body and the good sources of carbohydrates that are essential for the athletes (Appendix B). It also included the importance of reducing the carbs in the diet and choosing whole grains. Information about simple and complex carbohydrates was provided along with the pictures of some of the food items which contain them.
- Protein handout: Like the carbohydrate handout, the protein handout also gave information about protein, the various food sources of protein and the various functions that it serves inside the human body (Appendix B). To make the handout more interesting, bulletins meant to draw attention of the reader were included on why athletes should choose healthy proteins. The handout includes the recipe for Southwest black bean burger as an example of a healthy, protein-rich tasty food option for the athlete.
- Fat handout: This handout provides the importance of choosing healthy dietary fats in our diet (Appendix B). It gives brief information about how fat functions in

the body along with a comparison between and sources of monounsaturated fats, polyunsaturated fats, omega-3 fatty acids and saturated fats. Some menu planning tips also were added.

- Hydration handout: Athletes need to keep their body well-hydrated before, during and after physical activity. The hydration handout described what hydration is and the importance of water for the human body (Appendix B). The handout described how the athlete could tell if the body is deficient of water by describing that urine color generally reflects hydration level. The sugar content of some of the beverages which adolescents generally prefer to drink were shown with the help of sugar cubes. The handout also included some of the useful tips for staying hydrated for all the athletes.
- Smart snacking handout: It is important for the athletes to stay energized all day long. Since athletes have a busy schedule, planning for healthy snacks consumption throughout the day becomes extremely important. The smart snacking handout describes the importance of eating healthy snacks with some examples of snacks that will not only be healthy but also give the athletes a quick burst of energy for their sports (Appendix B). Examples of unhealthy snacks were also provided in the handout for the athletes to compare and understand the difference between consuming healthy and unhealthy snacks.
- Game day diet handout: The food to be consumed before and after a game is essential for the performance of the athletes. This handout gave a choice of possible food items that the athletes can consume before game so that flatulence is

avoided and there is plenty of time to digest the food (Appendix B). Some pre-game dinner options, pre-game breakfast options, examples of meal pre-game and post-game were provided in the handout.

**Nutrition workshops**. A 90-minute PowerPoint presentation which specifically covered topics such as carbohydrates, protein, fat, vitamins, minerals, hydration and snack options were created by the head soccer coach and the team's high-performance director of the Columbus Crew Soccer Academy for the athletes and their parents (Appendix D).

**Interactive nutrition lessons in the form of jeopardy and healthy snack samples**. Interactive team nutrition lessons were conducted by the researchers and were held before or after team practices. A total of five sessions were conducted across a three-day period, each session being an hour long and involved activities like a nutrition jeopardy game and healthy snack samples.

- Jeopardy game: The jeopardy game created using the PlayFactile jeopardy generator website included topics based on the nutrition education intervention handouts that were used for improving the participant's knowledge about nutrition (Appendix D). The jeopardy questions were reviewed by a registered dietitian and the Columbus Crew Academy head soccer coach. These questions were ranked between 100-500 points based on the level of difficulty and included questions on carbohydrate, protein, fat, hydration, performance and overall knowledge on sports nutrition. Information were provided for each of the questions answered

correctly and the information were varied based on the age of the players and the complexity of the questions.

- Snack samples. Following the jeopardy game, the players were given the opportunity to try healthy snack samples. To promote the fact that even healthy snacks can be tasty and to encourage protein-rich snacks, a recipe for a Greek yogurt ranch dip and a chocolate banana protein smoothie was provided. This dip is low in fat and sodium and high in protein and meant to encourage vegetable intake, it was served with baby carrots. The chocolate banana smoothie was served as a high protein drink as an example of a breakfast or after-practice snack that would lack added sugars or protein powders. The United States Department of Agriculture's Super Tracker software was used to generate nutrition facts for these recipes. These recipes were prepared at home and brought to the practice facility to be distributed to the athletes after the jeopardy game.

**Pre and Post Intervention Measurement of Data**

Data was collected before and after the nutrition education intervention by the research team at the practice facilities of the Columbus Crew Academy.

**Anthropometric measurements.** A scale, a portable free-standing stadiometer and a Tanita DC-430 Total Body Composition Analyzer were used to collect anthropometric data, which included weight, height and body fat percentage of the participants. Body fat, muscle, body water, visceral fat, body mass index (BMI) and basal metabolic rate (BMR) were measured using the Tanita for players aged 18 years and above. For players below 18 years, body fat, muscle, body water and BMI were

measured. For the accuracy in the measurements with the Tanita the clothing weight was also assessed and entered. During data collection, the players wore either shorts and long sleeve training shirt (entered as a clothing weight of 2.1 pounds), a long sleeve training shirt and pants (entered as a clothing weight of 2.1 pounds) or pants with long sleeve training shirt and a jacket (entered as a clothing weight of 3.6 pounds). The participants had to stand upright, barefooted, heels together and looking straight ahead when the measurements were taken using the stadiometer.

**Nutrition Knowledge and Attitudes Questionnaire (NK&A).** The Nutrition Knowledge, Attitudes and Behavior Questionnaire was developed and validated (Walsh et al., 2011b) and, included questions about nutrition knowledge (macronutrient consumptions, questions related to hydration and dietary supplements) (Appendix D). The questionnaire also asked for food and fluid consumption patterns before, during and after training sessions and matches. Questions on attitudes and beliefs regarding sports nutrition and improvement of sports performance were also included in the questionnaire. The original questionnaire was developed for the senior school rugby players in Ireland; therefore, some alterations were done with respect to the language and foods consumed. For the ease of understanding and completion of the questionnaire, check boxes were added.

**General and Sports Nutrition Knowledge Questionnaire.** The purpose of the validated General Sports and Nutrition Knowledge Questionnaire was to identify myths and false nutritional beliefs in order to improve nutrition education programs (Calella et al., 2017:Appendix D). The questionnaire was divided into two sections: the first section

included questions on general nutrition and the second section included questions about sports nutrition.

**Healthy Heart Score Questionnaire (HHS).** The validated Healthy Heart Score questionnaire was developed by a team of researchers at the Harvard School of Public Health (Sotos-Prieto et al., 2017). The questionnaire evaluates the current lifestyle habits affecting cardiovascular health such as smoking status, weight, nutritious diet and daily exercise (Appendix D). The questions about nutrition in the HHS questionnaire include average consumption of fruits, vegetables, nuts, whole grains, red meat, processed meat and sugar-sweetened beverages and alcohol over the past year by the participants. The HHS would help to determine the average weekly consumption of different food items by the participants and determine the risk of development of cardiovascular diseases in the future.

**Questions that were used for the Analysis from the Three Validated Questionnaires**

For the ease of computation of a large volume of data, the responses to Nutrition Knowledge and Attitudes questionnaire and General and Sports Nutrition Knowledge questionnaire were grouped into smaller categories to help calculate knowledge scores of the athletes in the categories like energy and refueling, carbohydrates, proteins, fats, hydration and fluids and supplements before and after the intervention. Questions that were included for each of the categories are listed in Table 1. Questions in the Healthy Heart Score questionnaire were used to compare the average weekly consumption of foods by the participants before and after the intervention. The responses of each of the

participants were used to determine the lifestyle behavior using the Healthy Heart Score online calculator and to assess the odds of developing CVD in this population.

Table 1:

*Questions that were grouped for each of the categories for the nutrition knowledge score calculation in the Nutrition Knowledge and Attitudes Questionnaire, General and Sports Nutrition Knowledge Questionnaire and Healthy Heart Score Questionnaire.*

Nutrition Knowledge and Attitudes Questionnaire

a. Knowledge about Energy and Refueling:
18. After training refueling is important.
19. Food choices which are good ones before and after exercise.

b. Carbohydrates:
20. You should not eat carbohydrate after 5 pm or you will get fat, from what you eat and drink.
21. From what you eat and drink, you should get most of your energy (calories) from carbohydrates.

c. Proteins:
28. Muscles get most of their energy from proteins.
29. If you eat more protein than you need, it is likely to be stored as fat.
30. The more protein you eat, the more muscle you can build.

d. Hydration:
22. During exercise of longer than 1 hour, sports drinks are better than water (e.g. Lucozade Sport, Powerade, and Gatorade).
23. You only need to drink when you are thirsty. Dehydration can reduce performance.

e. Supplements:
25. It is better to get vitamins and minerals from supplements than from foods.
26. You can trust all of the claims made about supplements, e.g.," this rapidly builds muscle."
27. Most people get the vitamins and minerals they need from food, so they should take a supplement.

General and Sports Nutrition Knowledge Questionnaire

a. Carbohydrates:
30. CHO is no good for an athlete.
33.Consuming CHO after 5pm can enhance performance,
45.It is advisable for an athlete eating a low glycemic index meal but rich in CHO, 1-2 hours after training,
44. A man and women of the same age, practicing the same sport have the same energy requirements.

b. Fats:

Table 1 continued

35. For a person doing sports the diet should not contain more than 15% fat.
32. Athletes must reduce their fat intake to a minimum.
11. Olive oil is high in monounsaturated fat.
12. The dried fruit is a rich source of essential fatty acids.

c. Proteins:

34. Eating more protein will make muscles bigger.
41. An excessive dietary protein intake can lead to liver and kidney damage.
46. Athletes practicing extensive training have double protein requirement than the general population.
60. If an athlete fails to cover his protein requirements with sole nutrition it is necessary to integrate amino acids.

d. Hydration:

47. Drinking fluids before, during and after competition is needed.
48. Coaches must not allow drinking fluids during a training.
49. The best advice for athletes is to drink when they are thirsty.
50. For an athlete, cold water quenches thirst better.

e. Supplement:

56. Supplements can be good substitutes for the athletes.
57. An athlete will never be able to meet his iron needs with food, a supplement is required.
62. Food supplements are always needed both in agonistic and non-agonistic sports.
63. Since dietary supplements are harmless, you do not need a specialist's advice.
64. Vitamin C supplement is always needed for those who practice strength sports.

Healthy Heart Score Questionnaire

a. Whole wheat, oatmeal, or other whole grain bread consumption:

During the past year how often on an average did you eat these grains, Whole wheat, oatmeal or other whole grain bread, serving size= 1 cup.

b. Servings of fruit:

During the past year how often on an average did you eat a serving of fruit? e.g.: 1 serving= 1 small apple, half cup strawberries, 10 grapes.

c. Servings of vegetables:

During the past year how often on an average did you eat a serving of vegetables? e.g.: 1 serving= half cup cooked broccoli or 1 cup lettuce.

Table 1 continued

d. Servings of nuts:
During the past year how often on an average did you eat a serving of nuts? e.g.: 1 serving= 1 oz. nuts like peanuts, almonds, walnuts, pistachios, etc.

e. Servings of red meat:
During the past year how often on an average did you eat a serving of red meat? e.g. 1 serving= beef, pork or lamb (4-6 oz.) 1 hamburger patty.

f. Servings of processed Meat:
During the past year how often on an average did you eat a serving of processed meat? e.g.: 1 serving = 1 slice or 1 piece of bologna, salami, sausage, 2 strips of bacon, etc.

g. Servings of sugar-sweetened beverages:
During the past year how often on an average did you eat a serving of sugar-sweetened beverages? e.g.: 1 serving=1 glass/bottle/ can of soda with sugar like Coke, Pepsi, etc. or other beverages.

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**Data Analysis**

Descriptive Statistics (mean, standard deviation and range) were calculated for each of the five athlete teams. The nutrition knowledge scores of the athletes were calculated by the percentage mean scores in each of the categories as per the questionnaire. The general nutrition knowledge scores were evaluated based on the responses to the Nutrition Knowledge and Attitudes questionnaire. The assessment of the sports nutrition knowledge was determined from the responses to the General Sports and Nutrition Knowledge questionnaire. The responses from the Healthy Heart Score were used to compare the average weekly consumption of whole wheat foods, vegetables, fruits, red meat, processed meat and sugar-sweetened beverages. The online Healthy Heart Score calculator helped determine the long-term risk of development of CVD in the

participants. The variables for the anthropometric measurements included the height, weight, BMI and body fat percentage of the participants. Paired t-test was used to compare the data collected at baseline to the data collected after the intervention. Two-tailed p-value <0.05 would be considered statistically significant. Odds ratio with 95% confidence intervals (CI) was used to assess the CVD risk. All the analysis were performed using the SPSS software.

# Chapter 4: Results

## Participant Data

The participants of this research study were members of the Columbus Crew soccer academy in Columbus, Ohio. They were grouped into 5 groups, U19, U17, U15, U14 and U13 based on the teams for which they play. Table 2 shows the anthropometrics of the teams before and after the nutrition education intervention.

Team U14 (n=15) had the most participants. Team U13 (n= 10) had the greatest change in their mean body weight, from 92 lbs before the intervention to 100 lbs after the intervention. The body fat percentages decreased from 10% before the intervention to 6% after the intervention in the U19 group. The mean height and BMI did not change much after the intervention in any of the teams.

Table 2.

*Anthropometrics (mean, standard deviation (SD)) of Columbus Crew Academy athletes on the U19, U17, U15, U14 and U13 teams before and after a nutrition education intervention.*

| Athlete Teams, N (100 %) | Team U19, 9 (16%) | | Team U17, 11 (19%) | | Team U15, 12 (21%) | | Team U14, 15 (26%) | | Team U13, 10 (18%) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Mean (SD) | Range | Mean (SD) | Range | Mean (SD) | Range | Mean (SD) | Range | Mean (SD) | Range |
| Weight (lbs.) | | | | | | | | | | |
| Pre | 153 (23) | 134-211. | 144 (18) | 108-184 | 130 (21) | 107-174 | 110(15) | 89-138 | 92(15) | 71-112 |
| Post | 151 (15) | 135-181. | 148 (16) | 128-182 | 132 (17) | 97-162 | 112(15) | 92-141 | 100(15) | 83-124 |
| Height (inches) | | | | | | | | | | |
| Pre | 69 (2) | 67-74. | 68 (3) | 63-72 | 66 (3) | 60-71 | 65(3) | 59-69 | 60(4) | 53-64 |
| Post | 69 (3) | 66-73. | 70 (2) | 67-72 | 67 (2) | 62-69 | 66(2) | 61-70 | 60(4) | 54-67 |
| BMI ($kg/m^2$) | | | | | | | | | | |
| Pre | 22 (3) | 20-30 | 22 (3) | 18-27 | 22 (5) | 15-34 | 18 (2) | 15-22 | 19(3) | 16-27 |
| Post | 23 (2) | 21-26 | 22 (2) | 20-27 | 21 (2) | 18-25 | 19 (3) | 15-26 | 19(2) | 17-25 |
| Body Fat (%) | | | | | | | | | | |
| Pre | 10 (3) | 7-17 | 12 (3) | 6-18 | 11 (4) | 5-19 | 10(2) | 6-14 | 12(3) | 8-18 |
| Post | 6 (3) | 1-11 | 11 (3) | 6-15 | 12 (3) | 9-17 | 9(3) | 5-14 | 12(3) | 9-19 |

**Findings from the Nutrition Knowledge and Attitudes Questionnaire**

The nutrition knowledge scores pre and post intervention for all the groups are shown in Table 3. Team U14 showed the most significant improvement in their knowledge scores in three categories of energy and refueling ($p=0.013$), food consumption before and after the exercise ($p=0.004$) and protein consumption ($p=0.022$). This team showed a significant improvement in their total knowledge scores from 47% before the intervention to 62% after the intervention ($p=0.01$).

A significant decrease in the nutrition knowledge scores from 44.5% to 37.0% was observed in U13 in the category for knowledge about supplements ($p=0.022$). Other teams did not show a significant change in their knowledge scores in any of the categories. The total nutrition knowledge scores increased from 61%, 55%, 50% before the intervention to 70%, 64% and 60% after the intervention for U19, U17 and U15 but these scores were not statistically significant ($p=0.064$, $p= 0.057$ and $p= 0.177$).

Table 3:

*Percentage of correct responses on the Nutrition Knowledge and Attitudes Questionnaire for Columbus Crew Academy athletes on the U19, U17, U15, U14 and U13 teams pre and post of a nutrition education intervention.*

| Athlete Teams | U19 (n=9) | | | U17 (n=11) | | | U15 (n=12) | | | U14 (n=15) | | | U13 (n=10) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Knowledge Scores | Pre | Post | p-value | Pre | Post | p-value | Pre | Post | p-value | Pre | Post | p-value | Pre | Post | p-value |
| Knowledge about energy and refueling | | | | | | | | | | | | | | | |
| | 62.5 | 100 | 0.08 | 50.0 | 90.0 | 0.104 | 69.0 | 84.5 | 0.436 | 22.0 | 78.0 | 0.013 | 33.0 | 22.0 | 0.254 |
| Knowledge about food consumption before and after exercise. | | | | | | | | | | | | | | | |
| | 81.0 | 72.0 | 0.285 | 70.0 | 67.5 | 0.758 | 57.5 | 69.0 | 0.273 | 58.0 | 75.0 | 0.004 | 86.0 | 75.0 | 0.438 |
| Knowledge about carbohydrate consumption. | | | | | | | | | | | | | | | |
| | 25.0 | 50.0 | 0.227 | 40.0 | 50.0 | 0.343 | 34.5 | 34.5 | 0.776 | 50.0 | 44.5 | 0.512 | 28.0 | 44.5 | 0.081 |
| Knowledge about protein consumption. | | | | | | | | | | | | | | | |
| | 25.0 | 37.5 | 0.351 | 13.0 | 30.0 | 0.231 | 18.0 | 33.0 | 0.19 | 18.5 | 41.0 | 0.022 | 41.0 | 33.0 | 0.142 |
| Knowledge about hydration. | | | | | | | | | | | | | | | |
| | 87.5 | 75.0 | 0.197 | 73.0 | 86.5 | 0.104 | 56.5 | 79.5 | 0.656 | 70.5 | 92.5 | 0.225 | 78.0 | 59.0 | 0.272 |
| Knowledge about supplements. | | | | | | | | | | | | | | | |
| | 62.5 | 66.5 | 0.763 | 63.0 | 76.5 | 0.399 | 56.5 | 69.0 | 0.356 | 48.0 | 63.0 | 0.081 | 44.5 | 37.0 | 0.022 |
| Total Nutrition Knowledge Scores. | | | | | | | | | | | | | | | |
| | 61.0 | 70.0 | 0.064 | 55.0 | 64.0 | 0.057 | 50.0 | 60.0 | 0.177 | 47.0 | 62.0 | 0.01 | 52.0 | 47.2 | 0.432 |

*Note:* Within each team, pre- and post-test means for each question are significant at $p < 0.05$. Please refer Table 1 for individual questions in each category.

**Findings from the General and Sport Nutrition Knowledge Questionnaire**

Table 4 shows the sports nutrition knowledge scores in the participants before and after the intervention. The sports nutrition knowledge scores in the category of knowledge about consumption of fats increased from 40% before the intervention to 70% after the intervention in the U19 team ($p=0.015$). This group also showed a significant increase in their nutrition knowledge scores from 28% before the intervention to 50% after the intervention in the category of knowledge about protein consumption ($p=0.024$). U14 showed a significant increase in their scores in the category of carbohydrate consumption from 16% to 60% after the intervention ($p=0.000$). An increase in the sports nutrition knowledge score from 40% and 70% before the intervention to 20% and 56% after the intervention was observed in U14 in the category of knowledge about fluids and hydration and knowledge about supplements use ($p=0.026$ and $p=0.008$).

U19 showed increase in their sports nutritional knowledge in all the categories. U17 showed an increase in knowledge in the categories of knowledge of protein consumption, knowledge about fluids and hydration and knowledge about supplements use. U15 showed an increase in their knowledge scores in the category knowledge about carbohydrate consumption, knowledge about consumption of fats, knowledge about consumption of protein and knowledge about fluids and hydration. U13 showed the least increase in their knowledge scores in all the categories.

Table 4:

*Percentage of correct responses based on the General and Sports Nutrition Knowledge Questionnaire for Columbus Crew Academy athletes on the U19, U17, U15, U14 and U13 teams pre and post of a nutrition education intervention.*

| Athlete Groups | Team U19 | | | Team U17 | | | Team U15 | | | Team U14 | | | Team U13 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sports Nutrition Knowledge Scores | | | | | | | | | | | | | | | |
| | Pre | Post | p-value | Pre | Post | p-value | Pre | Post | p-value | Pre | Post | p-value | Pre | Post | p-value |
| Knowledge about carbohydrates consumption | | | | | | | | | | | | | | | |
| | 50.0 | 58.0 | 0.399 | 34.0 | 34.0 | 1.000 | 40.0 | 46.5 | 0.685 | 16.0 | 60.0 | 0.000 | 29.0 | 32.5 | 1.000 |
| Knowledge about consumption of fats | | | | | | | | | | | | | | | |
| | 40.0 | 70.0 | 0.015 | 30.0 | 36.0 | 0.604 | 30.0 | 36.0 | 0.604 | 20.0 | 52.0 | 0.061 | 27.0 | 47.0 | 0.094 |
| Knowledge about protein consumption. | | | | | | | | | | | | | | | |
| | 28.0 | 50.0 | 0.024 | 38.0 | 58.0 | 0.085 | 30.0 | 42.0 | 0.297 | 18.0 | 40.0 | 0.137 | 35.5 | 44.4 | 0.325 |
| Knowledge about fluids and hydration | | | | | | | | | | | | | | | |
| | 50.0 | 72.0 | 0.057 | 38.0 | 56.0 | 0.244 | 40.0 | 54.0 | 0.345 | 40.0 | 70.0 | 0.026 | 35.5 | 44.5 | 0.548 |
| Knowledge about supplements use | | | | | | | | | | | | | | | |
| | 46.0 | 56.0 | 0.299 | 28.0 | 48.0 | 0.063 | 44.0 | 26.0 | 0.159 | 20.0 | 56.0 | 0.008 | 22.0 | 24.0 | 0.834 |

*Note:* Within each team, pre- and post-test means for each question are significant at $p < 0.05$. Please refer Table 1 for individual questions in each category.

**Findings from the Healthy Heart Score Questionnaire.**

The Healthy Heart Score questionnaire was used to compare the average weekly consumption of whole wheat foods, fruits, vegetables, nuts, red meat, processed meat and sugar-sweetened beverage intake by the athletes before and after the nutrition education intervention (Table.5).

There was a significant reduction in consumption of red meat ($p = 0.037$), from 3.0 servings per week to 1.5 servings per week after the intervention in U19. There was also a significant reduction in the consumption of processed meat ($p = 0.048$), in the same group, from 2.5servings to 1 serving per week. U17 showed a significant increase in the average weekly consumption of red meat consumption after the intervention from 2 servings to 7 servings ($p=0.041$). A significant increase in the average weekly fruit consumption ($p=0.011$) from 6 servings to 11 servings after the intervention was observed in U14 athletes.

No significant change in the average weekly consumption of whole wheat foods, vegetables or sugar-sweetened beverages was observed in any of the teams after the nutrition education interventions.

Table 5:

*Comparison of the food consumption patterns of the Columbus Crew Academy athletes before and after the Nutrition Education Intervention based on the responses of the Healthy Heart Score.*

| Player Groups | Team U19 | | | Team U17 | | | Team U15 | | | Team U14 | | | Team U13 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Average weekly consumption | Pre | Post | p-value | Pre | Post | p-value | Pre | Post | p-value | Pre | Post | p-value | Pre | Post | p-value |
| Servings of whole wheat, oatmeal, or other whole grain bread consumption | | | | | | | | | | | | | | | |
| | 4.0 | 1.5 | 0.090 | 4.0 | 6.0 | 0.337 | 2.0 | 5.5 | 0.095 | 2.5 | 3.5 | 0.310 | 2.5 | 4.5 | 0.395 |
| Servings of fruits | 7.0 | 5.5 | 0.490 | 10.2 | 10.5 | 0.909 | 10.0 | 8.0 | 0.412 | 6.0 | 11.0 | 0.011 | 15.0 | 11.0 | 0.285 |
| Servings of vegetables | | | | | | | | | | | | | | | |
| | 4.0 | 6.0 | 0.335 | 7.5 | 9.00 | 0.645 | 7.50 | 5.0 | 0.173 | 6.0 | 8.5 | 0.124 | 8.0 | 10.0 | 0.682 |
| Servings of nuts | 3.0 | 2.5 | 0.869 | 6.0 | 6.0 | 0.585 | 9.5 | 4.5 | 0.061 | 5.5 | 7.0 | 0.512 | 3.0 | 9.5 | 0.094 |
| Servings of red meat | | | | | | | | | | | | | | | |
| | 3.0 | 1.5 | 0.037 | 3.5 | 4.5 | 0.076 | 5.5 | 9.0 | 0.524 | 3.0 | 4.5 | 0.342 | 3.0 | 5.5 | 0.372 |
| Servings of processed Meat | | | | | | | | | | | | | | | |
| | 2.5 | 1.0 | 0.048 | 2.0 | 7.0 | 0.041 | 5.5 | 4.0 | 0.511 | 3.0 | 2.5 | 0.645 | 3.5 | 3.5 | 0.916 |
| Servings of sugar-sweetened beverages. | | | | | | | | | | | | | | | |
| | 1.0 | 1.0 | 0.260 | 2.5 | 3.0 | 0.519 | 5.00 | 3.0 | 0.570 | 2.0 | 2.0 | 1.00 | 2.5 | 3.5 | 0.356 |

*Note:* For serving sizes of all the food items, please refer Table 1. P significant at <0.05.

# Chapter 5: Discussion

The purpose of this study was to investigate the effectiveness of a nutrition education intervention on the nutrition knowledge, attitudes, beliefs and habits of adolescent soccer athletes. The study compared the general nutrition and sports nutrition knowledge of the athletes before and after the intervention. It also assessed the food consumption patterns in the athletes which might have an influence in the development of cardiovascular diseases in that athlete population.

Nutrition education interventions research studies done previously, concentrated only on macronutrients and micronutrients (Partida, et al., 2018; Patton-Lopez et al., 2018a; Baskale & Bahar, 2010). The nutrition education intervention in the current study was novel in its sense that it not only included topics on consumption of macronutrients like carbohydrates, fats and proteins, but also included topics on the importance of hydration. The intervention also discussed the importance of healthy snacking with examples of a variety of healthy snacks, to help them stay energized all throughout the day. The intervention included a game day diet giving examples of dinner pre-game, breakfast pre-game, meal-pre-game and meal post-game. The sports nutrition lessons learned during the intervention period would help these athletes choose the healthy foods that provide them the energy needed during practice as well as prevent them from obesity. In later years of their life, even if they are not into sports these good food habits learned during the adolescent years would continue with them until adulthood.

## Anthropometrics of the Participants

The body composition of the participants included the details about their height, weight, BMI and body fat percentage. The participants of each team had a mean normal

BMI within the range of 18.0 $kg/m^2$ to 24.99 $kg/m^2$ both before and after the intervention. According to the Tanita Corporation (2018), body fat percentages of adolescent males below 15% is generally considered normal with low body-fat risk. All the teams had a mean normal body fat percentage within the range of 6% to 14%, suggesting that they were all healthy adolescents and none of the teams had athletes who had obesity.

The post-intervention body composition measurements, taken 5 months after the pre-intervention measurements were taken, showed no noticeable change in the anthropometrics of these participants. Anthropometrics measurements taken later may have brought significant difference in these values for the research findings. A previous research study by Walsh.et.al. (2011), compared the body composition within the age groups 15 years to 18 years in rugby players of Ireland, the results of which showed elevated body fat percentage (>15%) in 10% of the participants.

**Nutrition Knowledge and Attitudes Questionnaire**

This questionnaire assessed the general nutrition knowledge in the adolescent athletes. Highest significant improvement in the nutrition knowledge scores after the intervention was observed for U14 in three categories, knowledge about energy and refueling ($p=0.013$), knowledge about food consumption before and after exercise ($p=0.004$) and knowledge about protein consumption ($p=0.022$). The research study done by Walsh et al., (2011) used the same questionnaire to assess the nutrition knowledge and attitudes in adolescent rugby players of Ireland. The findings of this study demonstrated poor knowledge scores in the category of the foods required for refueling, the role of protein in muscle formation and the appropriate use of sport drinks. This study was

different from the current study as there was no application of a nutrition education intervention to compare the nutrition knowledge scores of the athletes.

There was considerable improvement observed for all the teams in the category of knowledge about carbohydrate consumption. Nutrition knowledge scores increased for U19, U17, and U14. U13 had adequate baseline knowledge about hydration even before the intervention. Although the nutrition knowledge scores increased for U17 and U19 after the nutrition education intervention, this change was not statistically significant. Moreover, U19 showed more improvement in the category than the other groups. No change in the nutrition knowledge in the category of protein was observed in any of the teams. A similar cross-sectional study done by Naeeni et al., (2014), compared the nutrition knowledge scores of junior high school athletes to the senior high school athletes. The findings showed higher significant nutrition knowledge scores in the senior high school athletes. They had more knowledge regarding macronutrient consumption but were deficient in knowledge of specific food groups, vitamins and minerals.

The intervention was created for the adolescent athletes of the five different teams. The nutrition lessons were delivered at the practice sessions. There is no record of the presence of all the participants in each of the nutrition education sessions. There is possibility, a knowledge gap in some of the participants which was reflected in their responses after the intervention and hence affected the total nutrition knowledge scores. Moreover, there was drawback in the study setting for testing the effectiveness of nutrition intervention. The participants could have been equally divided into an intervention group and a control group and followed for a time span of about a year.

Comparing the nutrition knowledge scores of the intervention group to the control group may have brought significant changes to the result findings.

**The General and Sports Nutrition Knowledge Questionnaire**

The General and Sports Nutrition Knowledge Questionnaire was used to assess the sports nutrition knowledge of the participants before and after the nutrition education intervention. There was lack of adequate sports nutrition knowledge before the intervention in the all the teams in the categories like carbohydrates, proteins, fats, fluids and hydration and supplements use. On an average, only half of the answers were correct in each of these categories for each of the teams. A similar study done by Andrews et al.,(2016), assessed the overall mean sports nutrition knowledge scores in the major Division-I university student-athletes. The athletes scored 56.9%, which was considered inadequate and more sports nutrition education was suggested to improve the scores of these athletes.

There was significant improvement in the sports nutrition knowledge scores in the U19 athletes in the category of knowledge about consumption of fats and knowledge about consumption of proteins. Significant improvement was also observed in the U14 team athletes in the category of knowledge about fluids and hydration and knowledge about supplements use. A study done previously by Hawk (2014), compared the sports nutrition knowledge of adolescent athletes in the intervention to the control group, unlike this study which compared the sports nutrition knowledge scores in adolescent athletes of different age groups at baseline and after the intervention. The findings of the study

showed a significantly higher nutrition knowledge score in the intervention group compared to the control group ($p=0.008$).

For the current study, no significant improvement was observed in the category of knowledge about carbohydrate consumption in any of the teams after the intervention. There was also no significant improvement in the sports nutrition knowledge scores for the teams U15 and U13 in any of the categories after the intervention. A possible explanation for this lack of improvement in sports nutrition knowledge in these teams could be that the nutrition intervention did not include proper sports nutrition lessons in each of the categories designed for improvement of sports nutrition knowledge in the younger athletes like the teams U15 and U13. The nutrition education lessons perhaps were more informative for the older athletes like team U19, the result of which was a significant improvement in their sports nutrition knowledge scores in two categories after the intervention.

**Healthy Heart Score**

The average weekly consumption of various foods before and after the intervention were assessed using the Healthy Heart Score questionnaire. The nutrition topics concentrated on the consumption of macronutrients that would help in enhancing their sports performance. The intervention did not specifically include lessons on increasing fruits, vegetable and whole grains consumption and reducing the intake the red-meat, processed-meat and sugar sweetened beverages. Topics on knowledge about consumption of these foods and the information on the consequences of improper

consumption of these foods perhaps would have brought significant changes in the average weekly intake of these foods after the intervention.

This questionnaire is mainly used to estimate CVD risk in individuals in their future years through healthy lifestyle behaviors. For this study, the Healthy Heart Score online calculator was used to generate the lifestyle behaviors of the athletes. The report generated for each of the participants were measured on a scale of 0 to 12, where values between 1 to 5 was considered healthy lifestyle behavior and 6 to 12 was considered unhealthy lifestyle behavior (Figure 1). The risk of development of CVD in the participants were assessed based on their average weekly consumption of whole grains, vegetables, fruits, red meat, sugar-sweetened beverages and their lifestyle behaviors (Table 6). Lower odds for risk of CVD development was observed in individuals who did not consume red meat or sugar-sweetened beverages and followed a healthy lifestyle behavior (OR=0.797, 95% CI: 0.587, 1.08) and OR=0.687, 95% CI: 0.431, 1.094). Higher odds for risk of CVD development was observed in individuals who did not consume whole grains, vegetables and fruits and followed a healthy lifestyle behavior (OR=1.333, 95% CI: 0.126, 14.165, OR=1.625, 95% CI: 0.130, 20.356 and OR=2.25, 95% CI: 0.212, 23.832).

Table 6

*Risk of development of CVD based on food consumption pattern and healthy lifestyle behaviors followed by the participants.*

| Average Weekly Consumption | Healthy lifestyle behaviors | | p-value | Odds of development of CVD. OR (95% CI) |
|---|---|---|---|---|
| | Followed(%) | Did not follow(%) | | |
| Whole grains | 10.0 | 90.0 | 0.650 | 1.333(0.126-14.165) |
| Vegetables | 11.0 | 88.0 | 0.578 | 1.625(0.130-20.356) |
| Fruits | 87.0 | 13.0 | 0.452 | 2.250(0.212-23.832) |
| Red Meat | 77.0 | 23.0 | 0.080 | 0.797 (0.587-1.08) |
| Sugar-sweetened Beverages | 90.7 | 9.3 | 0.024 | 0.687(0.431-1.094) |

*Note:* Servings of whole grains, vegetables, fruits, red meat and sugar-sweetened beverages are shown in Table 2. OR=Odds Ratio. $p<0.05$, significant.

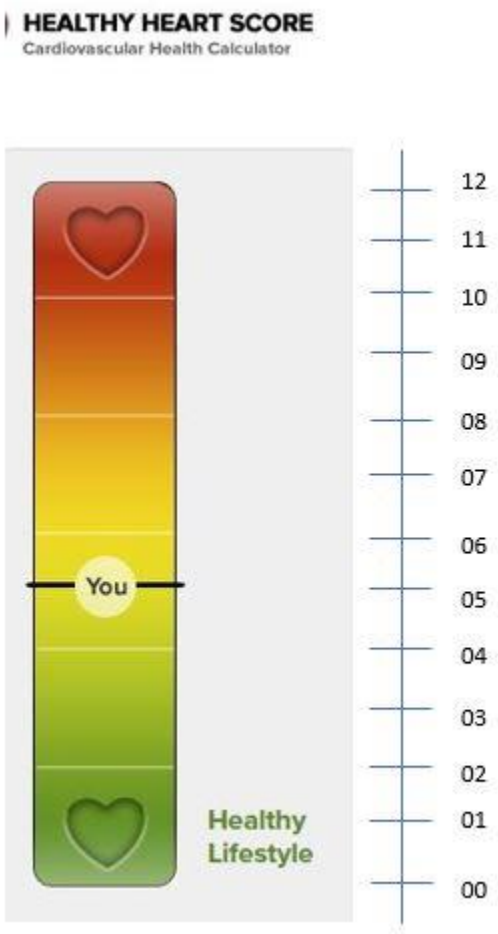


Figure 1: The HHS online calculator used for assessing the risk of development of CVD in the participants.

Literature shows that a variety of other factors associate with the risk of development of CVD and not just nutritional factors in adolescents (Celermajer & Ayer, 2006; Daniels et al., 2011b). Family history of heart diseases, obesity, alcohol use, smoking, stress and uncontrolled diabetes are a few of them (Sotos-Prieto et al., 2017). The details of these factors were not considered while the results were analyzed.

Considering these factors for research studies in the future would throw more light into the development of CVD risk and suggestion for prevention strategies would be possible.

**Future Directions**

The nutrition education intervention for this study was carried on for a period of five months. The study population were adolescent athletes, who are in their maximum learning phase of their life. In future, perhaps a longer intervention would be capable of bringing more significant improvement in the knowledge scores of adolescent athlete population. Furthermore, the age-group of the adolescent athletes varied from 12 years to 19 years. Different nutrition education materials with more details on the macronutrients, micronutrients, hydration and supplements addressing the needs of each of the age groups separately would be a more effective learning material for adolescent athletes.

The Healthy Heart Score Questionnaire applies for adults who are of the age twenty years and above. It addresses questions mainly to assess the risk of development of cardiovascular diseases. For assessing food consumption patterns in adolescent athletes, considering food logs or food-frequency questionnaires in future research studies would be more relevant, as it would give description of the different kinds of cereals, fruits, vegetables, dairy and meat and eat products consumed by individuals throughout the day.

**Conclusion**

This research study showed that the adolescent soccer athletes lacked adequate nutrition knowledge especially in the areas of macronutrient consumption. The nutrition education intervention could increase the general nutrition and the sports nutrition

knowledge of the athletes in certain categories like energy and refueling, foods to be consumed before and after training, knowledge about hydration and fluids and knowledge about supplements use. The intervention was also capable of bringing a change in the food consumption patterns in some of teams as they showed increased consumption of fruits and vegetables and decreased consumption of red meat and processed meat after the intervention.

The intervention as a whole was not effective in increasing the knowledge of these adolescent athletes as they displayed deficit of knowledge in the areas of consumption of macronutrients like carbohydrates, fats and protein in most of the teams. The athletes lacked knowledge in the area of protein consumption at baseline and the intervention was not capable of improving the knowledge in this category. A possible explanation for this could be that the questionnaires used for data collection included questions on consumption of micronutrients and the use of supplements. The drawback for the current research nutrition intervention was that it did not include topics on micronutrients and supplements use, which might have affected the nutrition knowledge scores results after the intervention.

In the future, an education intervention which includes more components on protein consumption would be necessary to improve both general and nutrition knowledge scores of the athletes. A longer intervention would perhaps positively change the concepts about sports nutrition in the athlete population and help them choose healthy foods to maximize their sports performance.

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# Appendix A: Consent Forms

**Ohio University**
**Parental Consent Form**

Title of Research: Educational Intervention on Eating Habits and Nutritional Knowledge in Youth Soccer Academy Players
Researchers: Mercedes Sotos Prieto, PhD, Samantha Buls

You are being asked for permission for your child to participate in research. For you to be able to decide whether you want your child to participate in this project, you should understand what the project is about, as well as the possible risks and benefits in order to make an informed decision. This process is known as informed consent. This form describes the purpose, procedures, possible benefits, and risks. It also explains how your child's personal information will be used and protected. Once you have read this form and your questions about the study are answered, you will be asked to sign it. This will allow your child's participation in this study. You should receive a copy of this document to take with you.

## Explanation of Study

This study is being done to investigate the level of nutritional knowledge and the dietary habits in academy soccer players. By signing below, you are agreeing to allow your child to participate in the following:

- The collection of anthropometrics including height, weight, and body fat percentage using a *Tanita* Total Body Composition Analyzer. All anthropometric measurements will be taken by a trained researcher in a semi-private area.
- The completion a pre-intervention 3-day Food Recall, Nutritional Knowledge Questionnaire and the Healthy Heart Score cardiovascular disease risk prediction tool to assess nutrition knowledge and current nutrition status. Following the assessment, your child will participate in a nutrition education program addressing the following topics:
    - Overall healthy diet
    - Game-day diet
    - Training/ practice day diet
    - Carbs, protein, fat, vitamins, minerals, veggies, and fruit in diet
    - Nutrition during travels (healthy snacks, etc.)
    - Adequate hydration
- At the end of this 2017-2018 soccer season, and after the completion of the nutrition education program, your child will complete a post-intervention 3-day food recall, Nutritional Knowledge Questionnaire and the Healthy Heart Score cardiovascular disease risk prediction tool. Anthropometrics including height, weight, and body fat percentage will be collected using a *Tanita* Total Body Composition Analyzer.
-

## Risks and Discomforts

No risks or discomforts are anticipated.

## Benefits

Individually, your child may benefit by receiving free nutrition education from trained researchers.

## Confidentiality and Records

Your child's study information will be kept confidential. Any information provided will be stored in a locked filing cabinet in a private locked office. No one outside the research team will have access to this information.

Additionally, while every effort will be made to keep your child's study-related information confidential, there may be circumstances where this information must be shared with:

* Federal agencies, for example the Office of Human Research Protections, whose responsibility is to protect human subjects in research;
* Representatives of Ohio University (OU), including the Institutional Review Board, a committee that oversees the research at OU.

## Contact Information

If you have any questions regarding this study, please Mercedes Sotos Prieto via e-mail at sotospri@ohio.edu or via phone at 740-593-9943.

If you have any questions regarding your child's rights as a research participant, please contact Dr. Chris Hayhow, Director of Research Compliance, Ohio University, (740)593-0664 or hayhow@ohio.edu.

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By signing below, you are agreeing that:

- you have read this consent form (or it has been read to you) and have been given the opportunity to ask questions and have them answered;
- you have been informed of potential risks to your child and they have been explained to your satisfaction;
- you understand Ohio University has no funds set aside for any injuries your child might receive as a result of participating in this study;
- you are 18 years of age or older;
- your child's participation in this research is completely voluntary;
- your child may leave the study at any time; if your child decides to stop participating in the study, there will be no penalty to your child and he/she will not lose any benefits to which he/she is otherwise entitled.
-

Parent Signature_____ Date_____

Printed Name_____

Child's Name_____

**Ohio University**
**Minor Assent Form**

Title of Research: Educational Intervention on Eating Habits and Nutritional Knowledge in Youth Soccer Academy Players
Researchers: Mercedes Sotos Prieto, PhD, Samantha Buls

You are being asked to participate in research. For you to be able to decide whether you want to participate in this project, you should understand what the project is about, as well as the possible risks and benefits in order to make an informed decision. This form describes the purpose, procedures, possible benefits, and risks. It also explains how your personal information will be used and protected. Once you have read this form and your questions about the study are answered, you will be asked to sign it. This will allow your participation in this study. You should receive a copy of this document to take with you.

## Explanation of Study

This study is being done to investigate the level of nutritional knowledge and the dietary habits in academy soccer players. By signing below, you are agreeing to participate in the following:

- The collection of anthropometrics including height, weight, and body fat percentage using a *Tanita* Total Body Composition Analyzer. All anthropometric measurements will be taken by a trained researcher in a semi-private area.
- The completion a pre-intervention 3-day Food Recall, Nutritional Knowledge Questionnaire and the Healthy Heart Score cardiovascular disease risk prediction tool to assess nutrition knowledge and current nutrition status. Following the assessment, you will participate in a nutrition education program addressing the following topics:
    - Overall healthy diet
    - Game-day diet
    - Training/ practice day diet
    - Recovery day diet
    - Nutrition during travels (healthy snacks, etc.)
    - Adequate hydration
- At the end of this 2017-2018 soccer season, and after the completion of the nutrition education program, you will complete a post-intervention 3-day food recall, Nutritional Knowledge Questionnaire and the Healthy Heart Score cardiovascular disease risk prediction tool.

### Risks and Discomforts

No risks or discomforts are anticipated.

### Benefits

You may benefit by receiving free nutrition education from trained researchers.

### Confidentiality

All information will be kept confidential. Any information provided will be stored in a locked filing cabinet in a private locked office. No one outside the research team will have access to this information.

## Contact Information

If you have any questions regarding this study, please Mercedes Sotos Prieto via e-mail at sotospri@ohio.edu or via phone at 740-593-9943.

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By signing below, you are agreeing that:

- you have read this assent form (or it has been read to you) and have been given the opportunity to ask questions and have them answered;
- you have been informed of potential risks to your child and they have been explained to your satisfaction;
- your participation in this research is completely voluntary
- you may leave the study at any time

Signature_____ Date_____

Printed Name_____

Version Date: ***[insert 09/23/17]***

**Ohio University**
**Adult Consent Form With Signature**

Title of Research: Educational Intervention on Eating Habits and Nutritional Knowledge in Youth Soccer Academy Players
Researchers: Mercedes Sotos Prieto, PhD

You are being asked to participate in research. For you to be able to decide whether you want to participate in this project, you should understand what the project is about, as well as the possible risks and benefits in order to make an informed decision. This process is known as informed consent. This form describes the purpose, procedures, possible benefits, and risks. It also explains how your personal information will be used and protected. Once you have read this form and your questions about the study are answered, you will be asked to sign it. This will allow your participation in this study. You should receive a copy of this document to take with you.

## Explanation of Study

This study is being done to investigate the level of nutritional knowledge and the dietary habits in academy soccer players. By signing below, you are agreeing to participate in the following:

- The collection of anthropometrics including height, weight, and body fat percentage using a *Tanita* Total Body Composition Analyzer. All anthropometric measurements will be taken by a trained researcher in a semi-private area.
- The completion a pre-intervention 3-day Food Recall, Nutritional Knowledge Questionnaire and the Healthy Heart Score cardiovascular disease risk prediction tool to assess nutrition knowledge and current nutrition status. Following the assessment, you will participate in a nutrition education program addressing the following topics:
    - Overall healthy diet
    - Game-day diet
    - Training/ practice day diet
    - Carbs, protein, fat, vitamins, minerals, veggies, and fruit in diet
    - Nutrition during travels (healthy snacks, etc.)
    - Adequate hydration
- At the end of this 2017-2018 soccer season, and after the completion of the nutrition education program, you will complete a post-intervention 3-day food recall, Nutritional Knowledge Questionnaire and the Healthy Heart Score cardiovascular disease risk prediction tool. Anthropometrics including height, weight, and body fat percentage will be collected using a *Tanita* Total Body Composition Analyzer.

### Risks and Discomforts

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### Benefits

Participants may benefit from receiving free nutrition education from trained researchers.

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Signature_____ Date_____

Printed Name_____

## Appendix B

**Carbohydrate handout**

# Carbohydrates

Three main forms of carbohydrates

1. Sugars 2. Starches 3. Fiber

## Reduce the carbs in your diet

Reduce the general consumption of carbs and cut as much as possible the simple carbohydrates and sugar added products. Increase the healthy fats and proteins in your diet.

## Choosing Whole Grains

Choose whole grains over refined grains because they are a better source of fiber and contain essential nutrients

## What are Carbohydrates?

Carbohydrates are macronutrient that the body needs. They are an important part of a healthy diet. Carbohydrates are digested and broken down into glucose (blood sugar) and used as energy in the body or stored in the liver and muscles to be used later.

**Restrict your carbs consumption at the beginning of the week and increase them 48 hours prior to the game**

## Types of Carbohydrates

### Simple Carbohydrates

Simple carbohydrates are quickly digested and they raise blood glucose levels rapidly. Although they are found naturally in fruits, vegetables, and milk, the ones that have a spike effect in the blood sugar are those in refined breads, white rice, potatoes, chips, added sugar products, candy, desserts, and soda.

### Complex Carbohydrates

Complex carbohydrates are digested at a slower rate than simple carbohydrates. They give the body energy over a longer period of time because they are packed with fiber. Food sources include: whole grain breds and cereals, brown rice, and legumes.

Make Half Your Grains Whole!

## Carbohydrates to totally avoid in your Diet

Cookies

White bread

Fried potatoes

Chips

Sweetened cereals

Soda and lemonade

Candy

Cakes and donuts

White rice and pasta

Artificial

Smoothies

## Complex Carbohydrates to Include in your Diet

Whole Grain Bread

Whole Grain Pasta

Whole Grain Crackers

Oatmeal

Brown Rice

## Simple Carbohydrates to Include in your Diet

Fruits

Vegetables

**Protein handout.**

# PROTEIN

## What is Protein?

Protein is a macronutrient that is one of the three main building blocks of food. Protein plays a very important role in the body by building, repairing, and protecting your muscles and tissues.

**Protein Builds:** Throughout life, you need protein to build cells, tissues, and muscles. Protein is especially important during growth spurts, puberty, and high levels of physical activity.

**Protein Repairs:** Protein helps your body heal cuts and wounds as well as helping your muscles recover from exercise.

**Protein Protects:** Protein helps your immune system build antibodies that protect you from disease.

### CHOOSE HEALTHY PROTEIN

- Choose ground beef or pork labeled at least 85% lean.
- Choose organic, grass fed beef, pork, lamb, chicken or turkey if possible.
- Broil, grill, roast, poach, boil, grill or bake meats instead of frying if possible.
- The EGG contains high quality proteins. It is good to eat in periods of demanding training sessions.
- Add beans in your diet together with vegetables.
- Add Tofu or Quinoa in your salads to eat vegetal proteins in your diet
- The milk can be a good source of proteins after a game or training to help the body recover from the effort.
- Choose lunchmeats, such as turkey, ham and roast beef from the deli station and avoid pre-packaged deli meats.
- Add natural and/or plain whole milk yogurt (no sugars added) in your breakfast or dessert.

## Does Eating Extra Protein Make You Stronger?

Athletes need more protein consumption than non-athlete people. However, if you are meeting your protein needs, eating extra protein will not directly increase the size or strength of your muscles. A combination of exercise and protein in the diet allows your muscles to repair themselves and grow stronger. Although protein is very important, excess amounts of protein in the body ends up being stored as fat in the tissues.

## Vary Your Protein

| Beans & Legumes (1 cup cooked) | Nuts & Seeds (1 ounce) | Animal Protein (3 ounces) | Eggs & Dairy |
|---|---|---|---|
|  Lentils 18 g |  Hemp Seeds 10 g |  Chicken Breast 26 g |  1 Large Egg 6 g |
|  Edamame 17 g |  Pumpkin Seeds 9g |  Sirloin Steak 23 g |  1 Cup Greek Yogurt 22 g |
|  Black Beans 15 g |  Almonds 6g |  Salmon 17 g |  1 oz. Cheese 7g |

## Southwest Black Bean Burgers

Recipe from www.runninginaskirt.com

- 2- 15 oz. cans black beans (rinsed)
- ¼ cup chopped cilantro
- ½ cup diced onion
- ¼ cup diced red pepper
- 1 teaspoon minced garlic
- 1 egg
- ½ cup panko bread crumbs
- ¼ teaspoon cayenne or chipotle powder
- ½ teaspoon cumin
- Salt and pepper to taste

**Instructions:** Mash half of the beans in a bowl until the texture of a paste. Add in the other half of whole beans, cilantro, onion, red pepper, garlic, panko, cayenne, cumin, salt, pepper, and any additional spices. Stir the mixture well and add the beaten egg. Mix until well combined. Form the mixture into 6 patties about ½ inch thick. Coat a skillet with cooking spray on medium heat. Add burgers to pan and cook for 5 minutes on each side. Top with guacamole and serve on your favorite whole grain buns or bed of lettuce.

**Fat handout**

# The Fat in our diet

## Choosing Healthy Fats

Fat is an essential macronutrient that allows your body to have energy and to absorb nutrients. It is important to understand which fats are healthiest and which ones you should avoid so you can make the best choices.

The fat should be an essential and predominant component of our diet.

## Fats in our diet

**Monounsaturated and Polyunsaturated Fats:** These are healthy fats that help to lower your cholesterol. They tend to be liquid at room temperature and provide many health benefits.

**Omega-3 fatty acids:** These fats are found in some fish, nuts, and oils and help your neural and cardiovascular system to run more efficiently.

**Saturated fats:** This fat is found in the meat, dairy and butter.

### Monounsaturated and Polyunsaturated fats

Extra Virgin Olive oil
Avocado
Nuts
Nut butters
Seeds
Walnuts
Fatty fish like salmon
Walnuts
Flaxseed

### Saturated Fat

Meat (pork, beef, lamb)
Poultry with skin
Coconut Oil
Butter
Dairy (milk, cheese, yogurt)

## Which Fats do we need to avoid?

**Trans fats:** These unhealthy fats are oils that have been modified for a longer shelf. When **hydrogenated** or **partially hydrogenated oil** is listed as an ingredient, the food contains trans fat. These fats should be totally avoided.


### Sources of Trans Fats

Stick Margarine/Shortening
Packaged snack foods
Fried food
Fast food
Commercially baked pastries
Cake mix/Pancake Mix
Processed foods
Ice Cream

# Meal Planning Tips

The following tips can help you choose healthy fats over unhealthy fats.

- Cook or bake with heart healthy oils like extra virgin olive oil.
- Enjoy a serving of nuts (1/4 cup) as a healthy and easy snack.
- Add ground flaxseed and berries to your yogurt or smoothies for a quick breakfast.
- Have a slice of avocado on your sandwich.
- Choose grass fed or pastured raised dairy (milk, cheese, butter) and eggs.
- Choose grass fed or pastured raised meat (Beef, pork, lamb).
- Try to eat fatty fish at least three times per week.
- Add natural peanut butter (no sugar added), extra virgin olive oil or eggs in your breakfast
- Avoid trans fats in cookies, donuts, cakes, fast food, muffins, croissants, biscuits etc.

**Hydration handout.**

# Hydration

## Important for all athletes

### What is hydration?

Hydration is giving your body the water that it needs in order to function. A lack of water will lead to dehydration and hindered performance. The body loses water through breathing, sweating, and digestion; therefore it is important to drink water all throughout the day.

## Why is water important?

Water makes up 60% of your body weight. Your cells, organs, and tissues all need water in order to function properly. Water regulates body temperature, lubricates joins and tissues, helps eliminate waste products, transports nutrients to cells, maintains blood circulation, protects organs, and helps with digestion.

| Urine Color | Meaning |
|---|---|
| Clear | Good hydration, but you might be drinking too much |
| Pale Yellow | Good hydration. Keep it up! |
| | |
| Bright Yellow | Mild or moderate dehydration |
| Orange, Amber | Moderate or severe dehyration |
| Tea-Colored | Severe dehydration |
| Try to be above the red line! | |

## Tips For Staying Hydrated

1. Drink water before you are thirsty
2. Always carry a water bottle
3. Add lemon or other fruits to your water to add flavor
4. Drink water when you wake up, at each meal, and between meals

When should you hydrate?
Before, During, and After Exercise!


Rethink Your Drink
1 Teaspoon of sugar
Zero Sugar Content

**Smart-snacking handout**

# Smart Snacking

**Fueling the body to improve performance**

## Healthy Snacking

For All Day Energy

Snacking throughout the day is important for athletes especially before, during, and after exercise. Unhealthy food options filled with sugar, saturated fat, sodium, and calories should not be selected because they lack key nutrients. Healthy snacks will give the body the energy it needs for proper growth development, overall health, and enhanced performance. Trying to balance school, soccer practice, and extra curricular activities can be difficult and extremely time consuming. Knowing what snacks to consume can help prevent unhealthy choices.

## Planning

Scheduling meals and snacks throughout the day and having a set routine can help eliminate excess snacking. Planning ahead can save time when it comes too healthy eating. Try to keep the fridge and pantry filled with nutritious snacks to prevent selecting unhealthy food and beverages.

# Healthy Snack Ideas for Busy Athletes

Stick with unprocessed snacks

- Banana, Apple, or Celery with Nut Butter (peanut, almond, cashew)
- Mixed nuts and seeds
- Fruit or Raw Vegetables
- Handful of Nuts and Seeds
- Cottage Cheese with Melon/Tomato
- Plain Greek Yogurt with Fruit
- Low Sugar Energy Bars
- Hard Boiled eggs
- Seasoned Sunflower Seeds
- Beef Jerky

Unhealthy snack options

Stay away from empty calories such as greasy friend, processed, and sugar filled food and beverages because they provide very little nutritional content.

- Candy
- Cookies
- Cake
- Doughnuts
- Potato Chips
- Pop tarts
- Energy Drinks
- Cola
- Lemonade
- Sweet Tea

**Game Day Diet handout**

# Game Day Diet

## What to eat before and after a game?

Before intense exercise, be sure to fuel your body with a balanced diet that includes fat, protein and whole grain carbs. Avoid foods that can create flatulence or room in the stomach like salad, beans or legumes. Allow plenty of time for your food to digest and be sure to refuel immediately after exercise.

**Healthy Choices**

| | |
|---|---|
| Carbohydrates → | Fruits, Vegetables, Whole Grains |
| Healthy Fats → | Nuts, Seeds, Olive Oil, Avocados, Salmon |
| Lean Protein → | Meat, Fish, Eggs, Yogurt, Milk |

**After training how long should you wait before you eat?**

A. 2-3 hours

B. 0-30 min

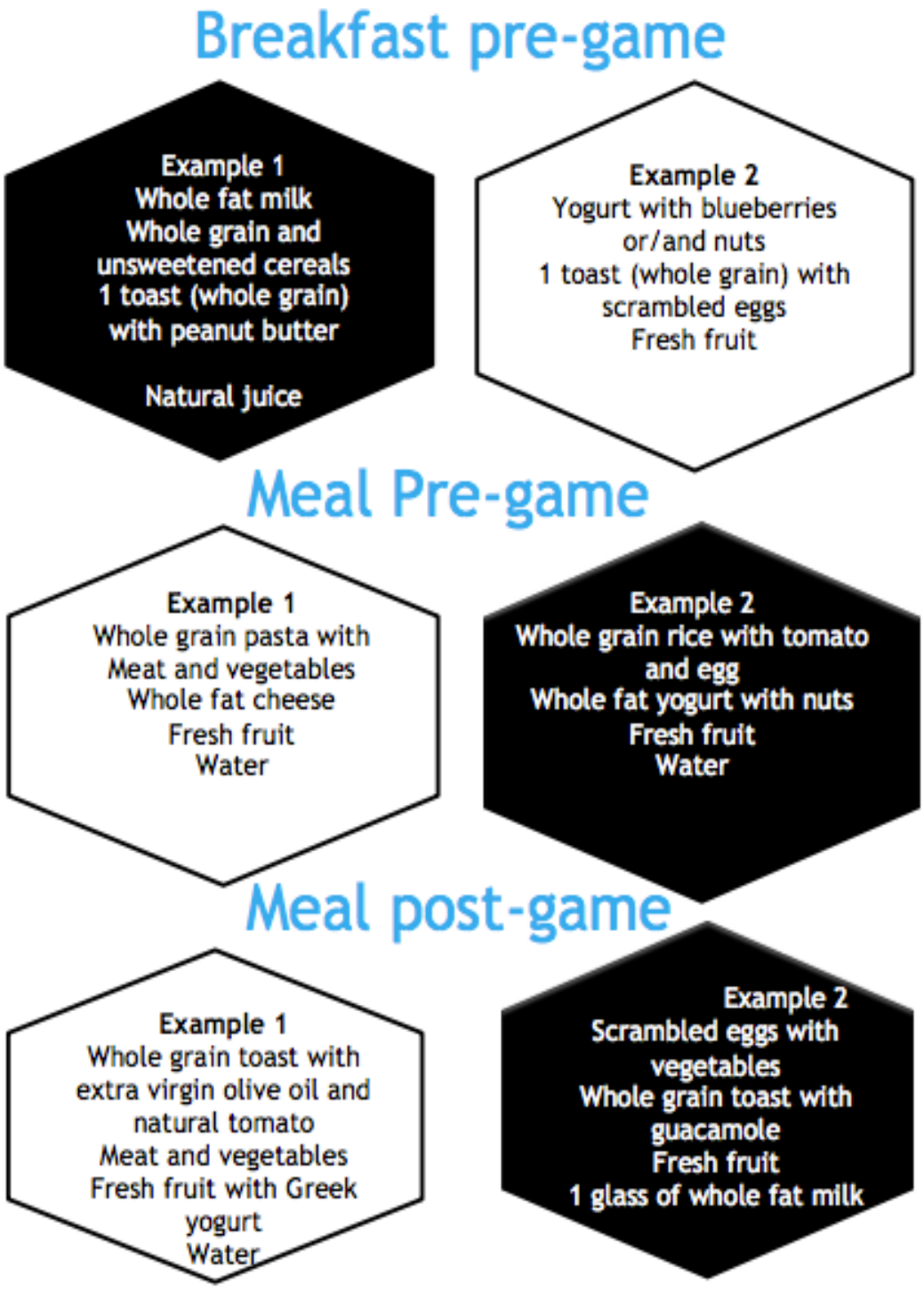
C. 1-2 hours

Answer: The correct answer is B. Soccer players should eat a balanced meal (fat, protein and whole grain carbs) within thirty minutes of exercise. Also, they should drink water.

## Dinner pre-game

**Example 1**
**Whole grain rice with vegetables and olives**
**Fish and whole fat cheese**
**1 serving of fruit**
**Water**

**Example 2**
**Meat and vegetables**
**Whole grain bread with guacamole**
**1 whole fat yogurt**
**Water**


Breakfast pre-game
Example 1
Whole fat milk
Whole grain and unsweetened cereals
1 toast (whole grain) with peanut butter
Natural juice
Example 2
Yogurt with blueberries or/and nuts
1 toast (whole grain) with scrambled eggs
Fresh fruit
Meal Pre-game
Example 1
Whole grain pasta with Meat and vegetables
Whole fat cheese
Fresh fruit
Water
Example 2
Whole grain rice with tomato and egg
Whole fat yogurt with nuts
Fresh fruit
Water
Meal post-game
Example 1
Whole grain toast with extra virgin olive oil and natural tomato
Meat and vegetables
Fresh fruit with Greek yogurt
Water
Example 2
Scrambled eggs with vegetables
Whole grain toast with guacamole
Fresh fruit
1 glass of whole fat milk

# Appendix C: Nutrition Workshops

## Nutrition Workshop Powerpoint Slides

### Macronutrient Breakdown


17% total calories from protein

50% total calories from carbohydrate

33% total calories from fat

11% total calories from saturated fat

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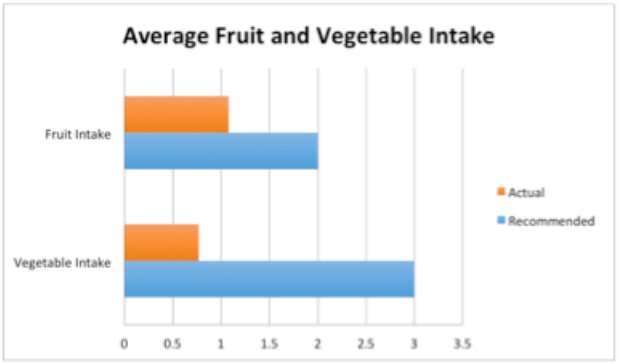
### Average Fruit and Vegetable Intake




**Vegetables:**
0.77 cups/day

**Fruit:**
1.08 cups/day

USDA MyPlate recommends 3 cups of vegetables per day and 2 cups of fruit per day as part of a healthy diet.

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## Appendix D: Nutrition Lessons.

### Jeopardy Questions

| Carbohydrates | Protein | Fats | Hydration | General |
|---|---|---|---|---|
| $100<br>Name the two types of carbohydrates. | $100<br>What two MyPlate food groups could beans belong in? | $100<br>Which type of fat is a healthy fat? | $100<br>Dehydration can hinder performance? | $100<br>Name five MyPlate food groups |
| $200<br>"Multigrain" breads are always whole grain. True or False? | $200<br>Eating extra protein and taking protein supplements will make your muscles bigger | $200<br>Which snack food contains a healthy fat? | $200<br>How many teaspoons of sugar are in a 20-ounce soda? | $200<br>Which nutrient helps build strong bones? |
| $300<br>Fruits, vegetables, and whole grains are important because they supply our body with _____, which helps with heart health and digestion. | $300<br>Which of the following is a rich source of iron? | $300<br>Fatty fish like salmon or halibut is a good source of which fatty acid? | $300<br>This beverage provides no calories and is the best way to stay hydrated | 300<br>To get all the vitamins and minerals that your body needs it is important to take supplements? |
| $400<br><br>Which food does not contain fiber? | $400<br>Are eggs high in cholesterol? What is cholesterol? | $400<br>If snack food is fat-free of low-fat, what might have been added to it to increase flavor? | $400<br>Sports drinks (Gatorade) contain a lot of sugar? | $400<br>Name the three nutrients that supply our body with energy? |

| | | | | |
|---|---|---|---|---|
| $500<br>Carbohydrates are digested and broken down into ____ and used as energy in the body or stored in the liver and muscles to be used later | $500<br>Does protein build muscle? Is it stored as fat? | $500<br>The 2015 Dietary Guidelines for Americans recommends that we limit _____ and _____ in our diet. | $500<br>When is it appropriate to consume a sports drink? | $500<br>What does a calorie measure? |
| $600<br>What is glycemic index? | $600<br>Which of the following food options are good to consume after exercise? | $600 | $600<br>What is the difference between the sugar found in soda and the sugar found in 100% fruit juice or milk? | $600<br>After training how long should you wait before consuming food? |

**1. Name the five different food groups**
Protein, dairy, fruits, vegetables, grains

**2. After training how long should you wait before consuming food?**
Players should consume a protein and carbohydrate snack within thirty minutes of exercise and then again 1-2 hours after exercise to rebuild glycogen stores in muscles

**3. Dehydration can hinder performance?**
True

**4. Sports drinks (Gatorade) contain a lot of sugar?**
True

**5. When is it appropriate to consume a sports drink?**
When vigorously exercising for 60 minutes or more, sports drinks are recommended to help replenish electrolytes.

**6. What is glycemic index?**
Glycemic index is a number that will allow you to classify foods according to the effect they have on blood glucose (sugar). Foods with a high glycemic index (simple carbohydrates) will raise blood sugar levels more rapidly than foods with a low glycemic index (complex carbohydrates).

**7. Which of the following is a rich source of iron?**
   - **a. Meat**
   - b. White bread
   - c. Apples

**8. Which of the following is a healthy fat?**

a. Olive oil
b. Avocados
c. Nuts
**d. All the above**

**9. Which type of fat is a healthy fat?**

A. Trans fat
B. Saturated Fat
**C. Unsaturated fat**

**10. What does a calorie measure?**
A calorie measures energy

**11. Fruits, vegetables, and whole grains are important because they supply our body with _____, which helps with heart health and digestion.**
Fiber

**12. Name the two types of carbohydrates.**
Simple and Complex

**13. Name the three nutrients that supply our body with energy?**
Carbohydrates, Protein, and Fat

**14. Processed/packaged foods tend to be high in ...**
Salt/sodium

**15. This beverage provides no calories and is the best way to stay hydrated.**
Water

**16. What are healthy carbohydrates?**

Complex

**17. "Multigrain" breads are always whole-grain. True or False?**
False. Multigrain only means that more than one grain is present and the primary ingredient can still be refined wheat flour.

**18. Fatty fish like salmon or halibut is a good source of which fatty acid?**
Omega-3s

**19. On the Nutrition Facts Label, the Percent Daily Values are based on a person consuming how many total calories per day?**
2000 calories

**20. Which nutrient helps build strong bones?**
Calcium

**21. What two MyPlate food groups could beans belong in?**
Proteins and vegetables

**22. How many teaspoons of sugar are in a 20-ounce soda?**
Approximately 17 teaspoons

**23. The 2015 Dietary Guidelines for Americans recommends that we limit _____ and _____ in our diet.**

Saturated fat and added sugars

**24. If snack food is fat-free of low-fat, what might have been added to it to increase flavor?**
Sugar is used in place of fat

**25. Which snack food contains a healthy fat?**
a. Chips
**b. Almonds**
c. Cookies
d. Chocolate

**26. What is the difference between the sugar found in soda and the sugar found in 100% fruit juice or milk?**
Soda contains added sugar, while 100% fruit juice and milk contain natural sugar in the form of fructose (fruit sugar) and lactose (milk sugar)

**27. Name two sources of protein.**
Meat, nuts, seeds, peanut butter, soy etc.

**28. What's healthier white rice or brown rice?**
Brown rice

**29. To get all the vitamins and minerals that your body needs it is important to take supplements?**
False

**30. When should you drink water?**
Before, during, and after exercise

**31. Eating extra protein and taking protein supplements will make your muscles bigger.**
False

**32. Which of the following are starchy vegetables? Choose all that apply**
a. Spinach
**b. Corn**
**c. Peas**
d. Carrots
e. Cauliflower
**f. Potatoes**

**33. Which food does not contain fiber?**
a. Broccoli
b. Oatmeal
**c. Steak**
d. Baked beans
e. An apple

**34. Which of the following food options are good to consume after exercise?**
a. Chips and Gatorade
b. Fruit snacks
**c. Banana with peanut butter**
d. Chicken and salad

**35. Carbohydrates are digested and broken down into ____ and used as energy in the body or stored in the liver and muscles to be used later**

Glucose (sugar)

77

**EXAMPLE**

| **Time and Meal** | **Food Eaten** ***Please be as detailed as possible*** | **Where are you?** | **With who?** | **Hunger Scale 0-10** | **How you were feeling? What drove you to choose the food item when you did?** |
|---|---|---|---|---|---|
| Time of day that you are eating or drinking any food or beverage. Record the meal or list as a snack | Enter all the foods that you eat for the three days as described in the directions above. | Where you are physically during the meal or snack | Who are you consuming the meal or snack with | Describe your hunger: 0 - not hungry or very full 10- very hungry, it is well past time to eat | Use descriptive words such as happy, sad, comfortable, satisfied, tired, excited, depressed, etc. to describe your feelings about eating and reasons for eating. |
| 8:15 am Breakfast | 1 packet Quaker Instant Oatmeal and 1 small apple | Home | Family | 8 | I woke up very hungry |
| 10:30 am Morning Snack | Starbucks Grande Vanilla Latte (skim milk) and Blueberry Kind Bar | Car | Alone | 5 | Bored, |

NAME: _____

**TRAINING DAY** Date:

| Time and Meal | Food Eaten *Please be as detailed as possible* | Where are you? | With who? | Hunger Scale 0-10 | How you were feeling? What drove you to choose the food item when you did? |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

NAME: _____

**GAME DAY** Date:

| Time and Meal | Food Eaten *Please be as detailed as possible* | Where are you? | With who? | Hunger Scale 0-10 | How you were feeling? What drove you to choose the food item when you did? |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

NAME: _____

**OFF DAY** Date:

| Time and Meal | Food Eaten *Please be as detailed as possible* | Where are you? | With who? | Hunger Scale 0-10 | How you were feeling? What drove you to choose the food item when you did? |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

# Appendix E: Questionnaires

## Nutrition Knowledge and Attitudes Questionnaire

**Personal Information**

Age:_____

Date of birth:_____

**Your Training Schedule**

1. Position you play:_____
2. Your academy training schedule-
   Number of hours per week: _____
   Swimming, pitch, fitness: _____
   Weights: _____
3. Details of training outside of academy-
   Number of hours per week _____
   Swimming, pitch, fitness: _____
   Weights: _____

**Your Eating and Drinking Habits**

4. How often do you eat a breakfast?
   a. Every day
   b. 2-3 days per week
   c. Less than 2 days per week
   d. Never
5. What type of lunch do you normally eat?
   a. Packed lunch from home
   b. I go home for lunch
   c. School meals
   d. I buy lunch outside school
   e. I don't have a lunch
6. What type of dinner (i.e., main meal) do you normally eat?
   a. Homemade meal
   b. Takeaway
   c. Other _____
   d. Meal from restaurant
   e. I don't have a dinner
7. Do you usually snack between your meals?
   a. Yes
   b. No
8. If yes, what type of snacks do you eat?
   a. Biscuits, cakes, sweets
   b. Crisps, popcorn, pretzels
   c. Fresh fruit
   d. Breakfast cereal, cereal bars
   e. Scone, bread, crackers
   f. Other _____
9. Check any of the following fluids that you usually drink just before, during, and after exercise:

| | Before exercise | During exercise | After exercise |
|---|---|---|---|
| Water | | | |
| Diluted squash (e.g., MidWadi) | | | |
| Soft Drinks (e.g., Coca-Cola) | | | |
| Diet drinks (e.g., Diet 7up) | | | |
| Pure fruit juice (e.g., Squeez) | | | |
| Sports drinks (please verify brand _____ | | | |
| Other (Please Specify) _____ | | | |
| None | | | |

10. Do you drink alcohol, e.g., beer, alco-pops, etc?
    a. Yes
    b. No
11. How soon before a match or training do you last eat?
    a. Within the 1 hour before
    b. More than 1 hour before

12. How soon after a match or training do you first eat?
    a. Within ½ an hour after
    b. More than ½ an hour after

13. Please check any of the following foods that are typical of the last food you eat before you exercise and the first food you eat after you exercise:

| | Before exercise | After exercise |
|---|---|---|
| Meat, fish, chicken | | |
| Beans | | |
| Cheese | | |
| Eggs | | |
| Bread, bagel, rolls, wrap | | |
| Potatoes (other than chips) | | |
| Chips | | |
| Pasta, rice | | |
| Breakfast cereal | | |
| Yogurt, milk | | |
| Scone | | |
| Biscuit | | |
| Chocolate | | |
| Fruit | | |
| Vegetables | | |
| Other (please specify) _____ | | |

14. Circle any of the following nutrition supplements that you are currently taking:
    a. Protein supplements (amino acids)
    b. Herbal products, e.g., ginseng, Echinacera
    c. Vitamins, minerals
    d. Slim Fast, Complan, Build-up
    e. Creatine
    f. Other (please specify)_____

**Your Attitudes Toward Nutrition**

How do you rate the importance of what you eat and drink to your performance?

| | Very important | Important | Of some importance | Of no importance |
|---|---|---|---|---|
| **As a part of your training program**<br>What you eat:<br>What you drink: | | | | |
| **As part of your match preparation**<br>What you eat:<br>What you drink: | | | | |

15. As a soccer player, I have
    a) Different nutritional requirements than other people my age
    b) The same nutritional requirements as other people my age
    c) Don't know

16. Circle the following statements that apply to you:
    a. I have trouble knowing what I should eat.
    b. I feel my diet meets my nutritional requirements.
    c. I try and follow a diet plan that I believe will improve my sporting performance.
    d. I feel under pressure from teammates, coaches, and others to follow a particular diet.

17. Read the following statements and check the box that best describes what you think:

| | Strongly agree | Agree | Disagree |
|---|---|---|---|
| Increasing muscle mass (bulk) is essential to improving soccer performance. | | | |
| Heavier (i.e., greater muscle mass) players are more successful than lighter players in soccer. | | | |
| I think supplements are necessary to support my training program. | | | |

**Your Knowledge of Nutrition**

18. After training or a match:
    a. You should wait 2-3 hours before eating, to allow your body to recover
    b. You should eat immediately to start refueling
    c. Don't know

19. Which of the following food choices are good ones before and after exercise? Check one box for each food choice

| | Yes | No | Don't know |
|---|---|---|---|
| Sausage and chips | | | |
| Chicken with pasta and tomato sauce | | | |
| Steak and salad | | | |
| Ham sandwich and fruit | | | |

20. You shouldn't eat carbohydrate (e.g., bread, pasta, potato) after 5 p.m. or you will get fat.
    a. True
    b. False
    c. Don't know
21. From what you eat and drink, you should get most of your energy (calories) from carbohydrates (e.g., bread, pasta, potato).
    a. True
    b. False
    c. Don't know
22. During exercise of longer than 1 hour, sports drinks are better than water (e.g., Lucozade Sport, Powerade, Gatorade).
    a. True
    b. False
    c. Don't know

23. You only need to drink when you're thirsty.
    a. True
    b. False
    c. Don't know

24. Dehydration can reduce performance.
    a. True
    b. False
    c. Don't know
25. It is better to get vitamins and minerals from supplements than from foods.
    a. True
    b. False
    c. Don't know
26. You can trust all of the claims made about supplements, e.g., "this rapidly builds muscle."
    a. True
    b. False
    c. Don't know
27. Most people can't get the vitamins and minerals they need from food, so they should take a supplement.
    a. True
    b. False
    c. Don't know
28. Muscles get most of their energy for exercise from protein.
    a. True
    b. False
    c. Don't know
29. If you eat more protein than you need, it is likely to be stored as fat.
    a. True
    b. False
    c. Don't know
30. The more protein you eat, the more muscle you can build.
    a. True
    b. False
    c. Don't know

**Nutritional Information You Have Received**

31. Have you ever looked for dietary advice for sport?
    a. Yes
    b. No
32. If yes, where did you look for this advice?
    a. Magazines, books
    b. Internet
    c. Sporting organizations
    d. Friends, teammates
    e. Family member, parents
    f. Coach, trainer
    g. Other (please specify)

    _____

33. If you have been given advice about diet, what were you told?

34. Do you think the advice you received is useful?
    a. Yes
    b. No
35. Do you feel you could benefit from advice about nutrition?
    a. Yes
    b. No
36. If yes, what areas do you need most information on?
    a. Advice on losing weight
    b. Match-day dietary advice
    c. Advice on gaining weight
    d. General healthy eating advice
    e. Suitable snacks
    f. Recipes, cooking skills
    g. Training-day dietary advice
    h. Other (please specify)

    _____

37. How would you like this information to be delivered?
    a. Information sheets
    b. Internet, Web site, links
    c. Information talks
    d. School magazine
    e. Group discussions
    f. Through coaches
    g. Other (please specify)

    _____

38. Have you any comments to add?

## General and Sports Nutrition Knowledge Questionnaire

### GeNSK- General and Sport Nutrition Knowledge Questionnaire

**The purpose of this questionnaire is to identify myths and false nutritional beliefs in order to improve nutritional education programs**

**Name/Surname:**
**Gender: Male ☐ Female ☐**
**Date of Birth:**
**Weight: Height:**
**Employment father/mother:**

**Level of education father/mother:**
**Do you practice any Sport? YES ☐ NO☐**
**Sport:**
**How many times a week:**
**Average length:** *(minutes per day)*:

**My knowledge about healthy eating are driven by: (you can choose more than one answer)**

| | | | |
|---|---|---|---|
| *Nutritional education programs at school* | ☐ | *From that I see on the TV* | ☐ |
| *Nutritional education programs in other places* | ☐ | *From the web* | ☐ |
| *From what my teachers tell me* | ☐ | *From my friends* | ☐ |
| *From what my parents tell me* | ☐ | *I have no knowledge about to healthy eating* | ☐ |
| *From what my coaches tell me* | ☐ | *Anything else……* | |

### SECTION 1: GENERAL NUTRITION

Following are the questions refer to the nutritional composition of some foods. Choose the answer with an X.

**1. The Carbohydrate content of such foods is:**

| | High | Low or absent | I do not know |
|---|---|---|---|
| *Boiled ham* | ☐ | ☐ | ☐ |
| *White bread* | ☐ | ☐ | ☐ |
| *Tomato* | ☐ | ☐ | ☐ |
| *Apple* | ☐ | ☐ | ☐ |
| *Ricotta* | ☐ | ☐ | ☐ |
| *Breackfast cereals* | ☐ | ☐ | ☐ |

**2. The Protein content of such foods is:**

| | High | Low or absent | I do not know |
|---|---|---|---|
| *Chicken meat* | ☐ | ☐ | ☐ |
| *Dried beans* | ☐ | ☐ | ☐ |
| *Pear* | ☐ | ☐ | ☐ |
| *Rice* | ☐ | ☐ | ☐ |
| *Codfish* | ☐ | ☐ | ☐ |
| *Parmesan* | ☐ | ☐ | ☐ |
| *Chocolate* | ☐ | ☐ | ☐ |

**3. The Fat content of such foods is:**

| | High | Low or absent | I do not know |
|---|---|---|---|
| *Salami* | ☐ | ☐ | ☐ |
| *Mayonnaise* | ☐ | ☐ | ☐ |
| *Dried chickpeas* | ☐ | ☐ | ☐ |
| *Pasta* | ☐ | ☐ | ☐ |
| *Butter* | ☐ | ☐ | ☐ |
| *Jam* | ☐ | ☐ | ☐ |

**4. The Fiber content of such foods is:**

| | High | Low or absent | I do not know |
|---|---|---|---|
| *Honey* | ☐ | ☐ | ☐ |
| *Brown bread* | ☐ | ☐ | ☐ |
| *Chicken broth* | ☐ | ☐ | ☐ |
| *Potatoes* | ☐ | ☐ | ☐ |
| *Pear* | ☐ | ☐ | ☐ |
| *White bread* | ☐ | ☐ | ☐ |

**5. The Salt content of such foods is:**

| | High | Low or absent | I do not know |
|---|---|---|---|
| *White bread* | ☐ | ☐ | ☐ |
| *Courgettes* | ☐ | ☐ | ☐ |
| *Canned peas* | ☐ | ☐ | ☐ |
| *Canned tuna* | ☐ | ☐ | ☐ |
| *Frozen peas* | ☐ | ☐ | ☐ |

**6. The Calcium content of such food is:**

| | High | Low or absent | I do not know |
|---|---|---|---|
| *Turkey* | ☐ | ☐ | ☐ |
| *Peas* | ☐ | ☐ | ☐ |
| *Walnut* | ☐ | ☐ | ☐ |
| *Olive oil* | ☐ | ☐ | ☐ |
| *Brown bread* | ☐ | ☐ | ☐ |

**7. The Iron content of such foods is:**

| | High | Low or absent | I do not know |
|---|---|---|---|
| *Calf meat* | ☐ | ☐ | ☐ |
| *Apple* | ☐ | ☐ | ☐ |
| *Honey* | ☐ | ☐ | ☐ |
| *Sea bass* | ☐ | ☐ | ☐ |

**8. The Potassium content of such foods is:**

| | High | Low or absent | I do not know |
|---|---|---|---|
| *Pasta* | ☐ | ☐ | ☐ |
| *Dried lentils* | ☐ | ☐ | ☐ |
| *Olive oil* | ☐ | ☐ | ☐ |
| *Honey* | ☐ | ☐ | ☐ |

**Are these claims true or false? (Only one answer is possible)**

| | | | |
|---|---|---|---|
| **9** | *The egg white is high in cholesterol* | | |
| | **TRUE** ☐ | **FALSE** ☐ | **I DO NOT KNOW** ☐ |
| **10** | *The high fat meals are ever high in cholesterol* | | |
| | **TRUE** ☐ | **FALSE** ☐ | **I DO NOT KNOW** ☐ |
| **11** | *The olive oil is high in monounsaturated fat* | | |
| | **TRUE** ☐ | **FALSE** ☐ | **I DO NOT KNOW** ☐ |
| **12** | *The dried fruit is a good source of essential fatty acids* | | |
| | **TRUE** ☐ | **FALSE** ☐ | **I DO NOT KNOW** ☐ |
| **13** | *The ripened cheese are saltier than the fresh one* | | |
| | **TRUE** ☐ | **FALSE** ☐ | **I DO NOT KNOW** ☐ |
| **14** | *An high-energy food is exclusively a fat food* | | |
| | **TRUE** ☐ | **FALSE** ☐ | **I DO NOT KNOW** ☐ |
| **15** | *The brown bread is richer in fiber than the white one* | | |
| | **TRUE** ☐ | **FALSE** ☐ | **I DO NOT KNOW** ☐ |
| **16** | *Bran is the outer part of the grain kernel that is very high in fiber* | | |
| | **TRUE** ☐ | **FALSE** ☐ | **I DO NOT KNOW** ☐ |
| **17** | *Tinned pulses are saltier than the dry one* | | |
| | **TRUE** ☐ | **FALSE** ☐ | **I DO NOT KNOW** ☐ |
| **18** | *Omega-3 and omega-6 are particular fatty acids* | | |
| | **TRUE** ☐ | **FALSE** ☐ | **I DO NOT KNOW** ☐ |
| **19** | *Our body creates vitamin D from direct sunlight on our skin when we are outdoors* | | |
| | **TRUE** ☐ | **FALSE** ☐ | **I DO NOT KNOW** ☐ |
| **20** | *The iron in meat are more easily absorbed than the same mineral found in vegetables* | | |
| | **TRUE** ☐ | **FALSE** ☐ | **I DO NOT KNOW** ☐ |
| **21** | *A variety of foods contain a natural amount of sodium* | | |
| | **TRUE** ☐ | **FALSE** ☐ | **I DO NOT KNOW** ☐ |
| **22** | *Dairy are a good iron source* | | |
| | **TRUE** ☐ | **FALSE** ☐ | **I DO NOT KNOW** ☐ |
| **23** | *Carrots are a good source of vitamin A* | | |
| | **TRUE** ☐ | **FALSE** ☐ | **I DO NOT KNOW** ☐ |

**24. Glycemic index of a food: (Indicate the only correct response)**

| | |
|---|---|
| Indicates the carbohydrate content of a food | ☐ |
| Allows you to classify foods according to the effect they have on blood glucose (glycemia) | |
| Indicates the rate at which glucose increases as a result of the intake of a food containing a known amount of protein | |
| Indicates the caloric density of a food | |
| | ☐ |

**Are these claims true or false? (Only one answer is possible)**

| | | | |
|---|---|---|---|
| **25** | *An unbalanced diet is the only risk factor for the development of cardiovascular disease* | | |
| | **TRUE** ☐ | **FALSE** ☐ | **I DO NOT KNOW** ☐ |
| **26** | *In the obesity the diet play an important role, physical activity does not* | | |
| | **TRUE** ☐ | **FALSE** ☐ | **I DO NOT KNOW** ☐ |
| **27** | *A low calcium and vitamin D intake during life, associated with a lack of physical activity may increase fracture risk* | | |
| | **TRUE** ☐ | **FALSE** ☐ | **I DO NOT KNOW** ☐ |
| **28** | *The fiber helps to ease constipation* | | |
| | **TRUE** ☐ | **FALSE** ☐ | **I DO NOT KNOW** ☐ |
| **29** | *To obtain an healthy weight loss the carbohydrates must not be removed from the diet* | | |
| | **TRUE** ☐ | **FALSE** ☐ | **I DO NOT KNOW** ☐ |

## SECTION 2: SPORT NUTRITION

**Are these claims true or false? (only one answer is possible)**

| | | | |
|---|---|---|---|
| **30** | *To eat carbohydrate is no good for an athlete* | | |
| | **TRUE** ☐ | **FALSE** ☐ | **I DO NOT KNOW** ☐ |
| **31** | *B-group vitamins play an important role in muscle metabolism* | | |
| | **TRUE** ☐ | **FALSE** ☐ | **I DO NOT KNOW** ☐ |
| **32** | *Athletes must reduce the fat intake to a minimum* | | |
| | **TRUE** ☐ | **FALSE** ☐ | **I DO NOT KNOW** ☐ |
| **33** | *Consuming carbohydrates after 5pm can enhance performance* | | |
| | **TRUE** ☐ | **FALSE** ☐ | **I DO NOT KNOW** ☐ |
| **34** | *Eating more protein will make muscles bigger* | | |
| | **TRUE** ☐ | **FALSE** ☐ | **I DO NOT KNOW** ☐ |
| **35** | *For a person doing sports the diet should not contain more than 15% fat* | | |
| | **TRUE** ☐ | **FALSE** ☐ | **I DO NOT KNOW** ☐ |
| **36** | *Athletes can eat whatever they want because they have a fast metabolism* | | |
| | **TRUE** ☐ | **FALSE** ☐ | **I DO NOT KNOW** ☐ |
| **40** | *Physical exercise is the main factor improving muscular strength* | | |
| | **TRUE** ☐ | **FALSE** ☐ | **I DO NOT KNOW** ☐ |
| **41** | *An excessive dietary protein intake can lead to liver and kidney damage* | | |
| | **TRUE** ☐ | **FALSE** ☐ | **I DO NOT KNOW** ☐ |
| **42** | *At the end of a training session an athlete must have a meal* | | |
| | **TRUE** ☐ | **FALSE** ☐ | **I DO NOT KNOW** ☐ |
| **43** | *To reduce pasta, potato and bread intake during the training period is needed* | | |
| | **TRUE** ☐ | **FALSE** ☐ | **I DO NOT KNOW** ☐ |
| **44** | *A man and woman of the same age, practicing the same sport have the same energy requirements* | | |
| | **TRUE** ☐ | **FALSE** ☐ | **I DO NOT KNOW** ☐ |
| **45** | *It is advisable for an athlete eating a low glycemic index meal but rich in carbohydrates, 1-2 hours after training* | | |
| | **TRUE** ☐ | **FALSE** ☐ | **I DO NOT KNOW** ☐ |
| **46** | *Athletes practicing extensive training have double protein requirement than the general population* | | |
| | **TRUE** ☐ | **FALSE** ☐ | **I DO NOT KNOW** ☐ |
| **47** | *Drinking fluids before, during and after a competition is needed* | | |
| | **TRUE** ☐ | **FALSE** ☐ | **I DO NOT KNOW** ☐ |
| **48** | *Coaches must not allow drinking fluid during a training* | | |
| | **TRUE** ☐ | **FALSE** ☐ | **I DO NOT KNOW** ☐ |
| **50** | *The best advice for athletes is to drink when they are thirsty* | | |
| | **TRUE** ☐ | **FALSE** ☐ | **I DO NOT KNOW** ☐ |
| **51** | *For an athlete cold water quenches thirst better* | | |
| | **TRUE** ☐ | **FALSE** ☐ | **I DO NOT KNOW** ☐ |
| **52** | *During training an athlete can hold a cube of ice in the mouth to get rid of it* | | |
| | **TRUE** ☐ | **FALSE** ☐ | **I DO NOT KNOW** ☐ |

| | | | |
|---|---|---|---|
| **53** | *An important aid to the performance of an athlete is water* | | |
| | **TRUE** ☐ | **FALSE** ☐ | **I DO NOT KNOW** ☐ |
| **54** | *Drinks for sports and energy drinks are the same* | | |
| | **TRUE** ☐ | **FALSE** ☐ | **I DO NOT KNOW** ☐ |
| **55** | *Drinks for athletes contains mineral salts* | | |
| | **TRUE** ☐ | **FALSE** ☐ | **I DO NOT KNOW** ☐ |

**56. What is the most appropriate drink after two hours of workout?**

| | |
|---|---|
| *Energy drink* | ☐ |
| *Sports drink* | ☐ |
| *Fruit Juice* | ☐ |
| *Cola* | ☐ |
| *I do not know* | ☐ |

**Are these claims true or false? (Only one answer is possible)**

| | | | |
|---|---|---|---|
| **57** | Supplements can be good substitutes for the athletes' meals | | |
| | **TRUE** ☐ | **FALSE** ☐ | **I DO NOT KNOW** ☐ |
| **58** | An athlete will never be able to meet his iron needs with food, a supplement is required | | |
| | **TRUE** ☐ | **FALSE** ☐ | **I DO NOT KNOW** ☐ |
| **59** | Sports drinks contain caffeine | | |
| | **TRUE** ☐ | **FALSE** ☐ | **I DO NOT KNOW** ☐ |
| **60** | If an athlete fails to cover his protein requirements with the sole nutrition it is necessary to integrate amino acids | | |
| | **TRUE** ☐ | **FALSE** ☐ | **I DO NOT KNOW** ☐ |
| **61** | Erythropoietin is a dopant used to improve resistance | | |
| | **TRUE** ☐ | **FALSE** ☐ | **I DO NOT KNOW** ☐ |
| **62** | Food supplements are always needed, both in agonistic and non-agonistic sports | | |
| | **TRUE** ☐ | **FALSE** ☐ | **I DO NOT KNOW** ☐ |
| **63** | Since dietary supplements are harmless, you do not need the specialist's advice | | |
| | **TRUE** ☐ | **FALSE** ☐ | **I DO NOT KNOW** ☐ |
| **64** | The vitamin C supplement is always needed for those who practice strength sports | | |
| | **TRUE** ☐ | **FALSE** ☐ | **I DO NOT KNOW** ☐ |
| **65** | Deep eating is the best way to make mass and toning for a sportsman | | |
| | **TRUE** ☐ | **FALSE** ☐ | **I DO NOT KNOW** ☐ |
| **66** | Eggs and egg whites contain protein, other foods are not. This is the basis of a sportsman's diet | | |
| | **TRUE** ☐ | **FALSE** ☐ | **I DO NOT KNOW** ☐ |
| **67** | Light products can be consumed at will by an athlete | | |
| | **TRUE** ☐ | **FALSE** ☐ | **I DO NOT KNOW** ☐ |

## Healthy Heart Score Questionnaire


ID number:

**Do you smoke cigarettes?**

a. Current smoker
b. Former smoker
c. Non-smoker

**How many hours per day do you usually sleep?**

**During the past year, what was your average time per week spent doing each of these activities?**

| | 0 | 1-4 min | 5-19 min | 20-59 min | 1 h | 1-1.5h | 2-3h | 4-6h | 7-10h | +11h |
|---|---|---|---|---|---|---|---|---|---|---|
| Slow walking (slower than 3 miles per hour) | | | | | | | | | | |
| Brisk walking (3 mph or faster) or hiking outdoors | | | | | | | | | | |
| Jogging (slower than 10 min/mile) | | | | | | | | | | |
| Running (10 min/mile or faster) | | | | | | | | | | |
| Bicycling (including stationary machine) | | | | | | | | | | |
| Lap swimming | | | | | | | | | | |
| Tennis | | | | | | | | | | |
| Calisthenics/Aerobics/Aerobic Dance/Rowing Machine | | | | | | | | | | |
| Squash or racquet Ball | | | | | | | | | | |
| Yoga | | | | | | | | | | |
| Strength training | | | | | | | | | | |
| Other moderate and vigorous intensity activity | | | | | | | | | | |
| Sitting at home while watching TV | | | | | | | | | | |
| Sitting while using computer/Ipads/tablet/playing video games | | | | | | | | | | |
| Sitting on the car/bus | | | | | | | | | | |

**During the past year, how often, on average, do you eat a serving of fruit? (Do not count fruit juice. One serving is, for example, 1 small apple, ½ cup strawberries or 10 grapes)**

| | | | |
|---|---|---|---|
| Never | 1-3 per month | 1 per week | 2-4 per week |
| 5-6 per week | 1 per day | 2-per day | + 4 per day |

**During the past year, how often, on average, do you eat a serving of vegetables? (Do not count potatoes (baked or French-fried). One serving is, for example, ½ cup string beans or cooked broccoli or 1 cup lettuce)**

| | | | |
|---|---|---|---|
| Never | 1-3 per month | 1 per week | 2-4 per week |
| 5-6 per week | 1 per day | 2-per day | + 4 per day |

**Typically, how often do you eat a serving of nuts or nut butter? One serving = 1 ounce of nuts (i.e. peanuts, almonds, pistachios, walnuts, etc.) or 1 tablespoon of nut butter**

| | | | |
|---|---|---|---|
| Never | 1-3 per month | 1 per week | 2-4 per week |
| 5-6 per week | 1 per day | 2-per day | + 4 per day |

**During the past year, how often, on average, do you eat these grain foods?**

| ss | Never | 1-3 per month | 1 per week | 2-4 per week | 5-6 per week | 1 per day | 2 per day | +4 per day |
|---|---|---|---|---|---|---|---|---|
| High fiber cold cereal (≥8 grams of fiber)<br>Serving size = 1 cup | | | | | | | | |
| Low fiber cold cereal (≤ 1 gram of fiber)<br>Serving size = 1 cup | | | | | | | | |
| Other cold cereal<br>Serving size: 1 cup | | | | | | | | |
| Oatmeal/oat bran<br>Serving size = 1 cup, cooked | | | | | | | | |
| Other cooked breakfast cereal (cream of wheat, corn grits, etc)<br>Serving size: 1 cup | | | | | | | | |
| Whole wheat, oatmeal, or other whole grain bread<br>Serving size = 1 slice | | | | | | | | |
| Rye or pumpernickel bread<br>Serving size = 1 slice | | | | | | | | |
| White bread<br>Serving size = 1 slice | | | | | | | | |
| Pasta<br>Serving size = 1 slice | | | | | | | | |
| Bagels, English muffins, rolls<br>Serving size= 1 whole roll | | | | | | | | |
| Pancakes<br>Serving size = 2 medium pancakes | | | | | | | | |
| Crackers (triscuits, saltines, ritz, etc)<br>Serving size = 6 crackers | | | | | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Popcorn, low-fat or fat free Serving size = 3 cups | | | | | | | | |
| Brown rice Serving size = 1 cup, cooked | | | | | | | | |
| Added bran Serving size = 1 tablespoon | | | | | | | | |
| Other grains (barley, quinoa, etc) Serving size = 1 cup, cooked | | | | | | | | |
| Added germ Serving size = 1 tablespoon | | | | | | | | |

**During the past year, how often, on average, do you eat a serving of red meat? Serving size = 1 hamburger patty, Beef, pork, or lamb as a main dish, e.g. steak, roast, ham (4-6 oz)**

| | | | |
|---|---|---|---|
| Never | 1-3 per month | 1 per week | 2-4 per week |
| 5-6 per week | 1 per day | 2-per day | + 4 per day |

**During the past year, how often, on average, do you eat a serving of processed meat? Serving size = 1 slice or piece of bologna, salami, sausage, 2 strips of bacon, or 1 hot dog**

| | | | |
|---|---|---|---|
| Never | 1-3 per month | 1 per week | 2-4 per week |
| 5-6 per week | 1 per day | 2-per day | + 4 per day |

**During the past year, how often, on average, do you consume a serving of alcohol? One drink = 4 ounces of wine, 12 ounces of beer/malt beverage, or 1.5 ounces of spirit**

| | | | |
|---|---|---|---|
| Never | 1-3 per month | 1 per week | 2-4 per week |
| 5-6 per week | 1 per day | 2-per day | + 4 per day |

**During the past year, how often, on average, do you consume a serving of sugary drinks? One serving = 1 glass, bottle or can of soda with sugar (e.g. Coke, Pepsi, Sprite, etc.) or other sugar-sweetened beverage.**

| | | | |
|---|---|---|---|
| Never | 1-3 per month | 1 per week | 2-4 per week |
| 5-6 per week | 1 per day | 2-per day | + 4 per day |


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