

CALIFORNIA STATE UNIVERSITY, NORTHRIDGE

DEVELOPMENT OF A SPORT NUTRITION CURRICULUM TO INCREASE
NUTRITION KNOWLEDGE AMONG HIGH SCHOOL ATHLETES IN LOS
ANGELES, CA.

A graduate project submitted in partial fulfillment of the requirements
for the degree of Master of Science in
Family and Consumer Sciences

by

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May 2016

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DEDICATION

This graduate project is dedicated to:

God for the strength and blessings he has given me.

My parents, Norik and Karmen Sarkisian, they have supported me in reaching my goals with encouragement and unconditional love throughout my life.

My two older brothers, Narbe and Ara Sarkisian, who have always pushed me to be the best version of myself.

All the people who have shaped me into the person I am today, my friends, the high school athletes who participated in this project, the coach, and athletic director who all were a part of making this project possible.

ACKNOWLEDGEMENT

I would like to thank the committee members, who took the time and supported my project.

Dr. Mimura, you have been a huge part of my education. You have taught me to think critically and have always supported me in order to learn as much as possible.

Dr. Froyen, you have sparked an interest in sports nutrition with your extensive knowledge and passion for sports nutrition.

To my chair, Dr. Besnilian, for guiding and pushing me to do my best at all times. You have been an incredible mentor throughout my dietetic internship and education. You have motivated, inspired me to reach my full potential, and have always guided in the right path.

To Dr. Sussman, who has been amazing support throughout this project and my education.

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ABSTRACT

DEVELOPMENT OF A SPORTS NUTRITION CURRICULUM TO
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The purpose of this project was to develop and implement a sports nutrition curriculum to increase nutrition knowledge among high school athletes in Los Angeles, CA. The sports nutrition curriculum consisted of six lesson plans and PowerPoint lectures. The topics covered in the lectures included macronutrients, micronutrients, hydration, supplements, and nutrient timing. After each lecture a quiz was given to evaluate student understanding based on the lecture objectives. In addition to the quizzes, a pretest and posttest questionnaire were given and consisted of the same eight multiple-choice questions, with the exception that the posttest had additional open-ended questions.

To address the research questions a mixed methods design was used. The curriculum consisted of a 3-week workshop, meeting twice a week for 45

minutes. In order to measure the increase in nutrition knowledge, quantitative data were collected through the pre and posttest questionnaire results. Out of 37 students, 30 completed both the pre and posttest. A paired samples t-test was used to measure the increase in nutrition knowledge. Qualitative data were collected from the posttest open-ended questions and the evaluation forms completed by the experts.

Results suggests that the sports nutrition curriculum increased nutrition knowledge among the high school athletes by an average of 32 % and was shown to be statistically significant. The comments and suggestions obtained from the open-ended posttest questionnaire were all positive, where 100 % of the participants made some kind of dietary changes in their diets. The feedback and comments presented from experts were all positive. It was shown that the implementation of the sports nutrition curriculum for high school athletes increased nutrition knowledge.

CHAPTER I

INTRODUCTION

According to the Academy of Nutrition and Dietetics nutrition is a key component in every stage of the life cycle (Academy of Nutrition and Dietetics, 2016). Good nutrition plays a part in supporting health, wellness, and quality of life from the time of conception through pregnancy, birth, childhood, teenage, and the rest of one's life. During the adolescents years health can improve by incorporating healthy eating habits (California Department of Public Health, 2013). Aside from infancy, the adolescent years are a critical time where growth is still taking place, including hormonal, cognitive, and emotional changes. Nutrition plays an important role in the adolescent growth spurt, in turn; the amount and demand of calories and nutrients tend to increase. Additionally, lifestyle and food habits are developed, along with individualization, where the adolescents begin to have more control over their food choices.

Since this is an important time where growth is taking place, considerations for active adolescents needs to be considered. No matter the age, nutrition plays a role in athletic performance (Cotugna, Vickery, & McBee, 2005). In order to achieve optimal growth, development, and performance the proper amounts of macronutrients, micronutrients, and fluids are needed (Purcell, 2013). Active adolescents also need to consider the timing of their meals in order to perform well physically (Purcell, 2013). Teaching high school athletes the

importance of sports nutrition may help in preventing nutrient deficiencies, injuries, fatigue, disease, while assisting in decreased recovery time and their athletic pursuit by improved physical performance (Hoch, Goossen, & Kretschmer, 2008). One way is to develop healthy eating habits early on with appropriate nutrition information so the athletes meet the needs for their sports, overall health, development, and growth (Cotugna et al., 2005).

Statement of the Problem

Although the interest in nutrition is high, knowledge in sports nutrition among young athletes and high schools student athletes are lacking (Cotugna et al., 2005). This may be due to the nutrition guidance given by the people surrounding these athletes (Cotugna et al., 2005). Coaches, parents, and friends are the primary sources contributing nutritional information to adolescent athletes. While the correct information may occasionally be provided, nutrition education from a credible source is needed to encourage healthy eating patterns and habits (Duellman, Lukaszuk, Prawitz, & Brandenburg, 2008). According to Victoria Rosenfeld, RD, CSSD, at Princeton University (Collegiate and Professional Sports Dietitians Association, 2014), athletes may be advised by coaches to lose weight for improved performance, but the correct guidance of doing so in a safe manner is lacking. As a result, the athletes pursue diets recommended by friends, teammates, family, or search diets online. Consequences such as decreased energy levels, dysfunctional eating behaviors, and increased body fat may occur when the

athlete is given misinformed nutrition information. Correct nutrition counseling however, may change and improve body composition and improve performance (Collegiate and Professional Sports Dietitians Association, 2014).

There are many nutrition misconceptions and misinformation given to active adolescents that may affect their specific nutritional needs. Some of these include hydration, pre and post meals, protein needs, timing of meals, and food myths (Cotugna et al., 2005). Since the diet of active adolescents does differ from their less active peers, proper nutrition is critical to optimize health (Cotugna et al., 2005). Inadequate amount of calories may increase the risk of puberty delays, menstrual dysfunction, injury, and illness (Position of the American Dietetic Association, Dietitians of Canada, and the American College of Sports Medicine, 2000; Meyer, O'Connor, & Shirreffs, 2007). The common adolescent athlete nutrient deficiencies include calcium and iron (Cotugna et al., 2005). Adolescent years are also a critical time for bone development which means nutritional knowledge is necessary to prevent the risks of improper nutrition while physically active (Nichols, Rauh, Barrack, Barkai, & Pernick, 2007). A study done in 2002 on 39 high schools students in a low-income community determined if nutrition supplement education would affect nutrition supplement knowledge. Although the experimental group received five nutrition supplement lessons in a short-term study, the results showed a significant increase in sport nutrition supplement knowledge (Little, Perry, & Lucia Volpe, 2002). Education did increase nutrition

knowledge.

Sports nutrition education in high schools is lacking and according to the LAUSD athletic department specialist and director, Dawn Xitcho (personal communication, April 20, 2016), there are currently no sports nutrition curriculums for high school athletes. Therefore, considering the importance of nutrition during this period, age group, and activity levels, there is a need of a sports nutrition curriculum in high schools to increase nutrition knowledge.

Purpose and Significance

The purpose of this project was to develop a sports nutrition curriculum for high school athletes to increase nutrition knowledge via different sport nutrition topics. Nutrition professionals could then use the curriculum to teach high school athletes the importance of wholesome nutrition, its benefits, and the risks that come with poor nourishment. Encouraging and motivating high school athletes is important because of their different dietary needs which may impact physical performance, growth, short and long-term good health, and development (Hoch, Goossen, & Kretschmer, 2008).

Research Questions

In order to evaluate the sports nutrition curriculum effect on change in nutrition knowledge, it was hypothesized that providing a focused nutrition intervention for adolescent athletes in a high school would result in increase in nutrition knowledge.

The following research questions guided the project:

- (1) Are there significant changes in nutrition knowledge between pre and posttest among high school students following the implementation of sports nutrition curriculum?
- (2) What comments, observations, and suggestions do experts have to improve the sports nutrition curriculum?

Conceptual Framework

The conceptual framework that guided this project was the human ecological model. The framework consists of the microsystem, mesosystem, exosystem, and macrosystem (Bronfenbrenner, 1994). Using the human ecological model as a framework, it was hypothesized that teaching sports nutrition among high school athletes will increase nutrition knowledge. It will also provide the school with a sports nutrition curriculum to implement among the athletes and all other students.

The microsystem represents the immediate people and interactions in direct contact with the individual such as the high school athlete and the school. The mesosystem is the interaction between the different parts of the individual's microsystem, such as the relationship between the individual teaching the curriculum and the coach attending the lectures. Their relationship and interaction could have an impact on the high school athlete. For example, the person teaching the curriculum could impact the nutritional knowledge of the coach, which in turn

the learned knowledge could have an impact on the high school athlete. The exosystem is the setting where the individual is affected by its surroundings but is not involved in frequent participation. The approval from the athletic director of the implementation of the curriculum at the high school would be an example; it would affect the high school athlete because the sports nutrition lectures would be allowed. The macrosystem is the largest scope, where the individual is affected by with factors including the government, policies, and economy. In regards to the study, a school wide policy could be made to implement nutrition education in high schools - specifically a sports nutrition curriculum for athletes. It would educate the athletes, coaches, and trainers, about the different nutritional needs for adolescent athletes.

Overview of Methodology

In order to answer the research questions mixed methods both qualitative and quantitative (Wisdom & Creswell, 2013). The quantitative was the pre and posttest measuring the increase in nutrition knowledge after the implementation of the sports nutrition curriculum. Qualitative included the posttest open-ended questions and expert feedback, which was used to receive comments, observations, and suggestions for improvement of the sports nutrition curriculum.

Assumptions and Limitations

The project was based on the following assumptions:

- The participants will be high school athletes.

- The participants will speak and read English fluently.
- The participants will be honest about their answers while completing the pretest and posttest questionnaire.
- The participants will understand the content of the nutrition lectures.
- The participants will be expected to be on time for the lectures.
- The participants will complete a pre and posttest questionnaire.

Certain limitations of the project exist:

- Some participants may be more motivated to make nutritional changes than others.
- The high school is located in San Fernando Valley, Los Angeles area and will not be representing other cities, states or countries.
- The study is limited to the ages 14 through 16, and is not applied to all ages.
- The participants may have different levels of sport nutrition knowledge and eating habits before exposure to the nutrition lectures.
- Some participants may come from families and backgrounds that are more aware of healthy eating and have easier access to healthier foods.
- The sample size was small, which may not have enough participants.
- Increasing nutrition knowledge does not necessarily indicate there will be changes in dietary habits and food choices.

Definitions

1. Nutrition: the process of where nutrients are consumed and utilized in the body for nourishment (Nutrition, n.d.).
2. Macronutrient: substance needed in larger quantities for energy, growth, and health such as carbohydrates, protein, and fat (Macronutrient, n.d.).
3. Micronutrient: chemical substance such as a vitamin or mineral that is essential and are needed in smaller quantities for health and growth (Micronutrient, n.d.).
4. Malnutrition: not enough or not the right amount of nutrient intake leading to poor nutrition or an unhealthy state (Malnutrition, n.d.).
5. Antioxidant: a substance that prevents harmful reactions occurring with oxygen such as free radicals in the body (Antioxidant, n.d.).
6. Glycogen: glucose storage in the body (Glycogen, n.d.).
7. RD: Registered Dietitian, who is an expert who has learned, through education, the connection between food and how it relates to disease and health (Ansel, 2014)
8. CSSD: Board Certified Specialist in Sports Dietetics, focuses on nutrition and fueling for sports and athletics (Sports, Cardiovascular, and Wellness Nutrition, 2015)

Organization of the thesis

Chapter one presented the problem that a lack of knowledge amongst high school athletes regarding the importance of nutrition may negatively impact their

performance and general health. The problem, purpose, significance, research questions, and conceptual framework were discussed. Chapter two reviews current and relevant literature related to why nutrition is important, why it is important for athletes, sports nutrition, and the lack of nutrition knowledge and education in high schools. Chapter three described the methods used to address the research questions including the program design, its setting, data sources (qualitative and quantitative), and the sample. Chapter four described the results of the study both qualitative and quantitative. Chapter five discussed the summary in relation to the literature. The discussion section will summarize the project, results, limitations, practice and policy implications, conclusion, and recommendations for further research.

CHAPTER II

REVIEW OF LITERATURE

Nutrition among adolescents has an impact on physical and cognitive performance, growth, and development. In order to optimize physical performance, it is important to have the knowledge of what type of foods to consume along with nutrient timing (Purcell et al., 2013). The nutritional needs of adolescent athletes are best met with a sports nutrition diet, but many of them consume a diet better suited for the general population (Meyer, O'Connor, & Shirreffs, 2007). Making sure the athlete has the proper sport nutrition knowledge to make responsible food choices may help in their athletic performance, preventing macro- and micronutrient deficiencies, and improving overall health. Consequences of not eating the right quality and quantity of foods may include malnutrition (Purcell et al., 2013). In addition to reduced physical performance, there is also an increased risk of injuries, longer recovery time, and other health complications (Hoch et al., 2008). Therefore, the active adolescent will require a specific nutritional map where certain macronutrients and micronutrients are of more importance (Purcell et al., 2013).

There is limited research on the implementation of a sports nutrition curriculum for high schools athletes and there is a lack of nutrition knowledge among coaches and athletes. The purpose of this chapter is to discuss and review the importance of nutrition among adolescents, importance of nutrition for

adolescent athletes, sports nutrition, and the lack of nutrition knowledge and education in high schools.

Nutrition and Adolescents

The body undergoes many changes including growth in height and weight, cognitive transformations, psychosocial development, emotional and reproductive maturation, and overall development (Drake, 2012). The intake of calories, protein, and micronutrients, along with appetite tends to increase depending on the activity level and physical changes (Erkan, 2011). Malnutrition as mentioned may lead to nutrient deficiencies, delayed growth, and other health complications. However not only are the changes physiological, but also psychological. Research has suggested healthy eating habits and exercise during adolescent years may have a positive effect on concentration, verbal, and reasoning ability (Esteban-Cornejo, Gomez-Martinez, Tejero-Honzalez, Castillo, Lanza-Saiz, Vicente-Rodriguez, Marcos, & Martinez-Gomez, 2014). Another study conducted in Sweden on 9260 adolescent boys, displayed consumption of fish more than once a week was associated with higher scores in combined intelligence, verbal performance, and visuospatial performance (Adberg, Aberg, Brisman, Sundberg, Winkvist, & Toren, 2009).

Importance of Nutrition for Adolescent Athletes

About 30 to 45 million, 6-18 years olds in the U.S. are involved in sports and athletics (Brenner, 2007). According to Jenna A. Bell-Wilson, PhD, RDN,

CSSD, states poor nutrition and malnutrition may affect the athletic performance of the adolescent athlete resulting in low energy and fatigue for workouts, increased risk of illness, and a negative effect on bone growth. Most research suggests adolescents struggle with being overweight or obese, however for active adolescents more emphasis should be put on consuming enough calories (Nisevich, 2008).

Nutrition plays a part in being a competitive athlete and may require a certain weight range in order to compete or fit a certain look for the sport. Sports such as gymnastics, running, boxing, wrestling, and figure skating are some that fit into this category. Some of the consequences of reduced caloric intake among adolescent athletes include stunted growth and loss of lean body mass (Beals, 2004). A study done on 6048 athletes, ages 10-17 years old, showed ~19% of boys and 15% of girls had a lower body fat percentage even below the recommended levels (Kalnina, Sauka, Timpka, Dahlstrom, Nylander, Selga, Ligere, Karlina, Preiedite, & Larins, 2015). In summary, it turned out that about one in every fifth had a low body fat percentage, which may cause negative health consequences if they become severe enough which can affect growth (Kalnina et al., 2015). A study done on 68 elite athletes, ages 12-18 years old, divided the athletes into two groups: gymnasts and non-gymnasts (swimmers, tennis players, and table tennis players). The results showed the gymnasts, both boys and girls, had lower iron status than the nongymnasts (Constantini, Eliakim, Zigel, Yaaron,

& Falk, 2000). This indicated that certain sports require even more nutritional attention compared to others.

For adolescent boys, weight category sports such as wrestling may require rapid weight loss in order to compete in a certain weight class. This may cause increased risk of reduced physical performance, strength, and increase the risk of eating disorders, and health problems. Among girls, the female athlete triad may occur and includes three components that are related to each other, energy balance, menstrual function, and the bone health (Nattiv, Loucks, Manore, Sanborn, Sundgot-Borgen, & Warren, 2007). To determine the energy availability, the caloric intake must subtract the energy expenditure lost from physical activity. When not eating adequate amount of calories, eating disorders may occur, along with amenorrhea, and increased risk of osteoporosis. Research has shown if adequate calories are met with the calories used during exercise, it will not increase the risk of menstrual disturbances or decrease bone mass. Sports that require a more slender body type and lower body fat percentage among girls need more attention because restrictive eating patterns are more likely to be seen frequently with this population. Therefore, to decrease the risk of the female athlete triad, education among coaches, athletes, and family members should occur to encourage prevention and intervention of the female athlete triad. A team approach including a registered dietitian should be included (Nattiv et al., 2007).

Considering the importance of nutrition during this time, studies on adolescents have shows the recommendations for fruit, vegetables, and milk are not being met (Kimmons, Gillespie, Seymour, Serdula, & Blanck, 2009). Some of the contributors to this are skipped breakfast, high consumption of sugar-sweetened beverages, and a low meal frequency (Moreno, Rodriguez, Fleta, Bueno-Lozano, & Bueno, 2010). Certain micronutrient intakes that tend to be lower among adolescents include iron, zinc, vitamin B6, and calcium (Nisevich, 2008). Vitamin D is a common deficiency during adolescent years (Steinbeck, 2009). A study done on 90 females ages 16 through 22 years old, showed about 60% were Vitamin D deficient, which was associated with decreased height and an increased body fat percentage (Kremer, Campbell, Reinhardt, & Gilsanz, 2009). A low intake of calcium and an increased risk of iron deficiency are seen among active adolescents (Cotugna et al., 2005). A study was done looking at the intake of calcium and Vitamin D with one of the age groups being 14 through 18 year old females. They used data from NHANES 2003-2006 and the Dietary Reference Intake (DRI). The adequate intake (AI) for ages 14 through 18 years old is 1,300 mg per day for both genders (Drake, 2012). This female age group was the furthest away from meeting the AI (Bailey, Dodd, Goldman, Gahche, Dwyer, Moshfegh, Sempos, Picciano, 2010). Analysis from the NHANES data 2003-2006 in addition, stated not even half of boys and 10% of girls were meeting their calcium intake of 1,300 mg/day or higher (Drake, 2012). Iron is necessary

for several functions in the body including during increase in body mass, blood volume, and hemoglobin, while it is lost through sweat (Position of the American Dietetic Association, Dietitians of Canada, and the American College of Sports Medicine, 2000). In another study, nutritional status was evaluated in 33 junior elite Canadian female soccer athletes. The results showed majority of the players failed to meet their recommended energy, carbohydrate, and micronutrient intake. Most of the athletes were deficient in serum iron and hydroxyvitamin D status. In addition, none of the subjects were meeting their DRI for vitamin E, A, and phosphorus (Gibson, J, Stuart-Hill, Martin, & Gaul 2011). The study concluded that adolescent athletes need a better understanding of their nutritional requirements to prevent nutrient deficiencies. The result of a better understanding and knowledge could maximize their performance and improve their health (Gibson et al., 2011).

A study with 60 adolescent sprint athletes, included their micronutrient and supplement usage for three years, measured in 6-month intervals (Aerenhouts, Deriemaeker, Hebbelinck, & Clarys, 2012). The results showed a low intake of iron among girls, while with both genders a low intake of vitamin E, B2, and a high sodium intake. The consumption of vegetables was far below the recommended 300 g/day. The consumption of fruits showed a trend towards a higher intake, but was not significant throughout the three years. In addition, the vitamin and mineral consumption despite the supplement consumption was not

consistent over the three-year period, and did not always meet the guidelines. The consumption of fruits and vegetables are not merely important to meet the demands of exercise when providing antioxidants and staying healthy, but to also prevent other health complications in the future such as cancer and cardiovascular disease (Craig & Mangels, 2009).

Nutrition for Athletes

The nutrients providing energy for the athletes are carbohydrates, proteins, and fats (Cotugna et al., 2005). These are called macronutrients and are needed to help with athletic performance, recovery time, reducing the risk of injury, and boosting the immune system. The amount of calories needed depends on the athlete's age, gender, developmental stage, amount of lean mass, and activity level (Position of the American Dietetic Association et al., 2000). Carbohydrate is a primary macronutrient used for energy during high intensity exercise, for endurance athletes, and is also needed to maintain and restore glycogen stores (Nisevich, 2008). Glycogen can be used during exercise when the athlete needs additional energy. The recommendation of a high carbohydrate snack is within 30 minutes after exercise to help restore glycogen and aid with recovery (Purcell et al., 2013). About 55% of calories should come from carbohydrates (Nisevich, 2008).

Up to 10 - 35% of the daily calories should come from protein, which is involved in many different functions such as maintaining, synthesizing, and

repairing muscle (Purcell, 2013; Otten, Hellwig, & Meyers, 2006). Additional role of protein include growth, maintenance of cells, and aiding the formation of antibodies to help fight infection (Schilling, 2008). When physically active, it becomes important to have adequate amounts of protein and the need generally tends to be a bit higher. The protein requirements can be met by food consumption from sources such as eggs, dairy, poultry, beef, seafood, beans legumes, and beef (Schilling, 2008). The breakdown products of protein metabolism may cause extra production of harmful urea, and having excess protein in the diet may be a cause (MedlinePlus, 2015). The body tries to excrete and eliminate urea via urine; however, this process requires proper hydration (Victoria State Government, 2014). It is recommended to consume good sources of carbohydrates and protein throughout the day particularly after training because glycogen stores are restored more quickly and depleted muscles can repair quicker (Desbrow et al., 2014).

Fat has many different important functions in the body, some of them include providing energy, transporting the fat-soluble vitamins A, D, E, K, essential fatty acids, producing hormones needed for a regular menstrual cycle, and insulation and protection of internal organs (Schilling, 2008). About 20 - 30% of total calories should come from fat (Nisevich, 2008). Certain fats, such as Omega-3 fatty acids, may help in providing faster recovery because they have

anti-inflammatory characteristics (Mickleborough, 2013). Sources include fish, walnuts, flaxseeds, and leafy greens (Harvard School of Public Health, n.d.).

The micronutrients aid in releasing energy from the macronutrients, act as antioxidants, involved in bone health, hemoglobin synthesis, immune system, and play a part in many other functions in the body. Fruits and vegetables, particularly those with colors such as red, orange, yellow, dark green and blue are beneficial sources of vitamins and antioxidants (Montana State University, 1998). Good sources of minerals include protein foods, such as meat and dairy products (Purcell et al., 2013). The specific vitamins and minerals central for the athlete include Vitamin A, D, E, C, selenium, thiamin, iron, B vitamins, and calcium (Position of the American Dietetic Association et al., 2000). Exercise has many benefits, however during exercise skeletal muscles produce free radicals, which may cause oxidative damage in cells (Powers & Jackson, 2008). Antioxidants are required to get rid of the free radicals and prevent cellular oxidative damage. The vitamins and minerals that help with protecting the cell membranes from oxidative damage are vitamins E, C, A, and selenium. Antioxidants are a good substance to prevent cellular damage and can be found in foods such as fruits and vegetables (MedlinePlus, 2016).

Vitamins are categorized into fat-soluble and water-soluble (MedlinePlus, 2015). The fat-soluble vitamins of more importance for the athletes are A, D, and E (Position of the American Dietetic Association et al., 2000). Vitamin D is

involved in skeletal benefits and is a potent secosteroid hormone (Shuler, Wingate, Moore, & Giangarra, 2012). Vitamin D is needed to aid the absorption of calcium (Purcell et al., 2013). Vitamin E is also an antioxidant and helps protect the cells against oxidative damage (Position of the American Dietetic Association et al., 2000). Since aerobic exercise increases antioxidant enzyme production, more vitamin E may be needed for athletes. Vitamin D deficiency may increase the risk for injury and increased recovery time (Shuler, Wingate, Moore, & Giangarra, 2012). Good sources of vitamin E include vegetable oil, eggs, almonds, sunlight, and dairy products (Ogan & Pritchett, 2013). The water-soluble vitamins include the B vitamins and Vitamin C (National Cancer Institute, n.d.). Certain B vitamins help in facilitating energy metabolism by releasing energy from nutrients; these include thiamin, riboflavin, niacin, pyridoxine, pantothenic acid, and biotin (Barrack & Van Loan, 2011). The B vitamins that help in muscle repair are folate and vitamin B12 (Barrack & Van Loan, 2011). Research shows certain vitamin B requirements are higher for athletes (Barrack & Van Loan, 2011). Vitamin C is involved in protein metabolism, act as an antioxidant, and regenerates other antioxidants in the body such as Vitamin E. Sources include fruits and vegetables such as citrus fruits, berries, tomatoes, and potatoes (MedlinePlus, 2015).

Minerals are also involved in the diet of an athlete and play an important role. Calcium is needed for many functions including muscle contraction,

maximize bone mineral density, and to inhibit bone loss (Barrack & Van Loan, 2011). One way to decrease the risk of stress fractures is to make sure there the calcium intake is adequate (DiFiori, Benjamin, Brenner, Gregory, Jayanthi, Landry, & Luke, 2014). Sources of calcium include dairy products, dark leafy greens, broccoli, fortified cereal and juices, and fish with soft bones (National Institutes of Health, 2013). Iron is needed for its oxygen-carrying capacity, hemoglobin production, and for enzymes that are involved in the immune function (Montana State University, 1998). While iron deficiency is one of the most common deficiencies in the world, not enough iron may lead to reduced performance and impaired muscle function for optimal aerobic endurance performance among active adolescents (Nisevich, 2008). Good sources of iron include red meat, whole grains, beans, legumes, and fortified cereals (MedlinePlus, 2015). Zinc is needed for growth, the immune function, enzymes, muscle repair and synthesis, and energy production (Nisevich, 2008). Zinc is also better absorbed when there is an adequate amount of protein in the diet (Nisevich, 2008). Not having enough zinc may decrease strength and endurance (Rodriguez, DiMarco, & Langley, 2009). Magnesium is needed for energy metabolism, immune system, and is involved in muscle and nerve function (MedlinePlus, 2015). Sources include leafy greens, nuts, and whole grains. An inadequate amount increases oxygen requirement during exercise and may in result reduce physical performance (Barrack & Van Loan, 2011). Having too much zinc on the

other hand, which may be more likely from supplements, may interfere with copper and iron status (Montana State University, 1998). Since zinc is a mineral, any mineral in excess may lead to mineral imbalances. In addition minerals in high doses can become toxic. Good sources of zinc include protein foods such as seafood and whole grains.

Hydration is a key component of active adolescents and must to be considered to prevent the risk of dehydration (Nisevich, 2008). Fluid helps in staying hydrated and is needed before, during, and after exercise. The amount depends is contingent upon several factors including the environment, amount of sweat produced, and the amount of exercise (Bergeron, Devore, & Rice, 2011). Weight can also be used to determine how much fluid is lost in order to replenish adequate amounts after exercise. The 2011 American Academy of Pediatrics (AAP), recommends about 1 -1.5 liters of water for every hour of exercise for the adolescent. This is applied if the adolescent is well hydrated before. Proper and adequate nutrition, along with hydration helps with recovery and performing well physically (Mujika, 2010).

Lack of Nutrition Knowledge and Education in High Schools

Most of the literature and research has been conducted on collegiate and adult athletes during one point in time (Barrack & Van Loan, 2011). More research is recommended during a longer period of time, but with adolescent athletes. According to the California Nutrition and Physical Activity Guidelines

for Adolescents, the factors for poor eating habits is the lack of knowledge of appropriate nutrition and the effects that come with poor intake, the increased incidence of disordered eating with trying to gain muscle mass and meeting weight cut-offs for sports (California Department of Public Health, 2013). In addition more education is needed for the athletes, coaches, and people surrounding the athletes. The people surrounding the high school athletes are the main sources the athletes seek nutritional information, and the proper information needs to be provided (Barrack & Van Loan, 2011).

A study conducted with 108 competitive judo adolescent athletes, showed two thirds of athletes were influenced by their coaches to cut weight before competition. This shows the need for coaches to have appropriate nutrition knowledge to guide their athletes in order to decrease the risk of reduced performance, growth, and development complications (Berkovich, Eliakim, Nemet, Stark, & Sinai, 2015). Often times student athletes, coaches and trainers may be misinformed about sports nutrition (Cotugna et al., 2005). Having credible and reliable sports nutrition information available for the high school athletes and coaches may be one step closer for improved nutrition.

In order to develop sustainable healthy eating habits, participation in nutrition education programs should begin early (Blow-Hoffman & DuPaul, 2003). The school environment is an effective environment to encourage health promotion and good eating habits for life-long healthy lifestyle (Blom-Hoffman &

DuPaul, 2003). School based nutrition programs have shown to increase the nutrition knowledge among adolescents and high school students (Wang, Stewart, Chang, Ji, & Shi, 2014). What seemed to increase knowledge the most was the actual curriculum and peer support activities, more so than handouts and posters. The activities involved problem solving, discussion, and sharing ideas. In addition, how the participants felt about the activity determined more if they increased their nutrition knowledge compared if they were participating or not. Educating adolescents instead of telling them what to do have been demonstrated to be more effective (Greener, Wagner, & Petersen, 2010).

In order to change a behavior such as improving healthier eating habits, research has shown increased nutrition knowledge is needed. One of the first steps is through education; gain information, facts, and skills such as what kind of foods and when to eat (Spendlove, Heaney, Gifford, Prvan, Denyer, & O'Connor, 2012). Nutrition knowledge and education has been shown to have an influence on the food choices, eating behaviors, food habits, and attitude towards food (Crites & Aikman, 2005; Sachithanathan, Buzgeia, Awad, Omran, & Faraj, 2012). Among adolescents, nutrition education is important to prevent unhealthy food habits for better nutritional status (Sachithanathan et al., 2012). Nutrition education has been shown to increase nutrition knowledge and it has also been shown through a study, students who increased nutrition knowledge from a nutrition course had an overall lower intake of fat after the course. This may

decrease the risk of chronic disease later in life, improving health (Emrich & Mazier, 2009).

As described, the literature reviewed in this chapter affirmed that nutrition is important for adolescent athletes, adequate amounts of macronutrients and micronutrients is needed to meet their demands of being active, growth, and development. The project proposes adding to current body of knowledge related to sports nutrition and developing, implementing, and evaluating a nutrition curriculum for high school athletes. Implementation of a high school sports nutrition curriculum may be a way of increasing nutrition knowledge.

CHAPTER III

METHODOLOGY

The purpose of this project was to develop a sports nutrition curriculum to increase nutrition knowledge among high school athletes. Having appropriate and reliable sports nutrition knowledge is important for active adolescents because their nutritional needs differ and they are growing in addition to being more physically active (Purcell et al., 2013). The program was developed to help meet the nutritional needs of the high school athletes. A mixed method design was used, meaning both quantitative and qualitative data were measured. This chapter will outline the process and articulate the methods used for the curriculum development, implementation, and evaluation. The program design, setting, data sources and sample will be explained as well.

Program Design

To address the research questions, the projected used mixed methods design, which consists of both quantitative and qualitative data (Wisdom & Creswell, 2013). The quantitative data can help you with getting scores and number data, and the quantitative data used in this project was the percent increase in nutrition knowledge after the implementation of the sports nutrition curriculum among high school athletes. The quantitative data helped with comparison of nutrition knowledge between pretest at week 0 and posttest at week 6. The qualitative data can help with getting in-depth information such as

descriptions, opinions, and the qualitative data used in this project was the posttest questionnaire open ended questions and the expert evaluations. The qualitative data provided in depth information about comments, observations, and suggestions regarding the curriculum. These methods helped to obtain information about the knowledge level increase of the students' participation (in the class) and offering suggestions, and areas of improvement for the developed curriculum from the experts.

Sports Nutrition Curriculum Development and Implementation

The curriculum consisted of six lectures where lesson plans, PowerPoint slides, and quizzes were developed. Meetings were arranged with the coaches to determine the optimal number of students for participation, the time, and dates. The lectures and presentations were held between February and March 2016. The program duration was three weeks with two lectures per week. The lectures were taught in a classroom setting with the PowerPoint slides. The participants took their own notes during lectures.

The first lecture was an introduction to sports nutrition, where the impact of food on the body was discussed to stimulate the student's thoughts about the food choices they made. The second lecture covered the macronutrients (carbohydrates, proteins, and fats). The function of each was explained, different food sources, and when to consume them. The third lecture covered vitamins, where the more important vitamins for the active adolescents were emphasized.

The fourth lecture focused on minerals and the importance of hydration. The fifth lecture combined several different components from previous lectures of eating and focused on how to make a meal, different pre and post workout snacks, and tips for eating out. The sixth lecture covered the basics of reading a nutrition label, regulation of supplements, food myths and diets. The lesson plans, 1-6, are attached in appendix A. The six PowerPoint lectures were developed from the lesson plans and are attached in appendix B.

By the end of lecture on the last PowerPoint slide, four to five quiz questions were given for the student to enhance learning. The quizzes were graded and given back to the students but were not measured and included in the results section as a measurement.

Instruments and Procedures

The instruments included were the sports nutrition curriculum (lesson plans and PowerPoint lectures), pre and posttest questionnaire, and expert feedback through two different evaluation forms. The first evaluation forms was for the whole curriculum including the lesson plans and PowerPoint lectures. The second evaluation form was for the coach who was present during the lectures and evaluated the presentation of the lectures.

Evaluation by Participants

In order to evaluate the increase in nutrition knowledge a pre- and posttest questionnaire was administered, which consisted of eight questions additional

information gathered were gender, age, participation in sports, the kind of sport, and ethnicity. The multiple-choice questions measured knowledge in topics covering macronutrients, micronutrients, nutrient timing and the recommendations for fruit and vegetable servings per day. A total of five choices were given in which the students had to circle the correct answer. A scale was used ranging from 1 through 5 and an option of “not sure” was included if the student did not know the answer. The questions asked included 1) How many servings of fruits and vegetables are recommended per day? 2) The macronutrients include? 3) What is true about the fat-soluble vitamins? 4) What is true about the water-soluble vitamins? 5) Which may lead to weight gain? 6) When is the best time to eat after exercise? 7) Which food group helps in restoring glycogen levels? 8) Which food group is primarily used for higher intensity exercise? Refer to Appendix C for sample pre test questionnaire.

The same eight multiple-choice questions were used on the pretest and posttest; however, the posttest had four additional open-ended questions. The open-ended questions were 1) What are some changes you have made to your food intake since the start of the program? 2) What are some changes you have made to your physical activity since the start of the program? 3) What are some changes and recommendation you have for improving this program? 4) What topics would you like to learn more about? An additional comments section was included as well. See Appendix D for a sample posttest questionnaire.

The four experts completed two different evaluation forms. Three of the experts completed an evaluation form after reviewing the lesson plans and PowerPoint lectures prior to the start of the program. The fourth expert, the coach, attended the lectures and completed the second evaluation form after the implementation of the lectures based on the lecture content and how the lectures were presented. Both will be discussed in more detail below.

Evaluation by Expert Panelists

Four expert panelists were selected based on their knowledge, teaching, and nutrition expertise. One expert was a professor at California State University, Northridge (CSUN), held a Doctor of Education degree and had extensive sports nutrition knowledge in metabolism. The second expert held a Master's degree in nutrition from CSUN, a registered dietitian who worked with athletes and had a specialty in sports nutrition. The third expert was the director of athletics at the high school there the curriculum was implemented. The fourth expert was the coach and physical education teacher for the high school athletes. All four received the curriculum through email and provided written evaluations.

Two different evaluation forms were used but with the same rating score 1 through 5 (1: strongly disagree, 2: disagree, 3: neither agree or disagree, 4: agree, and 5: strongly agree). Three of the experts evaluated the whole curriculum including the lesson plans and PowerPoint slides. The areas of evaluation were the following, the lesson plan and PowerPoint slides were organized and easy to

follow, the lesson plan and PowerPoint slides were appropriate for high school students, the PowerPoint slides had enough and appropriate visuals, the lecture objectives were clear and realistic, the lesson plan was detailed enough to be utilized by another teaching professional, the lesson plan and PowerPoint slides were free of grammatical errors, and the lesson plan and PowerPoint slides were an effective tool to increase nutrition knowledge among high school students. One additional open-ended question was included and asked what suggestions or feedback could improve the curriculum and/or the presentations, and additional comments. See Appendix E for the evaluations tool for three of the experts.

The second evaluation form was used for the coach who attended the lectures. The areas of evaluation were the following, the presenter maintained eye contact with the students while presenting, communicated effectively (clarity and loudness), geared teaching to education level, quiz questions were appropriate based on lecture objectives, showed concern in answering the student's nutritional questions, showed passion and interest in the topic, started and ended the lectures in a timely manner. The open-ended question asked what suggestions or feedback could improve the presentation and/or the lectures, and additional comments. Refer to Appendix F for a sample evaluation form for the coach.

Data Collection and Analysis

The high school coach assisted in recruiting the 37 participants to participate in all the lectures. Of the 37, 30 of them completed both the pre and

posttest. The participants were between the ages 14 through 16 years of age. They were residing in Los Angeles, San Fernando Valley area and from one high school. Students of both genders participated.

All pretests were performed at week 0 and the posttest at week 6. The expert evaluation feedback forms were given at week 0. Data was entered on excel and analyzed using a paired samples t-test in SPSS 22. This included the curriculum review tool and feedback from the experts. Data analysis included the pre and posttest questionnaire measuring the nutrition knowledge. The experts were sent the evaluation forms via email, and were sent back when completed.

Summary

The curriculum consisted of six lesson plans along with the PowerPoint lectures. The nutrition knowledge was measured by the pre and posttest questionnaire. The posttest questionnaire had four additional open-ended questions, which provided in-depth information. An evaluation tool with an evaluation form was provided to the experts. It used a rating score of 1 through 5 (1: strongly disagree, 2: disagree, 3: neither agree or disagree, 4: agree, and 5: strongly agree).

CHAPTER IV

RESULTS

The purpose of this project was to develop a sports nutrition curriculum comprised of six lesson plans and PowerPoint lectures to increase nutrition knowledge among high school athletes. The participants completed the pre and posttest questionnaires, and the experts completed two different evaluation forms. The sports nutrition curriculum were improved and adjusted to the final curriculum.

Results from the Evaluation by Members of the Target Population

Research Question 1

Are there significant changes in nutrition knowledge between pre and posttest among high school students following the implementation of sports nutrition curriculum?

A pre and posttest was administered to determine changes in knowledge. Refer to Appendix C and D for a sample questionnaire and detailed list of questions. Each individual question on the survey was entered into an excel spread sheet (see Appendix G). If the student answered the questions correctly, it was entered as 0, but if it was incorrect, it was entered as 1. The sampled paired t tests indicate that overall there are significant increase in nutrition knowledge between pre and posttest among high school students in five out of eight questions, following implementation of sports nutrition curriculum (see table 4.1).

Table 4.1

Paired samples t-tests for nutrition knowledge increase for individual question

Question	N	Pretest		Posttest		t value	p value
		M	SD	M	SD		
1	30	.73	.45	.50	.51	3.67	.006*
2	30	.70	.47	.13	.35	5.46	.000*
3	30	.83	.38	.23	.43	6.60	.000*
4	30	.80	.41	.73	.45	0.63	0.55
5	30	.10	.31	.20	.41	-1.36	0.18
6	30	.83	.38	.10	.31	7.71	.000*
7	30	.77	.43	.47	.51	2.76	0.01*
8	30	.83	.38	.73	.45	1.36	0.18

A paired sample t-test was used to get detail information about the percent increase for each individual students and each individual question. They were analyzed individually, providing more information on which questions the nutrition knowledge increase was significant. The first question was 1) How many servings of fruits and vegetables are recommended per day? Based on the paired sample t-test results, they were statistically significant at 0.05 level concerning how many servings of fruits and vegetables were recommended per day. The data analyses indicated that nutrition knowledge was significantly higher at posttest than it was at pretest. The second question was 2) The macronutrients include? The results showed there was a significant increase in knowledge regarding the macronutrients. The third question was 3) What is true about the fat-soluble vitamins? The results showed there was a significant increase in knowledge knowing properties of the fat-soluble vitamins. Question four asked 4) What is

true about the water-soluble vitamins? The results did not indicate statistically significant increase in nutrition knowledge. Question five asked the students 5) Which may lead to weight gain? Similar to question 4, no significant differences were found on this question. The sixth question was 6) When is the best time to eat after exercise? Results indicated there was a statistically significant increase in nutrition knowledge with when the best time of food consumption after exercise. The seventh question was 7) Which food group helps in restoring glycogen levels? Results indicated there was a significant increase in nutrition knowledge. Question eight was 8) Which food group is primarily used for higher intensity exercise? It did not show a significant increase in knowledge.

Total of 30 students completed the pre and posttest questionnaire. The overall percent increase in nutrition knowledge was 32%, with an ± 18 SD. As for the descriptive results, the mean was a score of 5 out of 8 for the posttest questionnaire. The mean for the pretest questionnaire was 2 out of 8. The highest percent increase was seen with 75%, none of the students did worse, and two students had no change in their nutrition knowledge.

Table 4.2

Overall nutrition knowledge changes from pretest to posttest

N	Pretest		Posttest		t value	p value
	M	SD	M	SD		
30	.31	.19	.62	.20	9.93	.000*

In analyzing the qualitative open ended question on the posttest questionnaire, the participants also confirmed some changes they had made after the lectures and were asked to report the changes in open ended questions with the posttest questionnaire. Out of 30 respondents, 30 (100%) mentioned they had made some changes with their food intake. Some of the comments included, “I’m more aware of the food choices I make now and I want to become healthier.” Another participant stated “I eat more fruits and vegetables and know how to read nutrition labels now.” Other participants stated, “I eat less junk food and make healthier choices while eating out”, “I am more careful with what I eat before and after exercise”, “I choose more whole grains than before”, “Drink less soda and eat less sweets”, and “ I’ve started to drink more water.” Overall, these comments suggested an interest and awareness in nutrition knowledge and choices.

When it came to exercise, certain participants stated they had “increased physical activity”, “started working out at least 30 minutes to one hour a day”, and one of them stated, “I decided to go back to joining more sports.” Summaries of recommendations made by the participants for improving the program were increased for lecture and the usage of food visuals in class. Certain topics the participants wanted to learn more about included the type of exercises to perform, different diets including plant based, food myths and supplements, creating a healthy lifestyle, prevention of athletic injuries, and weight management for over and under weight. Additional comments that kept reoccurring was the lectures

were “I learned so much more than I thought I knew”, “I loved learning about sports nutrition, it was really helpful and useful”, and one participant stated “It sparked an interest for possible major in college.”

Results from the Evaluation by the Experts

Research Question 2

What comments, observations, and suggestions do experts have to improve the sports nutrition curriculum?

The experts were asked to evaluate the curriculum using the evaluation form in appendix E. A scale 1 through 5 was used. One the scale one would be strongly disagree, two would be disagree, three would be neither agree or disagree, four would be agree, and would be strongly agree. For the expert evaluation all answers were scored a 5, meaning strongly agree. The experts agreed and confirmed that the lesson plan and PowerPoint were organized and easy to follow, the curriculum was appropriate for high school students, the PowerPoint’s had enough and appropriate visuals, the lecture objectives were clear and realistic, the lesson plan was detailed enough to be used by another teaching professional, the lesson plan and PowerPoint’s were free of grammatical errors, and the curriculum was an effective tool to increase nutrition knowledge among high school students. There was no suggestions or feedback for improvement, and the comments were all positive. Some of the comments included “it can improve eating patterns of high school students”, “it will increase

nutrition knowledge and stimulate interest in the nutrition field among the students.” In addition “the curriculum was adequate for the high school student.”

The evaluation form completed from the coach (see appendix F) scored a 5 on all of the questions as well. It was confirmed that the presenter maintained eye contact with the students while presenting, communicated effectively (clarity and loudness), geared teaching to educational level, quiz questions were appropriate based on the lecture objectives, showed concern in answering the students nutritional questions, showed passion and interest in the topic, and started and ended the lectures in a timely manner. Additional comments included “it was straight forward, delivered with clarity, and easy for the students to understand. All questions were answered, and the presenter and presentation were great. She made sure the students understood the materials presented and stayed after class to answer any questions.”

Summary

The program was conducted to increase nutrition knowledge among high school athletes. The results for research question one indicated all high school athletes had increased their knowledge. When a second analysis was conducted to see if there was a significant difference in the increase in knowledge for each individual question on the questionnaires, the results showed in regards to the first question regarding servings of fruits and vegetables are recommended per day it was shown to be statistically significant. The other questions that showed to be

statistically significant when it came to nutrition knowledge were question two, the macronutrients include question three, what is true about the fat-soluble vitamins, question six, when is the best time to eat after exercise, and question seven, which food group helps in restoring glycogen levels. There was not a significant change in increased nutrition knowledge for question four, what is true about the water-soluble vitamins, question five, which may lead to weight gain, and question eight, which food group is primarily used for higher intensity exercise.

In regards to program changes and feedback, all experts agreed that the lesson plans and PowerPoint lectures were organized and easy to follow, the curriculum was appropriate for high school students, the PowerPoint's had enough and appropriate visuals, the lecture objectives were clear and realistic, the lesson plan was detailed enough to be used by another teaching professional, the lesson plan and PowerPoint's were free of grammatical errors, and the curriculum was an effective tool to increase nutrition knowledge among high school students. In addition the evaluation completed by the coach strongly agreed that the presenter maintained eye contact with the students while presenting, communicated effectively (clarity and loudness), geared teaching to educational level, quiz questions were appropriate based on the lecture objectives, showed concern in answering the students nutritional questions, showed passion and interest in the topic, and started and ended the lectures in a timely manner.

The experts provided with all positive feedback with the lesson plans, PowerPoint lectures, the presentations, and the implementation of the curriculum. A discussion of these results and their implications for policy and practice are presented in Chapter 5.

CHAPTER V

DISCUSSION

This chapter will discuss and interpret the results while looking at the research questions and theoretical framework. Nutritional needs are different for active adolescents and need to be addressed to improve physical performance and overall health while decreasing the risk of fatigue and injuries (Purcell et al., 2013; Hoch et al., 2008). Research suggests there is a lack of knowledge among the active adolescents as well as the people surrounding the athletes such as coaches and families (Barrack & Van Loan, 2011). Sports nutrition curriculum implementation was shown to increase nutrition knowledge, which may be a method of increasing awareness about the specific nutritional needs. There is limited research on finding high school sports nutrition programs in the literature. In addition, there is no implementation of this kind of curriculum within the high school system according to the LAUSD (Xitcho, 2016).

Summary of the study

The curriculum was developed to increase nutrition knowledge among high school athletes. It consisted of six lesson plans and PowerPoint lectures, a pre and posttest questionnaire, and two evaluation forms for the experts. The lectures covered topics such as macronutrients, micronutrients, hydration, and nutrient timing. The curriculum was implemented to educate and increase nutrition knowledge among the high school athletes as a main goal to meet their

needs for athletic performance, growth, development and overall good health. The nutrition knowledge increased by an average of 32 %. Teaching adolescent may be a way to prevent the risks with that come with poor nutrition such as deficiencies, fatigue, increased risk of injuries, and longer recovery time. This will also help the adolescent later in life because good eating habits are developed though increased knowledge about foods.

Discussion

Concepts from the Human Ecological Model (Bronfenbrenner, 1994) were used as a framework for this sports nutrition curriculum and intervention. The model was a way to represent the various components of the project organized around the ideas presented in the conceptual framework outlined in Chapter 1.

The framework was utilized by the researcher to evaluate the effectiveness of a school-based sports nutrition curriculum workshops and lectures in increasing nutrition knowledge. The framework had the high school athlete as the individual in a high school setting, being influenced by the presenter teaching the sports nutrition lectures. This in turn would have an affect such as increased nutrition knowledge. The relationship between the presenter and coach who attended the lectures affected the high school athlete in a manner where the coach could provide learned proper nutrition information and guide his athletes better if needed. The support and approval from the athletic director of the implementation of the curriculum at the high school helped in increasing the nutrition knowledge.

A school policy would be possible to implement this sports nutrition curriculum in high schools to increase nutrition knowledge. Not only would this education benefit the high school athletes, but also the coaches, trainers, and the people surrounding the athletes.

Changes in Knowledge

Both quantitative and qualitative data reported by students indicate that the high school students increased their knowledge of proper nutrition habits for athletes, the number of servings for fruits and vegetables, macronutrients, fat-soluble vitamins, nutrient timing, and which food group helps in restoring glycogen levels to lead to a healthier lifestyle and possible better physical performance outcomes. These results are consistent with the goals of the program to increase participants' nutrition knowledge from pre to posttest. The quantitative data suggested a significant increase in the high school student knowledge from pre to posttest. It is apparent from the qualitative data, including the responses of children to the open-ended questions, that they had increased the consumption of healthier foods such as fruits, vegetables, whole grains, and decreased the intake of sweets and soda. They learned to read nutrition labels and making healthier food choices while eating out. In addition, some of the participants had increased their physical activity levels and some decided to join more athletic teams.

The findings were similar to the findings in a study completed by Wang et al. (2014), which showed school-based nutrition program increased the nutrition

knowledge among adolescents and high school students. According to Blom-Hoffman et al. (2003), the school environment is an effective environment to encourage health promotion and good eating habits for life-long healthy lifestyle. Nutrition knowledge necessary in order to improve eating habits. One of the first steps is through education; gain information, facts, and skills such as the healthier selection of foods and when to eat them (Spendlove et al., 2012). Nutrition knowledge and education has been shown to have an influence on the food choices, eating behaviors, food habits, and attitude towards food (Crites & Aikman, 2005; Sachithanathan et al., 2012).

The findings showed that increased in nutrition knowledge were significant higher at posttest. In addition the individual analysis by each question number showed that certain areas of nutrition had more of an increase in knowledge. There could be two explanations for this result. One explanation is that the students may have known the answer from before and there was not much increase. Second, it could be that the concept may be too difficult and additional hours are needed to explain the properties of the water-soluble vitamins, glycogen, and which macronutrient is used during what kind of exercise. Therefore this leads to the conclusion that we may need to change the curriculum to include more slides and time spent explaining these concepts.

Overall the conclusion is that there is a need for such a curriculum to increase nutrition knowledge during a critical time period where growth is still

taking place while being an adolescent athlete.

Changes and Feedback from Curriculum Review

The feedbacks from the experts were very positive. They all scored the highest a five, meaning strongly agree in the following areas; the lesson plans and PowerPoint lectures were organized and easy to follow, the curriculum was appropriate for high school students, the PowerPoint's had enough and appropriate visuals, the lecture objectives were clear and realistic, the lesson plan was detailed enough to be used by another teaching professional, the lesson plan and PowerPoint's were free of grammatical errors, and the curriculum was an effective tool to increase nutrition knowledge among high school students. The second evaluation form completed by the coach scored a five as well in the following areas; the presenter maintained eye contact with the students while presenting, communicated effectively (clarity and loudness), geared teaching to educational level, quiz questions were appropriate based on the lecture objectives, showed concern in answering the students nutritional questions, showed passion and interest in the topic, and started and ended the lectures in a timely manner.

All the comments were positive and they were all very supportive of the sports nutrition curriculum. They believed it was an appropriate tool appropriate for the participants to increase nutrition knowledge.

Implications for Policy and Practice

The sports nutrition curriculum developed for the high school athletes

have the potential to increase nutrition knowledge and improve their eating habits to meet the demands of their sports, growth and development. Registered dietitians can collaborate and partner up with high schools to implement a sports nutrition curriculum to increase nutrition knowledge as well as encourage healthy eating patterns. A collaboration could be made where a registered dietitian could be hired on staff working with the coaches, trainers, and also help counsel the athletes helping them to learn more about nutrition. Other nutrition professionals dealing with adolescent athletes could use the curriculum. It may serve as an educational tool implemented at other high schools for the athletes, coaches, trainers, peers, and the people surrounding the athletes as well. The coaches and the professionals surrounding the athletes can help guide the adolescent for making better food choices through their increased knowledge and awareness. Policy enforcement could be made in the future for the implementation of a sports nutrition curriculum for high school athletes to educate. Such education could also influence and increase knowledge among coaches, trainers, and the people surrounding athletes to meet their unique nutrition needs to support growth, development, and the needs of their physical activity levels. A policy could be created with the implementation of sports nutrition lectures within a school system in Los Angeles, CA.

Recommendations for Further Research

This project implemented a sports nutrition curriculum and studied the

increase in knowledge among high school athletes. There are seven suggestions for future research.

1. There was increase in knowledge at posttest. Studies should conduct follow-ups at six months longer periods of time.
2. This study obtained some qualitative data. For future research, it is suggested to conduct focus groups to get more insight on the effectiveness of the curriculum and how it can be improved.
3. Obtain comments and feedback about the overall program but from children who are active in sports.
4. The workshop was three weeks, with six lectures, and 45 minutes each. It is suggested to change the curriculum to a longer lecture time and workshop.
5. Testing their actual athletic performance would show the benefits of increased nutrition knowledge among adolescents.
6. This study grouped both genders and all sports together. Dividing each category and seeing the differences between each might be more effective for increasing knowledge. Education can then be targeted towards their specific sport and gender requirements.
7. Testing to see more details about their actual changes in eating habits and behaviors would show the effectiveness of the increased nutrition knowledge.

Limitations

One of the limitations was the long-term nutrition and physical habits which were not assessed with the participants because of the duration of the study. Also, majority of the high school athletes were of one ethnicity in a specific location, San Fernando Valley area, Los Angeles. Another limitation was targeted towards the age group 14 through 16 and did not include all adolescent years. The nutrition knowledge of the different high school athletes may have been different, therefore some may have benefitted less or more depending on their current nutrition knowledge beginning of the lectures. Another limitation was the duration, because the curriculum was three weeks, and may have not had enough time or enough materials to support a higher increase in nutrition knowledge and to make an impact on their nutritional habits. In addition, having nutrition knowledge is quite insignificant compared to actual behavior and habits. In other words, increased nutrition knowledge through the implementation of the curriculum did not necessarily mean the high school athletes would apply the learned information for changed nutritional habits and behaviors for the long-term.

Concluding Statement

The purpose of this project was to increase nutrition knowledge among the adolescent athletes. The need and importance of proper nutrition, especially during adolescence and specifically with adolescent athletes is crucial. There is

not any current nutrition curriculum or sports nutrition curriculum being taught in higher schools. Therefore, the goal of this project was to increase nutrition knowledge, and receive feedback from experts in regards to the development and implementation of a sports nutrition curriculum in one high school in the San Fernando Valley. The goal of increasing knowledge, implementing, and obtaining feedback on the curriculum was overall met through this project.

Ultimately, to ensure proper nutrition and intake, there needs to be similar curriculums implemented in other high schools, following up to see if students are utilizing their knowledge, providing more support and resources for school, and long-term programs and studies. This outcome of our program was similar to other studies confirming that a school based sports nutrition curriculum can be beneficial for the students and can increase their knowledge. Having a partnership with school, children and community is critical given there is a need in adolescents. We need to continue to provide systematic evaluation of these programs and involve schools, parents, school personnel, and the community in order to educate this population of need and the people surrounding the athletes.

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APPENDIX A

Lesson Plan:

Lesson 1: Introduction to Sports

Nutrition

Learning Objectives:

1. The students will be able to define sports nutrition and why it is important.
2. The students will be able to list three consequences each of poor and good nutrition.
3. The students will be able to define BPR and how nutrition and hydration plays a role in each stage.
4. The students will be able to list three factors that affect caloric needs.

Time required:

45 minutes

Set up for lecture:

PowerPoint

Topic	Slide number	Slide content	Activity
Introduction	1	Sports Nutrition	
Objectives	2	The objectives for this lecture are the following: 1. Define sports nutrition and why it is important.	
		2. List three consequences each of poor and good nutrition.	
		3. Define BPR and how nutrition and hydration plays a role in each stage.	

		4. List three factors that affect caloric needs.	
Definitions	3	<p>The definition of nutrition is:</p> <ul style="list-style-type: none"> • A substance ingested (food, supplement, drinks) which has an impact on the body such as providing energy, nourishment and preventing disease. <p>The definition of sports nutrition is:</p> <ul style="list-style-type: none"> • Nutrition that focuses on the diet of an athlete or someone who is more physically active for optimum performance. 	
Importance of nutrition	4	<p>Why should we care about food?</p> <ul style="list-style-type: none"> • Because our building blocks are made up from the foods we have been eating 	
	5	<p>Ask the audience:</p> <ul style="list-style-type: none"> • What kind of fuel does this car need? <p>Follow up questions:</p> <ul style="list-style-type: none"> • What would happen if the car used water instead of gas? It would not run properly. Your body works the same way, so you need to make sure you fuel it properly. 	
	6	<p>How does nutrition affect us?</p> <ul style="list-style-type: none"> • Athletic performance • Energy levels • Mood • Sleep • Recovery time • Growth • Deficiencies • Cognitive (memory, concentration, thinking clarity) • Prevention of disease (long term) <p>Who may benefit from learning about sport nutrition?</p> <ul style="list-style-type: none"> • Physically active individuals and basic nutrition may benefit 	

		anyone.	
Consequences of poor nutrition	7	<p>Poor nutrition may have consequences such as:</p> <ul style="list-style-type: none"> • Diminished athletic performance, strength, aerobic (running etc.) • Chronic fatigue • Weight loss or gain • Loss of muscle • Increased risk of injuries • More likely to be sore • Longer recovery time 	
BPR	8	<p>BPR stands for: Build, perform, and recover. Now we will look more closely at each stage and how nutrition and hydration plays a role.</p> <ul style="list-style-type: none"> • B – Build. Proper nutrition and hydration needed while training for performance. Helps building muscle, giving energy and getting ready for improving performance. • P – Perform, game day. Proper nutrition and hydration needed to perform well the day of. • R - Recover with proper nutrition and hydration to refuel body and muscles to decrease recovery time. Sleep is included here. 	
	9	<p>How much energy do you need for each stage of BPR?</p> <ul style="list-style-type: none"> • INDIVIDUALIZED. Each person is different. Not too much, not too little. <p>The different caloric depends on:</p> <ul style="list-style-type: none"> • Intensity of activity, age, sex (female/male), genetics, body size, type of sport performed 	

	10	<p>Determining the amount of food needed:</p> <ul style="list-style-type: none"> • Calories consumed calories expended • You need to eat the same calories you burn off to keep energy balance and maintain your weight. If you want to lose weight you have to burn more calories or eat less. If you want to gain you need to consume more calories than you burn or exercise less. 	
Summary	11	<ul style="list-style-type: none"> • Sports nutrition makes an impact on the body, health, and athletic performance. • Consequences of poor nutrition include fatigue, reduced athletic performance, being more prone to injuries, nutrient deficiencies • BPR stands for: build, perform, recovery. Sports nutrition plays a role in each stage 	
	12	Any questions? Thank you!	
On a piece of paper...	13	<ol style="list-style-type: none"> 1. Define sports nutrition and why it is important. 2. List 3 consequences each of poor and good nutrition. 3. Define BPR and how nutrition and hydration plays a role in each stage. 4. List 3 factors that affect caloric needs. 	Quiz

Lesson Plan:

Learning Objectives:

Time required:

Set up for lecture:

Activity:

Lesson 2: Macronutrients

1. The students will be able to list the main function of carbohydrates and four different food sources.
2. The students will be able to list the main function of protein and four different food sources.
3. The students will be able to list the main function of fats and four different food sources.
4. The students will be able to define macronutrients.
5. The students will be able to state the ratio to consume of carbohydrates to protein before and after exercise.

45 minutes

PowerPoint

Ranking Food Game: Divide into seven groups. Have them rank in order which food they think is the healthiest in descending order. Give them five minutes. After they are done, have each group explain which food they put in descending why. Instructor can explain things such as having a variety of fresh fruits and vegetables are healthier than always eating one kind etc.

Quiz

Topic	Slide number	Slide content	Activity
Introduction	1	Today we will talk about sports nutrition and will be focusing on the macronutrients. Before we do so, we will begin with an activity.	Ranking Food Game
Objectives	2	1. List the main function of carbohydrates and four different food sources.	
		2. List the main function of protein and four different food sources.	
		3. List the main function of fats and four different food sources.	
		4. Define macronutrients.	
		5. State the ratio to consume of carbohydrates to protein and after exercise.	
The six classes of nutrients	3	The six classes of nutrients are: 1. Carbohydrates* 2. Proteins* 3. Fats* 4. Vitamins 5. Minerals 6. Water *Macronutrients	
Macronutrients	4	Macronutrients are needed in larger quantities. These include carbohydrates, protein, fats	
Carbohydrates	5	Function of carbohydrates include: <ul style="list-style-type: none"> • Primary fuel and energy source for the body and brain • Used during high intensity exercise • Athletes need more than someone who is not 	

		<p>physically active</p> <ul style="list-style-type: none"> • 4 calories/gram <p>Storage of carbohydrates:</p> <ul style="list-style-type: none"> • In the muscles and liver • “Glycogen” • Eating too much can be stored as fat <p>When to eat carbohydrates</p> <ul style="list-style-type: none"> • BPR - every stage • Before exercise because easier to digest for energy • During exercise over about 1 hour or intense exercise simple carbohydrates (sports drink, banana etc.) • After exercise because reaches muscles quickly for glycogen storage <p>45 – 65 % of calories should come from carbohydrates.</p> <ul style="list-style-type: none"> • 15 % of less from simple carbohydrates • 40 – 50 % from complex carbohydrates 	
Sources of carbohydrates	6	Rice, bread, pasta, potatoes, sweet potatoes, cereal, granola bars, flour, fruit, milk, juice, soda, cookies, sweets, candy, pastry, and many more.	
Simple vs. Complex Carbohydrates	7	Simple carbohydrates: Candy, ice cream, cookies, honey, refined sugars. Simple carbohydrates that are natural include fruit and milk. Complex carbohydrates: whole grain breads, pasta, cereal, vegetables, beans	
Fiber	8	<p>Remove waste from the digestive system</p> <ul style="list-style-type: none"> • "Cleans the intestines" <p>May prevent constipation, cancers. Eat fruits and vegetables with the</p>	

		skin, whole grain breads, nuts and seeds. Don't eat too much fiber before exercise, because digested slower. Don't eat during exercise.	
Protein	9	<p>Function:</p> <ul style="list-style-type: none"> • Prevent muscle breakdown • Build muscle and aids in recovery • Repairs and build tissues • Growth • Hair, skin, nails • 4 calories/gram • Not a main energy source during exercise (exceptions) <p>Storage of proteins:</p> <ul style="list-style-type: none"> • Can't be stored • Having too much can be stored as fat <p>When to eat proteins:</p> <ul style="list-style-type: none"> • B and R • 4:1 ratio of carbohydrates to protein before exercise (providing energy during exercise) • 3:1 ratio of carbohydrates to protein after exercise (storing glycogen) • Consume within 15-30 minutes after exercise. <p>Eating more protein may increase need for water. Up to 35 % of calories</p>	
Protein sources	10	<p>Not all proteins the same</p> <ul style="list-style-type: none"> • Some contain all amino acids (body absorb more) • Some are missing certain amino acids (body absorbs less) <p>Plant sources:</p> <ul style="list-style-type: none"> • Usually not complete 	

		<p>proteins</p> <ul style="list-style-type: none"> • Nuts, seeds, beans, legumes, lentils, soy beans, tofu, peanuts, tempeh • Ex. of complete protein: corn + peas, wheat +peanuts, rice + beans <p>Animal sources:</p> <ul style="list-style-type: none"> • Complete proteins • Chicken, fish, meat, dairy, cheese, seafood, eggs 	
Fats	11	<p>Function:</p> <ul style="list-style-type: none"> • Adding calories • Energy • Protection of internal organs • Brain • Hormones • Provides energy during low intensity activity, or prolonged exercise • 9 calories/gram <p>Storage of fats:</p> <ul style="list-style-type: none"> • Can be stored • Anything you eat too much of (carbohydrates, proteins, or fat) → stored as fat <p>When to eat fats:</p> <ul style="list-style-type: none"> • Should be in each big meal (breakfast, lunch, dinner) in small amounts • Avoid high fat foods before exercise. Fat makes food sit in stomach longer. • 20-35% of calories 	

Sources of fat	12	<p>Saturated:</p> <ul style="list-style-type: none"> • Solid at room temperature • Mostly animal sources • Sources: Bacon, butter, meats (visible and invisible), white part of protein, skin, cookies, ice cream, coconut oil, dairy (varies) <p>Unsaturated:</p> <ul style="list-style-type: none"> • Liquid at room temperature • Mostly from plant source • Sources: olive oil, canola oil, sunflower oil, safflower oil, nuts, seeds, vegetable oil, corn oil, peanuts, soybeans 	
Summary	14	<p>Carbohydrates:</p> <ul style="list-style-type: none"> • Main energy source for athletes • 4:1 ratio before exercise • 3:1 ratio after exercise • Restore glycogen stores <p>Proteins</p> <ul style="list-style-type: none"> • Needed for recovery, building, and maintaining muscle mass <p>Fats</p> <ul style="list-style-type: none"> • For calories • Proper fats may help with recovery and reducing inflammation (omega 3) 	
	15	Any questions? Thank you!	
On a piece of paper...	16	<ol style="list-style-type: none"> 1. List the main function of carbohydrates and four food sources. 2. List the main function of protein and four food sources. 3. List the main function of fats and four food sources. 4. Define macronutrients. 	Quiz

		5. State the ratio to consume of carbohydrates to protein before and after exercise.	
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Lesson Plan:**Lesson 3: Vitamins****Learning Objectives:**

1. The students will define micronutrients.
2. The students will list the main function of vitamins.
3. The students will list the main differences between fat-soluble and water-soluble vitamins
4. The students will be able to state the more important vitamins needed for athletes.

Time required:

45 minutes

Set up for lecture:

PowerPoint

Activity:

Quiz

Topic	Slide number	Slide content	Activity
Introduction	1	Sports Nutrition: Vitamins	
Objectives	2	<ol style="list-style-type: none"> 1. Define micronutrients. 2. List the main function of vitamins. 3. List the main differences between fat- and water-soluble vitamins 4. State the more important vitamins needed for athletes. 	
The 6 classes of nutrients	3	<ol style="list-style-type: none"> 1. Carbohydrates 2. Proteins 3. Fats 4. <u>Vitamins*</u> 5. Minerals 6. Water *Micronutrient	

Effect of Exercise	4	<p>More calories burnt</p> <ul style="list-style-type: none"> • Need to eat adequate amount of calories <p>Oxidative stress</p> <p>Increased free radicals</p> <ul style="list-style-type: none"> • Need antioxidants <p>Help with recovery for athlete</p>	
Micronutrients	5	<p>Nutrients you need less of:</p> <ul style="list-style-type: none"> • Vitamins and minerals <p>What's the difference between vitamins and minerals?</p> <ul style="list-style-type: none"> • Vitamins can be broken down by acid, heat, or air • Minerals hold on to their structure 	
Do vitamins provide energy?	6	No. Energy drinks that says so, not correct.	
Vitamins	7	<p>The fat-soluble vitamins are:</p> <ul style="list-style-type: none"> • Vitamin A, D, E, K • Higher risk of toxicity • Can be stored in the body • If excreted usually in feces <p>The water-soluble vitamins are:</p> <ul style="list-style-type: none"> • B complex, vitamin C • Less risk of toxicity • Usually excreted when too much consume (urine) 	
Fat soluble vitamins	8	<p>Vitamin A</p> <ul style="list-style-type: none"> • Function: vision, skin, bone health, antioxidant • Good for athletes • Sources: beef, liver, eggs (yolk), shrimp, fish, fortified milk, cheddar and Swiss cheese, sweet potatoes, carrots, pumpkin, squash, spinach, mango, sweet potatoes. <p>Vitamin D</p> <ul style="list-style-type: none"> • Function: bone health, good for growing adolescents • Sources: sun exposure, fatty fish, fortified milk, dairy, margarine, or 	

		cereals	
Fat soluble vitamins	9	<p>Vitamin K</p> <ul style="list-style-type: none"> • Function: blood clotting • Sources: leafy greens, cabbage, kale, eggs (yolk), spinach, broccoli, liver <p>Vitamin E</p> <ul style="list-style-type: none"> • Function: antioxidant, phospholipids in cells • Good for athletes! • Sources: vegetable oils, salad dressings (vegetable oil), wheat germ, almonds, nuts, leafy greens 	
Water soluble vitamins	10	<p>B vitamins</p> <ul style="list-style-type: none"> • Function: metabolism, brain, blood • Thiamin and riboflavin • Good for athletes! • Sources: whole grains, dairy, meats, chicken, nuts, seeds 	
Water soluble vitamins	11	<p>Vitamin C</p> <ul style="list-style-type: none"> • Function: antioxidant, immune system, skin • Sources: citrus fruits, bell peppers, spinach, berries, tomatoes 	
Summary	12	<p>Vitamins do not provide energy; they help in releasing the energy from the foods. The vitamins important for the adolescent athlete:</p> <ul style="list-style-type: none"> • The B vitamins: thiamin and riboflavin. From whole grains, dairy products <p>The antioxidants: vitamin A, C, E. Sources include sweet potatoes, carrots, citrus fruits, fruits, bell peppers, almonds, vegetable oils, nuts</p>	
	13	Any questions? Thank you!	

On a piece of paper...	14	<ol style="list-style-type: none">1. The students will define micronutrients.2. The students will list the main function of vitamins.3. The students will list the main differences between fat- and water-soluble vitamins4. The students will be able to state the more important vitamins needed for athletes.	
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Lesson Plan:

Learning Objectives:

Lesson 4: Minerals and Hydration

1. The students will be able to state at least one difference between vitamins and minerals.
2. The students will be able to list two main minerals important for the athlete.
3. The students will be able to list at least two reasons why hydration is important.
4. The students will be able to write two symptoms of dehydration.
5. The students will state the time frame when sport drinks are recommended.

Time required:

45 minutes

Set up for lecture:

PowerPoint

Activity:

Quiz

Topic	Slide number	Slide content	Activity
Introduction	1	Sports Nutrition: Minerals and Hydration	
Objectives	2	<ol style="list-style-type: none">1. The students will be able to state at least one difference between vitamins and minerals.2. List two of the main minerals important for the athlete.3. List at least two reasons why hydration is important.4. Write two symptoms of dehydration.5. State the time frame when sport drinks are recommended.	
The 6 classes of nutrients	3	<ol style="list-style-type: none">1. Carbohydrates2. Proteins	

		<p>3. Fats 4. Vitamins <u>5. Minerals*</u> <u>6. Water</u> *Micronutrient</p>	
Micronutrients	4	<p>Just like the vitamins, minerals belong to the micronutrients. Neither, vitamins or minerals provide energy</p> <ul style="list-style-type: none"> • Only from the macronutrients <p>Nutrients you need less of: vitamins And minerals</p>	
Minerals	5	<p>Explain how some of the minerals are included in the periodic table.</p>	
Vitamins vs. minerals	6	<p>What's the difference?</p> <ul style="list-style-type: none"> • Vitamins more sensitive Can be broken down by acid, heat, or air • Minerals not as sensitive Hold on to their structure 	
Minerals	7	<p>Iron</p> <ul style="list-style-type: none"> • Function: red blood cells, oxygen transportation • Consume with vitamin C for better absorption • Increased losses in sweat • Sources: red meat, poultry, eggs, fruits, green vegetables, grains, fortified bread <p>Calcium</p> <ul style="list-style-type: none"> • Function: bones, teeth, muscle contraction, blood clotting, blood pressure • Not having enough: increased risk of stress fractures, decreased bone-mineral content and density • Increased losses in sweat • Sources: yogurt, dairy, tofu, salmon, sardines, fortified juices, leafy greens, broccoli, kale 	

Minerals	8	<p>Phosphorus</p> <ul style="list-style-type: none"> • Function: build and protect bones, teeth, metabolism, cells • Sources: wide variety of foods, milk, dairy products, meat, fish, chicken, eggs, broccoli, almonds • Too much phosphorus from soda leak calcium out of bones <p>Sodium</p> <ul style="list-style-type: none"> • Sodium and chloride most abundant in sweat • Heavy sweating = increased loss of sodium • Loss may cause cramping • Function: balancing fluid in the body, muscle contractions, blood pressure regulation • Sources: packaged foods, salt, processed foods, soy sauce 	
Hydration	9	<p>Function:</p> <ul style="list-style-type: none"> • Maintain blood volume • Regulate body temperature • Muscle contraction • Recovery • Performance • Injury prevention • Prevent dehydration <p>How fluids are lost:</p> <ul style="list-style-type: none"> • Sweat • Evaporation • Breathing • Removing waste products 	

Dehydration	10	<p>Symptoms</p> <ul style="list-style-type: none"> • Decreased physical performance • Loss on concentration • Cramps • Headache • Dizziness • Confusion • Fatigue • Bloating • Dehydration of more than 2 % of BW may increase the risk of nausea, vomiting, diarrhea 	
Why cramps and fatigue?	11	<p>Results of sweating:</p> <ul style="list-style-type: none"> • Decreased blood volume • Increased HR • Increased body heat • Less oxygen + nutrient rich blood to muscles <p>These result in slower removal of wastes leading to fatigue and cramps.</p>	
How to improve hydration	12	<p>Thirst is not a good indicator Drink fluids during each stage, BPR Drink throughout the day Begin hydration days before game day Stay away from drinks that dehydrate the body such as soda, coffee, energy drinks, alcohol For every pound lost in sweating, hydrate with 16 oz (2 cups) of water</p>	
Am I hydrated?	13	<p>Check urine color in the morning. Follow urine color chart.</p>	
Sport drinks	14	<p>Contains sugar and electrolytes Do not dilute Help in fighting dehydration, can improve performance, easier to drink For exercise lasting longer than 1 hour Not always the case. Depending on the intensity and if in hot and humid conditions.</p>	
Summary	15	<p>Vitamins and minerals do not provide energy</p>	

		<p>Important minerals for the adolescent athlete</p> <ul style="list-style-type: none"> • Iron • Calcium • Sodium <p>Hydration helps in every stage, BPR</p> <ul style="list-style-type: none"> • Check the color of the urine • Should be light yellow 	
	16	Any questions? Thank you!	
On a piece of paper...	17	<ol style="list-style-type: none"> 1. State the main difference between vitamins and minerals. 2. List the main minerals important for the athlete. 3. List at least 3 reasons why hydration is important. 4. Write at least 3 symptoms of dehydration and ways to hydrate. 5. State the time frame when to consume sport drinks. 	

Lesson Plan:

Learning Objectives:

Lesson 5: Putting it all together

1. The students will list the best time frame to eat after exercise.
2. The students will be able to draw what the athlete's plate should consist of (five components).
3. The students will be able to list two reasons why snacks are important and give one examples each of a pre and post workout snack.
4. The students will be able to write four ways of choosing healthier options while eating out.

Time required:

45 minutes

Set up for lecture:

PowerPoint

Activity:

Quiz

Topic	Slide number	Slide content	Activity
Introduction	1	Sports Nutrition: Putting it together	
Objectives	2	<ol style="list-style-type: none">1. List the best time frame to eat after exercise.2. Draw what the athlete's plate should consist of (five components).3. List two reasons why snacks are important and give one examples each of a pre and post workout snack.4. Write four ways of choosing healthier options while eating out.	

When should I eat?	3	<p>Eat every 2-3 hours Takes about 1-4 hours for the food to leave the stomach</p> <ul style="list-style-type: none"> • Carbohydrates → digested more quickly • Protein → helps staying full • High fat → takes longer <p>Eat within 15-30 minutes after exercise</p> <ul style="list-style-type: none"> • Protein and some carbohydrates • Easier to produce glycogen, decreased muscle breakdown 	
General guideline	4	<p>3 meals per day. How many of you eat breakfast?</p> <ul style="list-style-type: none"> • Breakfast (do NOT skip!) • Lunch • Dinner <p>Snacks</p> <ul style="list-style-type: none"> • At least 2 snacks per day (pre and post workout) • Ideal 3 snacks: pre + post + bedtime snack 	
Athletes plate	5	<p>Carbohydrates (1/3) Vegetables (1/3) Protein (1/4) Fat (small amount) Water or Low Fat Milk to drink.</p>	
What should I eat?	6	<p>More UNPROCESSED and WHOLE foods As close to its natural state as possible</p> <ul style="list-style-type: none"> • Carbohydrates: fruits and vegetables (BUT are lower carbohydrates), rice, pasta, bread, oatmeal, sweet potatoes • Protein: chicken, fish, meat, seafood, tofu, fish, eggs, dairy • Fats: nuts, seeds, vegetable oils • Dairy: yogurt, low fat or fat free milk, low fat cheese 	

Breakfast ideas	7	<p>Which food is the carbohydrates, proteins, fats?</p> <ol style="list-style-type: none"> 1. Breakfast burrito <ul style="list-style-type: none"> • 1 whole wheat tortilla, scrambled eggs, veggies, cheese, Greek yogurt, avocado 2. Oatmeal and Egg <ul style="list-style-type: none"> • Oatmeal, banana, berries, cinnamon unsalted nuts, low fat milk, 1 whole egg 3. Omelet <ul style="list-style-type: none"> • 1 whole egg + 2 egg whites, 1/2 cup of veggies, 2 slices of 100% whole wheat toast, 1 small piece of fruit 4. Sandwich <ul style="list-style-type: none"> • 2 slices 100% whole wheat toast, turkey or eggs, veggies, avocado 	Name the food and which macronutrient it belongs to
Snacks do matter	8	<p>Provide energy for the muscles Maximize blood sugar Maximize glycogen stores Reduce fatigue Reduce hunger</p>	
Pre workout snacks	9	<p>4:1 ratio carbohydrates to protein</p> <ul style="list-style-type: none"> • Carrots, whole wheat pita, hummus • Unsalted pretzels, PB • Baby food package • Whole grain crackers, yogurt • Trail mix, fruit (low fiber) • String cheese, whole grain crackers • 100 % whole wheat toast, PB, banana 	
Post workout snacks	10	<p>3:1 ratio carbohydrates to protein</p> <ul style="list-style-type: none"> • Banana, 100 % whole wheat toast, PB • Apple sauce, string cheese • Greek yogurt with granola • Hummus, whole wheat pita • Low fat cottage cheese + 1 fruit • 1 egg, whole grain crackers, 1 fruit • Fruit, low fat cottage cheese or string 	

		cheese <ul style="list-style-type: none"> • Energy bar • Trail mix 	
Make your trail mix	11	Benefits: <ul style="list-style-type: none"> • No salt, sugar, oils added! You can add: <ul style="list-style-type: none"> • Nuts (almonds, walnuts, cashews, pecans etc.) • Seeds (sunflower, pumpkin etc.) • Dried fruits (mango, apples, apricots, plums etc.) • Dried berries (cranberries, cherries, blueberries etc.) • Granola • Pretzels • Dried coconut slices 	
Eating out	12	Limit or have less of: <ul style="list-style-type: none"> • Fried foods • White flour bread (whole wheat) • Heavy sauce and dressings • Sautéed foods • Foods described as “crispy” or “rich” • Sodas • Desserts • Tempura • Limit croutons, cheese, dressing • Avoid complimentary bread 	
Eating out	13	Look for: <ul style="list-style-type: none"> • Steamed • Broiled • Baked • Grilled Ask for: <ul style="list-style-type: none"> • Whole wheat > white • Dressing on the side • Water or low fat milk to drink • To-go box before eating • Substitution for healthier options. Chips, fries → salad 	

Summary	14	<p>Eat every 2-3 hours</p> <p>Eat a snack 15-30 minutes after exercise</p> <ul style="list-style-type: none"> • Protein and some carbohydrates <p>Athletes Plate</p> <ul style="list-style-type: none"> • 1/3 carbohydrates, 1/3 vegetables, 1/4 protein, small amount of fat, water or low fat milk to drink <p>Pre and post workout snacks</p> <p>Healthier options eating out</p> <p>Nutrition label</p> <ul style="list-style-type: none"> • Ingredients • Serving size • Carbohydrates • Protein 	
	15	Any questions? Thank you!	
On a piece of paper...	16	<ol style="list-style-type: none"> 1. List the best time frame to eat after exercise. 2. State what their plates should consist of. 3. List 3 reasons why snacks are important and give 2 examples each of a pre and post workout snacks. 4. Write 3 examples of choosing healthier options while eating out. 	

Lesson Plan:

Learning Objectives:

Lesson 6: Supplements and Food Myths

1. The students will be able to state how supplements are regulated.
2. The students will be list four natural foods that have added benefits.
3. The students will be able to list at least two food myths.
4. The students will be able to list at least two possible downfalls with different diets.
5. The students will be able to read a nutrition label.

Time required:

45 minutes

Set up for lecture:

PowerPoint

Activity:

Quiz

Topic	Slide number	Slide content	Activity
Introduction	1	Sports Nutrition: Supplements and food myths/diets	
Objectives	2	1. State how supplements are regulated. 2. List four natural foods that have added benefits. 3. List at least two food myths. 4. List at least two possible downfalls with different diets. 5. Able to read a nutrition label.	
Supplements	3	Can be consumed by eating or drinking Should NOT replace a meal, should supplement Ex. of supplements <ul style="list-style-type: none">• Vitamins• Minerals	

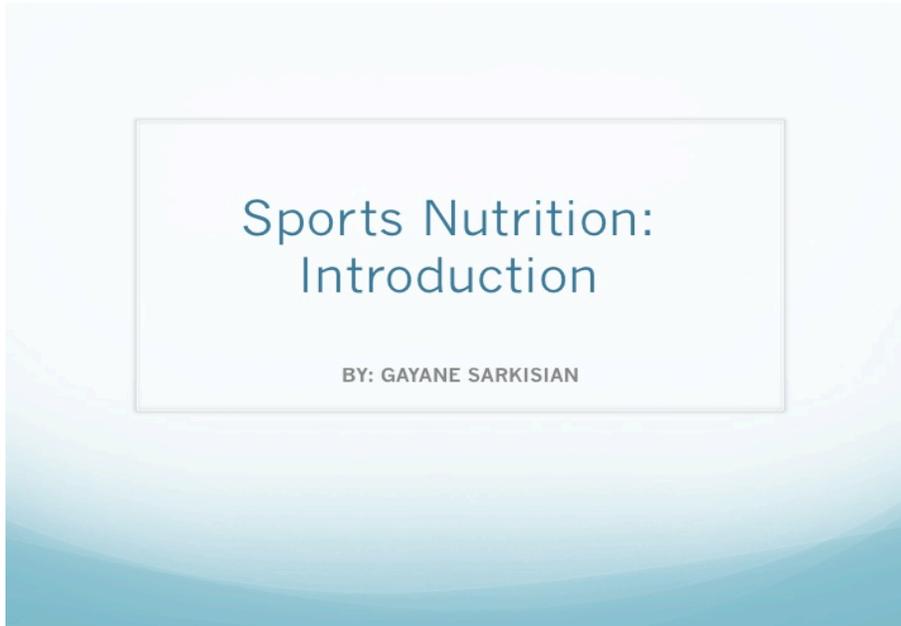
		<ul style="list-style-type: none"> • Herbs • Protein powder • Fiber 	
When to possibly use supplements	4	<p>Certain health conditions</p> <p>Hospital setting</p> <p>Deficiency</p> <p>A restricted diet</p> <p>Vegetarian, vegan</p>	
Are supplements safe to use?	5		
Supplements	6	<p>The FDA does NOT regulate supplements</p> <p>May cause side effects or symptoms, increase risk of toxicity</p> <p>Company responsible</p> <p>Making sure their product is safe</p> <p>If evaluated not safe, then the FDA can take action</p> <p>If you do decide to consume</p> <ul style="list-style-type: none"> • Don't go over 100 % of the DV • Look for NSF, USP, GMP 	
Energy drinks and bars	7	<p>Energy bars</p> <ul style="list-style-type: none"> • Some high in carbohydrates or protein (some both) • May have a lot of added sugars, artificial flavors • Nothing special, more for convenience • Better to eat real food <p>Energy drinks</p> <ul style="list-style-type: none"> • Different from sport drinks • Caffeine, stimulants, sugar, sugar alcohols, vitamins • Better to drink water, low fat milk, low fat chocolate milk, coconut water, or 100% fruit juice 	
Food > Supplements	8	<p>Considering the safety issues, should we try to get our nutrients from food or supplement?</p> <p>Use nutrition, hydration, and lifestyle changes to meet your needs!</p>	

Nutrition label	9	<ol style="list-style-type: none"> 1. Check the ingredients. The shorter the list the better. 2. Check serving size 3. Check calories 4. Check protein, fat, carbohydrates 5. Check sodium 6. Check vitamins and minerals 	
Natural foods	10	<p>Cinnamon Turmeric Ginger Kale Berries Walnuts Sweet potatoes Bananas Chia seeds Tart cheery juice</p>	
Food myths	11	<p>Vitamin C will help get rid of your cold Eating after 6/7/8 pm is bad Eating egg yolk is bad Athletes need supplements Fat-free and low-fat foods better than full-fat versions</p> <ul style="list-style-type: none"> • Can be higher in calories, artificial ingredients, or sugar 	
Different diets	12	<p>Paleo</p> <ul style="list-style-type: none"> • No grains <p>Low carbohydrate diet</p> <ul style="list-style-type: none"> • Athlete needs carbohydrates <p>Mediterranean diet</p> <ul style="list-style-type: none"> • Complex carbohydrates, lean proteins, healthy fats <p>High protein diet</p> <ul style="list-style-type: none"> • Not always better. Need right amount. <p>Any others you have heard?</p>	
Summary	13	<p>Food > supplements</p> <ul style="list-style-type: none"> • More nutrients • No regulation <p>Don't always believe what you hear</p> <ul style="list-style-type: none"> • Do your research 	

		Balanced diet with more natural foods and less processed <ul style="list-style-type: none"> • Complex carbohydrates, fruits, vegetables, lean proteins, healthy fats 	
	14	Any questions? Thank you!	
On a piece of paper...	15	<ol style="list-style-type: none"> 1. State how supplements are regulated. 2. List four natural foods that have added benefits. 3. List at least two food myths. 4. List at least two possible downfalls with different diets. 	

APPENDIX B

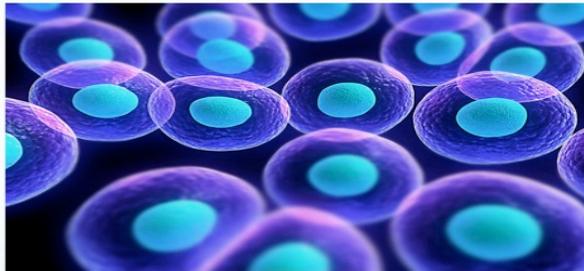
Lecture 1



Definitions

- Nutrition
 - Substance ingested (food, supplement, drinks) that has an impact on the body such as providing energy, nourishment and preventing disease.
- **Sports nutrition**
 - Nutrition that focuses on the diet of an athlete or someone who is more physically active for optimum performance.

Importance of nutrition



Why should we care about food?

Importance of nutrition



What kind of fuel does this car need?

Importance of nutrition

- How does it affect us?
 - Athletic performance
 - Energy levels
 - Recovery time
 - Cognitive
- Who may benefit from learning about sport nutrition?

Consequences of poor nutrition

- Diminished athletic performance
- Fatigue
- Weight loss or gain
- Increased risk of injuries
- More likely of soreness
- Longer recovery

BPR

BUILD → PERFORM → RECOVER

- **B**
Proper nutrition and hydration
- **P**
Game day. Proper nutrition and hydration
- **R**
Proper nutrition and hydration. Sleep included.

BPR

- How much energy do I need for each stage of BPR?
 - INDIVIDUALIZED
- Different caloric depending on:
 - Intensity of activity
 - Age
 - Gender
 - Genetics
 - Body size
 - Type of sport

BPR

- Determining the amount of food needed
- Calories consumed calories expended

Summary

- Sports nutrition make an impact
 - Performance and health
- Consequences of poor nutrition
- BPR

Any questions?



Thank you!

On a piece of paper...

- 1. Define sports nutrition and why it is important.
- 2. List three consequences each of poor and good nutrition.
- 3. Define BPR and how nutrition and hydration plays a role in each stage.
- 4. List three factors that affect caloric needs.

Lecture 2

Sports Nutrition: Macronutrients

BY: GAYANE SARKISIAN

Objectives

- 1. List the main function of carbohydrates and four different food sources.
- 2. List the main function of protein and four different food sources.
- 3. List the main function of fats and four different food sources.
- 4. Define macronutrients.
- 5. State the consumption ratio of carbohydrates to protein before and after exercise.

The six classes of nutrients

1. Carbohydrates*
2. Proteins*
3. Fats*
4. Vitamins
5. Minerals
6. Water

*Macronutrients

Macronutrients

- Nutrients the body needs in larger quantities:
 - Carbohydrates
 - Proteins
 - Fats



Protein

Carbohydrates

Fats

Carbohydrates

- Function:
 - Body and brain
 - High intensity exercise
 - 4 calories/gram
- Storage of carbohydrates:
 - “Glycogen”
 - Eating too much → stored as fat
- When to eat carbohydrates
 - BPR
 - About 1 hour or intense exercise simple carbohydrates (sports drink, banana etc.)
 - After exercise
- 45 – 65 % of calories

Sources of carbohydrates

- Rice, bread, pasta, potatoes, sweet potatoes, cereal, granola bars, flour, fruit, milk, juice, soda, cookies, sweets, candy, pastry, and many more.



Simple vs. Complex

- **Simple carbohydrates:**
 - candy, ice cream, cookies, honey, refined sugars. Simple carbohydrates that are natural include fruit and milk



- **Complex carbohydrates:**
 - whole grain breads, pasta, cereal, vegetables, beans



Fiber

- Remove waste from the digestive system
 - “Cleans the intestines”
- May prevent constipation, cancers
- Eat fruits and vegetables with the skin, whole grain breads, nuts and seeds
- Not too much before exercise
- Don't eat during exercise



Protein

- Function:
 - Prevent muscle breakdown
 - Build muscle
 - Growth
 - 4 calories/gram
 - Not a main energy source during exercise
 - Exceptions
- Storage of proteins:
 - Can't be stored
 - Having too much → stored as fat
- When to eat proteins:
 - B and R
 - 4:1 ratio of carbohydrates to protein before exercise
 - 3:1 ratio of carbohydrates to protein after exercise
 - 15-30 minutes after exercise
 - More protein may need increase need for water
- Up to 35 % of calories



Protein sources

- Not all proteins the same
- Plant sources:
 - Usually not complete proteins
 - Nuts, seeds, beans, legumes, lentils, soy beans, tofu, peanuts, tempeh
 - Ex. of complete protein:
 - corn + peas, wheat +peanuts, rice + beans
- Animal sources:
 - Complete proteins
 - Chicken, fish, meat, dairy, cheese, seafood, eggs



Fats

- Function:
 - Energy
 - Protection
 - Brain
 - Low intensity activity or prolonged exercise
 - 9 calories/gram
- Storage of fats:
 - Can be stored
 - Anything you eat too much of (carbohydrates, proteins, or fat) → stored as fat
- When to eat fats:
 - Should be in each big meal (small amount)
 - Avoid high fat foods before exercise
- 20-35% of calories

Sources of fat

- Saturated:
 - Solid at room temperature
 - Mostly animal sources
 - Sources:
 - bacon, butter, meats (visible and invisible), white part of protein, skin, cookies, ice cream, coconut oil, dairy (varies)



- Unsaturated:
 - Liquid at room temperature
 - Mostly from plant source
 - Sources:
 - olive oil, canola oil, sunflower oil, safflower oil, nuts, seeds, vegetable oil, corn oil, peanuts, soybeans



Omega 3

- Exercise increase inflammation in the body
- Omega 3 helps in reducing inflammation
 - Ex.: walnuts, olive oil, avocado, chia seeds

Summary

- Carbohydrates
 - Main energy source
 - 4:1 ratio before exercise
 - 3:1 ratio after exercise
 - Restore glycogen stores
- Proteins
 - Needed for recovery, building, and maintaining muscle mass
- Fats
 - For calories
 - Proper fats may help with recovery and reducing inflammation (omega 3)

Any questions?



Thank you!

On a piece of paper...

- 1. List the main function of carbohydrates and four different food sources.
- 2. List the main function of protein and four different food sources.
- 3. List the main function of fats and four different food sources.
- 4. Define macronutrients.
- 5. State the ratio to consume of carbohydrates to protein before and after exercise.

Lecture 3

Sports Nutrition: Vitamins

BY: GAYANE SARKISIAN

Objectives

- 1. Define micronutrients and which nutrients belong to the micronutrients.
- 2. List at least two vitamins and one food source from each.
- 3. List two differences between fat- and water-soluble vitamins (Ex. storage, excretion)
- 4. State at least three important vitamins needed for athletes.

Effect of exercise

- Burn more calories
 - Need to eat adequate amount of calories
- Oxidative stress
 - Increased free radicals
 - Need antioxidants
 - Recovery

The six classes of nutrients

1. Carbohydrates
2. Proteins
3. Fats
4. Vitamins*
5. Minerals
6. Water

*Micronutrient

Micronutrients

- Nutrients you need in less quantity:
 - Compared to macronutrients
 - Vitamins and minerals
- Vitamins vs. minerals?
 - Broken down by acid, heat, or air
 - Minerals hold on to structure



Questions

1. What's the difference between macro and micronutrients?
2. Do vitamins provide energy?



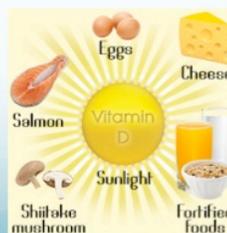
Vitamins

- Fat soluble:
 - Vitamin A, D, E, K
 - Higher risk of toxicity
 - Can be stored
 - Excretion (feces)
- Water soluble:
 - B complex, vitamin C
 - Less risk of toxicity
 - Excretion (urine)



Fat-soluble vitamins

- **Vitamin A**
 - Function:
 - Vision, skin, bone health, antioxidant
 - Sources:
 - Beef, liver, eggs (yolk), shrimp, fish, fortified milk, cheddar and Swiss cheese), sweet potatoes, carrots, pumpkin, squash, spinach, mango, sweet potatoes
- **Vitamin D**
 - Function:
 - Bone health
 - Good for growing adolescents
 - Sources:
 - Sun exposure, fortified milk, margarine or cereals, fatty fish, fortified dairy



Fat soluble vitamins

- **Vitamin K**
 - Function:
 - Blood clotting
 - Sources:
 - Leafy greens, cabbage, kale, eggs (yolk), spinach, broccoli, liver
- **Vitamin E**
 - Function:
 - Antioxidant
 - Phospholipids in cells
 - Sources:
 - Vegetable oils, salad dressings (vegetable oil), wheat germ, almonds, nuts, leafy greens



Water soluble vitamins

- **B vitamins**

- Function:
 - Metabolism
 - Brain
 - Blood
 - *Thiamin* and *riboflavin*
 - Good for athletes!

- Sources:
 - Whole grains, dairy, meats, chicken, nuts, seeds



Water soluble vitamins

- **Vitamin C**

- Function:
 - Antioxidant
 - Immune system
 - Skin
- Sources:
 - Citrus fruits, bell peppers, spinach, berries, tomatoes



Summary

- Vitamins do not provide energy, they help in releasing the energy from the foods
- The vitamins important for the adolescent athlete
 - B vitamins
 - Thiamin and riboflavin
 - The antioxidants
 - Vitamin A, C, E

Any questions?



Thank you!

On a piece of paper...

- 1. Define micronutrients and which nutrients belong to the micronutrients.
- 2. List at least two vitamins and one food source from each.
- 3. List two differences between fat- and water-soluble vitamins (Ex. storage, excretion)
- 4. State at least three of the most important vitamins needed for athletes.

Lecture 4

Sports Nutrition: Minerals and Hydration

BY: GAYANE SARKISIAN

Objectives

- 1. State at least one difference between vitamins and minerals.
- 2. List at least two of the main minerals important for the athlete.
- 3. List at least two reasons why hydration is important.
- 4. Write at least two symptoms of dehydration.
- 5. State the time frame when sport drinks is recommended.

The six classes of nutrients

1. Carbohydrates
2. Proteins
3. Fats
4. Vitamins
5. Minerals*
6. Water



*Micronutrient

Micronutrients

- Just like the vitamins, minerals belong to the micronutrients.
- Neither, vitamins or minerals provide energy
 - Macronutrients
- Nutrients you need less of:
 - Vitamins
 - Minerals

Minerals

Hydrogen 1 H 1.00794																	Helium 2 He 4.002602																	
Lithium 3 Li 6.941	Boron 5 B 10.811	Carbon 6 C 12.0107	Nitrogen 7 N 14.0064	Oxygen 8 O 15.9994	Fluorine 9 F 18.9984032	Neon 10 Ne 20.1797																												
Sodium 11 Na 22.98976928	Magnesium 12 Mg 24.304	Aluminum 13 Al 26.9815386	Silicon 14 Si 28.0855	Phosphorus 15 P 30.973762	Sulfur 16 S 32.06	Chlorine 17 Cl 35.453	Argon 18 Ar 39.948																											
Potassium 19 K 39.0983	Calcium 20 Ca 40.078	Scandium 21 Sc 44.955912	Titanium 22 Ti 47.867	Vanadium 23 V 50.9415	Chromium 24 Cr 51.9961	Manganese 25 Mn 54.938045	Iron 26 Fe 55.845	Cobalt 27 Co 58.933195	Nickel 28 Ni 58.6934	Copper 29 Cu 63.546	Zinc 30 Zn 65.38	Gallium 31 Ga 69.723	Germanium 32 Ge 72.630	Arsenic 33 As 74.9216	Selenium 34 Se 78.96	Bromine 35 Br 79.904	Krypton 36 Kr 83.80																	
Rubidium 37 Rb 85.4678	Sr 38 Sr 87.62	Yttrium 39 Y 88.905848	Zirconium 40 Zr 91.224	Niobium 41 Nb 92.90638	Molybdenum 42 Mo 95.94	Technetium 43 Tc 98	Ruthenium 44 Ru 101.07	Rhodium 45 Rh 101.07	Palladium 46 Pd 106.42	Silver 47 Ag 107.8652	Cadmium 48 Cd 112.411	Indium 49 In 114.818	Tin 50 Sn 118.710	Antimony 51 Sb 121.757	Tellurium 52 Te 127.603	Iodine 53 I 126.905	Xenon 54 Xe 131.29																	
Cesium 55 Cs 132.90545196	Ba 56 Ba 137.327	* 57-70	Lanthanum 57 La 138.90547	Hafnium 71 Hf 178.49	Tantalum 72 Ta 180.94788	Tungsten 73 W 183.84	Rhenium 74 Re 186.207	Osmium 75 Os 190.23	Iridium 76 Ir 192.222	Platinum 77 Pt 195.084	Gold 78 Au 196.966569	Mercury 79 Hg 200.59	Thallium 80 Tl 204.3833	Lead 81 Pb 207.2	Bismuth 82 Bi 208.9804	Po 83 Po 209	Astatine 84 At 210	Rn 85 Rn 222																
Francium 87 Fr 223	Ra 88 Ra 226	** 89-102	Lr 103 Lr 260	Rf 104 Rf 261	Db 105 Db 262	Sg 106 Sg 263	Bh 107 Bh 264	Hs 108 Hs 265	Mt 109 Mt 266	Uun 110 Uun 267	Uuu 111 Uuu 268	Uub 112 Uub 269						Uuq 114 Uuq 289																
		* Lanthanide series																																
		57	58	59	60	61	62	63	64	65	66	67	68	69	70																			
		La	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb																			
		138.90547	140.12	140.90768	144.242	144.9126	150.358	151.964	157.25	158.92535	162.5001	164.930329	167.25947	168.93032	173.054688																			
		** Actinide series																																
		89	90	91	92	93	94	95	96	97	98	99	100	101	102																			
		Ac	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No																			
		227	232.037724	231.036888	238.02891	237.048173	244.064224	247.071251	251.076466	257.10375	261.108888	267.105213	270.103752	277.103752	285.103752																			

Vitamins vs. Minerals

- What's the difference?
 - Vitamins more sensitive
 - Can be broken down by acid, heat, or air
 - Minerals not as sensitive
 - Hold on to their structure

Minerals

- **Iron**
 - Function:
 - Red blood cells, oxygen transportation
 - Vitamin C
 - Increased losses in sweat
 - Sources:
 - Red meat, poultry, eggs, fruits, green vegetables, grains, fortified bread
- **Calcium**
 - Function:
 - Muscle contraction, bones, teeth,
 - Not having enough:
 - Increased risk of stress fractures, decreased bone-mineral content and density
 - Increased losses in sweat
 - Sources:
 - Yogurt, dairy, tofu, salmon, sardines, fortified juices, leafy greens, broccoli, kale



Minerals

- **Phosphorus**
 - Function:
 - Build and protect bones, metabolism, cells
 - Sources:
 - Wide variety of foods, milk, dairy products, meat, fish, chicken, eggs, broccoli, almonds
 - Too much phosphorus from soda leak calcium out of bones
- **Sodium**
 - Sodium and chloride most abundant in sweat
 - Lost in sweating
 - Function:
 - Balancing fluid in body
 - Muscle contractions
 - Blood pressure regulation
 - Sources:
 - Packaged foods, salt, pickled foods, condiments, processed foods, soy sauce



Hydration

- **Function:**
 - Blood volume
 - Body temperature
 - Muscle contraction
 - Recovery
 - Performance
 - Prevent dehydration
- **How fluids are lost:**
 - Sweat, evaporation, breathing, removing waste products



Dehydration

- Symptoms
 - Decreased physical performance
 - Loss of concentration
 - Cramps
 - Headache
 - Dizziness
 - Confusion
 - Fatigue
 - Bloating
- Dehydration of more than 2 % of BW may increase the risk of nausea, vomiting, diarrhea



Why cramps and fatigue?

- Results of sweating:
 - Decreased blood volume
 - Increased HR
 - Increased body heat
 - Less oxygen + nutrient rich blood to muscles
 - These result in slower removal of wastes leading to fatigue and cramps.

How to improve hydration

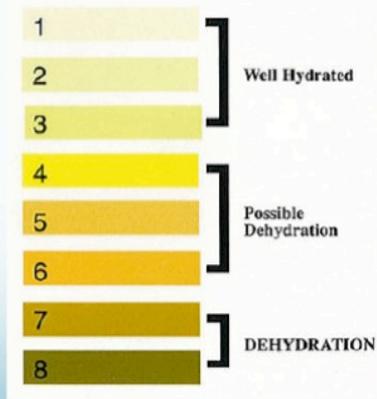
- Thirst
 - Not a good indicator
- Fluids during each stage, BPR
 - Drink throughout the day
 - Begin hydration days before game day
- Stay away from drinks that dehydrate
 - Ex. soda, coffee, energy drinks, alcohol
- Every pound lost in sweating
 - Hydrate with 16 oz (2 cups) of water



Am I hydrated?

- Check urine color in the morning

Urine Color Chart



Sport drinks

- Contains sugar and electrolytes
- Do not dilute
- Help in fighting dehydration, can improve performance
- For exercise lasting longer than 1 hour
 - Not always the case. Depends on intensity and environment.

Summary

- Vitamins and minerals do not provide energy
- Important minerals for the adolescent athlete
 - Iron
 - Calcium
 - Sodium
- Hydration helps in every stage, BPR
- Check the color of the urine
 - Should be light yellow

Any questions?



Thank you!

On a piece of paper...

- 1. State at least one difference between vitamins and minerals.
- 2. List at least two of the main minerals important for the athlete.
- 3. List at least two reasons why hydration is important.
- 4. Write at least two symptoms of dehydration.
- 5. State the time frame when sport drinks is recommended.

Lecture 5

Sports Nutrition: Putting it Together

BY: GAYANE SARKISIAN

Objectives

- 1. List the best time frame to eat after exercise.
- 2. State what the athlete plate should consist of (draw, five components).
- 3. List two reasons why snacks are important and give one example each of a pre and post workout snack.
- 4. Write four ways of choosing healthier options while eating out.

When should I eat?

- Eat every **2-3 hours**
- Digestion ~1-4 hours
 - Carbohydrates → digested more quickly
 - Protein → helps staying full
 - High fat → takes longer
- Eat within 15-30 minutes after exercise
 - Protein and carbohydrates
 - Build and decrease muscle breakdown, restore glycogen

General guidelines

- Three meals per day
 - **Breakfast**
 - Lunch
 - Dinner
- Snacks
 - At least two snacks per day (pre and post workout)
 - Ideal three snacks

Athlete's Plate

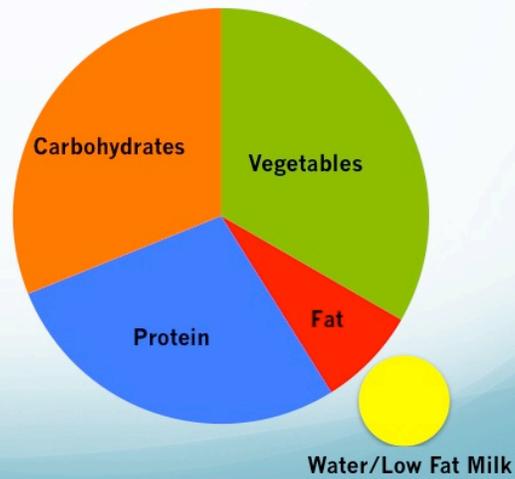
Carbohydrates (1/3)

Vegetables (1/3)

Protein (1/4)

Fat (small amount)

Water or Low Fat Milk to drink.



What should I eat?

- More UNPROCESSED and WHOLE foods
 - As close to its “natural state”
- Carbohydrates
 - Fruits
 - Vegetables (lower carbohydrates)
 - Rice, pasta, bread, oatmeal, sweet potatoes
- Protein
 - Chicken, fish, meat, seafood, tofu, fish, eggs, dairy
- Fats
 - Nuts, seeds, vegetable oils
- Dairy
 - Yogurt, low fat or fat free milk, low fat cheese



Breakfast ideas

Which food is carbohydrates, proteins, and fats?

- 1. Breakfast burrito
 - 1 whole wheat tortilla, scrambled eggs, veggies, cheese, Greek yogurt, avocado
- 2. Oatmeal and Egg
 - Oatmeal, banana, berries, cinnamon unsalted nuts, low fat milk, 1 whole egg
- 3. Omelet
 - 1 whole egg + 2 egg whites, 1/2 cup of veggies, 2 slices of 100% whole wheat toast, 1 small piece of fruit
- 4. Sandwich
 - 2 slices 100% whole wheat toast, turkey or eggs, veggies, avocado

Snacks do matter

- Provide energy
- Maximize blood sugar
- Maximize glycogen stores
- Reduce fatigue
- Reduce hunger

Pre workout snacks

4:1 ratio carbohydrates to protein

- Carrots, whole wheat pita, and hummus
- Unsalted pretzels and hummus or PB
- Baby food package
- Greek yogurt and fruit or granola
- Apple sauce and string cheese



Post workout snacks

3:1 ratio carbohydrates to protein

- Banana, 100 % whole wheat toast, PB
- Low fat cottage cheese, 1 fruit
- 1 egg, whole grain crackers or 1 fruit
- Fruit and low fat cottage cheese or string cheese
- Trail mix and fruit



Make your Trail mix!

- Benefits:
 - No salt, sugar, oils added!
- You can add:
 - Nuts (almonds, walnuts, cashews, pecans etc.)
 - Seeds (sunflower, pumpkin etc.)
 - Dried fruits (mango, apples, apricots, plums etc.)
 - Dried berries (cranberries, cherries, blueberries etc.)
 - Granola
 - Pretzels
 - Dried coconut slices

Eating out

Limit or have less of:

- Fried foods
- White flour bread (whole wheat)
- Heavy sauce and dressings
- Sautéed foods
- Foods described as “crispy” or “rich”
- Sodas
- Desserts
- Tempura
- Limit croutons, cheese, dressing
- Avoid complimentary bread



Eating out

- Look for:
 - Steamed
 - Broiled
 - Baked
 - Grilled
- Ask for:
 - Whole wheat > white
 - Dressing on the side
 - Water or low fat milk to drink
 - To-go box before eating
 - Substitution for healthier options
 - Chips, fries → salad



Summary

- Eat every 2-3 hours
- Eat a snack 15-30 minutes after exercise
 - Protein and some carbohydrates
- Athletes Plate
 - 1/3 carbohydrates, 1/3 vegetables, 1/4 protein, small amount of fat, water or low fat milk to drink
- Pre and post workout snacks
- Healthier options eating out

Any questions?



Thank you!

On a piece of paper...

- 1. List the best time frame to eat after exercise.
- 2. State what the athlete plate should consist of (draw, consist of five components).
- 3. List two reasons why snacks are important and give one example each of a pre and post workout snack.
- 4. Write four ways of choosing healthier options while eating out.

Lecture 6

Sports Nutrition: Supplements and Food Myths/Diets

BY: GAYANE SARKISIAN

Objectives

- 1. State how supplements are regulated.
- 2. List four natural foods that have added benefits.
- 3. List at least two food myths.
- 4. List at least two possible downfalls with different diets.
- 5. Able to read a nutrition label.

Supplements

- Consumed by eating or drinking
- Should NOT replace a meal, should supplement
- Ex. of supplements
 - Vitamins
 - Minerals
 - Herbs
 - Protein powder
 - Fiber



When to possibly use supplements

- Certain health conditions
 - Hospital setting
 - Genetic factors
- Deficiency
- A restricted diet



Are supplements safe to use?



Supplements

- The FDA does NOT regulate supplements
- May cause side effects or symptoms, increase risk of toxicity
- Company responsible
 - Making sure their product is safe
 - If not safe - FDA can take action
- If decide to consume
 - Don't go over 100 % of the DV
 - Look for NSF, USP, GMP



Energy drinks and bars

- Energy bars
 - Some high in carbohydrates or protein
 - May have added sugars or artificial flavors
 - Convenience
- Energy drinks
 - Different from sport drinks
 - Caffeine, stimulants, sugar, sugar alcohols, vitamins

Food > Supplements

- Considering the safety issues...
 - Food or supplement?
- Use nutrition, hydration, lifestyle changes to meet your needs!



Nutrition label

4 BOX TOPS EDUCATION box tops!

YoPlait
Smoothie
TRIPLE BERRY
THAWABLE, BLENDED, NONFAT MILK & FROZEN YOGURT POUCHES
MAKES 2 SMOOTHIES
(One full serving of fruit)**
KEEP FROZEN
NET WT 7.6 OZ (215g)

Nutrition Facts
Serving Size 1/2 pouch (107g)
8 FL. OZ Prepared
Servings Per Container 2

Amount Per Serving	As packaged	Prepared
Calories	70	110
Calories from Fat	10	15
% Daily Value**		
Total Fat 1.5g*	2%	2%
Saturated Fat 0g	0%	0%
Trans Fat 0g		
Cholesterol 0mg	0%	1%
Sodium 30mg	1%	4%
Total Carbohydrate 14g	5%	7%
Dietary Fiber 2g	8%	8%
Sugars 10g		
Protein 2g		
Vitamin A	0%	4%
Vitamin C	25%	25%
Calcium	50%	60%
Iron	4%	4%

* Amount as packaged. As prepared with skim milk, one serving practices 1.5g total fat, less than 5mg cholesterol, 90mg sodium, 25g total carbohydrate (15g sugars), and 5g protein.
**Percent Daily Values are based on a diet of 2,000 calories per day. Your daily values may be higher or lower depending on your calorie needs.
Calories 2,000 2,500
Total Fat Less than 65g 65g
Saf Fat Less than 25g 25g
Cholesterol Less than 300mg 300mg
Sodium Less than 2,400mg 2,400mg
Total Carbohydrate 300g 375g
Dietary Fiber 25g 30g

Ingredients: Strawberries, Blueberries, Water, Raspberries, Nonfat Yogurt (skim milk, yogurt cultures), Sugar, Fructose, Calolium Phosphate, Milkfat, Corn Starch, Banana Puree, Natural Flavor, Nonfat Milk, Gelatin, Xanthan Gum, Pectin, Carrageenan, Sucralose, Citric Acid.
CONTAINS MILK INGREDIENTS.
DISTRIBUTED BY YOPLAIT USA, INC., MINNEAPOLIS, MN 55440
****one full serving of fruit = 1/2 cup of fruit**
© 2011 YoPlait USA, Inc.
YoPlait is a registered trademark of YOPLAIT Marques Internationales SAS (France) used under license. 3022062803

Natural foods

- Cinnamon
- Turmeric
- Ginger
- Kale
- Berries
- Walnuts
- Sweet potatoes
- Bananas
- Chia seeds
- Tart cherry juice

Food myths

- Vitamin C - get rid of your cold
- Eating after 7pm is bad
- Eating egg yolk is bad
- Athletes need supplements
- Fat-free and low-fat foods better than full fat versions



Different diets

- Paleo
 - No grains
- Low carbohydrate diet
 - Athletes need carbohydrates
- Mediterranean diet
 - Complex carbohydrates, lean proteins, healthy fats
- High protein diet
 - Not always better. Need right amount.

Any others you have heard?

Summary

- Food > supplements
 - No regulation
- Don't always believe what you hear
 - Do your research!
- Balanced diet with more natural foods and less processed
- Nutrition label
 - Ingredients
 - Serving size
 - Carbohydrates
 - Protein
 - Vitamins and minerals

Any questions?



Thank you!

On a piece of paper...

- 1. State how supplements are regulated.
- 2. List four natural foods that have added benefits.
- 3. List at least two food myths.
- 4. List at least two possible downfalls with different diets.

APPENDIX C
QUESTIONNAIRE

Name: _____ Date: _____ School: _____

What is your gender? 1. Male 2. Female

What is your age? _____

In terms of an ethnicity/race, I am:

1. African American/Black 2. Asian 3. Caucasian/White 4. Hispanic/Latino 5.

Other _____

Are you currently physically active? 1. Yes 2. No

Are you currently participating in a sports team? 1. Yes 2. No

If yes, what sport? _____

If yes, where? _____

On the next questions, please do not guess. If you are ‘not sure’, answer ‘not sure’.

1. How many servings of fruits and vegetables are recommended per day?

1. Five vegetables and two fruits

2. Five vegetables and 4 fruits

3. Five vegetables and five fruits

4. Two vegetables and five fruits

5. **Not sure**

2. The macronutrients include?

1. Protein
2. Carbohydrates
3. Fats
4. Minerals and minerals
5. Protein, carbohydrates, fats
6. All of the above

7. Not Sure

3. What is true about the fat-soluble vitamins?

1. They can be stored
2. They cannot be stored
3. They are the vitamins C, D, A
4. They are not toxic

5. Not sure

4. What is true about the water-soluble vitamins?

1. They are the vitamins A, D, K, A
2. They are usually less toxic because they can be excreted
3. They are more sensitive to heat and pH changes
4. 2) and 3)

5. Not sure

5. Which may lead to weight gain?

1. Excess carbohydrates
2. Excess protein

3. Excess fat

4. Any of these in excess may lead to weight gain

5. Not sure

6. When is the best time to eat after exercise?

1. After 30 minutes

2. After 15-30 minutes

3. After one hour

4. After 45 minutes

5. Not sure

7. Which food group helps in restoring glycogen levels?

1. Proteins

2. Fats

3. Carbohydrates

4. Vitamins and minerals

5. Not sure

8. Which food group is primarily used for higher intensity exercise?

1. Fats

2. Proteins

3. Carbohydrates

4. All of them

5. Not sure

Additional comments:

APPENDIX D
QUESTIONNAIRE

Name: _____ Date: _____ School: _____

What is your gender? 1. Male 2. Female

What is your age? _____

In terms of an ethnicity/race, I am:

1. African American/Black 2. Asian 3. Caucasian/White 4. Hispanic/Latino 5.

Other _____

Are you currently physically active? 1. Yes 2. No

Are you currently participating in a sports team? 1. Yes 2. No

If yes, what sport? _____

If yes, where? _____

On the next questions, please do not guess. If you are ‘not sure’, answer ‘not sure’.

1. How many servings of fruits and vegetables are recommended per day?

1. Five vegetables and two fruits

2. Five vegetables and 4 fruits

3. Five vegetables and five fruits

4. Two vegetables and five fruits

5. **Not sure**

2. The macronutrients include?

1. Protein
2. Carbohydrates
3. Fats
4. Minerals and minerals
5. Protein, carbohydrates, fats
6. All of the above

7. Not Sure

3. What is true about the fat-soluble vitamins?

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4. After 45 minutes

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7. Which food group helps in restoring glycogen levels?

1. Proteins

2. Fats

3. Carbohydrates

4. Vitamins and minerals

5. Not sure

8. Which food group is primarily used for higher intensity exercise?

1. Fats

2. Proteins

3. Carbohydrates

4. All of them

5. Not sure

What are some changes you have made to your food intake since the start of the program?

What are some changes you have made to your physical activity since the start of the program?

What are some changes and recommendations you have of improving this program?

What topics would you like to learn more about?

Additional comments:

APPENDIX E

Evaluation

Lesson plan and PowerPoint's

Development of a Sports Nutrition Curriculum to Increase Nutrition

Knowledge among High school Athletes in Los Angeles, CA.

Name: _____ **Date** _____

Position: _____

- Rating Score:**
- 1: Strongly Disagree
 - 2: Disagree
 - 3: Neither Agree or Disagree
 - 4: Agree
 - 5: Strongly Agree

Area of Evaluation	1	2	3	4	5
1. The lesson plan and PowerPoints were organized and easy to follow.					
2. The lesson plan and PowerPoints were appropriate for high school students.					
3. The PowerPoints had enough and appropriate visuals.					
4. The lecture objectives were clear and realistic.					
5. The lesson plan was detailed enough to be used by another teaching					

professional.					
6. The lesson plan and PowerPoints were free of grammatical errors.					
7. The lesson plan and PowerPoints were an effective tool to increase nutrition knowledge among high school students.					

What suggestions or feedback do you have to improve the curriculum and/or the presentations?

Additional Comments:

APPENDIX F

Evaluation

Lesson plan and PowerPoint's

Development of a Sports Nutrition Curriculum to Increase Nutrition

Knowledge among High school Athletes in Los Angeles, CA.

Name: _____ **Date** _____

Position: _____

- Rating Score:**
- 1: Strongly Disagree
 - 2: Disagree
 - 3: Neither Agree or Disagree
 - 4: Agree
 - 5: Strongly Agree

Area of Evaluation	1	2	3	4	5
1. Maintained eye contact with the students while presenting.					
2. Communicated effectively (clarity and loudness).					
3. Geared teaching to educational level.					
4. Quiz questions were appropriate based on lecture objectives.					
5. Showed concern in answering the student's nutritional questions.					

6. Showed passion and interest in the topic.					
7. Started and ended the lectures in a timely manner.					

What suggestions or feedback do you have to improve the presentation and/or the lectures?

Additional Comments:

APPENDIX G

PRE AND POST TEST QUESTIONS

1. How many servings of fruits and vegetables are recommended per day?
 2. The macronutrients include?
 3. What is true about the fat-soluble vitamins?
 4. What is true about the water-soluble vitamins?
 5. Which may lead to weight gain?
 6. When is the best time to eat after exercise?
 7. Which food group helps in restoring glycogen levels?
 8. Which food group is primarily used for higher intensity exercise?
-

Question	Pretest Correct	Pretest Incorrect	Posttest Correct	Posttest Incorrect	% increase
1	27	73	50	50	23
2	30	70	87	13	57
3	13	87	77	23	64
4	20	80	23	77	3
5	87	13	80	20	7
6	20	80	87	13	67
7	23	77	53	47	30
8	17	83	27	73	10