5-2020

Club Athletes: Dietary Supplement Use and How the Registered Dietitian Can Better Serve this Population

Rachel E. Robbins
Utah State University

Follow this and additional works at: https://digitalcommons.usu.edu/etd

Part of the Nutrition Commons

Recommended Citation
https://digitalcommons.usu.edu/etd/7757

This Thesis is brought to you for free and open access by the Graduate Studies at DigitalCommons@USU. It has been accepted for inclusion in All Graduate Theses and Dissertations by an authorized administrator of DigitalCommons@USU. For more information, please contact digitalcommons@usu.edu.
ABSTRACT

Prevalence of Supplement Usage Among Club Athletes at Utah State University

by

Rachel E. Robbins, Master of Science
Utah State University, 2020

Major Professor: Dr. Heidi Wengreen, Ph.D., R.D.
Department: Nutrition

Dietary supplements are widely available in the United States. It is well documented that athletes of all levels use supplements to gain a competitive edge. There is limited data on collegiate club athletes dietary supplement use. This population is unique due to their lack of available resources and often lack of drug testing in their sports. The purpose of the first study was to assess dietary supplement use in club athletes at Utah State University (USU). A survey was sent electronically to all 401 club athletes at USU. There was a 12% response rate of the survey (n=49). Of those that responded to the survey, 65% reported taking at least one dietary supplement in the previous two months. This is lower than the reported dietary supplement use frequency in collegiate athletes. Club athletes reported taking supplements for energy support and to gain muscle or weight most frequently. The most frequent sources of information surrounding dietary supplements were parents and peers. The second study’s purpose was to look at how other Division 1 universities are engaging their student-athletes (SA) outside the fueling
station and provide recommendations for future sport nutrition programming for the club athletes at USU. To assess how universities are engaging their student-athletes, semi-structured interviews were set up with ten Division 1 sports dietitians. All dietitians that participated worked with NCAA athletes and did not work with club athletes. The most common theme identified was physical presence with the SA. This was crucial for increasing trust and rapport with the student-athlete. All dietitians stated that being around the athletes and letting them know you are there to support them and not just teach nutrition helped build rapport and trust which led to increased participation in their programming. All universities offered one-on-one nutritional counseling, body composition testing, grocery store tours, cooking classes or demos, and team talks. One university screened all new athletes for nutritional concerns and one university conducted nutrition focused blood work on all athletes. Overall, while SA may be difficult, increasing engagement can happen through persistence and physical presence with the athlete.
PUBLIC ABSTRACT

Prevalence of Dietary Supplement Use Among Club Athletes at Utah State University
Rachel E. Robbins, RD

Dietary supplements are a booming business in the United States. Currently over half of Americans have taken a dietary supplement in the last year. Collegiate and professional athletes are even more likely to take a dietary supplement to get a competitive edge over their opponents. The objective of this study was to assess dietary supplement use in club athletes at Utah State University. Club athletes are non-scholarship athletes associated with a university. They often do not the same level of funding or resources that NCAA or scholarship athletes have. A survey was sent to all 401 club athletes at Utah State University electronically. 49 club athletes responded to the survey. Of those that responded 65% reported using a dietary supplement in the last two months. The most common dietary supplements consumed were protein, caffeine or energy drinks, Vitamin D, multivitamins, and fish oil. The most common reasons for taking a dietary supplement were to support energy, gain muscle or strength and general health. Both parents and friends were equally selected as the athlete’s source of information about dietary supplement use. Overall, dietary supplement use was less than expected for a collegiate athlete. The supplements consumed and reasons for taking supplements were in line with current research on NCAA athletes. The objective of the second study was to assess how to engage the student athlete. Currently there is limited research on how to engage collegiate athletes in sports nutrition programming. Semi-
structured interviews were set up with Division I university sports dietitians. These interviews revealed that physical presence was the biggest contributor to increasing participation in sport nutrition programming. This is due to the athlete will build rapport and trust with the sports dietitian and will be more likely to believe them and come to them when they have a nutritional concern. All universities had similar sport nutrition programming. All universities offered one-on-one nutritional counseling, group talks, grocery store tours, cooking classes or demos, and body composition testing. The most frequent request of service from the student-athletes were body composition testing and one-on-one nutritional counseling. The information collected in this study was used to create recommendations for future effective sport nutrition programming with club athletes at Utah State University.
ACKNOWLEDGMENTS

I would like to thank Dr. Heidi Wengreen for pushing me even though I never thought I would be able to conduct research. I would like to thank my fellow graduate assistants with whom I have worked very closely with and have pushed me farther than I could have gone by myself.

I give special thanks to my friends and family for whom I could not have completed this adventure without. I appreciate their patience with me as I learned how to become a researcher and their moral support through each step of this process from the proposal to writing my final words. I could not have completed this without your cheerleading and support.

Rachel E. Robbins
CONTENTS

Page

ABSTRACT ....................................................................................................................... iii

PUBLIC ABSTRACT ......................................................................................................... v

ACKNOWLEDGMENTS ................................................................................................ vii

LIST OF TABLES ............................................................................................................. ix

CHAPTER

I.  THE IMPORTANCE OF DIETARY SUPPLEMENT REGULATION AND
    SAFETY OF SUPPLEMENTS KNOWLEDGE IN CLUB ATHLETES............1

II.  SURVEY OF CLUB ATHLETE’S BEHAVIORS AND PERCEPTIONS
     RELATED TO SUPPLEMENT USE.............................................................................25

III. SEMI-STRUCTURED INTERVIEWS OF DIVISION I SPORTS
     DIETITIANS ABOUT ENGAGEMENT OF STUDENT ATHLETES ...............55

IV. CONCLUSIONS AND FUTURE RECOMMENDATIONS..............................75

APPENDICES ...................................................................................................................82
<table>
<thead>
<tr>
<th>Table</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-1</td>
<td>Subsections of Survey to Predict Adolescent Athlete Dietary Supplement Use</td>
</tr>
<tr>
<td>2-2</td>
<td>Characteristic of the Population</td>
</tr>
<tr>
<td>2-3</td>
<td>Types of Dietary Supplements Consumed with Gender and Age Influences</td>
</tr>
<tr>
<td>2-4</td>
<td>Reasons for Taking Dietary Supplements and the Influence of Gender and Age</td>
</tr>
<tr>
<td>2-5</td>
<td>Club Athlete’s Sources of Information</td>
</tr>
<tr>
<td>2-6</td>
<td>Means and Standard Deviations of Subcategories of SPAADSU</td>
</tr>
<tr>
<td>2-7</td>
<td>Logistic Regression Analysis of the Subsections and Total SPAADSU</td>
</tr>
<tr>
<td>3-1</td>
<td>Individual Responses to Coded Themes from the Semi-Structured Interviews of Registered Dietitians Working with Division I NCAA Athletes</td>
</tr>
</tbody>
</table>
Chapter I

The Importance of Dietary Supplement Regulation and Safety of Supplements

Knowledge in Club Athletes

Abstract:

Over half of Americans consume supplements daily, and in those that consider themselves athletes the percentage that consume dietary supplements is even higher. Supplements are currently loosely regulated by the United States federal government. This lack of oversight contributes to the occurrence of low quality, fraudulent, or contaminated supplements in the U.S. marketplace, increasing the risk of harm to American supplement consumers. Club athletes may be at an increased risk of taking an unsafe supplement due to lack of drug testing in several of the club sports compared to the NCAA athletes. Surveys of athletes show that trainers, family, peers, and the media heavily influence whether or not the athlete decides to take supplements. Due to a widespread lack of knowledge regarding the safe use of supplements, education of club athletes on these principles are vital for them to make safe choices about their use of dietary supplements.

Problem Statement:
Dietary supplement use is common among the average American consumer. According to the Consumer Survey Report 2018, 75% of American adults take dietary supplements (“2018 CRN Consumer Survey on Dietary Supplements,” 2018). Dietary supplement use among Americans that identify themselves as athletes is even more common and, some studies report that as many as 90% of athletes use dietary supplements (Knapik et al., 2016). Athletes take supplements for many reasons, including to enhance performance and recover from exercise. Most athletes are unaware of how dietary supplements are regulated and most falsely assume that because dietary supplements are readily available to purchase in U.S. markets, that they are safe to consume.

Intercollegiate athletes participating in the National Collegiate Athletic Association (NCAA) must abide by regulations that ban the use of many dietary supplements. However, club athletes are often not under the same restrictions and this may lead to less cautionary use of dietary supplements. Club athletes may be unaware of the risks associated with dietary supplement use and may be taking dietary supplements that are unnecessary or harmful. Providing club athletes with education regarding risks associated with dietary supplement use, largely due to the lack of regulation provided by the U.S. government, may change their beliefs and behaviors regarding dietary supplement use, which would ultimately reduce risk of either testing positive for a WADA banned substance or taking an unwanted or potentially dangerous substance.

**Background**
Introduction

The dietary supplement industry is very profitable in the U.S., in part due to the current federal regulations that do not require pre-market review or approval of dietary supplements. American consumers are often confused about the definition and regulatory process of dietary supplements, and many believe they are safe because they are available. This paper will clarify the definition of dietary supplements and will review the current state of federal regulation of the manufacturing and sale of dietary supplements. In addition, this paper will review findings from studies that examine the frequency of use of dietary supplements among college-aged students, as well as factors that are associated with this use.

What is a Dietary Supplement?

Congress defined dietary supplement as part of the Dietary Supplements Health and Education Act (DSHEA) of 1994 as any product taken orally that contains a “dietary ingredient.” A dietary ingredient is defined as an extract, concentrate, pill, tablet, powder, bar, or liquid that contains a vitamin, mineral, enzyme, or herbal substance or any derivative of those mentioned. The product must be labeled as a dietary supplement and is not to be used as a sole item for a meal or the diet. (“Dietary Supplement Health and Education Act of 1994,” n.d.).

Regulation of Supplements
The supplement industry in the U.S. is very loosely regulated. The main legislation that governs the supplement industry is the US Dietary Supplement Health and Education Act (DSHEA) of 1994. This act was part of an initiative to expand the FDA’s power. Originally, the legislation proposed was much more stringent than our current legislation, and proposed that the U.S. regulate dietary supplements more like drugs than food ingredients. The dietary supplement manufactures lobbied for the regulation of supplements to be different from regulations set for drugs. They also campaigned to the general public expressing that the legislation originally proposed would limit access to dietary supplements. The combined efforts of the general public and the supplement industry led to the development of the DSHEA legislature.

The act provided a definition of dietary supplements for the first time in the history of the U.S. It also provided regulation for what could be sold as a supplement and required that supplement labels not contain false information or have misleading statements, however, the legislation did not require pre-market review or approval of dietary supplement ingredients of claims. Essentially, under the DSHEA dietary supplements are regulated as a subcategory of food. This means that as long as the supplement contains a known dietary ingredient, manufacturers would not have to alert the Food and Drug Administration (FDA) of the ingredients used to create a new supplement.

A known dietary ingredient is an ingredient that had been used in a dietary supplement prior to October 4, 1994. If the ingredients were considered not known or new, then the company would have to alert the FDA of their intended use, and they would have to provide evidence that the ingredient was safe. However, new dietary
supplements with known ingredients do not have to get approval or review from the FDA. For a product to be considered a supplement and not a drug, the product must not claim to treat or mitigate a disease. The product must be intended to support the natural body’s function or a natural part of the diet (Nutrition, n.d.). This allows new products to become easily and quickly accessible to the public and has helped aid the growth of the supplement industry.

Under the current DSHEA regulation, dietary supplement manufacturers, not the FDA, are responsible for ensuring the safety of supplements. Dietary supplement manufacturers may package and sell dietary supplements without approval from the FDA. The FDA has authority to remove a product from the shelf or ban an ingredient if multiple adverse events are reported. However, it is up to the supplement manufactures to report adverse events to the FDA. Prior to 2006, it was up to the consumers, not the supplement companies, to report any adverse event to the FDA (“Dietary Supplement Health and Education Act of 1994,” n.d.; Nutrition, n.d.).

Under the DSHEA law of 1994, the manufacturer is responsible for ensuring safety of the supplement and accuracy of the label. In 2007, the FDA published regulations for Current Good Manufacturing Practices. The regulations provide guidance to ensure the identity, purity, quality, strength, and composition of supplements. Products may not state that they treat, diagnose, or cure any disease or disease state. However, the manufactures may put on their label how their product supports the structure or a function of the nutrient and its related function in the body. For example, a supplement manufacture may state calcium supports overall bone health and structure, they may not say that taking a calcium supplement will prevent osteoporosis. Manufactures must label
all ingredients and quantities of all ingredients in a product unless it is a “proprietary blend” (Nutrition, n.d.). In a proprietary blend, manufactures are required to list all ingredients in the supplement, but they do not have disclose amounts.

Another issue that is common among supplements is cross-contamination. Some studies have shown up to 25% of supplements sold in the United States marketplace to contain ingredients that are not listed on the label (Hans Geyer et al., 2008). This puts the consumer at risk to take a supplement that could be potentially dangerous for them to consume or is an unwanted substance. The FDA must be alerted by the consumer or manufacture to know that there may be a contaminated supplement in the marketplace. The FDA has very limited resources for removing supplements from the marketplace. The public must alert the FDA directly or the supplement manufactures, who in turn must report adverse events to the FDA. This can lead to the FDA to pull the product off the shelves or more commonly they release a statement warning of its use.

Advertising of dietary supplements are regulated by the Federal Trade Commission (FTC) and not the FDA (Nutrition, n.d.) (“Dietary Supplement Health and Education Act of 1994,” n.d.). The FTC, unfortunately, does not have the resources to keep up with all the supplements on the market, and sometimes false or misleading advertisements about supplements do occur.

**Dietary Supplement Usage**

The U.S. dietary supplement industry is ever growing. In 2017, dietary supplements were a 40.17 billion dollar a year industry, and this valuation has grown
astronomically over the last thirty years (“The Nutritional Supplement Market in North America (2018-2023),” 2018). For context, in 1994, the supplement industry was worth just 3.3 billion dollars a year (Maughan & Shirreffs, n.d.).

Dietary supplements are readily available to American consumers and this availability likely contributes to their widespread use. Since the 1970’s, many surveys have shown that 35-60% of the United States population take one or more supplements (Perko, 1999). According to the Council for Responsible Nutrition (CRN) Consumer Survey on Dietary Supplements 2018, 75% of adult Americans have taken a supplement in the last year (“2018 CRN Consumer Survey on Dietary Supplements,” 2018). This number is larger than in previous years. In 2009, 65% of Americans reported taking supplements, a number greater than that reported in other studies of American consumers. A recent study that looked at the data from the National Health and Nutrition Examination Survey (NHANES) collected between 1999 and 2012 found that supplement use among U.S. adults has remained steady at an average of 52%. This is on par with several other studies that have assessed supplement usage among the general population (Goston & Toulson Davisson Correia, 2010; Kantor, Rehm, Du, White, & Giovannucci, 2016; Marra & Bailey, 2018; Newberry, Beerman, Duncan, McGuire, & Hillers, 2001; Valentine, Schumacher, Murphy, & Ma, 2018).

College students are at least as likely to consume supplements as are other American adults. In 2009, a survey was administered at five universities in the U.S. In the survey, 66% of the over 1000 respondents consumed supplements. Of these, 41% consumed 1-2 supplements one time or more per week and 12% reported taking greater
than five supplements a week in the six months before the survey was administered (Lieberman et al., 2015).

Athletes are more likely to consume supplements than are non-athletes. In 1994, a survey of 10,000 athletes found that just 46% took supplements (Sobal & Marquart, 1994). In 2013, a survey of 462 athletes that either attended a 2-year college, 4-year university, or a trade school, 85.9% consumed some sort of supplement to help them enhance their athletic performance. This survey was unique in that it surveyed semiprofessional, intercollegiate, and club-level athletes. Intercollegiate and club athletes had about the same dietary supplement use: 89.4% and 88.5% respectively (Hoyte, Albert, & Heard, 2013a). The most common supplement used was caffeine, either in a pill or in the form of an energy drink (Hoyte et al., 2013a). In a survey administered to over 400 students at a Division I university, the researchers found 58% of all college students were currently taking, or had taken, dietary supplements within the last year. They also sampled a small portion of student-athletes. Data indicated 71.4% of males and 42.9% of females take supplements (Valentine et al., 2018). This is consistent with other surveys that have found student-athlete supplement use to be anywhere from 60-90%. All studies used surveys that asked the athletes if they consumed a dietary supplement in the last year or six months (Dascombe, Karunaratna, Cartoon, Fergie, & Goodman, 2010; Hoyte et al., 2013a; Knapik et al., 2016; Valentine et al., 2018).

The most common reasons for dietary supplement use among American adults is to improve or maintain overall health and prevention of health problems (Marra & Bailey, 2018). Athletes report taking supplements to improve strength and power, increase energy, and to gain muscle and or weight. Males were more likely to take a
supplement to help them improve speed, agility, or strength. Females were more likely to take a supplement to prevent health problems (Froiland, Koszewski, Hingst, & Kopecky, 2004).

**Common Supplements Used by Collegiate Athletes**

The variety of supplements in the marketplace seems almost endless. Athletes often feel pressured to be the best in their sport of choice. This can sometimes lead to an athlete taking an ergogenic aid. Ergogenic aid is a very broad term used to define any substance that is used to enhance sports performance (Thein, Thein, & Landry, 1995). Very few studies have looked at the overall efficacy of performance and long-term supplement use of non-anabolic supplements. Non-anabolic substances are any supplement that does not directly support muscle building or is not consist of or derived from a hormone that supports muscle building. This would include vitamin and mineral supplements. In one such study, the Australian Institute of Sport conducted a randomized control trial of 82 athletes from four different sports. The athletes consumed a supplement tablet that contained 10-50 times the recommended daily amount of a variety of vitamins and minerals. The athletes were followed for eight months to see if the supplementation affected sport performance. The researchers found that supplementation with vitamins and minerals that were significantly higher than the current recommended daily values did not significantly affect athletes’ sports performance (Telford RD et al., 1992).

In a survey of over 400 athletes, 80.1% of athletes consumed some type of caffeine supplement to enhance their athletic performance (Hoyte et al., 2013a). In a survey of about 200 student athletes, the majority (73%) of supplements consumed were
for “energy enhancement,” 61.4% used a protein and calorie replacement drink or bar, and 37.2% reported using creatine. Of those surveyed, 67% reported taking a multivitamin every day (Froiland et al., 2004). Another survey of about 200 student-athletes reported that a calorie and/or protein supplement was the most common supplement consumed by intercollegiate athletes (Burns, Schiller, Merrick, & Wolf, 2004). Several other surveys of intercollegiate and elite athletes stated the most common supplements that were reported to be used were caffeine, calorie replacements, protein supplements, and creatine (Darvishi et al., 2013; Dascombe et al., 2010; Hoyte et al., 2013a; Hoyte, Albert, & Heard, 2013b; Kristiansen, Levy-Milne, Barr, & Flint, 2005; Lieberman et al., 2015).

**Accidental Doping**

The regulatory agency that creates the banned substances list for most sports is the World Anti-Doping Agency (WADA). This organization oversees compliance of anti-doping policies in sports worldwide. They also provide education to prevent “positive” doping tests, which is when an athlete tests positive for a WADA-banned substance. WADA conducts research on various dietary supplement ingredients and creates the formal list of banned substances, which is updated annually ("What We Do," 2013). Due to the lack of regulation of supplements in the United States, even if an athlete is careful to avoid any listed ingredients on a supplement that may fall into the banned or prohibited WADA list, they can still test positive for a banned substance. This may occur because of unwanted and unlisted ingredients that are banned. Adulteration of dietary supplements may occur by cross-contamination in the manufacturing plant. Being
identified as having taken a banned ingredient, whether intentional or not, leads to consequences for the athlete which include missing a competition or suspension from the sport for multiple competitions or seasons.

Several studies have been published highlighting the low-quality standards of many supplement manufacturers. This can lead to supplements becoming contaminated whether intentionally or unintentionally by cross-contamination. Anywhere from 3-25% of supplements have been reported to contain low amounts of steroids or other stimulants that were not listed on the label (H Geyer et al., 2004; Hans Geyer et al., 2008). In a study where athletes consumed 5 g of a creatine supplement that was purposely contaminated with a banned substance of 2.5 micrograms of a nandrolone precursor which is considered an anabolic steroid, they found 25% of the athletes tested positive for the banned substance. The level of contamination the banned substance measured out to be just 0.00005% of the product (Watson, Judkins, Houghton, Russell, & Maughan, 2009). This could have been easily replicated in a manufacturing plant due to cross-contamination.

The products that are contaminated with banned substances such as anabolic steroids are not limited to supplements targeted towards athletes. In 2005, samples of vitamin C, multivitamins, and magnesium tablets from a single manufacturer tested positive for anabolic steroids such as prostanozol, methasterone, and androstatrienedione (Hans Geyer et al., 2008). A study conducted in 2001 analyzed 634 supplements that were purchased in 13 different countries from 215 different manufacturers. They found 18.8% of supplements purchased in the United States were contaminated with prohormones which are banned by WADA. The supplements that tested positive for
anabolic androgenic steroids had concentrations ranging from 0.01 to 190 micrograms. Supplements that tested positive for prohormones had a total concentration adding up to more than 1 microgram (H Geyer et al., 2004). Other studies have demonstrated that supplements can be contaminated with pharmaceuticals such that drugs are falsely labeled and marketed as supplement ingredients. This often happens in supplements marketed towards fat loss or enhancing energy (Parr, Koehler, Geyer, Guddat, & Schänzer, 2008; Parr et al., 2008). Others have unlisted stimulants which can lead to adverse effects for the person consuming the supplement such as tachycardia, flushing, or anxiety (Baume, Mahler, Kamber, Mangin, & Saugy, 2006; Tarnopolsky, 2010).

**Athlete Resources for Choosing Safe Supplements**

Though it is up to the consumer to seek out such information, several independent organizations test the quality of dietary supplements. Dietary supplement companies pay third-party organizations to test the quality and safety of their dietary supplements’ quality and safety checks, they can so indicate this on their dietary supplement label. For example, Consumer Labs and the United States Pharmacopeia (USP) test the products for label accuracy, assuring consumers that supplements carrying their verification symbol have the ingredients as listed on the ingredient list. Another resource for student-athletes is the National Sanitation Foundation (NSF) International Certified for Sport symbol. This symbol can be found directly on the product labeling. It ensures that the product has been tested and does not contain any substances banned by WADA (“About Us | Certified for Sport®,” n.d.). There are also other certifications athletes can look for in the supplement aisle such as Informed Sport. This label also
certifies what is listed on the label matches what is in the product. Similarly to the NSF International Certified for Sport symbol, they test for WADA banned substances ("Informed-Choice | Sports Supplement Banned Substance Testing," n.d.).

**Club Athletes**

Club athletes are student athletes that are not sanctioned by the NCAA. They do not have the same regulations as NCAA athletes because they are not governed by the NCAA. Therefore, many sports do not have to follow the banned substances rules set by WADA. Each club sport has a different regulatory body. Some of these regulatory bodies do not actively drug test their athletes, while others such as the USA Powerlifting Organization, which governs Utah State’s powerlifting team, does conduct standard drug testing that follows WADA policies with their athletes. The lack of drug testing and substance regulation in club sports can lead to an increased potential of an athlete taking a dangerous or WADA banned substance. There is extremely limited research on club athlete supplement usage and whether they take known banned or dangerous substances. This is why it is important that club athletes are educated on the regulation of supplements and how to choose a safe supplement.

**Sources of Information**

American consumers’ confidence in supplement products and trust in the supplement industry is extremely high. According to the Council for Responsible Nutrition 2018 Consumer Survey on Dietary Supplements, 87% of adults in the United
States have confidence in the safety, quality, and effectiveness of supplements. This is up 5% from the survey conducted in 2009. Additionally, 78% of adults consider the supplement industry trustworthy. This is also up 5% from the first time the question was asked in the survey in 2016 (“2018 CRN Consumer Survey on Dietary Supplements,” 2018).

Athletes often want to be informed about the substances they put in their body. They want to be able to fuel their body the best they can to help them perform at their peak. Athletes are also heavily advertised to. There are advertisements distributed all over magazines, television, and social media telling them to take a new supplement that will help them become faster, stronger or achieve better body composition. Many athletes believe that nutritional supplements are not required when eating a well-balanced diet (Dascombe et al., 2010). However, a student athlete often has a very hectic schedule, and nutrition and sleep are often neglected. Student athletes then will turn to nutritional supplements to help “fill in the gaps” and help them achieve the performance that they want. Friends, family, trainers, coaches, and teammates are often sources of information and recommendations for supplements that athletes should take. One study found that 77% of those who took supplements took them on advice from family and friends (Darvishi et al., 2013). Other studies demonstrated that 77.6% and 41% of athletes received their information for their supplement use from family, friends, or the media (Herbold, Visonti, Frates, & Bandini, 2004; Jacobson, Sobonya, & Ransone, 2001). In another study looking at supplements taken and sources of information of college students who use the recreation center, 25% thought the internet was the best source for
information about supplement safety and efficacy, and 21% stated a nutrition store clerk was the best source of information (Jackson, Lyons, Roberts, Geary, & Williams, 2010).

The problem with getting their information from these sources is that the sources are not always well educated about the safety or efficacy of the supplement they are recommending. It is vitally important that dietitians aggressively market their expertise of dietary supplements to help these athletes make more informed choices (Dascombe et al., 2010). A study by Jacobson et al. in 2001, found that only 37% of athletes could correctly identify the correct function of nutrients, and 33% of those surveyed thought that vitamins were a direct source of energy (Jacobson et al., 2001).

**Why Club Athletes Are at an Increased Risk**

NCAA student-athletes often have more resources for obtaining information about dietary supplements than much of the rest of the student population. In a study of 236 athletes where 88% used supplements, 39.8% reported going to their athletic trainers, 23.7% sought advice from their strength and conditioning coaches, and 14.4% went to dietitians as primary sources of information (Burns et al., 2004). Dietitians are uniquely qualified when it comes to administering supplement advice. Other professions may receive some training on supplement use, however, these professions are not proficient in understanding individual nutrients and their contribution to health, wellness, or sports performance. A recent study looked at sports nutrition knowledge among collegiate athletes, coaches, athletic trainers, and strength and conditioning coaches. They found only 35.9% of coaches had adequate knowledge about sports nutrition including dietary supplements (Torres-McGehee et al., 2012). This demonstrates the importance of
including the dietitian with other professionals to be a team of knowledgeable resources for student-athletes. It is important that the entire staff be trained on either safety and regulation of supplements or know to whom they can refer the athlete so that the athlete can make an informed decision.

Since club athletes do not have the same resources as NCAA athletes and may not have regular access to a dietitian, multiple athletic trainers, physical therapists, sports psychologists, and strength and conditioning coaches, it is important that they are educated on supplement regulation, safety, and efficacy. There is extremely limited research on club athletes and more needs to be done to determine if they are at an increased risk of consuming WADA-banned substances due to lack of regulation in their club sport organizations.

**Survey to Predict Adolescent Athletes Dietary Supplement Use**

The Survey to Predict Adolescent Athletes Dietary Supplement Use (SPAADSU) is a theory-based survey that is validated to predict supplement usage and knowledge in adolescent athletes (Perko, 1999). This tool is based on the Theory of Reasoned Action (TRA). The ultimate goal of TRA is to predict and understand human behavior, and it assumes that humans are rational beings and that they have the ability to use information to make decisions based on their own choice and will (Ajzen & Madden, 1986).

The first section of the SPAADSU (questions 1-13) collects demographic data, supplement usage, frequency, and sources of information. The next section
(questions 14-22) measures behavioral intentions regarding dietary supplement use. The third section (questions 23-32) measures attitudes towards behavior and knowledge of supplement regulation. The last section, (questions 33-46) measures subjective norms surrounding supplement use. The list of supplements included in this survey has been expanded to include more options for the athletes to choose from. This makes the lists much more inclusive for a larger variety of supplements the athletes may take due to the lack of regulation on the club sports. Athletes often cited the need for energy support as a major influencer on what kind of supplement they chose, and multiple forms of supplements in this category were included in this survey (Hoyte et al., 2013a).

Supplements that have been identified as often containing risky ingredients were also included in the supplement list, encompassing supplements in the weight loss and muscle building categories (Tucker, Fischer, Upjohn, Mazzer, & Kumar, 2018).

This survey encompasses the Theory of Reasoned Action based on the four sections. Each question in the survey is scaled on a 5-point Likert scale. The response can range from strongly disagree (1) to strongly agree (5). This survey for the proposed study is an adapted version of the SPAADSU. To my knowledge this tool has not had any validation studies. The study used to develop this tool and the study that confirmed the use of this tool in the adolescent and college population only looked at reliability of the tool which was originally assessed at 0.91 and then after it had been administered to over 4,000 athletes, it has been confirmed at 0.89 (Bartee, Grandjean, & Bieber, 2004; Perko, 1999).

This survey has been used to determine how likely an athlete is to be currently consuming supplements and whether they will continue taking supplements. The
SPAADSU is a reliable tool to assess supplement regulation and safety knowledge and frequency of use. It also asserts that the more positive an athlete views supplements as a social norm, paired with decreased knowledge about supplement regulation, and they believe the supplement may help them enhance their performance or health, then they will be very likely to consume or continue to consume taking the supplements. A study that used the SPAADSU in high school athletes found that information from this survey could be used to formulate an intervention to reduce supplement use and increase supplement knowledge. They found that attitudes surrounding supplements and knowledge of supplement regulation and safety were the biggest predictors of supplement use in high school athletes (Bartee, Grandjean, Dunn, Eddy, & Wang, 2004).

**Objectives of Research:**

The purpose of this research is to evaluate dietary supplement usage among club sport athletes and educate athletes about supplement safety and regulation. We also will interview Division 1 sport dietitians to learn how to engage the student athlete.

Specific aim A (SA1) Survey USU club athletes to determine their use of dietary supplements, 2) their source of information about dietary supplement use, and 3) their beliefs regarding the safety of dietary supplements.

SA2) Use the results from SA1 to guide the development of a class or other education event that will be delivered to club teams.
SA3) Evaluate the expectations, barriers, and pitfalls of offering nutrition programming to club athletes at Utah State University.

References


Chapter 2

Survey of Club Athlete’s Behaviors and Perceptions Related to Supplement Use

Abstract:

Due to the current state of how dietary supplements are regulated in the U.S., the use of dietary supplements always comes with some degree of risk. The objective of this study was to assess the frequency of use of dietary supplements among club athletes at Utah State University, a Division I school. Athletes answered questions about what types of supplements they consume, their behavioral intentions about supplements, attitudes towards supplement use, and subjective norms surrounding dietary supplement use. 12 % (n=49) of registered club athletes completed the survey. 65% of those who completed the survey consumed one or more dietary supplements on a regular basis. The most common reasons for consuming dietary supplements were to increase or support energy levels, gain muscle, and gain strength. Many believed their peers, parents, and coaches would approve of them taking dietary supplements to enhance their sport performance. There was disconnect between the reason the athlete chose why they were taking a supplement and what supplements they were consuming. This showed there is a need for education on effective and safe dietary supplementation with this population. Further research needs to be done to assess the needs of this population and provide education about dietary supplement regulation and how to choose a safe supplement.

Introduction:
Dietary supplements have become increasingly popular with athletes of all levels. In 1994, a survey of 10,000 athletes found that 46% of athletes took a dietary supplement on a regular basis (Sobal & Marquart, 1994). Current research places athlete dietary supplement usage as high as 98% (Dascombe, Karunaratna, Cartoon, Fergie, & Goodman, 2010; Hoyte, Albert, & Heard, 2013; Kristiansen, Levy-Milne, Barr, & Flint, 2005). Athletes at the collegiate and professional levels are not the only ones using supplements. The general population, especially college-aged young adults, are using dietary supplements. As many as 66% of college students use supplements on a regular basis and of those, 12% consume five or more supplements a week. (Lieberman et al., 2015) This increasing demand of supplements has also put pressure on the dietary supplement manufacturers to produce new products frequently.

Currently, dietary supplements are regulated under the US Dietary Supplement Health and Education Act (DSHEA) of 1994. This legislation increased the regulation of supplementation in the United States, and it also categorized dietary supplements as a subcategory of food not a drug. Under these current regulations, supplement manufacturers do not have to alert the Food and Drug Administration (FDA) if they are producing a new product with a known dietary ingredient. A dietary ingredient is any form or combination of vitamins, minerals, herb or other botanical, amino acid, or a substance for use by a person to supplement the diet by increasing total intake. They can come in any form such as a concentrate, metabolite, constituent, extract, or combination of any of the aforementioned (“Dietary Supplement Health and Education Act of 1994,” n.d.). This leaves a lot of room for supplements to come out to the marketplace that could be potentially dangerous.

Some studies have highlighted that anywhere from 3-25% of supplements sold in the United States are contaminated with ingredients that are not listed on the label. These
“additional” ingredients can be potentially dangerous items such as stimulants or small amounts of steroids or derivatives of steroids (Hans Geyer et al., 2008). Some of the most common supplements consumed by athletes are the biggest offenders of being contaminated with unlisted ingredients. Varsity and NCAA athletes have reported taking common supplements such as energy drinks or other caffeine supplements, protein and calorie replacement drinks and bars, and creatine. Many also reported taking a multivitamin supplement for general health promotion or to fill in the gaps of their diets (Froiland, Koszewski, Hingst, & Kopecky, 2004; Hoyte et al., 2013). Even though NCAA athletes tend to have many credible resources for helping them find a safe supplement, some will still test positive for a banned substance due to contamination of the supplements. These contaminated supplements are often found in energy enhancing supplements such as pre-workouts or fat burners, but also protein powders, sexual enhancement, and even individual vitamin and mineral supplements (H Geyer et al., 2004; Hans Geyer et al., 2008).

Athletes need to be educated on how to choose a safe and effective supplement for their goals. They also need to be educated about the dangers of contaminated supplements and how they can impact their career as an athlete or the risk to their health. Athletes can use tools, such as the National Sanitation Foundation (NSF) International Certified for Sport symbol, to pick a safe supplement. This is one of the most recognized certifications that can be easily found on a dietary supplement label. NSF International Certified for Sport approved supplements have been tested for any contamination. They (NSF) also run quality assurance tests that assure the product the athlete is purchasing contains the amount of supplement they are seeking (“About Us | Certified for Sport®,” n.d.). There are also other third-party verification symbols athletes can look for in the supplement aisle. Informed-Choice is another symbol found on dietary supplement packaging that ensures the supplement has been tested for any substances considered
dangerous or illegal by the World Anti-Doping Agency (“Informed-Choice | Sports Supplement Banned Substance Testing,” n.d.). Athletes can also look for the USP Verified symbol. This ensures the supplement contains only what is listed on the label (“Dietary Supplements Verification Program | USP,” n.d.). This company does not test for any World Anti-Doping Agency banned substances.

Club athletes are unique because they often have the same demands as varsity athletes but do not have the same degree of regulation and rules. Some club sports drug test their athletes and discourage using steroids or other NCAA banned ergogenic aids, while other club sports do not drug test their athletes at all. This leaves a lot of wiggle room for experimentation with dietary supplements as a club athlete. Club athletes also do not generally have the same resources for seeking out how to choose a safe supplement. For example, at Utah State University there is one Athletic Trainer for all 21 club teams. At many universities, club athletes may not have access to a Registered Dietitian (RD) to seek out credible information surrounding supplement use. This study aims to assess the frequency of dietary supplement usage among club athletes at USU. Athletes were asked to report on what types of supplements they consume and their perceptions, attitudes, and subjective norms surrounding dietary supplements. A supplement safety education class was also offered to all club athletes.

**Methods:**

All 401 club athletes at Utah State University were invited to participate in this study. The club presidents were contacted and asked to disperse the recruitment email and survey to all athletes on their teams. Those that chose to participate in the study had an option to provide their contact information so that they could be entered into a raffle to win a $25 Visa gift card.
To assess supplement use in club athletes and their intentions, attitudes, and subjective norms surrounding dietary supplements, the Survey to Predict Adolescent Athletes Dietary Supplement Use (SPAADSU) tool was used. This survey is a reliable tool used to predict supplement use and knowledge about supplement regulation in adolescent athletes (Perko, 1999). The 45-item survey is a theory-based tool that was developed using the Theory of Reasoned Action (TRA). The TRA is used to predict behavior. It asserts that humans use information such as their intentions, attitudes, and subjective norms surrounding the behavior to decide to do that behavior or not (Ajzen & Madden, 1986).

The SPAADSU is comprised of two sections. The first section measures demographics, recent supplement use, and sources of dietary supplement information. The second section is split into three subsections. Each of the subsections measure a part of the TRA that helps shape how we make decisions. The first subsection measures intention about supplement use (9 questions), the second measures attitudes about supplement use as well as knowledge about how supplements are regulated in the U.S (10 questions). The third and final subsection measures subjective norms surrounding supplement usage among young adults who consider themselves athletes (13 questions). Table 2-1 lists all the questions that were used in the second half of the survey.

| Table 2-1. Subsections of Survey to Predict Adolescent Athlete Dietary Supplement Use |
| **Intentions Towards Behavior** |
| I would use dietary supplements to improve my general health rather than for better athletic performance. |
I would use dietary supplements to improve my sports performance.

I would use dietary supplements if my coach gave them to me.

I would use dietary supplements if my teammate were taking them.

I would ask my coach if dietary supplements are safe.

I would ask my athletic trainer if dietary supplements were safe.

I would ask a registered dietitian if dietary supplements are safe.

I would ask a registered dietitian if dietary supplements work.

I would use dietary supplements that I know work.

\[\text{Attitudes Towards Behavior}\]

Dietary supplements are tested by the Federal Drug Administration (FDA).

Taking dietary supplements is safe because they are tested by scientists.

Taking dietary supplements would give me more energy.

Taking dietary supplements would help all athletes do better in sports.

Taking dietary supplements is a safe way for athletes to improve their performance.

Taking dietary supplements is a good way to build muscles.

Athletes my age need dietary supplements to improve sports performance.

Athletes my age need dietary supplements for general health reasons.

Dietary supplements are safe because professional athletes take them.

Dietary supplements work because professional athletes take them.

\[\text{Subjective Norms Around Behavior}\]
An adapted form of the SPAADSU was administered electronically via Qualtrics to all USU club athletes registered for class spring semester of 2019. In this adapted form of the survey, two questions were excluded, two questions were altered, and one question was added. The original survey was 44 questions long. The two questions that were deleted were considered not relevant to this study and included questions about supplement use for the purpose of avoiding the cold or flu. Two questions were added to the survey at the beginning to collect the
last five digits of participants’ A-numbers and what club sport they are in. A question was added in asking if they were aware there is a dietitian available to them at the Aggie Recreation Center. All other questions were included and not changed. The original survey just asked the participants to list the supplements they were consuming or have consumed. This study added an expansive list of 30 different types of supplements including a space to add in any supplements they are taking that are not listed. The survey was distributed between March 20th and April 5th, 2019.

Data Analysis:

The frequency of reports of categorical variables were assessed. Data was noted for sparse samples as well as missing data. The first half of the survey (13 questions) which collected demographic information, supplement use, reasons for supplement use, and sources of information was assessed using frequencies and descriptions. Due to small sample sizes, Fisher’s Exact Test was used to determine if there were nonrandom associations between categorical variables, including by gender and age. We were unable to assess differences by sport due to especially sparse reporting for this variable; here only 11 of 21 sports were represented. Some teams only had a single participant representing that sport.

The second half of the survey which assessed the TRA constructs (32 questions) was collected using a 5-point Likert scale in which 5 = strong agreement and 1 = strong disagreement with the given statements. The average score for each of the three previously described constructs (attitudes, intentions, and subjective norms) was computed and used as an independent variable in logistic regression models examining associations between these constructs and reported supplement use as a binary variable. To obtain the average score, scores for each
subsection were summed then divided by the number of questions in each section. This resulted in a number between one and five. This number represented the average choice on the Likert Scale (1 = strong disagreement, 5 = strong agreement). The higher the average response number, the more the athletes agreed with the statements listed in that subsection. This average response number was chosen to analyze the second half of the survey due to small sample size and this method has been used in other studies which used the SPAADSU to evaluate supplement use and had small sample sizes (Godo, 2004; Sell, 2013; Thelen, 2015). The average score of the behavior intentions questions was used as a measure of whether the athlete intended to take a dietary supplement in the future. The average score of the attitudes surrounding supplement use section was used as a measure of the athlete’s attitudes about supplement use and knowledge of supplement safety and regulation. The average score of the subjective norms questions was used as a measure of to what degree the athlete believed that their peers, family, coaches, or other authoritative figures would agree or disagree with the athlete’s decision to take a dietary supplement.

Results:

Table 2-2 describes the demographic characteristics of the data. 86% (n=42) of participants were Caucasian, 2% (n=1) were Asian, 2% (n=1) were Native Hawaiian or Other Pacific Islander, and 10% (n=5) selected they were more than one race. Of the participants 63% were female (n=31) and 37% male (n=18). Sophomores in college (n=17, 35%) were the most frequent respondents. The most frequent age of participants was 19 years old (n=11, 22%). The
most common sports played by the participants were Women’s Lacrosse (n=11, 22%), Women’s Club Volleyball (n=10, 20%), and Men’s Volleyball (n=7, 14%).

Table 2-2. *Characteristics of the population (n=49)*

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>Percentage</th>
<th>Took a Dietary Supplement</th>
<th>Did Not Take a Dietary Supplement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Participants</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>18</td>
<td>37%</td>
<td>14</td>
<td>4</td>
</tr>
<tr>
<td>Female</td>
<td>31</td>
<td>63%</td>
<td>18</td>
<td>13</td>
</tr>
<tr>
<td>Age: 18-19 Years</td>
<td>17</td>
<td>35%</td>
<td>9</td>
<td>8</td>
</tr>
<tr>
<td>Age: ≥ 20 Years</td>
<td>32</td>
<td>65%</td>
<td>23</td>
<td>9</td>
</tr>
<tr>
<td>Freshman</td>
<td>11</td>
<td>22%</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>Sophomore</td>
<td>17</td>
<td>35%</td>
<td>10</td>
<td>7</td>
</tr>
<tr>
<td>Junior</td>
<td>7</td>
<td>14%</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>Senior</td>
<td>11</td>
<td>22%</td>
<td>9</td>
<td>2</td>
</tr>
<tr>
<td>Graduate School</td>
<td>3</td>
<td>6%</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Asian</td>
<td>1</td>
<td>2%</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Race</td>
<td>Count</td>
<td>Percentage</td>
<td>Men's</td>
<td>Women's</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>-------</td>
<td>------------</td>
<td>-------</td>
<td>---------</td>
</tr>
<tr>
<td>Native Hawaiian or Other Pacific Islander</td>
<td>1</td>
<td>2%</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>White</td>
<td>42</td>
<td>86%</td>
<td>28</td>
<td>14</td>
</tr>
<tr>
<td>More Than One Race</td>
<td>5</td>
<td>10%</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Women's Lacrosse</td>
<td>11</td>
<td>22%</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Women's Club Volleyball</td>
<td>10</td>
<td>20%</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>Men's Volleyball</td>
<td>7</td>
<td>14%</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Cycling</td>
<td>5</td>
<td>10%</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Women's Rugby</td>
<td>5</td>
<td>10%</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Golf</td>
<td>3</td>
<td>6%</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Men's Lacrosse</td>
<td>3</td>
<td>6%</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Quidditch</td>
<td>2</td>
<td>4%</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Hockey</td>
<td>1</td>
<td>2%</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Men's Rugby</td>
<td>1</td>
<td>2%</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>
Of the 49 participants, 65% (n=32) reported taking a dietary supplement in the last two months. Gender nor age influenced whether the club athlete took a supplement in the last two months (p=0.219, p=0.219 respectively). Of those that consumed dietary supplements, 31% (n=15) reported consuming one supplement on a regular basis, 4% (n=2) reported consuming greater than five dietary supplements regularly. Regular supplement use was defined as using a supplement at least one time per week, and participants reported the supplements they consumed in the last two months. There was no significant difference between age and how many supplements were consumed on a regular basis (p=0.498). There was a significant difference between gender and how many supplements were consumed on a regular basis (p=0.03). 54% of females reported they did not take any supplements on a regular basis, whereas 39% of males reported taking one or more supplements on a regular basis. There was no significant difference between what grade in college they were in and whether they consumed dietary supplements (p = 0.494).

The most common dietary supplements consumed by club athletes were protein (22%, n=22), caffeine or energy drinks (19%, n=19), Vitamin D (11%, n=11), multivitamins (9%, n=9), and fish oil (7%, n=7). (Table 3) There was a significant difference between male and female use of energy supplements (p=0.045). Males (44% of males) were more likely to consume an energy supporting supplement than females. There was no difference between age groups on whether they would consume an energy supporting supplement (p=1.000). There was a significant
difference between genders on whether they consumed a protein or creatine supplement (p=0.036, p=0.020 respectively). In both cases males consumed more protein and creatine supplements than females (67% and 28% respectively). There were no differences in age groups on what types of supplements the club athlete’s consumed. (Table 2-3)

Table 2-3.

*Types of Dietary Supplements Consumed with Gender and Age Influences*

<table>
<thead>
<tr>
<th></th>
<th>Total (n=100)</th>
<th>Male (n=18)</th>
<th>Female (n=31)</th>
<th>Fisher’s Exact Test P-value</th>
<th>Age: 18-19 years (n=17)</th>
<th>Age: ≥ 20 years (n=32)</th>
<th>Fisher’s Exact Test P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arginine</td>
<td>1%</td>
<td>0%</td>
<td>3%</td>
<td>1.000</td>
<td>0%</td>
<td>3%</td>
<td>1.000</td>
</tr>
<tr>
<td>BCAA</td>
<td>4%</td>
<td>11%</td>
<td>6%</td>
<td>0.618</td>
<td>0%</td>
<td>13%</td>
<td>0.284</td>
</tr>
<tr>
<td>Beta-Alanine</td>
<td>1%</td>
<td>0%</td>
<td>3%</td>
<td>1.000</td>
<td>0%</td>
<td>3%</td>
<td>1.000</td>
</tr>
<tr>
<td>Caffeine</td>
<td>11%</td>
<td>33%</td>
<td>16%</td>
<td>0.286</td>
<td>12%</td>
<td>28%</td>
<td>0.287</td>
</tr>
<tr>
<td>Calcium</td>
<td>3%</td>
<td>6%</td>
<td>6%</td>
<td>1.000</td>
<td>0%</td>
<td>9%</td>
<td>0.542</td>
</tr>
<tr>
<td>Creatine</td>
<td>6%</td>
<td>28%</td>
<td>3%</td>
<td>0.020</td>
<td>12%</td>
<td>13%</td>
<td>1.000</td>
</tr>
<tr>
<td>D-ribose</td>
<td>1%</td>
<td>0%</td>
<td>3%</td>
<td>1.000</td>
<td>0%</td>
<td>3%</td>
<td>1.000</td>
</tr>
<tr>
<td>Energy Drinks</td>
<td>8%</td>
<td>28%</td>
<td>10%</td>
<td>0.124</td>
<td>18%</td>
<td>16%</td>
<td>1.000</td>
</tr>
<tr>
<td>Fish Oil</td>
<td>7%</td>
<td>17%</td>
<td>13%</td>
<td>0.697</td>
<td>6%</td>
<td>19%</td>
<td>0.397</td>
</tr>
<tr>
<td>Magnesium</td>
<td>3%</td>
<td>6%</td>
<td>6%</td>
<td>1.000</td>
<td>0%</td>
<td>9%</td>
<td>0.542</td>
</tr>
<tr>
<td>Multivitamin</td>
<td>9%</td>
<td>11%</td>
<td>23%</td>
<td>0.454</td>
<td>6%</td>
<td>25%</td>
<td>0.136</td>
</tr>
</tbody>
</table>
The most frequent reasons reported for taking dietary supplements were to support energy (18%, n=16), gain muscle (17%, n=15), gain strength (16%, n=14), and general health (13%, n=12). Both wanting to play better (12%, n=11) and similarly wanting to look better were selected 12% of the time (n=11). Other reasons club athletes reported taking dietary supplements were to gain weight (10%, n=9) and to lose weight (2%, n=2). Males were more likely to take a
supplement to gain weight and to gain muscle mass as compared to females (p=0.008, 0.001, respectively). Males were also more likely to take a supplement to play their sport better and to gain strength than females (p=0.010, p=0.003 respectively). No additional gender differences were observed. There were no differences between age groups observed. (Table 2-4)

Table 2-4.

Reasons for Taking Dietary Supplements and the Influence of Gender and Age

<table>
<thead>
<tr>
<th></th>
<th>Male (n=18)</th>
<th>Female (n=31)</th>
<th>Fisher’s Exact Test P-value</th>
<th>Age: 18-19 years</th>
<th>Age: ≥20 years</th>
<th>Fisher’s Exact Test P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Would Take Supplements to Gain Weight</td>
<td>39%</td>
<td>6%</td>
<td>0.008</td>
<td>29%</td>
<td>13%</td>
<td>0.244</td>
</tr>
<tr>
<td>Would Take Supplements to Gain Muscle</td>
<td>58%</td>
<td>13%</td>
<td>0.001</td>
<td>29%</td>
<td>31%</td>
<td>1.000</td>
</tr>
<tr>
<td>Would Take Supplements to Support Energy</td>
<td>50%</td>
<td>23%</td>
<td>0.063</td>
<td>18%</td>
<td>41%</td>
<td>0.123</td>
</tr>
<tr>
<td>General Health</td>
<td>Reasons</td>
<td>Would Take</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>------------------------------</td>
<td>----------------------------------------------</td>
<td>------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Would Take</td>
<td>0%   6%  0.526 6% 3% 1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supplements to Lose Weight</td>
<td>Would Take</td>
<td>44% 10% 0.010 12% 28% 0.287</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supplements to Play Better</td>
<td>Would Take</td>
<td>56% 13% 0.003 24% 31% 0.743</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supplements to Gain Strength</td>
<td>Would Take</td>
<td>33% 16% 0.286 24% 22% 1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supplements to Look Better</td>
<td>Source of Information:</td>
<td>28% 39% 0.541 41% 31% 0.539</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The sources of information about dietary supplements that athletes reported were examined by frequency of report. This information was used to determine the base knowledge and credibly of club athlete’s sources of information about dietary supplements. The largest source of information for athletes were their parents or guardians (19%, n=17) and friends (19%, n=17). This was followed by teammates (16%, n=14), coaches (11%, n=10), Registered
Dietitians (6%, n=5), media (6%, n=5), and other family (1%, n=1). 7% of participants reported other sources of information such as magazines and Instagram. 8% of participants reported receiving no information regarding dietary supplements from any source. (Table 5) Associations between gender or age and self-reported source of supplement information was examined using Fisher’s Exact Test. Males were more likely to get information regarding supplements from friends than were females (p = 0.03); no other differences in source of information was observed by gender. There were no differences between age groups and self-reported sources of supplement information. (Table 2-5)

Table 2-5.

*Club Athlete’s Sources of Information*

<table>
<thead>
<tr>
<th>Source of Information</th>
<th>Male (n=18)</th>
<th>Female (n=31)</th>
<th>Fisher’s Exact Test</th>
<th>Age: 18-19 years</th>
<th>Age: ≥20 years</th>
<th>Fisher’s Exact Test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>33%</td>
<td>26%</td>
<td>0.744</td>
<td>18%</td>
<td>34%</td>
<td>0.323</td>
</tr>
<tr>
<td>Teammates</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Source of Information:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coaches</td>
<td>28%</td>
<td>16%</td>
<td>0.465</td>
<td>18%</td>
<td>22%</td>
<td>1.000</td>
</tr>
</tbody>
</table>
Table 2-6 shows the three subcategories of questions from the second section of the SPAADSU with corresponding question numbers along with the means and standard deviation by subscale (intentions, attitudes, and subjective norms). The average of the behavioral intentions across all participants was 3.97 (SD=0.66). The range of scores for this section was 2.89 – 4.78. The average of attitudes towards dietary supplements was 2.74 (SD=0.53). The
range for the attitudes towards behavior subsection was 1.20 – 4.00. The average score for subjective norms surrounding dietary supplements was 3.75 (SD=0.46) with a range of scores of 2.75 – 4.92. The higher the average number in each category means the athletes agree with the statements in each category. The lower the average in each category mean the athletes did not agree with the statements. The higher averages in the behavioral intentions and subjective norms categories mean athletes agreed that they would be likely to use a dietary supplement and that their peers, coaches, and/or parents would approve of them taking a dietary supplement.

Table 2-6.

*Means and Standard Deviations of Subcategories of SPAADSU*

<table>
<thead>
<tr>
<th>Subcategories of SPAADSU</th>
<th>Question Numbers</th>
<th>Mean ± SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Behavioral Intentions</td>
<td>14-22</td>
<td>3.84 ± 0.52</td>
</tr>
<tr>
<td>Attitudes Towards Supplements</td>
<td>23-32</td>
<td>2.69 ± 0.54</td>
</tr>
<tr>
<td>Subjective Norms</td>
<td>33-46</td>
<td>3.75 ± 0.47</td>
</tr>
</tbody>
</table>

Logistic regression models were used to explore the associations between the independent variables representing the average subscale scores and the outcome of whether or not the athlete reported recent use of any dietary supplement (yes or no) (table 2-7). Each subscale was assessed all together with a total SPAADSU score of each subsection as well as independently from each other. We controlled for the effects of gender and age. None of the
subcategory summed average scores nor the total SPAADSU score were significantly associated with the odds of club athletes use of dietary supplements in the last two months.

Table 2-7.

**Logistic Regression Analysis of the Subsections and Total SPAADSU**

<table>
<thead>
<tr>
<th>Subsection</th>
<th>Behavioral Intentions</th>
<th>Behavioral Intentions + Gender</th>
<th>Behavioral Intentions + Gender + Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exp (B)</td>
<td>2.905</td>
<td>2.321</td>
<td>2.651</td>
</tr>
<tr>
<td>P-value</td>
<td>0.102</td>
<td>0.212</td>
<td>0.161</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Subsection</th>
<th>Attitudes Towards Behavior</th>
<th>Attitudes Towards Behavior + Gender</th>
<th>Attitudes Towards Behavior + Gender + Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exp (B)</td>
<td>3.099</td>
<td>2.747</td>
<td>3.405</td>
</tr>
<tr>
<td>P-value</td>
<td>0.081</td>
<td>0.128</td>
<td>0.084</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Subsection</th>
<th>Subjective Norms Surrounding Behavior</th>
<th>Subjective Norms Surrounding Behavior + Gender</th>
<th>Subjective Norms Surrounding Behavior + Gender + Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exp (B)</td>
<td>1.087</td>
<td>0.945</td>
<td>0.929</td>
</tr>
<tr>
<td>P-value</td>
<td>0.901</td>
<td>0.937</td>
<td>0.920</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Subsection</th>
<th>Total SPAADSU Score</th>
<th>Total SPAADSU Score + Gender</th>
<th>Total SPAADSU Score + Gender + Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exp (B)</td>
<td>1.041</td>
<td>1.033</td>
<td>1.039</td>
</tr>
<tr>
<td>P-value</td>
<td>0.141</td>
<td>0.361</td>
<td>0.416</td>
</tr>
</tbody>
</table>
Discussion:

Prevalence of club athlete dietary supplement use was less than expected. 49 club athletes (12%) completed the survey. All 21 club teams were invited to participate; 11 club teams had at least one participant. Of those that chose to participate, 31 (63%) were female and 18 were male. The most frequent age of participants was 19 years old. These young adults are often learning how to care for themselves as independents away from family which includes choosing to take dietary supplements. Overall 65% of club athletes stated they have taken at least one dietary supplement in the last two months. This is in line with current research assessing dietary supplement use across college students (Jackson, Lyons, Roberts, Geary, & Williams, 2010; Lieberman et al., 2015). This is lower than some studies which have assessed prevalence of dietary supplement usage among varsity or NCAA collegiate athletes to be at 88% (Burns, Schiller, Merrick, & Wolf, 2004; Kristiansen et al., 2005).

The athletes’ most frequently reported sources of information related to supplements were their parents and friends, both at 19% each. This answer was as expected because previous research conducted on collegiate athletes have stated family members and friends were often the largest source of information regarding dietary supplement use (Froiland et al., 2004). Other common sources of information athletes have reported were coaches and store clerks (Scofield & Unruh, 2006). There is potential these sources of information may not be very credible about dietary supplementation. A peer-centered dietary supplement education program could be beneficial for this population. The Adolescents Training and Learning to Avoid Steroids program and the Athletes Targeting Healthy Exercise and Nutrition Alternative Program are both peer
based education programs that have been proven effective in reducing substance related risky behaviors in adolescent athletes (Elliot et al., 2004; Goldberg et al., 1996).

The most frequently selected reason for taking a dietary supplement was to increase or support energy. This selection was expected because of the demands of being a college student and the hectic schedule of a student athlete. This is also consistent with other studies. One study reported 86% of student-athletes surveyed consumed an energy-type supplement, and 73% reported consuming energy drinks on a daily basis (Froiland et al., 2004).

The next most common reason was to either gain muscle or strength. Of those surveyed, 49% agreed dietary supplements were a good way for athletes to build muscle. This reason for taking supplements and belief in supplementation aid in building muscle is common among NCAA athletes (Dascombe et al., 2010; Froiland et al., 2004). Males in this study were more likely to select the reason for taking supplements to gain weight or muscle mass. This is consistent with previous research that found males were more likely to consume a supplement to improve speed, agility, strength, or weight (Froiland et al., 2004).

In a study conducted by Froiland et. al. that assessed use of dietary supplements and sources of information in 203 Division I male and female athletes, found that 89% of participants were consuming or had consumed dietary supplements. They assessed what the athlete thought was the definition of a dietary supplement, sources of information about dietary supplements, they asked athletes to report on frequency of use, type of supplement consumed, and reasons for taking dietary supplements. Many athletes considered sports drinks and calorie replacement drinks as food and not supplements. Overall, the most frequently consumed dietary supplements were energy drinks (73%), calorie replacement products of all types (61%), multivitamin (47%), creatine (37%), and vitamin C (32%). Males were more likely to consume ginseng, amino acids,
glutamine, hydroxy-methyl-buterate (HMB), weight gainers, whey protein, and Juven. Whereas females were likely to consume calcium and multivitamins. Gender was significant in influencing were the athletes received their information about dietary supplements. Males were likely to receive information from store nutritionists, other athletes, friends, or a coach. Females were more likely to receive information from family members. Gender was significant for predicting why an athlete chose to consume a dietary supplement. Females reported taking dietary supplements for overall health, whereas males reported taking dietary supplements for speed, strength, and muscle growth (Froiland et al., 2004).

Even though 32% of athletes in this study reported taking supplements to increase muscle or strength, only 6% reported using creatine. According to the article “International Society of Sports Nutrition Position Stand: Creatine Supplementation and Exercise,” creatine monohydrate is the most effective ergogenic aid for increasing power output and supporting lean body mass building (Buford et al., 2007). This indicates a knowledge gap between the reason why club athletes are taking supplements and knowledge of effective dietary supplements.

38% of athletes disagreed that the FDA or scientists test dietary supplements for safety, 33% had no opinion, and 29% thought that the FDA or scientists test dietary supplements for safety. The club athlete’s overwhelmingly (80%) recognized even though a professional athlete was consuming a dietary supplement that did not mean the dietary supplement was safe for them to consume. Another study that looked at collegiate student-athlete self-reported knowledge about supplement safety and use, 44.6% stated they were somewhat knowledgeable and 46.4% reported being either not very knowledgeable or not knowledgeable at all about supplement safety and use (Valentine, Schumacher, Murphy, & Ma, 2018).

The first subsection covered behavioral intention related to dietary supplement use. Behavioral intention is defined as a participant’s likelihood they will engage in a given behavior.
(“Consumer Health Informatics Research Resource—Behavioral Intention,” n.d.) The mean score was 3.84 with a standard variation of +/- 0.52. This indicates most club athletes surveyed agreed they would use a dietary supplement at some point, which is consistent with many studies that have assessed supplement usage in athletes to be often up to 90% (Kristiansen et al., 2005; Lieberman et al., 2015; Scofield & Unruh, 2006).

The second section assessed club athletes’ attitudes towards dietary supplement use and knowledge of dietary supplement safety. The mean score was 2.69 with a standard variation of +/- 0.54. This means the club athletes were close to neutral in this section. The athletes provided mixed responses on whether dietary supplements were safe to use because athletes took them or if they believed that dietary supplements were tested by scientists before being released to the public. Many athletes report getting information about supplements from sources such as friends, family, coaches, or nutrition store clerks. Other research has shown this is common with athletes and there is a knowledge gap that needs to be addressed surrounding supplement knowledge in the athlete community (Kristiansen et al., 2005).

The last section measured subjective norms surrounding dietary supplement usage. The mean score was 3.75 with a standard deviation of +/- 0.47. This states the athletes agreed people from many aspects of their life such as parents, coaches, and peers would agree with them taking a dietary supplement. This shows that who the athlete is around can have a significant influence over their decision to take a supplement. Other studies have used this survey to assess adolescent athletes and have found that 37.5% of athletes would use a dietary supplement to improve their sports performance. 75% of those surveyed agreed their parents and coaches would support them taking a dietary supplement. They also found that 20.1% of athletes surveyed believed dietary supplements are tested by scientists (Godo, 2004).
Each subsection of the SPAADSU for this survey was analyzed using logistic regression to see which section had the most influence on the club athlete’s selection of whether they have taken a dietary supplement in the last two months or not. Intentions towards behavior was not a significant influencer in this study, even when controlling for gender and age. This is surprising because the TRA asserts that attitudes and subjective norms are determinants of our intentions. It also asserts that behavioral intentions are one of the biggest influencers on whether we decide to act on a behavior or not. Another study that used the SPAADSU found that attitudes towards behavior and subjective norms surrounding behavior were significant in predicting whether the athlete selected that they were currently taking supplements or not, but intentions around supplement use was not a significant predictor (Bartee, Grandjean, Dunn, Eddy, & Wang, 2004).

**Limitations:**

This study had several limitations. First, only 49 out of 401 club athletes, 12% participated in this survey. The results from this study cannot be generalized to all club athletes at Utah State University. One reason that may have limited participation in this study was the advertisement for the study was only done through emails to the clubs’ presidents. The presidents then had to distribute the information to their athletes. It is possible not all club presidents distributed the information related to this study. Another limitation was that the data was self-reported. New dietary supplements come out frequently. A list was provided in the survey for the participant to indicate what types of supplements they were consuming; however, this list was not exhaustive. The teams that the highest number of respondents were the teams that were either currently participating in other sport nutrition programming or allowed the researcher to come to their practice to explain the purpose of this study in person. These teams
may be more invested in nutrition and this may influence their decision on whether they consume dietary supplements or not.

**Conclusions and Implications:**

Overall, dietary supplement usage among club athletes surveyed is consistent with the general college student population. The level of usage is slightly below what would be expected for varsity or NCAA athletes. Reasons for taking supplements and types of supplements consumed are in line with current research on NCAA and varsity athletes at collegiate universities. The demands of many of the club sports are similar to those that play NCAA sports and further research in this population needs to be done, however club athletes may be less inclined to participate in nutrition education than NCAA athletes due to the regulatory differences between these two classifications of athletes.
References


Chapter III

Semi-Structured Interviews of Division I Sports Dietitians About Engagement of Student Athletes

Abstract:

Student-athletes have hectic schedules and getting athletes to participate in sport nutrition programming can be difficult. Nine Division I sports dietitians were interviewed about engaging athletes at their universities. Interviews were transcribed by the main researcher. Two independent coders analyzed the transcripts and common themes were identified. Each university offered slightly different programming, but all universities offered one-on-one counseling, team talks, and some form of cooking class or cooking demonstration. Every dietitian emphasized having a physical presence with the student-athlete. Physical presence seemed to be the biggest contributing factor in building rapport and trust with the student-athlete. Participating in a multidisciplinary team also seemed to be very important for building buy-in not only from the athletes, but also from their support staff. Building a sport nutrition committee to assess student-athlete’s nutrition needs should be the base for building an effective sport nutrition program at a Division I university.

Introduction:
Previous research indicates a need for increasing knowledge about performance nutrition among student athletes. Student-athletes often under fuel and struggle to achieve performance and aesthetic goals (Andrews, Wojcik, Boyd, & Bowers, 2016; Rossi et al., 2017; Valliant, Emplaincourt, Wenzel, & Garner, 2012; Zawila, Steib, & Hoogenboom, 2003), which may negatively impact their performance and standings.

Nutrition education interventions and other nutrition programming provided by Registered Dietitians (RDs) have been shown to improve knowledge of performance nutrition in collegiate athletes (Hull et al., 2016) and this may translate into changed behavior. For example, athletes who are engaged in sports nutrition programming are more likely to fuel properly and make healthier choices while on team trips. They are also more likely to eat school provided options versus fast food prior to practice or competitions (Hull et al., 2016). Increasing participation and engagement in sports nutrition programming at universities is important to help student-athletes achieve their goals.

One barrier to student athlete’s involvement in nutrition programming is that they often have many demands on their time. Student-athletes must juggle academics, a social life, and the training, travel, and time involved in preparing for competition in their specific event. Though many athletes indicate that they are aware nutrition is an important factor in their success as an athlete, many choose to make less than healthy choices and give their concern about nutrition less priority than they do to other factors that influence their performance. In a recent PAC-12 survey, athletes reported they spend 50 hours a week on athletics during season. Of those surveyed, 55% stated they would sleep more if they had extra time during their day (Student-Athlete Time Demands April 2015, 2015). Asking an athlete to engage and participate in additional programming outside of what they are already balancing can be very challenging. This
can make engaging this population very difficult, despite the demonstrated need for nutrition programming.

Few studies have examined what factors are important in conducting effective nutrition programming. In a study that looked at an academic course aimed at improving sport performance through all aspects of an athlete’s life, including psychological health, physical health, and nutrition, athletes made improvements in increasing positive self-talk, goal setting, and belief in the method of their coaches and support staff, this included dietitians. These changes did not correlate to an increase in performance. However, this study did look at what engaged the athletes the most and found that being actively engaged through activities or participation throughout the entire class is important as student-athletes are a high energy population. They also stated creating a goal after each class that the athletes had to report on, whether it be successes or failures the next class, encouraged the student-athletes to utilize the skills they learned in the class in their everyday life (Curry & Maniar, 2004).

A recent systematic review of research pertaining to increasing dietary knowledge in college students reported a nutrition intervention with this population should have an education piece and a self-regulatory or self-monitoring piece. However, they also stated that the interventions included in the review were not effective long-term in keeping college students engaged in offered nutrition programming (Kelly, Mazzeo, & Bean, 2013).

A 1998 study from the University of Washington was the first study to offer a glimpse of what successful sports nutrition programing at a Division I University looks like (Vinci, 1998). Their programming included nutrition counseling to those that needed it, and 30-minute nutrition workshops. The sports nutrition program was part of a larger life skills program which provides life skills assistance to student-athletes. In a review on the topic of sports nutrition programming
published in 2016, effective sport nutrition programs should include a nutrition committee, a core progressive written curriculum, a written implementation plan, and an evaluation process. This paper outlined what the structure of the program should look like, however, they did not look at how to get student-athletes to engage in the programming (Parks et al., 2016).

The goal of this study was to interview Registered Dietitians working with Division I (DI) athletes in a university setting to obtain information about their experience engaging student-athletes. This information will be used to evaluate the current Utah State University club athlete sports nutrition programming and to provide future recommendations for club athlete sports nutrition programming at Utah State University.

**Methods:**

This study was approved by the Institutional Review Board at Utah State University. The list of known full-time sports dietitians available on the CPSDA website was used to create a list for potential study participants. Sports dietitians that worked with collegiate athletes at DI universities were contacted via email and requested to participate in a semi-structured interview. Any dietitians that did not work at a DI university or did not directly work with collegiate athletes were excluded from this study, nine sport dietitians from eight DI university sport nutrition programs participated in this study. One university had two sport dietitian participants.

Questions for the semi-structured interviews were developed before the interviews by the researcher who is a dietitian and professor/dietitian in the nutrition department. The questions were based off the predetermined themes we were searching for, such as how many athletes
and/or teams the dietitians work with, what the current programming is, did the dietitians experience any times of low student-athlete engagement in sport nutrition programming offering, what do the dietitians do currently to maintain engagement with student-athletes, and advice for a dietitian wanting to create a new sports nutrition program at a university. The questions for the interviews were reviewed by the Director of Sport Nutrition at Utah State University and a dietitian who is an expert in nutrition research and a professor in the nutrition department. The list of questions was sent to the participants before the interview.

All interviews were conducted over the phone and scheduled at a time that was convenient for the participants. Each interview last approximately 25 minutes. The interviews were conducted and recorded by the researcher than transcribed by the researcher. The research also took notes while the interview was being conducted in case there were issues with the recordings. At the beginning of the interview the researcher explained who she was, why she was wanting to learn this information, and the goals for completing this research. The researcher stated she was a graduate assistant at Utah State University and that she works with the club athletes, general student population, and the NCAA athletes at USU.

Data Analysis:

The interviews were recorded then transcribed by the researcher. All transcripts were uploaded to the computer software DeDoose (8.0.35), a web application for managing, analyzing, and presenting qualitative and mixed method research data was used to code and conduct thematic analysis of the transcripts. Two independent coders analyzed the transcripts. The coders looked for the predetermined themes as well as any other themes that may have
appeared. After initial coding, the coders met and discussed all themes. There were three predetermined themes the coders were looking for and two minor themes that emerged from the interviews. Agreement was considered when both coders coded the same quote under the same theme. Any disagreements among coding were discussed and resolved before finalizing the codes. The coders either deleted the disagreed coded quotes or resolved the discrepancy upon discussion and context of the quote. All four finalized themes were agreed upon by both coders.

Results:

Each interview lasted approximately 30 minutes and a total of nine dietitians from eight universities completed the interview. One university had two dietitians complete the interview. One dietitian completed the interview for two universities, so a total of nine universities’ programs are represented in this study. Eight out of the nine dietitians were female. Two of the nine dietitians have been at their current university less than a year, everyone else has been at their university at least two years. Three of the dietitians created or assisted in the creation of their sports nutrition program at their university, six dietitians were hired on with an existing sports nutrition program.

The semi-structured interview questions were organized by topics as follows: how many sports dietitians were at the universities, how many athletes and/or teams did each dietitian work with, what is the current programming outside the fueling station, did the dietitians experience any times of low student-athlete engagement, what the dietitians currently do to maintain or
increase student athlete engagement, and lastly what advice do they have for a sports dietitian wanting to create and implement a sport nutrition program at a DI university.

The first topic was how many sport dietitians were at the universities and how many athletes each dietitian was assigned to. Out of all eight DI programs one had a part-time sport dietitian, two had one full-time sport dietitian, three had three full-time sport dietitians, one university had four full-time positions, and one had six full-time positions. Five of the universities reported they had graduate assistants, interns, or nutrition fellows to support their performance nutrition programs.

At universities that had more than one dietitian, they reported each dietitian worked with 4-6 teams each. The larger the team or the more involved teams were in performance nutrition programming, the fewer teams the sports dietitian was assigned to. Graduate assistants, fellows, and interns were reported to manage 2-3 teams dependent on other assigned duties such as assisting with management of the fueling station and academic workloads. None of the dietitians interviewed worked with club athletes at their universities.

**Performance Nutrition Programming:**

Athletes participated in nutrition programming slightly different at each university. At universities with one dietitian many services were by request only. At universities where there was more than one sports dietitian, athletes were able to request specific services such as body composition testing, nutrition counseling, or special food requests at the fueling stations. Athletes were also referred to the sports dietitians by other sport professionals such as athletic trainers, coaches, or sport psychologists. Sports dietitians also worked with coaching staff and
athletic training to set up team talks or workshops with the teams. At most universities participation in performance nutrition programming was optional unless they were referred to the sports dietitian for nutrition counseling, then participation was generally considered mandatory.

The most requested service from student-athletes were body composition testing and nutrition counseling. Other services outside the fueling station were team talks, grocery store tours, meal planning, travel nutrition, hydration testing, cooking classes, and passive education. One university reported offering nutrition-related blood tests such as Vitamin D testing to student-athletes. One university reported their sports dietitians conducted initial screenings to all new athletes. Four universities offered dining with a dietitian as an interactive education session. All universities offered some type of cooking demonstration or class. The biggest inhibitor to conducting the cooking classes was cost of supplies.

**Engaging Student-Athletes:**

When asked about maintaining or increasing engagement with the student-athletes all dietitians agreed face time with athletes was extremely important. One dietitian stated, “Just being present helps so much, and whether it is traveling or being at practice. Just show up to be there with nothing nutrition related.” All dietitians emphasized having face time with the athletes, and to often be with the team not as a nutrition educator, but as support for the team. The common theme was the more the dietitian is visible and present to the athlete, the better rapport and more trust the athlete will have with the dietitian. This also included making purposeful face time with the athlete’s support system such as coaches and athletic trainers.

Another suggestion for increasing or maintaining engagement was to offer incentives to the athletes. One university utilized a sticker chart reward system for participating in
performance nutrition programming. Other universities used free meals to increase participation in programming, specifically dine with a dietitian, cooking classes or demos, and grocery store tours.

Several universities used social media to engage with athletes. “I did a survey with my athletes on like where do they get their information from, and like 80% of them were like Instagram and Twitter.” Social media outlets such as Instagram, Twitter, Facebook, and Snapchat were used at several universities. The most common reason was to create digital content the athletes could trust because so many athletes look to social media for information.

All sports dietitians reported periods of low engagement with student-athletes. Several reported working with the teams during their off season seemed to increase participation in the programming offered. They also stated low participation around finals and during the summer months. Each university had different programming that did not connect with their student-athletes. At some universities competitions between the teams were very successful for increasing or maintaining participation in nutrition programming, at other universities this strategy did not work well. When asked about periods of low engagement or programming that did not connect with the student-athletes, all dietitians stressed a one size fits all approach does not work for this population. One dietitian stated that “when I first initially came in, I had all these ideas of what I wanted to do. Not necessarily what people wanted, and every single sport is different, so you have to treat every sport as unique and figure out what their wants and needs are.”

Advice for a New Sports Nutrition Program:
When asked for what advice they would give to a young sports dietitian creating programming for club athletes at a Division I University, the most common piece of advice they gave was working with a multidisciplinary team. One dietitian put it as we need to “understand how dietitians can be the connector between all other professions.” To gain the support of the athletes’ mentors and support staff can help increase the awareness of a sports dietitian and any programming offered. They can also help create ‘buy-in’ for performance nutrition programming. A multidisciplinary team can also help shape the programming to the athletes’ needs and wants. Another common theme was persistence and patience. Face time with the athletes and their support staff was also reiterated. As one dietitian recommended “promoting services, being around, reaching them where they are most able to be reached, Twitter, texts, social media, send out resources, anything where you are physically around, get to know the staff of the teams.”

Discussion:

Though student-athletes can be difficult to work with due to large time constraints, all the dietitians interviewed had developed successful strategies to engage the student-athlete and encourage participation in their sports nutrition programming. The most common response among any of the questions asked was increasing physical presence with the athletes and their support staff. This entails attending practices, games, and making connections with the entire athletic staff. This shows the athletes that you are there to support them. This also helps build rapport with the athlete’s support staff. The support staff will know you better and be more likely to refer to you if they see a nutritional concern. Physical presence also allows the athletes to get
to know the sports dietitian and potentially make them more comfortable to seek out the sports
dietitian’s advice when needed. One dietitian emphasized reaching out to the athletes when and
where they are as opposed to them having to reach out to the dietitian. This helps to address the
problem that student-athletes are very busy, and time likely prohibits them from seeking
additional services or programming that is not required by their coach or program. Many
universities reported scheduling nutrition education events outside of what the athlete is already
doing often resulted in little participation. This implies in order to have successful sports
nutrition programming you must have buy-in from the coaching and support staff surrounding
the athletes.

Table 3-1. Individual Responses to Coded Themes from the Semi-Structured Interviews of
Registered Dietitians Working with Division I NCAA Athletes.

<table>
<thead>
<tr>
<th>Coded Theme</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Types of Programming</td>
<td>“Counseling, team talks, present at sessions, some practices, cooking</td>
</tr>
<tr>
<td></td>
<td>demos, grocery store tours, education on social media, texts, serve two</td>
</tr>
<tr>
<td></td>
<td>meals a day, and have education up at fueling station.”</td>
</tr>
</tbody>
</table>
“...grocery store tours, team talks, plate coaching, 3-site skin fold, no good way to do body comp right now, a lot of one-on-one, a lot of stuff with Athletic Training, hydration testing coming in the fall...”

“Individual consults, at the beginning of the year initial screenings with all athletes to see if there are any issues or red flags, body comp testing, ferritin testing, vitamin D testing, supplement education, hydration testing and education, cooking classes, grocery store tours, dining hall tours, team talks, workshops, travel nutrition, and game day nutrition.”

Engaging the Student-Athlete

“...try to travel with the teams at minimum to the post season, there with the teams, all the time helps build rapport with them and trust.”

“Being around and present a lot or have consultant model where they seek you out, working with people who are going to buy more are Athletic Trainers, Strength Coaches, and Sport Coaches.”

“...continually reminding them of your services helps, if you do not remind them, they forget about them because they are really busy.”

“Face time, face time, face time, face time, face time, going to dinner with them, going to team parties, or dorm room meetings.”

“Just being present helps so much, and whether it is traveling or being at practice, just showing up to be there with nothing nutrition related.”

Advice
“Figure our things that they are already doing that you know that they have questions about figure out whatever it is and just kind of interact with them and get them interested maybe get a survey going and find out what they’re struggling with, what questions or concerns do they have.”

“Find out who your allies are, who else there thinks it is important besides you, administrative support, provide documentation on what you’re doing and how you’re serving the athletes, find out what is important to the department (increase education, decrease injury, etc.). Drive your conversation around what is important to them, focus most on sports or the teams that are asking for it and go all in. Do a great job for a few.”

“To start small, under promise and over deliver, coaches get really excited about it and often want to do more than is possible. Start very basic and recruit as much as possible for help, stocking fridges and working at the fueling station is not an effective use of your time as a dietitian. Getting workers to do some of the grunt work is super helpful, because you can’t have a volunteer create handouts.”

“To understand how dietitians can be the connector between all other professions. We are key collaborators.”

Another common response to many of the questions was working with a multidisciplinary team. This included working with various support staff of the student-athlete.
This could include coaches, strength coaches, sports psychologists, physical therapists, student-athlete representatives, academic advisors, and athletic trainers. Creating buy-in of this support staff is critical for developing a successful sports nutrition program. This staff often spends more time with the athletes than the dietitians. They can often be an avenue for screening athletes that may be at risk of developing a nutritional concern such as under fueling or disordered eating.

According to recommendations published in 2016, an effective performance nutrition program should have an oversight committee that should include an athletics administrator, student-athlete representative, student-athlete development coordinator, sport medicine, coaches, food service, and academics (Parks et al., 2016). Other studies have shown that a multidisciplinary team can be effective in identifying and treating disordered eating/eating disorders in athletes. In just two years of a multidisciplinary approach to identifying athletes at nutritional risk for under fueling or disordered eating, the number of individuals referred for consultations with the dietitian doubled (Quatromoni, 2008). Other studies have shown that student-athletes do not go to just the sports dietitian for advice for nutrition and/or supplements. Athletic trainers and strength coaches are often sources of information (Burns, Schiller, Merrick, & Wolf, 2004; Froiland, Koszewski, Hingst, & Kopecky, 2004; Lieberman et al., 2015). This highlights the importance of connecting with all support staff the student-athlete interacts with.

Overall, most universities had a core nutrition curriculum that was offered to student athletes, but the curriculum was not standardized. All universities also offered some version of cooking classes or demos that instructed athletes on how to cook various foods. All sports dietitians emphasized face time with the athletes and their support staff. Several of the dietitians suggested when creating a new program to focus on a few teams rather than the entire student-athlete population. This would allow the sports dietitian to create ‘buy-in’ and figure out what is
or is not effective with their specific teams.

**Limitations and Strengths:**

There were several limitations to this study. None of the dietitians interviewed work with club athletes. Since these dietitians do not work with club athletes specifically, there is a chance this information could not relate to that population even though club athletes are still considered student-athletes. Those that knew other dietitians at their university who worked with club athletes did not know contact information or did not follow up with contact information. This study was only done with Division I university sports dietitians. Interviews were conducted during the summer when many sports dietitians are not working and could have limited the number of participants in this study. Though the sample size was small, the sample size was enough. There was saturation of each major theme in all interviews. No unique themes were found in any of the interviews. This group of dietitians included both those that have no experience building a sports nutrition program and those that have built at least one program from the ground up.

**Future Recommendations:**

To build a successful sports nutrition program for student-athletes at USU there would need to be ongoing support. If there was a graduate assistant that was able to dedicate 100% of their 20 hours per week to club athletes, the program could be successful. Another option would be to have an hourly or benefited RD to serve the club athletes. Recommendations for future
sports nutrition dietitians for club athletes at Utah State University would be to participate in the monthly round table meetings.

These meetings include many of the personnel required to create a sports nutrition committee such as representatives from many of the club athlete teams, an athletic trainer, and the club athlete administrators. Not all club teams have coaches, and the coaches are not employed by the university, so including a coach on the committee would be difficult. Participating in these meetings will help create awareness of performance nutrition programming across the support staff of the club athletes. The committee can be used to assess the needs and wants of the club athletes so that a curriculum can be formed. It will also help increase awareness of services to the club presidents who can relay the information to their teammates. Utilizing this committee, a select few teams could be identified as those likely to engage in programming. Focusing on a few teams versus all club athletes might be a way to increase future engagement and participation in programming. The committee should also be used to create an evaluation system of nutrition programming. This evaluation would look at club athlete participation in the programming, and if the programming is able to meet the needs that were identified from the committee.

Several universities reported social media was one of the easiest ways to interact and engage with student-athletes. Continuing to post weekly blog posts on Facebook with increased advertisement of the blog posts to the teams could be effective. Social media can be an effective way of relaying accurate and helpful information to college-aged populations (Browning & Sanderson, 2012). Creating a sports nutrition Instagram or SnapChat could also be helpful for connecting and engaging with the club athletes. Several other universities reported using these specific social media avenues to engage with their student-athletes. The last recommendation is
to create a standardized curriculum that can be used with all club athletes. This will allow the athletes to receive consistent information related to performance nutrition even if the dietitian’s position would be temporary as in the case of a graduate assistant. This could also be helpful if the coordinated program students were to be integrated into the sports nutrition program. A standardized curriculum would allow the students to gain experience working with athletes as well as the athletes would be receiving consistent information regardless who taught the curriculum.
References


Hull, M. V., Jagim, A. R., Oliver, J. M., Greenwood, M., Busteed, D. R., & Jones, M. T. (2016). Gender differences and access to a sports dietitian influence dietary habits of collegiate
https://doi.org/10.1186/s12970-016-0149-4


https://doi.org/10.1016/j.jneb.2016.03.002

https://doi.org/10.1016/j.jada.2008.01.008


Chapter IV

Conclusions and Recommendations

Introduction:

Club athletes are often a forgotten population. They are very competitive in their respective sports, but do not receive the same support and resources traditional varsity or NCAA athletes receive. This thesis aimed to explore whether club athletes differed in their use of supplements, types of supplements consumed, or reasons for taking supplements from traditional varsity or NCAA athletes. This thesis also aimed to look at how to engage the student-athlete and how to apply the information learned to the sports nutrition programming for club athletes at Utah State University.

Survey of Club Athlete’s Behaviors and Perceptions Related to Supplement Use

Club athlete supplement usage was assessed at 65.3%. This is below what would be expected of collegiate student-athlete, which is often up to 85% (Hoyte, Albert, & Heard, 2013). However, this is on par with dietary supplement use of college students (Valentine, Schumacher, Murphy, & Ma, 2018). Neither gender nor grade level influenced whether the club athlete selected they had taken a supplement in the last two months. The most common supplements consumed by the club athletes were protein, caffeine or energy drinks, Vitamin D, and
multivitamins. This is similar to what NCAA athletes are reported to take (Froiland, Koszewski, Hingst, & Kopecky, 2004). The most common reason for consuming a dietary supplement was for supporting energy. This is expected due to the high demands of being a student-athlete, a college student, and maintaining a social life. Club athletes equally get their information about dietary supplements from parents and friends. Collegiate athletes often turn to family and friends for information and opinions on taking dietary supplements more than they talk to coaches or dietitians (Froiland et al., 2004; Scofield & Unruh, 2006).

The intentions surrounding dietary supplement use was not a significant influencer on whether the club athlete selected they had taken a dietary supplement in the last two months (p=0.081). The club athletes did agree they would use a dietary supplement at some time for some reason. The Theory of Reasoned Action asserts that humans are rational beings and use information such as our subjective norms surrounding a behavior and attitudes towards our behavior to build intention on whether we will choose to do that behavior or not (Ajzen & Madden, 1986). Both attitudes towards taking dietary supplements and subjective norms surrounding dietary supplements were not significant predictors of whether the club athletes chose they had taken a dietary supplement in the last two months (p=0.081, p=0.901).

This study is limited to the few teams that responded to my survey. The findings cannot be generalized to all club athletes because of the low response rate (12%). Increasing engagement in sports nutrition programming would help increase participation in a future study. It was up to the club presidents to distribute the survey and study information to their teams. A future recommendation would be to reach out to the athletes individually to make sure the information is dispersed. This study did show there is a knowledge gap about dietary supplements and club athletes would benefit from education.
Semi-Structured interviews of Division I Sports Dietitians About Engagement of Student Athletes

Due to lack of participation in the first study, I wanted to learn how to engage the student-athlete. I also wanted to evaluate my current sports nutrition programming that is offered to the club athletes at Utah State University. Nine dietitians at eight Division I universities were interviewed. These interviews were semi-structured, and the questions were evaluated by our expert reviewer, the Director of Sports Nutrition at Utah State University.

The overarching theme from all the interviews with the dietitians was that face time with student-athletes is the most important aspect of getting engagement in your programming. Face time was the number one tool the dietitians used to build rapport and trust with the athletes. Common programming offered at universities was team talks, one-on-one nutrition counseling, body composition testing, hydration testing, cooking demos or cooking classes, grocery store tours, and travel nutrition. All dietitians emphasized working with a multidisciplinary team to increase buy-in from both support staff and the student-athlete. There is limited research on effective sports nutrition programming. The current research does suggest using a multidisciplinary team to build a sports nutrition committee (Parks et al., 2016). This committee can be used to assess the needs of the student-athletes. From that assessment a core curriculum could be formed. There were limitations to this qualitative study. None of the dietitians interviewed work with the club athlete population. There was a small sample size of Division I dietitians interviewed. This could have been to the timing of the study, which was conducted in the summer when many sports dietitians are not working. Utilizing the needs assessment from the committee and the information learned about engaging the student-athlete an effective sport
nutrition program could be formed for the club athletes here at Utah State University.

**Implications and Future Directions**

The information learned from my first study showed there is a gap in dietary supplement knowledge among club athletes here at USU. This population would benefit from education about how to choose a safe dietary supplement and effective supplement use for aiding their sport. I learned this population is not as captive as NCAA athletes and can be difficult to get engagement with. This led to the development of my second study, which was aimed at looking at how to engage the student-athlete.

I learned this population is very fickle. To provide effective sports nutrition programming the needs of each team should be assessed as well as overall student-athlete needs. A multidisciplinary committee should be formed to create the assessment. The results of the assessments would serve as the base for creating a core sports nutrition curriculum. A primary focus of the sports dietitian in the beginning should not be implementing the performance nutrition programming but building rapport and buy-in from the student-athletes and their support staff. This can be achieved by being around the student-athletes as much as possible. Physical presence was the best way according the sports dietitians I interviewed to build trust with the athletes. They also emphasized purposeful conversation with the athlete support staff so they can get to know the sports dietitian and build rapport. If the support staff has buy-in they will be likely to let the sports dietitian be more involved with the athletic teams and refer to the sports dietitian when appropriate.
Future graduate assistants that will work with the club athletes here at USU should focus their time on a few of the teams to build rapport and trust. They can do this by attending club team practices, events, and games. They could also meet with all the club team presidents to make sure they are aware of the sports dietitian’s presence. Another way they could create buy-in would be to make purposeful physical presence and contact the club teams’ athletic trainer. The club teams have one athletic trainer and they are constantly around her. If you can build rapport with the athletic trainer, they could potentially refer athletes to the sports dietitian. A multidisciplinary committee should be formed. This can be easily done by including the multidisciplinary committee’s agenda into the club president round table monthly meetings, as these meetings already include everyone but the sports dietitian.

The biggest barrier to achieving a successful sports nutrition program for club athletes at USU is time. The dietitian would have to be able to dedicate a minimum of 20 hours a week to the programming. This is due to the time required to show face or have a physical presence at practices and games with the club athletes. The second barrier would be building a rapport and trust with the club athletes’ support staff. The athletic trainer is removed from the main office at the ARC, which is where the administrative support for the club athletes exist. The main point of contact for the future dietitian is the Competitive Sports Coordinator, who is located in the administrative offices at the ARC. The coaches are also not accessible to the dietitian. Coaches are important for creating buy-in of sports nutrition programming. Getting coaches involved would be important for creating a successful sports nutrition program, however, coaches are not paid positions for club teams. Coaching positions are voluntary, and not every team has a coach. The dietitian should work with the club athlete presidents to get permission to reach out to their coaches in order to create rapport and buy-in. The last barrier are the club athlete presidents
themselves. The presidents are the main form of communication to the club athlete population. It is up to the club president to disseminate the information about the sports nutrition programming to their respective teams. If the club president is not bought into the sports nutrition programming, they may be less likely to pass the information along to the rest of their teammates.

Further research needs to be done with the club athletes about their dietary supplement knowledge and sports nutrition knowledge. My study showed there is a gap in knowledge about effective and safe dietary supplementation. An education intervention could be an effective way to increase knowledge in this population. An effective intervention would involve active participation of the club athletes and should be integrated into the performance nutrition programming. The intervention should not be outside the club athlete’s schedule but should be included during a preplanned practice or event. Low participation was an issue with this population in my study. I think increased participation could be achieved if the sports dietitian was able to have ample physical presence with the athletes and was able to build rapport and trust with the athletes before attempting any research.
References


Survey to Predict Adolescent Athlete Dietary Supplement Use

Section 1

Please answer the following questions about yourself. Your answers will not be shared with anyone.

Participants must be 18 years of age or older. Please answer all the questions.

1. Please list the last five of your A-number and your two-digit birth month: ______

2. What is your gender? ______

3. What is your age today? ______

4. What year of college are you in? Freshman Sophomore Junior Senior Graduate Student

5. Which of the following best describes your ethnic background?
   ___ American Indian or Alaska Native  ___ Asian
   ___ Black or African American  ___ Native Hawaiian or Other Pacific Islander
   ___ Hispanic or Latino  ___ More than one race
   ___ Prefer Not to Answer  ___ White

6. What sport do you play?
   ___ Baseball  ___ Cycling  ___ Esports
   ___ Figure Skating  ___ Golf  ___ Hockey
   ___ Men’s Lacrosse  ___ Women’s Lacrosse  ___ Powerlifting
   ___ Quidditch  ___ Racquetball  ___ Rodeo
   ___ Men’s Rugby  ___ Women’s Rugby  ___ Men’s Soccer
   ___ Swim and Dive  ___ Men’s Ultimate  ___ Women’s Ultimate
   ___ Water Polo  ___ Men’s Volleyball  ___ Women’s Club Volleyball
7. Have you taken one or more dietary supplements in the last 2 months (pill, powder, power/protein bar)?
   ____ Yes
   ____ No

8. If you answered yes to question 6, how many dietary supplements do you take on a regular basis?
   __ 1 __ 2-3 __ 4-5 __ >5

9. If you answered yes to question 6, how often do you take dietary supplements?
   __1 time per week __2-3 times per week __4-5 times per week __Every day

10. If you answered yes to question 6, what is your reason for taking dietary supplements?
    (Please check all that apply)
    ____ Gain weight ____ Lose weight ____ Gain strength
    ____ Gain muscle strength ____ Play sports better ____ Look better
    ____ For energy ____ Lose body fat ____ Not sure
    ____ General health reasons ____ Other: _______________________________

11. Where do you get information and advice regarding dietary supplement use?
    ____ Parents/guardian ____ Other family member (specify): _____________
    ____ Teammates ____ Media (specify): _____________
    ____ Coaches ____ Friends
    ____ Physician ____ Dietitian
    ____ Store Clerk ____ Other (specify): _______________________________
    ____ I have not received any information or advice about dietary supplements
12. The ARC has a Registered Dietitian on staff for athletes to consult.

_____ Yes  _____ No  _____ Not sure

13. Please check all dietary supplements that you are taking or have taken in the last 2 months. Be honest with your answers.

__ Arginine  __ BCAA  __ Beta-Alanine
__ Caffeine  __ Calcium  __ Carnitine
__ Chondroitin  __ CLA  __ Creatine
__ DMAA  __ D-ribose  __ Energy Drinks (e.g.: Redbull)
__ Fat Burners  __ Fish Oil  __ Glucosamine
__ Glutamine  __ HMB  __ L-Carnitine
__ Magnesium  __ Multivitamin  __ Meal Replacements (e.g.: Slimfast)
__ Nitric Oxide  __ Pre/Probiotics  __ Pre-workout
__ Protein Powder/Bars  __ Soy or Soy Isoflavones  __ Taurine
__ Thermogenics  __ Vitamin D
__ Other:_________________________________________________________________________

Section 2

The following questions are to be answered using a scale with 5 choices. Please check the choice that best describes how you feel about the statement. There are no right or wrong answers to these questions. Be honest with your answers.
   ___ Strongly agree   ____ Agree   ____ No opinion   ____ Disagree   ____ Strongly Disagree

15. I would use dietary supplements to improve my sports performance.
   ___ Strongly agree   ____ Agree   ____ No opinion   ____ Disagree   ____ Strongly Disagree

16. I would use dietary supplement if my coach gave them to me.
   ___ Strongly agree   ____ Agree   ____ No opinion   ____ Disagree   ____ Strongly Disagree

17. I would use dietary supplements if my teammate were taking them.
   ___ Strongly agree   ____ Agree   ____ No opinion   ____ Disagree   ____ Strongly Disagree

18. I would ask my coach if dietary supplements are safe.
   ___ Strongly agree   ____ Agree   ____ No opinion   ____ Disagree   ____ Strongly Disagree

19. I would ask my athletic trainer if dietary supplements were safe.
   ___ Strongly agree   ____ Agree   ____ No opinion   ____ Disagree   ____ Strongly Disagree

20. I would ask a registered dietitian if dietary supplements are safe.
   ___ Strongly agree   ____ Agree   ____ No opinion   ____ Disagree   ____ Strongly Disagree

21. I would ask a registered dietitian if dietary supplements work.
   ___ Strongly agree   ____ Agree   ____ No opinion   ____ Disagree   ____ Strongly Disagree

22. I would use dietary supplements that I know work.
   ___ Strongly agree   ____ Agree   ____ No opinion   ____ Disagree   ____ Strongly Disagree

23. Dietary supplements are tested by the Federal Drug Administration (FDA).
   ___ Strongly agree   ____ Agree   ____ No opinion   ____ Disagree   ____ Strongly Disagree

24. Taking dietary supplements is safe because they are tested by scientists.
   ___ Strongly agree   ____ Agree   ____ No opinion   ____ Disagree   ____ Strongly Disagree
25. Taking dietary supplements would give me more energy.
   ___ Strongly agree    ____ Agree    ____ No opinion    ____ Disagree    ____ Strongly Disagree

26. Taking dietary supplements would help all athletes do better in sports.
   ___ Strongly agree    ____ Agree    ____ No opinion    ____ Disagree    ____ Strongly Disagree

27. Taking dietary supplements is a safe way for athletes to improve their performance.
   ___ Strongly agree    ____ Agree    ____ No opinion    ____ Disagree    ____ Strongly Disagree

28. Taking dietary supplements is a good way to build muscles.
   ___ Strongly agree    ____ Agree    ____ No opinion    ____ Disagree    ____ Strongly Disagree

29. Athletes my age need dietary supplements to improve sports performance.
   ___ Strongly agree    ____ Agree    ____ No opinion    ____ Disagree    ____ Strongly Disagree

30. Athletes my age need dietary supplements for general health reasons.
   ___ Strongly agree    ____ Agree    ____ No opinion    ____ Disagree    ____ Strongly Disagree

31. Dietary supplements are safe because professional athletes take them.
   ___ Strongly agree    ____ Agree    ____ No opinion    ____ Disagree    ____ Strongly Disagree

32. Dietary supplements work because professional athletes take them.
   ___ Strongly agree    ____ Agree    ____ No opinion    ____ Disagree    ____ Strongly Disagree

33. My coach would support my using dietary supplements to improve sports performance.
   ___ Strongly agree    ____ Agree    ____ No opinion    ____ Disagree    ____ Strongly Disagree

34. My coach would support my using dietary supplements for general health reasons.
   ___ Strongly agree    ____ Agree    ____ No opinion    ____ Disagree    ____ Strongly Disagree

35. My teammates would support my using dietary supplements for better sports performance.
   ___ Strongly agree    ____ Agree    ____ No opinion    ____ Disagree    ____ Strongly Disagree

36. My teammates would support my using dietary supplements for general health reasons.
   ___ Strongly agree    ____ Agree    ____ No opinion    ____ Disagree    ____ Strongly Disagree
37. My parent(s) or guardian would support my using dietary supplements for better sports performance.

___ Strongly agree    ____ Agree    ____ No opinion    ____ Disagree    ____ Strongly Disagree

38. My parent(s) or guardian would support my using dietary supplements for general health reasons.

___ Strongly agree    ____ Agree    ____ No opinion    ____ Disagree    ____ Strongly Disagree


___ Strongly agree    ____ Agree    ____ No opinion    ____ Disagree    ____ Strongly Disagree

40. My doctor would support my using dietary supplements for general health reasons.

___ Strongly agree    ____ Agree    ____ No opinion    ____ Disagree    ____ Strongly Disagree

41. My athletic trainer would support my using dietary supplements for better sports performance.

___ Strongly agree    ____ Agree    ____ No opinion    ____ Disagree    ____ Strongly Disagree

42. My athletic trainer would support my using dietary supplements for general health reasons.

___ Strongly agree    ____ Agree    ____ No opinion    ____ Disagree    ____ Strongly Disagree

43. Generally speaking I want to do what my parent(s) or guardian want me to do.

___ Strongly agree    ____ Agree    ____ No opinion    ____ Disagree    ____ Strongly Disagree

44. Generally speaking I want to do what my doctor wants me to do.

___ Strongly agree    ____ Agree    ____ No opinion    ____ Disagree    ____ Strongly Disagree

45. Generally speaking I want to do what my coach wants me to do.

___ Strongly agree    ____ Agree    ____ No opinion    ____ Disagree    ____ Strongly Disagree
Semi-Structured Interview Questions

We are interested in nutrition programming, counseling, and/or services that you have provided to athletes at your institution outside of the Fueling Station or Training Tables. Please keep this in mind as you respond to the questions bellow.

1. For what institution do you work as a Registered Dietitian for the purpose of providing nutrition counseling and services to student athletes?
   a. How long have you been in this position?
   b. How many Registered Dietitians does your institution employee for the purpose of providing nutrition counseling and services to student athletes?
   c. What is the total number of athletes that you serve at your institution? Please distinguish between club and D1 athletes.

2. Do you work with club athletes?
   a. (If yes) What programming do you provide?
   b. (If yes) Do you have a budget for working with the club athletes?

If you do not work with club athletes, please answer the following questions about D1 athletes at your university.

3. How many teams do you work with?
   a. What is the total number of athletes at your university?

4. Did you assist in the creation of the sports nutrition program at your university, or was this an established program that preceded your hire date?

5. Are your services by request only, or do you reach out to the teams to schedule education or counseling?
6. Besides the fueling station, what other types of programming or education do you provide to athletes?
   a. Do you provide cooking classes?
   b. What percentage of your time is spent on non-fueling station-related duties?

7. What is the most commonly requested service that you provide to your athletes?

8. Are your services optional or mandatory?

9. Have you experienced times of low student-athlete engagement?

10. What strategies have you used in the past to attempt to increase engagement with athletes?
    a. What strategies have you tried that were successful?
    b. What strategies have you tried that were unsuccessful?

11. What do you currently do to maintain engagement with the student-athletes?

12. What nutrition programming do you provide that you feel has been the most valuable to student athletes?

13. Has there been anything that you have tried that just didn’t work?

14. What advice would you give to a Registered Dietitian trying to develop a nutrition program for club athletes at a University?
Engaging the Student Athlete

Things That Did Not Work with Student-Athletes (n=8)

- Cooking Classes (n=2)
- Food Choices at Fueling Station (n=1)
- Dine With a Dietitian (n=1)
- One Size Fits All Approach (n=5)
- Competitions Between Teams (n=1)
- Social Media Participation Push (n=1)
- Being Required to Attend (n=2)

Times of Low Engagement (n=7)

- Time Surrounding Finals (n=5)
- Spring Semester (n=4)
- During Season (n=1)

Things That Did Work with Student-Athletes (n=8)

- Physical Presence with Athletes (n=30)
- Incentive for Athletes (n=1)
- How Athletes are Contacted (n=8)
- Athlete's Requests (n=8)
- Sign Up Sheets (n=1)
- Referrals (n=8)
- RD Schedules (n=4)
- Social Media (n=7)
- Snapchat (n=2)
- Twitter (n=3)
- Instagram (n=2)
- Working with a Multidisciplinary Team (n=5)
Interviews of Sports Dietitians at D1 Universities

We are interested in nutrition programming, counseling, and/or services that you have provided to athletes at your institution outside of the Fueling Station or Training Tables. Please keep this in mind as you respond to the questions below.

15. For what institution do you work as a Registered Dietitian for the purpose of providing nutrition counseling and services to student athletes? University of Texas
   a. How long have you been in this position? Full time since 2012
   b. How many Registered Dietitians does your institution employ for the purpose of providing nutrition counseling and services to student athletes? 6, full time positions
   c. What is the total number of athletes that you serve at your institution? Please distinguish between club and D1 athletes. 534 right now

16. Do you work with club athletes? Do not, student services dietitians I believe works with club teams
   a. (If yes) What programming do you provide?
   b. (If yes) Do you have a budget for working with the club athletes?

If you do not work with club athletes please answer the following questions about D1 athletes at your university.

17. How many teams do you work with? Oversee football, mens basketball, womens swim, each dietitian has about 100 athletes, I have about 45 athletes plus director of program
   a. What is the total number of athletes at your university?
18. Did you assist in the creation of the sports nutrition program at your university, or was this an established program that preceded your hire date? Developed it from the ground up

19. Are your services by request only, or do you reach out to the teams to schedule education or counseling? Little bit of both, grown overtime based on demand of the coaches and teams, Student Athletes will reach out as well

20. Besides the fueling station, what other types of programming or education do you provide to athletes? Counseling, team talks, present at sessions, some practices, cooking demos, grocery store tours, education on social media, texts, serve two meals a day and have education up at fueling station

   a. Do you provide cooking classes? yes

   b. What percentage of your time is spent on non-fueling station-related duties? A lot we have an undergrad nutrition program, undergrad does the majority of the fueling station, each dietitian is responsible for their fueling station

21. What is the most commonly requested service that you provide to your athletes?

22. Are your services optional or mandatory?

23. Have you experienced times of low student-athlete engagement? Varied acceptance of what you’re doing, some student athletes are super interested, some student athletes are super sold into it, demand for services began to sky rocket, if you’re there you care

24. What strategies have you used in the past to attempt to increase engagement with athletes?
a. What strategies have you tried that were successful? Around and present a lot or have a consultant model where they seek you out, working with people who are going to buy in more are Athletic trainers, Strength Coaches, and coaches

b. What strategies have you tried that were unsuccessful? Depends on the team, they have their own personalities and their own needs, if they are required to be there it doesn’t work, they want to know you care about them

25. What do you currently do to maintain engagement with the student-athletes? Positive change happens through daily interaction with the athletes

26. What nutrition programming do you provide that you feel has been the most valuable to student athletes?

27. Has there been anything that you have tried that just didn’t work?

28. What advice would you give to a Registered Dietitian trying to develop a nutrition program for club athletes at a University? Find out who your allies are, who else there thinks it is important besides you, administrative support, provide documentation on what you’re doing and how you’re serving the athletes, find out what is important to the department (increase education, decrease injury, etc.) drive your conversation around what is important to them, focus most on the sports or the teams that are asking for it and go all in, do a great job for a few instead of a lot
We are interested in nutrition programming, counseling, and/or services that you have provided to athletes at your institution outside of the Fueling Station or Training Tables. Please keep this in mind as you respond to the questions below.

1. For what institution do you work as a Registered Dietitian for the purpose of providing nutrition counseling and services to student athletes? Notre Dame
   a. How long have you been in this position? 4 years in August
   b. How many Registered Dietitians does your institution employ for the purpose of providing nutrition counseling and services to student athletes? 4, all full time
   c. What is the total number of athletes that you serve at your institution? Please distinguish between club and D1 athletes. 750 athletes

2. Do you work with club athletes?
   a. (If yes) What programming do you provide?
   b. (If yes) Do you have a budget for working with the club athletes? No, but do work with the cheer team, occasionally club sports for a general how to fuel class about once a year

If you do not work with club athletes please answer the following questions about D1 athletes at your university.

3. How many teams do you work with? 3, football, hockey, fencing
   a. What is the total number of athletes at your university?

4. Did you assist in the creation of the sports nutrition program at your university, or was this an established program that preceded your hire date? Structure was here, but the program has evolved
5. Are your services by request only, or do you reach out to the teams to schedule education or counseling? Mixed, do schedule team talks with each team, but one on ones are requested

6. Besides the fueling station, what other types of programming or education do you provide to athletes? Team talks, social media, static education, snack bags, grocery store tours, cooking classes on occasion, cooking demos, body comp testing
   a. Do you provide cooking classes?
   b. What percentage of your time is spent on non-fueling station-related duties? 50/50

7. What is the most commonly requested service that you provide to your athletes? One on one meetings and body comp

8. Are your services optional or mandatory? Always optional, strongly encouraged, perception of things being mandatory doesn’t always go over well, highly encouraged from coaching staff, always optional from nutritional programing, may not be optional on the coaching/team side

9. Have you experienced times of low student-athlete engagement? Only around finals

10. What strategies have you used in the past to attempt to increase engagement with athletes?
    a. What strategies have you tried that were successful?
    b. What strategies have you tried that were unsuccessful?

11. What do you currently do to maintain engagement with the student-athletes? Biggest thing is face time, the more you’re physically present the more they see you as a human the more they trust you
12. What nutrition programming do you provide that you feel has been the most valuable to student athletes? Face time, face time, face time, face time, face time, going to dinner with them, going to team parties, dorm room meetings

13. Has there been anything that you have tried that just didn’t work? Competitions between teams, incentive teams, doing things during breaks

14. What advice would you give to a Registered Dietitian trying to develop a nutrition program for club athletes at a University? Promoting services, being around, reaching them where are most able to reached, twitter, texts, social media, resources that can send out to them, anything where you are physically be around, get to know the staff of the teams!!!
We are interested in nutrition programming, counseling, and/or services that you have provided to athletes at your institution outside of the Fueling Station or Training Tables. Please keep this in mind as you respond to the questions below.

1. For what institution do you work as a Registered Dietitian for the purpose of providing nutrition counseling and services to student athletes? University of Utah
   a. How long have you been in this position? As the director 2 years, been here 3 years in July
   b. How many Registered Dietitians does your institution employ for the purpose of providing nutrition counseling and services to student athletes? 3 Full time dietitians, 2 that work more with Olympic, and one for football, also have 3 part-time fellows, 2 interns in the CPD program
   c. What is the total number of athletes that you serve at your institution? Please distinguish between club and D1 athletes. Fluctuates, this spring about 475, in the fall it is more because of football

2. Do you work with club athletes? no
   a. (If yes) What programming do you provide?
   b. (If yes) Do you have a budget for working with the club athletes?

If you do not work with club athletes please answer the following questions about D1 athletes at your university.

3. How many teams do you work with? I oversee the department, I have 3 teams men’s basketball, women’s tennis, and gymnastics, most of the dietitians underneath have 3 teams this year, fellows normally have 2 teams plus fueling stations
   a. What is the total number of athletes at your university?
4. Did you assist in the creation of the sports nutrition program at your university, or was this an established program that preceded your hire date? It was already established when I came in as the assistant director, it has grown and evolved

Last school was at Liberty University in Virginia, built from ground up.

5. Are your services by request only, or do you reach out to the teams to schedule education or counseling? A little of both and depends on the team, some teams are super engaged other teams are not, really depends on the coaches. At Liberty by request only because I was the only dietitian there.

6. Besides the fueling station, what other types of programming or education do you provide to athletes? Individual consults, at the beginning of the year initial screenings with ALL athletes to see if there are any issues or red flags, body comp testing, ferritin testing, vitamin d testing, supplement education, hydration testing and education, cooking classes (team specific and general athletes), grocery store tours, dining hall tours, team talks, workshops, travel nutrition and game day nutrition (depends on the team on $$), menu planning (team specific, pre/post game meals, travel meals, home game meals), helping with recruiting
   a. Do you provide cooking classes?
   b. What percentage of your time is spent on non-fueling station-related duties?

7. What is the most commonly requested service that you provide to your athletes? Usually from coaches team talks of some kind, or individual consults

8. Are your services optional or mandatory?

9. Have you experienced times of low student-athlete engagement? Yeah typically during finals week, ebs and flows with the season with each team, for example ski they are
literally never here in season because they have to travel to practice, so most of their education is pre-season. In the fall a lot more education for spring teams and opposite in the spring time

10. What strategies have you used in the past to attempt to increase engagement with athletes?
   a. What strategies have you tried that were successful?
   b. What strategies have you tried that were unsuccessful?

11. What do you currently do to maintain engagement with the student-athletes? Try to be creative, with the coaches think what would be impactful, constantly trying new things, collaborating with coaches, Athletic training, Strength Coaches, and Physical Training, for example: hydration testing people stopped turning in their cups so they had to try a new strategy (send cups home etc.)

12. What nutrition programming do you provide that you feel has been the most valuable to student athletes?

13. Has there been anything that you have tried that just didn’t work? Some food items like broccoli, I don’t know from programming perspective very individualized by the team

14. What advice would you give to a Registered Dietitian trying to develop a nutrition program for club athletes at a University? To start small, under promise and over deliver, coaches get really excited about it and often want to do more than is possible, start very basic and recruit as much as possible for help, stocking fridges and working at the fueling station is not an effective use of your time as a dietitian, getting workers to do some of the grunt work is super helpful, because you can’t have a volunteer create handouts because they are not the dietitians.
We are interested in nutrition programming, counseling, and/or services that you have provided to athletes at your institution **outside of the Fueling Station or Training Tables.** Please keep this in mind as you respond to the questions bellow.

1. For what institution do you work as a Registered Dietitian for the purpose of providing nutrition counseling and services to student athletes? Louisiana State University
   a. How long have you been in this position? Almost 2 years on June 1st
   b. How many Registered Dietitians does your institution employee for the purpose of providing nutrition counseling and services to student athletes? 3 Full Time, 1 Graduate Assistant, 4 paid undergrad students up to 10 hours a week
   c. What is the total number of athletes that you serve at your institution? Please distinguish between club and D1 athletes. 470, 21 teams

2. Do you work with club athletes? No, the only team(s) we worked with are cheerleading, and dance team (tiger girls)
   a. (If yes) What programming do you provide?
   b. (If yes) Do you have a budget for working with the club athletes?

If you do not work with club athletes please answer the following questions about D1 athletes at your university.

3. How many teams do you work with? 4 teams, men’s basketball, swim/dive, soccer, softball all hands on deck during football camp in august
   a. What is the total number of athletes at your university?

4. Did you assist in the creation of the sports nutrition program at your university, or was this an established program that preceded your hire date? Kind of, I actually volunteered here with Jamie Meeks (founder) helped her create the bare bones program, when I got
hired it had been four or five years since it had been established, Lauren Raegan only one assistant and when I got hired we could get another assistant, we’re able to do a lot more since when I got here.

5. Are your services by request only, or do you reach out to the teams to schedule education or counseling? Mixed, most of the time the athletes will reach out to me, there are cases where I will reach out to the athlete if I get a referral, the coaches will reach out for team talks, etc.

6. Besides the fueling station, what other types of programming or education do you provide to athletes? Team talks, consults, grocery store tours, cooking classes, food demos, social media, passive education at the facilities (handouts/toilet talks), send recipes and tips via groupme, try to travel with teams at minimum to the post season, there with the team all the time helps build rapport with them and trust

   a. Do you provide cooking classes? Yes, able to use a cooking kitchen in food science lab and bring in outside chef and she will do them, size of the kitchen ideally only hold 12-15 people, only done 2 in 2 years, the other assistant has done 4 in 2 years. FSU opened it up for all athletes at LSU it is by team

   b. What percentage of your time is spent on non-fueling station-related duties? 85% not fueling station, Oliva the GA helps with fueling station

7. What is the most commonly requested service that you provide to your athletes?

   Individual consults, DEXA scans 3 per year

8. Are your services optional or mandatory?

9. Have you experienced times of low student-athlete engagement? Oh yes, unfortunately
10. What strategies have you used in the past to attempt to increase engagement with athletes?

a. What strategies have you tried that were successful? Just being present helps so much, and whether it is traveling or being at practice, just showing up to be there with nothing nutrition related. When I do big teams talks have a food demo there or some sort activity to do that is related to the team talk, i.e. make protein bites after protein talk, try to do fun little activities, pre/post workout nutrition – brought food samples and have them analyze and decide if they are good choices i.e. pretzels vs. peanut butter, being a friend to the coach, get the buy in from the coaches and it helps with athletes engagement

b. What strategies have you tried that were unsuccessful? Yes, LoveYourSelfie. Mainly because I didn’t prepare for it very well, athletes didn’t connect with it. Tried to do grocery store tour with men’s basketball but didn’t make it mandatory and no one showed up.

11. What do you currently do to maintain engagement with the student-athletes?

12. What nutrition programming do you provide that you feel has been the most valuable to student athletes? Consults and team talks retain info better, handouts/signs not sure how much they read it

13. Has there been anything that you have tried that just didn’t work?

14. What advice would you give to a Registered Dietitian trying to develop a nutrition program for club athletes at a University? I think being persistent, fight for a full-time position, developing relationships with coaches and staff, because if they are bought in athletes will follow
We are interested in nutrition programming, counseling, and/or services that you have provided to athletes at your institution outside of the Fueling Station or Training Tables. Please keep this in mind as you respond to the questions below.

1. For what institution do you work as a Registered Dietitian for the purpose of providing nutrition counseling and services to student athletes? Idaho State University
   a. How long have you been in this position? 5th year, still working up to full time, takes time to get buy in and a budget rolling, mostly the budget is the issue. When I first started I had money from a local store and do cooking classes, food demos, and fueling station. Because I did those things, the teams loved it, the coaches had to create space within their team budgets for those things. Track and field has like 80 athletes and no budget so they don’t get cooking classes, but football, softball, soccer, basketball does.
   b. How many Registered Dietitians does your institution employee for the purpose of providing nutrition counseling and services to student athletes? Just me.
   c. What is the total number of athletes that you serve at your institution? Please distinguish between club and D1 athletes. 304

2. Do you work with club athletes? No, well I work with the dance team, they aren’t part of the athletic department, they are part of the PE department
   a. (If yes) What programming do you provide?
   b. (If yes) Do you have a budget for working with the club athletes?

If you do not work with club athletes please answer the following questions about D1 athletes at your university.

3. How many teams do you work with? 12 teams plus cross country
a. What is the total number of athletes at your university?

4. Did you assist in the creation of the sports nutrition program at your university, or was this an established program that preceded your hire date? Well it was a grant that was written by dietetics professors and health ed profs, they were getting phone calls from Athletic Department. The athletes do exit interviews and they requested nutrition. They were having seniors and transfers saying I wish we had more nutrition information. They were trying to figure out how to fill that need. Created a grant and given a grant by DairyWest. I was hired through that grant and given a few specifics to focus on. The funding/hours are increased each year.

5. Are your services by request only, or do you reach out to the teams to schedule education or counseling?

6. Besides the fueling station, what other types of programming or education do you provide to athletes?
   a. Do you provide cooking classes?
   b. What percentage of your time is spent on non-fueling station-related duties?

7. What is the most commonly requested service that you provide to your athletes?

8. Are your services optional or mandatory? Optional

9. Have you experienced times of low student-athlete engagement? Kind of, it just takes time

10. What strategies have you used in the past to attempt to increase engagement with athletes?
    a. What strategies have you tried that were successful? I was a student athlete back in the day. Athletes love Athletic Trainers. Athletes spend a lot of time in the
training room and they care for the athletes. Spent time in the Athletic Training area and gain trust and take that load from them. They began referring. Four pronged focus: one-on-ones (promoted thru ATC), team talks (meet w/ all the coaches and they were awesome and excited to have me since day one, did whatever the coaches wanted like basics or hydration) show face (spent time at practices and games) (asked to travel with football), cooking classes super popular (crock pot cooking, bulk cooking, basic basic cooking skills, smoothies), grocery store tours (take teams, conversations you would never have map out the store and walk them through specific places, bread aisle read labels, dairy aisle what kinds to buy, etc.) also had this last year started taking them (softball they live together) started group counseling sessions with those that live together. Talk about the needs of each athlete and how they are different and how to plan a week-long menu together. Consider items in their home, their skill level, then go grocery shopping with them. Girls would actually follow the plan, the boys need only 2-3 days in a row. They wasted a lot of food. 10 grocery store tours a semester.

b. What strategies have you tried that were unsuccessful? A bulk cooking class w/ men’s basketball. Too much work for the athletes. Had 5 athletes leave before the class was over.

11. What do you currently do to maintain engagement with the student-athletes? Try really hard to have face time at their practices. If they see me they will remember. Some coaches talk me up some don’t. Even just popping in the gym for the 10 minutes in the warm up. Do you bring anything with you to the practices? Sometimes, I get free samples and used to make 100s of energy bites.
12. What nutrition programming do you provide that you feel has been the most valuable to student athletes? One on ones, from that I find what they need. I created an ED/DE policy because they talk to me. Created a health support team, referral system. Trained coaches, senior administration on DE/ED.

13. Has there been anything that you have tried that just didn’t work?

14. What advice would you give to a Registered Dietitian trying to develop a nutrition program for club athletes at a University? To understand how dietitians can be the connector between all other professions we are key collaborators. We can bring together mental health professionals with the athletes, the SCORE program to start this multidisciplinary team, it is opening the doors for nutrition protocols for concussions and ED/DE. Have to have that collaborative skill/personality.
We are interested in nutrition programming, counseling, and/or services that you have provided to athletes at your institution **outside of the Fueling Station or Training Tables**. Please keep this in mind as you respond to the questions below.

1. For what institution do you work as a Registered Dietitian for the purpose of providing nutrition counseling and services to student athletes? I work for Cal State University North Ridge we are a smaller middle tier D1 school in Los Angeles. Same level at Utah State.
   a. How long have you been in this position? I started at the end of August, so about 8 or 9 months.
   b. How many Registered Dietitians does your institution employee for the purpose of providing nutrition counseling and services to student athletes? I’m the only one. Do you have grad assistants or anything? I have student interns unfortunately they are not exactly grad assistants or anything like that, but that’s my goal for next year to create that position.
   c. What is the total number of athletes that you serve at your institution? Please distinguish between club and D1 athletes. Yeah, we have about 327 or 328 we have 17 teams.

2. Do you work with club athletes? I only work with NCAA athletes.
   a. (If yes) What programming do you provide?
   b. (If yes) Do you have a budget for working with the club athletes?

If you do not work with club athletes please answer the following questions about D1 athletes at your university.

3. How many teams do you work with? 17 teams.
a. What is the total number of athletes at your university?

4. Did you assist in the creation of the sports nutrition program at your university, or was this an established program that preceded your hire date? I would say there was a program that existed before me, but I have expanded it. It was bare bones when I got here but I definitely got a lot more funding and have expended it.

5. Are your services by request only, or do you reach out to the teams to schedule education or counseling?

6. Besides the fueling station, what other types of programming or education do you provide to athletes? I do all your typical like counseling, education, cooking classes, team talks, ISAK certified so I do all their body fat stuff. We do have a bod pod on campus but the athletes have to pay $35 to get bod podded. I also find the ISAK a lot easier because there is a lot more data then just your body fat, etc. I do a lot of meal planning, restaurant picking out, the typical type of things. Do you utilize your Instagram quite a bit with your athletes or is it more for your private business? So, my thing with Instagram was to provide information to athletes because they get all their information online anyways from like influencers. I wanted to provide quality content for them to look at, a lot of my students find me on Instagram on their own, but I don’t promote it to keep my private business separate from my job. Really hard to get engagement through the school Instagram. I did a survey with my athletes on like where do they get their information from. And like 80% of them were like Instagram and Twitter. If you can do something on social I think that’s great, the more education you can get out there it is really important for our field.

a. Do you provide cooking classes?
b. What percentage of your time is spent on non-fueling station-related duties? Yes, I believe about 40-45%, actually we will say 55%. I track all of my metrics to show what I am doing for the department. I track everything I do, I can ask for more money because I can show what I am doing.

7. What is the most commonly requested service that you provide to your athletes? Probably body fat.

8. Are your services optional or mandatory? Um I think it depends on the athlete. If they were referred to or not, if they set an appointment then it is mandatory. We have a pretty good interdisciplinary team, if there is any type of nutrition problem I am referred to immediately.

9. Have you experienced times of low student-athlete engagement?

10. What strategies have you used in the past to attempt to increase engagement with athletes?
    a. What strategies have you tried that were successful? So, I know looking at this because you are looking at club athletes. But I noticed when I first got here we didn’t really have a fueling station. Then we got a fueling station in January, that has drastically increased athlete engagement. I don’t know if that is possible for you, but having that bond with athletes over food. Maybe just being around them more, they seem to engage more the more you are around.
    
    b. What strategies have you tried that were unsuccessful? Um I think when I first initially came in I had all these ideas of what I wanted to do, and not necessarily what people wanted and every single sport is different so you have to treat every sport as unique and figure out what their wants and needs are. A one size
approach does not fit all, realize you’re just one person so don’t run yourself ragged. If people don’t reach out to me they won’t respond when I reach out to them.

11. What do you currently do to maintain engagement with the student-athletes?

12. What nutrition programming do you provide that you feel has been the most valuable to student athletes? Um I think there is different value in different things, I think it is all valuable. Body fat is valuable. Different athletes respond better to different things, some do well with counseling others in a group setting.

13. Has there been anything that you have tried that just didn’t work?

14. What advice would you give to a Registered Dietitian trying to develop a nutrition program for club athletes at a University? Yeah, the biggest advice I can give you. I don’t know if you have trainers or if you have coaches I would spend as much time with those people as you can. Those are the people that will allow you access to the athletes and those are the people who are going to help you with buy in. I noticed when I have better relationships with the trainers and coaches, I get their athletes more regularly. The more you are around people the more they will trust you with nutrition because it is such an emotional thing. Just going in and making sure you build that relationship and allow the nutrition stuff to come later.
We are interested in nutrition programming, counseling, and/or services that you have provided to athletes at your institution **outside of the Fueling Station or Training Tables.** Please keep this in mind as you respond to the questions below.

1. For what institution do you work as a Registered Dietitian for the purpose of providing nutrition counseling and services to student athletes? 5402317089 virginia tech
   a. How long have you been in this position? a/3 years p/2 years
   b. How many Registered Dietitians does your institution employee for the purpose of providing nutrition counseling and services to student athletes? 5 in athletics. 3FT, 2 GA’s
   c. What is the total number of athletes that you serve at your institution? Please distinguish between club and D1 athletes. 550

2. Do you work with club athletes? Just NCAA, dining dietitian was doing work doing team talks
   a. (If yes) What programming do you provide?
   b. (If yes) Do you have a budget for working with the club athletes?

If you do not work with club athletes please answer the following questions about D1 athletes at your university.

3. How many teams do you work with? 18 a/ 4 p/ 4 depends on how many athletes are each team 4-6 is pretty average
   a. What is the total number of athletes at your university?

4. Did you assist in the creation of the sports nutrition program at your university, or was this an established program that preceded your hire date? no
5. Are your services by request only, or do you reach out to the teams to schedule education or counseling? Both, depends on the athlete/team, referrals, reach out for team talks, text messages

6. Besides the fueling station, what other types of programming or education do you provide to athletes? G store tours, a lot social media, snap chat, team talks, dine w/ a dietitian, a lot education is intertwined w/ fueling station, graphics everywhere, informal
   a. Do you provide cooking classes? Yes. 2 per semester
   b. What percentage of your time is spent on non-fueling station-related duties? 50/50 a little over 50% is education

7. What is the most commonly requested service that you provide to your athletes? Mix individual counseling, food requests, body comp testing, bod pod, weekly weights, daily weights, hydration

8. Are your services optional or mandatory?

9. Have you experienced times of low student-athlete engagement? Spring is less involved than the fall, dine w/ a dietitian, off season is the best time

10. What strategies have you used in the past to attempt to increase engagement with athletes?
    a. What strategies have you tried that were successful? Being around teams, face time, incentives, free meal, cooking class = free food, trivia prizes
    b. What strategies have you tried that were unsuccessful?

11. What do you currently do to maintain engagement with the student-athletes?

12. What nutrition programming do you provide that you feel has been the most valuable to student athletes? Fueling station, go to one practice a week, being visible
13. Has there been anything that you have tried that just didn’t work? Nutrition captains, dine w/ a dietitians,

14. What advice would you give to a Registered Dietitian trying to develop a nutrition program for club athletes at a University? Figure out what resources you can use that don’t cost money, grocery store tours, social media, hydration educations (weigh ins and weigh outs), use a survey to find out where they are struggling, reach out to coaches
We are interested in nutrition programming, counseling, and/or services that you have provided to athletes at your institution outside of the Fueling Station or Training Tables. Please keep this in mind as you respond to the questions below.

1. For what institution do you work as a Registered Dietitian for the purpose of providing nutrition counseling and services to student athletes? University of Tulsa
   a. How long have you been in this position? 4.5 months
   b. How many Registered Dietitians does your institution employee for the purpose of providing nutrition counseling and services to student athletes? 1 full time, 1 graduate assistant
   c. What is the total number of athletes that you serve at your institution? Please distinguish between club and D1 athletes. Little over 400

2. Do you work with club athletes? no
   a. (If yes) What programming do you provide?
   b. (If yes) Do you have a budget for working with the club athletes?

If you do not work with club athletes please answer the following questions about D1 athletes at your university.

3. How many teams do you work with? 17 sports total, I work with 15, cross country doesn’t work with the sports performance department, primary for football, both will see all athletes for counseling, as far as team coverage, we do what we can for education, the Graduate Assistant has 2-3 for focus

4. Did you assist in the creation of the sports nutrition program at your university, or was this an established program that preceded your hire date? Already established
5. Are your services by request only, or do you reach out to the teams to schedule education or counseling? Kind of mixed, sign up sheet for counseling, reached out to Athletic training and sports medicine for counseling.

6. Besides the fueling station, what other types of programming or education do you provide to athletes? Grocery store tours, team talks, plate coaching, 3 site skin fold, no good way to do body comp right now, a lot of one on one, a lot of stuff with Athletic training, hydration testing coming in the fall, working with Athletic training and sports med to increase engagement letting them know how you can benefit them and the athletes.
   a. Do you provide cooking classes? no, cooking demos, don’t have funds for full cooking class, use a mobile cart for cooking demos.
   b. What percentage of your time is spent on non-fueling station-related duties?
      About 60%

7. What is the most commonly requested service that you provide to your athletes? One on ones.

8. Have you experienced times of low student-athlete engagement? Not really, continuously reminding them of your services helps, if you do not remind them they forget about them because they are really busy.

9. What strategies have you used in the past to attempt to increase engagement with athletes?
   a. What strategies have you tried that were successful?
   b. What strategies have you tried that were unsuccessful?
10. What do you currently do to maintain engagement with the student-athletes? Not really, when I first got here really high engagement, in the middle of the semester there was a lull because everyone had rushed in to see me right when I got here.

11. What nutrition programming do you provide that you feel has been the most valuable to student athletes? The team talks, the education around the fueling station, switch it out weekly/biweekly, trying to get the education into the locker rooms.

12. Has there been anything that you have tried that just didn’t work? Not really, everything I have done in the past, as long as you keep promoting they will utilize it.

13. What advice would you give to a Registered Dietitian trying to develop a nutrition program for club athletes at a University? Be creative in that way you approach things, have active games if you are giving educations, being persistent, acronyms for program curriculum A.G.G.I.E.S. (create one), use the acronym as your base for your education then build from there.
COREQ (Consolidated criteria for Reporting Qualitative research) Checklist

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Domain 1: Research team and reflexivity</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Personal characteristics</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interviewer/facilitator</td>
<td>1</td>
<td>Which author/s conducted the interview or focus group?</td>
<td>55</td>
</tr>
<tr>
<td>Credentials</td>
<td>2</td>
<td>What were the researcher’s credentials?</td>
<td>56</td>
</tr>
<tr>
<td>Occupation</td>
<td>3</td>
<td>What was their occupation at the time of the study?</td>
<td>56</td>
</tr>
<tr>
<td>Gender</td>
<td>4</td>
<td>Was the research male or female?</td>
<td>56</td>
</tr>
<tr>
<td>Experience and training</td>
<td>5</td>
<td>What experience or training did the researcher have?</td>
<td>--</td>
</tr>
<tr>
<td><strong>Relationship with participants</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relationship established</td>
<td>6</td>
<td>Was a relationship established prior to study commencement?</td>
<td>56</td>
</tr>
<tr>
<td>Participant knowledge of the interviewer</td>
<td>7</td>
<td>What did the participants know about the researcher?</td>
<td>56</td>
</tr>
<tr>
<td>Interviewer Characteristics</td>
<td>8</td>
<td>What characteristics were reported about the interviewer/facilitator?</td>
<td>56</td>
</tr>
<tr>
<td><strong>Domain 2: Study design</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Theoretical framework**

| Methodological orientation | 9 | What methodological orientation was stated to underpin the study? | 56 |

**Participant selection**

| Sampling | 10 | How were the participants selected? | 55 |
| Method of approach | 11 | How were participants approached? | 55 |
| Sample size | 12 | How many participants were in the study? | 55 |
| Non-participation | 13 | How many people refused to participated or dropped out? Reasons? | -- |

**Setting**

| Setting of data collection | 14 | Where was the data collected? | 56 |
| Presence of non-participants | 15 | Was anyone else present besides the participants and researchers? | -- |
| Description of sample | 16 | What are the important characteristics of the sample? | 56 |

**Data collection**

<p>| Interview guide | 17 | Were questions, prompts, guides provided by the authors? Was it pilot tested? | 55 |</p>
<table>
<thead>
<tr>
<th><strong>Repeat interviews</strong></th>
<th>18</th>
<th>Were repeat interviews carried out? If yes, how many?</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Audio/visual recording</strong></td>
<td>19</td>
<td>Did the research use audio or visual recording to collect data?</td>
<td>56</td>
</tr>
<tr>
<td><strong>Field notes</strong></td>
<td>20</td>
<td>Were field notes made during and/or after the interview or focus group?</td>
<td>56</td>
</tr>
<tr>
<td><strong>Duration</strong></td>
<td>21</td>
<td>What was the duration of the interviews or focus groups?</td>
<td>56</td>
</tr>
<tr>
<td><strong>Data saturation</strong></td>
<td>22</td>
<td>Was data saturation discussed?</td>
<td>62</td>
</tr>
<tr>
<td><strong>Transcripts returned</strong></td>
<td>23</td>
<td>Were transcripts returned to participants for comment and/or correction?</td>
<td>No</td>
</tr>
</tbody>
</table>

**Domain 3: analysis and findings**

**Data analysis**

<p>| <strong>Number of data coders</strong> | 23 | How many data coders coded the data? | 56 |
| <strong>Description of the coding tree</strong> | 25 | Did authors provide a description of the coding tree? | Appendices |
| <strong>Derivation of themes</strong> | 26 | Were themes identified in advanced or derived from the data? | 57 |
| <strong>Software</strong> | 27 | What software, if applicable, was used to manage the data? | 56 |</p>
<table>
<thead>
<tr>
<th>Participant checking</th>
<th>Did participants provide feedback on the findings?</th>
<th>No</th>
</tr>
</thead>
</table>

**Reporting**

<table>
<thead>
<tr>
<th>Quotations presented</th>
<th>Were participant quotations presented to illustrate the themes/findings? Was each quotation identified?</th>
<th>64-65</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data and findings consistent</td>
<td>Was there consistency between the data presented and the findings?</td>
<td>62</td>
</tr>
<tr>
<td>Clarity of major themes</td>
<td>Were major themes clearly presented in the findings?</td>
<td>57-60</td>
</tr>
<tr>
<td>Clarity of minor themes</td>
<td>Is there a description of diverse cases or discussion of minor themes?</td>
<td>--</td>
</tr>
</tbody>
</table>