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Sports nutrition practices of selected elite NCAA Division I athletic departments

Brian T. Lehmann

To the Graduate Council:

I am submitting herewith a thesis written by Brian T. Lehmann entitled "Sports nutrition practices of selected elite NCAA Division I athletic departments." I have examined the final electronic copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science, with a major in Human Performance and Sport.

Terese Stratta, Major Professor

We have read this thesis and recommend its acceptance:

Accepted for the Council:
Carolyn R. Hodges

Vice Provost and Dean of the Graduate School

(Original signatures are on file with official student records.)

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and recommend its acceptance:

Ralph Jones, Committee Member

Rob Hardin, Committee Member

Accepted for the Council:

Vice Provost and Dean of Graduate Studies

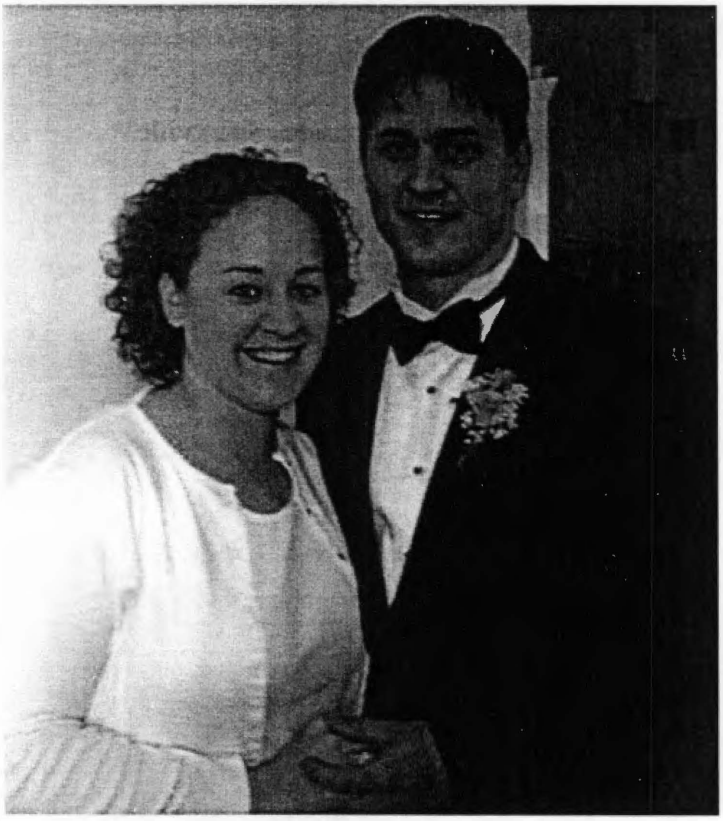
SPORTS NUTRITION PRACTICES OF SELECTED ELITE NCAA DIVISION I ATHLETIC DEPARTMENTS

A Thesis
Presented for the
Master of Science
Degree
The University of Tennessee, Knoxville

Brian T. Lehmann
August 2003

DEDICATION

It is with a sincere feeling of appreciation that I humbly dedicate this thesis to four special people in my life. To my Creator and Savior Jesus Christ, who is my example of effective servant-leadership. May my work in collegiate athletics be used for His perfect purpose. To my wife Miranda, who completes me. May we forever be as one. To Mabel House, who challenged me to achieve my dreams, generously provided opportunity to take action, and faithfully encouraged me to stay the course. May she receive the appreciation she deserves. To my mother, Carol Lehmann, who challenged me to be excellent in all that I do. May I show the same loving commitment to my family that she showed to me.



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ABSTRACT

The purpose of this study was to investigate the sports nutrition practices of NCAA Division I elite-level college athletic departments. More specifically, this study examined the perceptions of Registered Dietitians (RDs), Strength and Conditioning Coaches (SCCs), and Athletic Trainers (ATCs) on the following considerations of sports nutrition services: a) qualifications, classifications, and attributes of RDs, b) roles and responsibilities of RDs, c) factors influencing the employment of RDs, d) resources available to implement sports nutrition services, and e) the nutrition needs of student-athletes and benefits of nutrition for student-athletes. Data were collected through a two-part survey consisting of open and closed-ended questions the respondent being the principal provider of sports nutrition services at each athletic department. Participants of the study were determined by athletic ranking in football and post season bowl game appearances. Seventy-two universities in six conferences: SEC, Big 12, Big 10, ACC, PAC 10, and Big East as well as three teams placing in the top 25 AP Poll for 2002 were included in the present study. From this sample, 19 Division I athletic departments confirmed employment of an RD. While this research showed that RDs are increasingly being utilized by athletic departments to provide sports nutrition services, a comparison of current implementations of RD services to the advances documented in sports nutrition and dietetics literature in the dietetics indicated abundant potential for increased utilization of RDs by college athletic departments.

RDs must participate in evidence-based research to develop benchmarks or standards of best practice validating RDs as the authority of sports nutrition services for athletes. In this way, RDs in college athletic departments can document the benefits they

provide in the development of student-athletes. Evidence-based research documents the benefits RDs provide to college athletic department, and shows the usefulness of RDs for college athletic departments. It can be used to increase the demand for RDs in college athletics and validate their employment.

PREFACE

The physical development of college athletes in preparing for competition within their respective sports includes such disciplines as strength training, speed and quickness training, physical conditioning and muscular fitness, flexibility, rehabilitation, psychological training, and sports nutrition. Each discipline implements the latest scientific advances within the field. While sports nutrition is just one spoke in the wheel of physical development, sports nutrition is a highly specialized field that requires advanced training to adequately implement the advances of science. In order to maximize the benefits of sports nutrition in the development of athletes, many Division I universities have hired full-time dietitians to provide sports nutrition services. The purpose of this research serves as a progress report of how dietitians are being utilized in the physical development and training of athletes. It examines the position of the college sports nutritionist, the barriers preventing increased utilization of dietitians in college athletic departments, the perceived nutritional needs of athletes, and the expected benefits of implementing a sports nutrition program.

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LIST OF ABBREVIATIONS

ACC: Atlantic Coast Conference

ADA: American Dietetic Association

AP: Associated Press

ATC: athletic trainer certified

bw: body weight

CBC: complete blood count

CHAMPS/Life Skills Program: Challenging Athletes Minds for Personal Success

DEXA: dual energy x-ray absorptiometry

g: grams

kg: kilograms

LD: licensed dietitian

MD: medical doctor

NCAA: National Collegiate Athletic Association

PAC: Pacific Athletic Conference

REE: resting energy expenditure

RD: registered dietitian

SCAN: Sports, Cardiovascular, and Wellness Nutritionist (A practice group of the American Dietetic Association)

SCC: strength and conditioning coach

SEC: Southeastern Conference

SOAP: Subjective, Objective, Assessment, and Plan

DEFINITION OF TERMS

Elite-Level College Athletic Department – Athletic departments with greater access to economic resources. The following criterion variable was used to determine elite-level athletic departments: An NCAA Division I-A athletic department whose football program competes in a member conference of the Bowl Championship Series (BCS), or whose football program was ranked in the top 25 Associated Press Poll at the end of the 2002 season. The following conferences are members of the BCS: Athletic Coast Conference (ACC), Big East Conference, Big 10 Conference, Big 12 Conference, Pacific-10 Conference (PAC 10), and Southeastern Conference (SEC). Since membership in the BCS is directly linked with post-season bowl appearances, athletic departments within these six conferences have disproportional access to the majority of available post-season revenue. The only other athletic departments that have access to post-season bowl revenues are football programs that are ranked in the top 25 Associated Press Poll at the end of the season. The criterion variable used in this study, therefore, served to identify athletic departments within the NCAA that are financially elite.

Revenue Generating - Total Revenue – Total Expenses = Positive net income

Sports Nutrition – A subset of nutrition dealing with the application of nutrition and dietetics to an athletic population. It blends knowledge from the traditional fields of biochemistry, exercise physiology, medicine, nutrition, and physiology. Its focus is to optimize athletic performance and improve health through nutritional

enhancement of performance, energy balance and body composition, optimal growth and performance, good health and longevity, peak physiological function, and safety (38).

Sports Nutritionist – A professional who implements sports nutrition.

Strength & Conditioning Coach – A professional who develops exercise programs and implements these programs in the development of athletes. The title Sports Performance Specialist can also be used interchangeably.

CHAPTER 1
INTRODUCTION

STATEMENT OF THE PROBLEM

A myriad of services are currently available to college student-athletes. These services are intended to empower student-athletes by promoting their quality of life and enhancing their athletic performance. One initiative that targets these goals is the CHAMPS/Life Skills Program (Challenging Athletes Minds for Personal Success). Created, supported, and serviced by the NCAA, the CHAMPS/Life Skills Program is currently available to athletes at 118 Division I-A member institutions (30). Despite the fact that athletic departments have committed both philosophically and economically to developing an array of services that improve the academic, athletic, personal, and social well-being of student-athletes, one service remains underdeveloped, and yet is central and critical to the advancement of all other services: sports nutrition. Without proper nutrition, student-athletes have shown an increased morbidity, increased rate of injuries, and reductions in training and performance (5,15,33).

Historically, strength and conditioning coaches (SCCs) and athletic trainers (ATCs) have disseminated nutrition information to student-athletes (2). This information, however, has been limited and many times unsubstantiated. Although well-intentioned in their efforts, these professionals were lacking the appropriate advanced degrees in human nutrition education and formal clinical nutrition training to warrant offering advanced levels of nutrition support services (15, 17, 19). Currently, Registered Dietitians (RDs) are the leading authorities on food and nutrition-related information and services (4). As the training of student-athletes has mirrored the advances of science over

the past three decades, RDs with specialties in sports nutrition have pursued advanced training to ensure the implementation of effective nutrition interventions that target elite-level student-athletes.

A dearth of literature exists on the use of RDs in college sports nutrition services and on the status of sports nutrition services among NCAA Division I elite-level athletic departments (1). Although a report by Clark described the components of a college sports nutrition program, the information was limited to a single university only (19). To realize significant improvements in the holistic development of student-athletes, the literature on sports nutrition services must flourish. This study represents an initial contribution to the body of knowledge on sports nutrition practices of college athletic departments.

PURPOSE OF THE STUDY

The purpose of this study was to investigate the sports nutrition practices of NCAA Division I elite-level college athletic departments. More specifically, this study examined the perceptions of Registered Dietitians (RDs), Strength and Conditioning Coaches (SCCs), and Athletic Trainers (ATCs) on the following considerations of sports nutrition services: a) qualifications, classifications, and attributes of RDs, b) roles and responsibilities of RDs, c) factors influencing the employment of RDs, d) resources available to implement sports nutrition services, and e) the nutrition needs of student-athletes and benefits of nutrition for student-athletes.

SIGNIFICANCE OF THE STUDY

Only recently have elite-level college athletic departments focused on improving sports nutrition services when training student-athletes. Since no one has documented the sports nutrition services currently provided by elite-level college athletic departments, findings from this study serve as historical documentation of the inception of college sports nutrition services, and of the collective perceptions of sports nutritionist on the nutrition needs of student-athletes. Findings from this study also serve as a basis for establishing minimal standards or benchmarks of "best practices" when implementing future sports nutrition programs. This study provides valuable information that can be used by administrators, coaches, SCCs, and ATCs to justify the hiring of RDs and identify other competent personnel in the area of sports nutrition services. Finally, findings from this study highlighted disparities that currently exist between recommendations that are advanced through sports nutrition science and practices that are implemented in an applied athletic department setting. This information provides valuable feedback to sports nutritionists, and serves as a basis for identifying opportunities for growth in the area of sports nutrition services.

DELIMITATIONS

Since the implementation of sports nutrition services and the hiring of RDs require a substantial financial commitment, the identification of athletic departments for inclusion in this study was determined within an economic framework. Moreover, this study was delimited to elite-level athletic departments in an attempt to access the greatest number of RDs throughout the NCAA. Rather than sampling all 118 NCAA Division I-

A athletic departments, a criterion variable was used to identify financially elite athletic departments, those with the available buying power to hire an RD.

If an athletic department employed a full-time RD, the researcher delimited the study by excluding SCCs from participation in this study, because it was assumed that the full-time RD was the principal provider of sports nutrition services.

LIMITATIONS

Even though a criterion variable was used to determine elite-level athletic departments, and thus, provide maximal opportunity for the participation of RDs throughout the NCAA, some RDs may be employed in athletic departments that were excluded from participation in this study. These athletic departments may be financially elite because they are located within private institutions, and thus are beneficiaries of endowments and philanthropic gifts.

This study was also limited by the researcher's lack of control in the distribution of surveys within athletic departments. Even though extensive written and oral instructions were provided with the surveys, the researcher could not control if the surveys were distributed to the appropriate personnel within each of the athletic departments.

CHAPTER 2
REVIEW OF LITERATURE

INTRODUCTION

The purpose of this study was to investigate the sports nutrition practices of NCAA Division I elite-level college athletic departments. The purpose of this section is to provide a summary of the literature related to: a) the status of sports nutritionists, b) the utilization of nutritionists in college sports, and c) factors affecting the success of college sports nutrition services.

THE STATUS OF SPORTS NUTRITIONISTS

Qualifications

The title of Sports Nutritionist can be misleading. In most states, no professional standards or credentials are needed for people to refer to themselves as a Nutritionist. The advice and services he provides may be credible. However, a further investigation of his training is needed. Many Sports Nutritionists are also Registered Dietitians (RDs). The minimum requirements for obtaining the RD credential include: completing a minimum four-year degree in Human Nutrition or Dietetics, logging more than 1,000 hours in supervised practice experience under the direction of current RDs, maintaining active membership with the American Dietetics Association (ADA), and successfully passing the Registered Dietitian Examination. This standardized examination evaluates the knowledge and skills needed to practice dietetics in an entry-level position, and it is used as the licensure standard for many states (33). Furthermore, many RDs have advanced degrees in their specialized field of study.

Dietetics is a broad area of study involving many industries that affect food and nutrition. Entry-level dietitians receive limited training in most areas of dietetics. During the supervised practice experience, RDs are encouraged to specialize in a particular area of focus in dietetics. Sports Nutrition is one area of specialized training. RDs who receive specialized training in sports nutrition are best classified as "Sports Nutritionists." This title is a more specific identification for their specialized training in dietetics. In Tennessee, the title of Sports Nutritionist is a legal title, which requires state licensure to practice Sports Nutrition (11). In most other states, law protects the title of "Dietitian," but law does not protect the title of "Nutritionist." Thus, the title of Nutritionist should be followed by the RD credential to lend more credibility to the services being provided.

Most specializations in dietetics do not have a separate certification within their specialized field. Because Sports Nutrition does not have a specialized certification recognized by the American Dietetic Association, credible Sports Nutritionists are highlighted by their hands-on field experience within the sports industry. This experience provides superior training and qualifications to that of an entry-level RD. Although RDs are trained food and nutrition experts capable of a broad range of professional duties, specific "sports" education and training are not classical components of their education (1). For example, because the broad field of dietetics requires specialization, an entry-level RD may chose to specialize in clinical dietetics focusing on the treatment of oncology patients. While this cancer RD is qualified to practice within their area of specialization, they probably have limited training or knowledge in the specific nutritional needs of a student-athlete. Thus, three qualities are characteristic in

reliable Sports Nutritionists: 1) the RD credential, 2) hands on practical work experience in the specific sports industry, and 3) an advanced degree in human performance, sports nutrition or a related field.

A survey by the American Dietetic Association of its members provides helpful incite into the position of the Sports Nutritionist. In this survey, the salary range of Sports Nutritionists with five years of experience or less was $31,000 - $48,800 per year (12). Those positions that held a master's degree or higher ranged from $40,100 - $67, 900. Dietetics practioners as a whole enjoy considerable fringe benefits from their work including: paid vacations (81%), paid holidays (75%), paid sick days (74%), medical insurance (81% of respondents), dental insurance (73%), prescription drug benefit (68%), funding of professional development (59%), and defined contribution to retirement plan (63%) (13).

While this survey provides excellent information for the field of dietetics in general, it does not provide adequate detailed information to describe the specific Sports Nutritionist position of the collegiate RD working within a NCAA Division I elite-level athletic department. Such information that is missing includes the department in which the RD is best classified, number of years of employment in the current position, classification of employment as full-time, part-time, paid consultant, or some form of joint appointment with another university department, formal degrees and certifications obtained, total number of years of experience within the field of sports nutrition, and salary range or fringe benefit options of the current position. Also, the roles and responsibilities of the college RD are absent. Considering that no formal study has

compiled this information in aggregate form, the current study is valuable to those interested in seeking employment in collegiate sports nutrition.

THE UTILIZATION OF NUTRITIONISTS IN COLLEGE SPORTS

Benefits of Dietitians

It is difficult to directly relate enhanced nutrition to improvements in on the field performance success (25). However, nutrition influences a number of objective measures that relate to athletic performance. Such factors include improvements in lean body mass, weight management, and hydration status. Other factors effecting performance can be estimated such as perceived exertion, feelings of increased energy, increased rate of recovery from injury, and improved immune function (15). Other health related quality of life factors can be enhanced by the services of an RD such as the ability to concentrate, enjoyment of food quality, sensory satisfaction of food, confidence in one's ability to make appropriate food selections, and knowledge of safe nutritional supplements. RDs can provide medical nutrition therapy services for such specialized problems as injury recovery, diabetes, hypertension, hypercholesterolemia, and the treatment of eating disorders. RDs are available for the assessment, evaluation, and recommendations of dietary supplements. Also, they can aide in menu planning and cost controls for management of food service meals such as pre-game meals, athletic training table meals, and special banquets. These benefits listed are a snapshot of the most frequently offered services utilized by college universities to date, as specified through informal conversations with actively practicing RDs in college athletic departments reported during focus groups at an ADA sponsored national symposium on sports nutrition (39).

This list is not meant to be an exhausted account of all possible services, but instead, it serves as an affirmation of previously published services (15).

The Nutritional Needs of College Athletes

Student-athletes have been shown to have increased nutritional needs for fluids, carbohydrates, protein, certain B vitamins, and calcium as compared to the general population (15). A detailed discussion of the specific nutritional needs of student-athletes is beyond the scope of this paper, due to the detailed specificity of each sports' physiological demand. To provide some examples and explanation of this topic, increased protein and carbohydrate demand will be briefly discussed. However, it should be noted that hydration is also an issue that places high demands on student-athletes above the general population (21).

Before a nutritionist can successfully provide sports nutrition services to student-athletes, it is important that the specific demands of each sport are identified and understood. Dan Bernardot has provided an excellent resource for RDs describing in detail the specific physiological demands of many sports (20). These special demands are dependent on the age, sex, experience, and the individual sport in which the student-athlete competes (21). It is vital for athletic departments to utilize the services of RDs in implementing sports nutrition strategies, because RDs have formal training in the physiological demands of many sports. Also, they have training in specific sports nutrition strategies for providing the increased nutritional needs created by the physiological demands of elite competitive athletics. These increased nutritional needs of

student-athletes far exceed the nutritional needs of the general student body at a university (20).

Increased Protein Demand

The Recommended Dietary Allowance of protein for the general population is 0.8 grams (g) per kilogram (kg) of body weight (bw) per day. Strength and power student-athletes, such as football players, engaged in heavy training require about 1.76 g/kg of bw per day (21). This excess protein is needed for the building of new muscle tissue as well as preventing the breakdown of existing muscle tissue.

Carbohydrate Rich Diet

Susan Kleiner, Ph.D, R.D. stated that, "Total dietary energy, specifically carbohydrate energy" was the most important nutritional factor affecting muscle gain (21). Many student-athletes and coaches are under the misconception that increasing protein consumption will improve the body's ability to synthesize muscle tissue. Anecdotal reports state that mega-protein diets have been shown to improve muscle growth. The probable cause for this growth relates to the total energy increase in the diet and not specifically to the protein ingested. A high-carbohydrate diet is the preferred energy pathway for the body. It is the most efficient pathway, and it will enable the greatest recovery of energy for stressed muscles (21). The fatigue and poor performance associated with glycogen depletion can be prevented by a carbohydrate-rich diet consisting of 6-10 g/kg of bw per day. The typical American diet consists of 4 g/kg of bw per day. Qualified RDs are needed to educate student-athletes on practical methods to meet these recommendations and increased nutritional needs. Some of the reasons

student-athletes neglect to follow the recommendations include such perceived barriers as time, money, and necessary nutritional knowledge to translate the nutrition recommendations into food selections (22). Steen's review provides many helpful practical applications to address these needs and barriers (23). For elite-level athletic departments to improve nutrition related factors associated with increasing athletic performance and enhanced quality of life, it is vital they retain the expertise of an RD. RDs offer individualized nutrition plans to address the barriers preventing student-athletes from incorporating positive nutrition habits in their lives.

Services Provided by Registered Dietitians

Since the late 1980s, RDs have been employed by Division I athletic departments in full-time employment positions to provide sports nutrition services to student-athletes (15). While there are a wide range of services that have been provided to student-athletes, they can be grouped into four major classifications of assessment, 1) Anthropometrical, 2) Biochemical 3) Clinical and 4) Dietary (16).

Anthropometrics refers to the objective measurements of body size such as height, total body weight, body weight of fat mass, and body weight of fat free mass such as muscle, bone, and connective tissue (16). The relationship between diet, exercise, and weight control can be so closely related that the latter is often used as a validation of balance in the former. Student-athletes, coaches, and strength and conditioning coaches (SCCs) seem to be so consumed with anthropometrical measurements that the success or value of a nutrition program can be unhealthily balanced on the success at achieving anthropometrical goals (40,41). What constitutes an appropriate body weight for health

and performance depends on the student-athlete's sport, gender, age, natural genetic predisposition and other potentially unforeseen factors such as social, emotional, and psychological influences (17). Elite-level athletic departments need the expertise of an RD to both manage the appropriate assessment of body weight and guide the development of realistic body weight goals. Attorney Barbara Bickford highlights the potential damage coaches can have on student-athletes by pressuring them to attain unrealistic body weight goals (40). Grandjean notes that coaches are the single most blamed source of eating disorders in athletic populations (41). Coaches have a high level of influence on student-athletes, and even careless remarks can be taken to extremes. Careless comments about fat, weight, or student-athletes' specific body parts may trigger pathological behaviors in student-athletes that can lead to serious problems with eating disorders. RDs can educate coaches, athletic trainers (ATCs), and SCCs to remain current on issues concerning nutrition, diet, and weight control. Also, RDs can educate coaches, ATCs, SCCs and student-athletes about safe weight control and weight loss measures such as 1) defining optimum performance weight without overplaying the impact on performance, 2) setting a reasonable time frame for weight reduction with a maximum goal of two pounds lost per week, 3) modifying energy expenditure at a moderate rate, not more than 1,000 calories per week above the total caloric intake, and 4) making appropriate referrals of student-athletes at high risk for injuring themselves, or identifying student-athletes with distorted body image, or disordered eating (40). RDs can offer elite-level athletic departments a written protocol for personnel to confront the student-athlete once disordered eating behaviors are detected. In this way, RDs can lead

effective interventions in reducing the prevalence of negative health behaviors associated with nutrition and diet. RDs offer guidelines for realistic and healthy anthropometrical goals.

Sports such as wrestling, weight lifting, gymnastics, and diving complicate the distinction that must be made between what is realistic and healthy versus what will bring success in "making the cut," because these sports either have a weight classification or are judged by aesthic appearances. The importance of a valid, reliable, and meaningful assessment of body composition is therefore imperative as one tool in the healthcare professionals' repertoire against undesirable, but common, weight change practices used by student-athletes. RDs using valid and reliable methods of assessment of anthropometrics can help student-athletes set realistic goals for body composition changes over reasonable periods of time. While the scope of this paper will not cover the discussion of the most valid and reliable assessment procedures, those interested in this study should consult the following references cited (15, 16). RDs are uniquely qualified to provide the most valid and reliable anthropometrical assessments. Furthermore, they are trained to apply these results in directing an effective weight management program (42).

Significant biological evidence supports the fact that student-athletes in some sports often undergo changes in clinical physiology (16). Biochemical assessment includes the assessment of blood for substrates and biochemical markers indicating changes in normal physiology. A common example of these changes occurs in endurance runners. Sports hematology shows that stage III iron deficiency anemia is characterized,

among other measures, by low blood hemoglobin concentration. Since hemoglobin is necessary for adequate oxygen transport to working cells, a reduced hemoglobin level would reduce health and performance in student-athletes competing in endurance sports. Typically, biochemical assessments are performed within a clinical setting of a hospital under the care of a physician and phlebotomy certified professional. These labs test range from 20 to 150 dollars per test. Because of the cost associated with these tests, they typically are not performed as a screening tool of all student-athletes, but instead are reserved for student-athletes who present other clinical symptoms of abnormalities (16). RDs have training in evaluating biochemical assessments to normal values, and developing treatments to address the disparities.

Clinical assessment of nutritional status attempts to identify the initial nutritional state and the interplay of the factors influencing the progression or regression of nutritional abnormalities (16). The clinical assessment aims to identify student-athletes at risk for nutritional deficiencies and abnormalities by examining athletes for physical warning signs. For example, the loss of sweat from prolonged exercise can lead to dehydration. Dehydration presents physical and clinical symptoms such as loss of concentration, reduced strength and muscular endurance, compromised cardiac output, such as elevated heart rate and reduced stroke volume, and impaired thermoregulation (18). By identifying the warning signs of dehydration in the early stages, proper prevention of serious conditions can be achieved. RDs play a role in educating athletic department employees such as coaches and health care professionals on physical conditions that warrant clinical assessment and treatment. While much progress has been

made in training athletic department personnel in the warning signs of clinical impairment related to heat illness and heat stroke, this problem is only one issue that affects student-athletes. Eating disorders, disordered eating, and many other dietary insufficiencies present themselves through clinical symptoms. It is imperative that elite-level athletic departments employ an RD who can detect the clinical symptoms associated with nutritional deficiencies and eating disorders.

Dietary assessment includes services that are most commonly provided on a day-to-day basis by RDs for student-athletes (16). These services include analyzing diets for nutritional adequacy, developing individualized nutrition plans to meet the individual needs of student-athletes within specific sports, and consulting athletes regarding off-campus meal selections. There are a number of methods RDs implement to achieve behavior changes in dietary selections. RDs create handouts and printed materials such as posters to pass out nutrition information. They hold team talks and seminars to discuss common nutrition problems of student-athletes. They provide hands on cooking demonstrations, grocery shopping trips, and demonstrations on selecting from menus at local restaurants (19). RDs also train coaches and healthcare professionals such as ATCs, to make more educated decisions regarding policies that affect the student-athletes food supply. Dr. Kristine Clark has published on the topics of effective nutrition support services for college student-athletes (19). Her work on this subject provides an expansion on the potential for services RDs provide to college athletic departments. It should be noted that historically, the potential for services offered at elite-level athletic departments relied upon the RDs' ability to identify a problem, retain the necessary resources to

address the problem, and develop creative solutions that will be utilized by the student-athletes needing assistance. Skinner stated that an entrepreneurial approach exhibiting attributes such as self-motivation, vision, and professional creativity is effective for RDs to successfully integrate themselves in an athletic department (39).

FACTORS AFFECTING THE SUCCESS OF COLLEGE SPORTS NUTRITION SERVICES

Student-athletes' desire for accurate and practical nutrition information has been documented since 1991 (26). However issues such as time, money, life skills, cooking skills, lack of knowledge and attitudes and perceptions still prevent student-athletes from confidently adopting a healthy diet. Recently, student-athletes have shown more awareness of food choices and the beneficial effects of nutrition on performance, but this awareness has not translated into large scale lifestyle changes, primarily because of the above perceived barriers and life stressors (14).

Most college student-athletes understand the importance of food choices on body composition, athletic performance, and health, but many have grown up in a fast-food culture and arrive at college with little nutrition knowledge and skills needed to make proper food selections on a habitual basis. Many collegiate student-athletes come from urban backgrounds that relied on fast food restaurants as a means to get food. In a society were there are fewer two-parent families or where both parents work, there is even less time planning meals and snacks, and more eating on the run (31). As a result, student-athletes today do not feel comfortable with basic life skills like grocery shopping (24). They do not feel confident in their ability to select foods that are nutrient dense or

provide them with the nutrients they need to function optimally under the physiological stress of their sport (24). Needless to say, this lack of confidence necessitates a high demand for practical nutrition advice that student-athletes can trust. Student-athletes are not looking for a nutrition lecture. Instead, they are looking for simple answers on what they need to eat, and how they can get the job done in a timely manner (22, 24, 25). RDs are uniquely qualified to overcome these barriers and develop solutions addressing these needs.

Time

One life stressor student-athletes perceive is time. Student-athletes are faced with a busy schedule that requires them to live a dual role as student-athletes and public performers (22). This schedule creates a demand on time and energy leaving the student-athlete reluctant to engage in any additional activities that are not required. In a typical day, a student-athlete will attend morning classes, lift weights after lunch, get treatment for injuries in the early afternoon, attend a mandatory two to three hour practice, and have less than one hour to eat dinner before attending a mandatory three hour study hall (19). Student-athletes need nutrition information that is fast, simple, and easy to prepare. For example, poor advice for these student-athletes would be recommending adding four more starchy foods to their diet. Typically, student-athletes do not know how to identify a starchy food, and will not want to take the time to look up the information. Much better advice includes setting a goal for a student-athlete to eat one more bagel for breakfast at least four out of the seven days per week. Appealing to a student-athlete's interest in reducing muscle soreness or increasing energy throughout rigorous seasons are examples

of effectively framing a nutrition message to appeal to the interest's of student-athletes. In doing so, the probability of student-athletes adopting nutrition recommendations into their daily food choices is enhanced. RDs have extensive training in menu development, effective counseling strategies, marketing, and communication. This training is extremely useful in developing nutrition interventions that are effective at improving student-athletes nutrition related behavior.

Money

Since student-athletes have a preference for name brand foods and dining out, money becomes an issue (24). The most expensive form of eating is dining out, because a customer pays for the food and the service. Dave Ellis, former RD for the University of Nebraska, said student-athletes at first are reluctant to pay the price to eat at the university dining service training table at Nebraska for the non-subsidized meals. After a few months of poverty and heartaches, struggling to manage a food budget, Ellis noted student-athletes returned to the campus dining services (24). He reported that for his performance buffet to be effective in keeping his student-athletes as customers, he must convince them that his offerings are competitively priced to a fast food alternative meal. RDs have specialized training in cost controls of foodservice operations. RDs can be a tremendous asset for university athletic departments seeking fiscal integrity.

Historically, for many universities, financial limitations dictated the number of subsidized meals student-athletes received from the university. Before 1994, athletic departments were able to provide three subsidized meals. In 1994, the NCAA acknowledged the financial limitations of some of its members, and noted some

members' inability to subsidize three meals per day. In an effort to keep a level playing field between competitors, the NCAA mandated a limit of one subsidized meal per day. Ellis, former RD for the University of Nebraska, documented his appeals to the NCAA Competitive Safe Guards Committee, in which he noted the disparity between the NCAA bylaws and the nutritional needs of student-athletes. Bylaw 16.8.1.2.3 outlines the food stipend to student athlete's living off campus to be equal to the cost of a dormitory meal plan. This food cost has a significant missed meal factor calculated into the figure, resulting in a food stipend of 10 to 15 dollars per day. Therefore, student-athletes receive the food available to feed a general member of the student body, while they are asked to exert themselves strenuously, and create nutrient inadequacies in their body. Ultimately, this NCAA legislation creates a disparity between the increased nutritional needs of student-athletes and the financial commitment to meet these needs.

Life Skills

Administrators argued that adding additional cash to the monthly food stipend check might not guarantee that the nutrient inadequacies will be remedied. Ellis explained in his 15-year experience counseling student-athletes, he has found some student-athletes lacking basic childhood development skills, such as the ability to budget one's finances (31). He noted that during Christmas holidays when football received a larger per diem check compared to their standard monthly check, student-athletes used the money to buy designer clothing, video games, and other discretionary items rather than meeting their mandatory expenses first (31). With this history in mind, future

progress to improve the lives of student-athletes must address these elementary shortcomings.

Cooking Skills

Student-athletes do not intuitively know what foods will enhance their performance, although many coaches and athletic department employees expect them to know (25). Documented since 1989, student-athletes need guidance in selecting and preparing nutrient dense foods (27). RDs possess unique practical culinary skills to enhance nutrient intake through functional food preparation. For example, RDs offer practical hands on cooking demonstrations to educate student-athletes on the basics of cooking healthy foods.

Lack of Knowledge about Nutrition

The point that student-athletes and coaches have a lack of nutrition knowledge has been adequately supported in this paper. Lofty claims and sexy looking promotional models that appear in health magazines easily sway student-athletes (31). Many times this information is not peer reviewed. However, student-athletes tend to value this information more than peer-reviewed journals. RDs are needed at the collegiate level to show student-athletes the fallacies of these claims, and direct student-athletes in sound nutritional practices (25). Many coaches, SCCs, ATCs, and athletic directors are keenly interested in debunking falsely advertised and/or misleading claims of sports supplements (43). RDs can provide a wealth of information to student-athletes, coaches, ATCs, SCCs, and administrators to objectively evaluate the claims of sports supplements. Elite-level

athletic departments can benefit from RDs evaluations of products and their ability to sort the "quack" from the "quality" products.

CHAPTER III
METHODS

INTRODUCTION

The purpose of this study was to investigate the sports nutrition practices of NCAA Division I elite-level college athletic departments. More specifically, this study examined the perceptions of Registered Dietitians (RDs), Strength and Conditioning Coaches (SCCs), and Athletic Trainers (ATCs) on the following considerations of sports nutrition services: a) qualifications, classifications, and attributes of RDs, b) roles and responsibilities of RDs, c) factors influencing the employment of RDs, d) resources available to implement sports nutrition services, and e) the nutrition needs of student-athletes and benefits of nutrition for student-athletes. To investigate the sports nutrition practices of NCAA Division I elite-level college athletic programs, a two-part survey was administered to elite-level college athletic departments. The survey was administered to the professional identified by the athletic department's strength and conditioning coach (SCC) as the principal provider of sports nutrition services. Information in the survey was compiled and content analyzed to develop conclusions regarding Division I elite-level sports nutrition practices. For this research, the term elite-level athletic department was specifically defined as a NCAA Division I university ranking in the top 25 in the football Associated Press (AP) Poll for 2002, or a member institution in one of six conferences that appeared most frequently in the 2002 post season football bowl games.

PARTICIPANTS

Only elite-level college athletic programs were selected for participation in this study. These conferences included SEC (12 members), Big 12 (12 members), Big 10 (11

members), PAC 10 (10 members), Big East (15 members), and ACC (nine members). In 2002, three additional teams placed in the top 25 that were not members of the six conferences previously mentioned. With the addition of these teams, the total number of elite-level athletic departments surveyed was 72 (N=72).

The purpose of this classification was to identify revenue generating athletic departments. The term revenue generating indicates the athletic departments' ability to operate without a deficit. This research operates under the assumption that these athletic departments (N=72) would have the necessary buying power to purchase the services offered by RDs, because of their successful football program. Likewise, all other NCAA Division I football universities (N=41) not specified as elite-level were eliminated from this study, because of the likelihood that they would have inadequate funding to support the services of an RD. For example, Dave Ellis, former RD for the University Nebraska, highlighted an experience he had while employed at the University of Wisconsin in preparation for the 1993 Rose Bowl. While practicing at the local junior college, he was introduced to the team's trainer/strength coach/equipment manager/nutritionist. Economics dictated that this professional fulfill the duties of at least four job descriptions. Unfortunately, a fact of life in college athletics is the success of the revenue-generating sports can greatly affect the quality of the support services available to student-athletes (14). For this study, revenue generating is defined as Total Revenue – Total Expenses = Positive Net Income. For many athletic departments, football is the only revenue generating sport. Football generates a substantial amount of revenue from competition in post-season bowl games (39). This money is divided evenly among member

institutions of the athletic conference that were represented in the bowl game competition. Because of this fact, only universities with a successful revenue generating team or conference, such as football, were included in this study.

While it would be more objective to acquire a survey sample size of elite-level athletic departments by accessing each NCAA Division I athletic department's financial reports, this information is simply not available in itemized reporting. An exhaustive search with a qualified and experienced librarian determined the literature void of itemized financial data for elite-level athletic departments. It was concluded that the only alternative to receive this information was to personally contact each NCAA Division I member universities treasurer's office or athletic department. Instead of pursuing this option, this research was limited by the criterion previously specified. Furthermore, private NCAA Division I member universities would not be required to disclose their financial information under law. Ultimately, the only data close to the information requested on the athletic departments financial position was found in a report developed because of the Equity in Athletics Disclosure Act (38). This act requires the NCAA to report aggregate data for all NCAA athletic departments financial reports by gender. However, this report does not conclusively determine the financial position of any one athletic department's revenue generating ability. Therefore, the most unbiased form of generating a sample for surveying was determined to be the classification by conference ranking in post season football bowl game competition or individual ranking by final AP polling in 2002 for football.

The titles of respondents who were eligible to participate in this study included full-time athletic directors, strength and conditioning coaches (SCCs), athletic trainers (ATCs), registered dietitians (RDs), and nutritionists, and part-time RDs and nutritionists. Each athletic department's SCC identified the principal provider of sports nutrition services. The SCC made the decision of who would represent their athletic department in this research, because historically, the SCC has been charged with the responsibility of providing sports nutrition services to athletes (2).

Of the 72 athletic departments identified as elite-level, 70 agreed to participate in this study. One athletic department formally declined participation in this study, stating a lack of internal and external validity of the survey. Another athletic department formally declined participation stating that disclosing the operations of their athletic department would compromise the recruiting advantage of its university. He stated his intentions to remain private, because the university had a policy against sharing the practices of physical development the athletic department implements in the development of its athletes. Of the 70 surveys that were mailed, 20 were returned completed and signed. One survey was returned anonymously. Through the initial telephone conservations, 19 elite-level athletic departments indicated they employed an RD (N=19). Of the 19 RDs surveyed, seven were classified as full-time athletic department employees. Two athletic departments indicated that they employed a full-time nutritionist, but the nutritionist did not hold the RD certification. Since a total of nine elite-level athletic departments had representation from either a full-time RD or nutritionist as the principal provider of sports nutrition services, these athletic departments were exempt from completing the athletic

directors, strength and conditioning coaches, and athletic trainers survey. Therefore, the total number of athletic directors, strength and conditioning coaches, or athletic trainers surveyed from elite-level universities was reduced by nine (N= 63). The response rate for the SCC survey was 10 completed surveys out of a possible 63 surveys, or 16 percent. The response rate for the RD survey was 11 completed surveys out of a possible 19 surveys, or 58 percent. Five out of seven (71%) full-time athletic department RDs completed surveys. Five out of six (83%) part-time athletic department RDs with full-time joint appointments through the university returned the survey. One out of six (17%) part-time consultant dietitians completed the survey.

INSTRUMENTS

The author created two surveys, 1) "Survey for Athletic Directors, Strength and Conditioning Coaches, and Athletic Trainers," and 2) "Survey for Dietitians and Nutritionists." These surveys were validated with an informal advisory group of RDs, SCCs, nutritionists, athletic directors, and ATCs currently employed at elite-level athletic departments . See appendix A-1 and A-2 for complete examples of each survey.

The combination of both surveys were summarized into six sub-sections. These subsections included descriptions of a) qualifications, classifications, and attributes of RDs, b) roles and responsibilities of RDs, c) factors influencing employment of RDs, d) resources available to implement sports nutrition services, e) perceptions of nutrition needs of athletes and benefits of nutrition for athletes, and f) additional comments. Information on the roles and responsibilities of those professionals lacking the RD

credential, but who were designated as principal providers of sports nutrition services for the athletic department was also collected.

PROCEDURES

Because SCCs have historically been documented as the provider of sports nutrition services to college athletes, an initial introductory letter was mailed to these professionals (2). See appendix A-3 for a complete copy of this letter. This letter instructed the SCC to forward this survey to the professional designated by the athletic department as the principal provider of sports nutrition services. Two days after the mailing of this letter, a follow-up telephone call was made to the SCC at every elite-level athletic department for three purposes. 1) It encouraged participation in this study, 2) it determined who the principal provider of sports nutrition was at each athletic department, and 3) it screened each athletic department for employment of RDs by asking the SCC if their athletic department employed an RD. This telephone screening was conducted to aide in the forwarding of surveys to the appropriate professionals. Surveys could potentially be forwarded to athletic trainers (ATCs) or director of operations for a given team if they were designated as the principal provider of sports nutrition services. Also, the telephone contact re-enforced to SCCs whose athletic departments employed a full-time RD, that these SCCs were exempt from completing the strength and conditioning coaches survey part A. SCCs with full-time RDs at their athletic department were considered exempt from this study, because it was determined that the full-time RD was the principal provider of sports nutrition services. Elite-level athletic departments who employed part-time RDs were asked to return both an RD survey and a SCC survey,

because it was assumed that a part-time employee could not be the principal provider of a service for an athletic department, while serving in a part-time role. However, since the part-time employee was a credentialed RD, the expert opinion that this RD provided was valued in this research.

During the telephone contact, verbal confirmation of participation was requested. During the initial telephone confirmation, if a SCC identified another professional as the principal provider of sports nutrition services, then the survey was sent to the principal provider designated. Subjects were asked to provide their preferred method of receiving the survey, either by fax, mail, or email. In some instances, face to face interviews at national conventions were used to accommodate the needs of participants. The purpose of this extensive communication was to encourage the participants in this study to complete the survey and return it within the time frame specified. In every way, communication was exhausted in order to receive a higher response rate to the surveys.

After receiving the surveys, participants were allowed one week to complete and return the survey. After this one week time period, participants were telephoned a total of three times encouraging them to participate in the survey within an additional one week period. The cover letter explained the purpose of the survey, the expected time commitment, the anonymity of information, and the researcher's motivation for conducting the survey. This letter described the instructions for completing and returning the survey. It also provided instructions for the SCC to forward the survey to the professional designated by the athletic department as the principal provider of sports nutrition services. See appendix A-3 for a complete example of this letter.

All mailed surveys included a self-addressed, stamped envelope for replies. Several attempts were made to contact each participant by telephone encouraging reply within the allocated time of two weeks. Participants in this study were asked to volunteer their names and contact information in order to receive the results of this study in aggregate form. However, participants were not required to include their names or school names. In this way, participants were able to return an anonymous survey.

Participation in the survey was voluntary. Participants had the right to return the survey postage paid and uncompleted as an indication of their refusal to participate. No incentives were used for completion of this survey other than the opportunity to receive the aggregate results of this study upon completion of the survey. Names of participants and returned surveys were stored at the primary investigator's home in a hard copy form. Only the primary investigator and the graduate advisor had access to the raw data.

Data Collection Techniques

Surveys were provided to participants through multiple media outlets such as mail, telephone, fax, email, and even direct face-to-face meetings. Participants were telephoned once to confirm receipt of the survey and their willingness to participate. During a two-week time period, participants were contacted a maximum three times encouraging participation within the given time frame.

Data Analysis

The names of participants or athletic departments the participants were representing we not reported in the analysis. Through telephone conversations, participants were encouraged to include their athletic conference, in order for results to be

summarized in aggregate form by conference. However, this information was not required for participation. The survey contained fixed responses and open-ended questions. Answers to open-ended questions were content analyzed and summarized according to methods described by Denzin and Lincoln (28). The researcher generated raw data and higher-order themes via independent, inductive content analysis. At the point of development of higher-order themes, deductive analysis was used to confirm that all raw data themes were represented. This research follows that of previously published methods described by Ebben and Blackard (29). In this way, this research was strictly descriptive in nature.

CHAPTER IV
RESULTS

INTRODUCTION

The purpose of this study was to investigate the sports nutrition practices of NCAA Division I elite-level college athletic departments. More specifically, this study examined the perceptions of Registered Dietitians (RDs), Strength and Conditioning Coaches (SCCs), and Athletic Trainers (ATCs) on the following considerations of sports nutrition services: a) qualifications, classifications, and attributes of RDs, b) roles and responsibilities of RDs, c) factors influencing the employment of RDs, d) resources available to implement sports nutrition services, and e) the nutrition needs of student-athletes and benefits of nutrition for student-athletes. Using these five categories, responses to both surveys were summarized. Also, a section for additional comments was included from miscellaneous comments provided by participants. When appropriate, the distinction between responses of RDs and the responses of strength and conditioning coaches (SCCs), athletic trainers (ATCs), and athletic directors were separated to note the similarities and differences of perceptions between these professionals. While a goal of this research was to receive a large representation from each conference to present the results of this research in aggregate form sub-divided by conference, the low response rate of some conferences did not allow an accurate representation of the entire conference to be summarized. Therefore, results were reported in total aggregate form. Regrettably, the roles and responsibilities of those professionals lacking the RD credential, but who were designated as principal providers of sports nutrition services for the athletic department, for example a sports nutritionist without the RD credential, was grossly

incomplete and many times did not provide a logical answer to the question. Because of the excessive errors in completing this portion of the SCCs surveys, these data were eliminated from analysis. Only sections c) factors influencing employment of RDs and e) perceptions of nutrition needs of athletes and the benefits of nutrition for athletes were reported from the SCCs surveys.

Of 72 surveys mailed to SCCs, 10 surveys were returned completed (n=10 of 63 or 16%). Nine SCCs were determined exempt from participation, because their athletic department employed either a full-time RD or full-time nutritionist without the RD credential. From telephone conversations with SCCs and ATCs, it was determined that 19 athletic departments employed RDs. From these 19 athletic departments, 11 RDs chose to participate (N = 11 of 19 or 58%). The total number of athletic departments participating in this research was 19 (N=19). These athletic departments represented participation from the following conferences: SEC, Big 12, Big 10, PAC 10, Big East, and ACC.

QUALIFICATIONS, CLASSIFICATIONS, AND ATTRIBUTES OF REGISTERED DIETITIANS

RDs were questioned for their qualifications, classifications, and attributes. Of the 11 RDs responding to this survey, seven reported the Master of Science, Master of Public Health, or Master of Arts as their highest degree obtained. Four reported the Bachelor of Science or the Bachelor of Arts as their highest degree obtained. Five participants indicated they were licensed dietitians (LDs) through their state's health department. Other certifications held by participants included the ACSM Health and

Fitness Instructor (N = 2), and Certified Strength and Conditioning Professional credential (N =1).

Five RD participants indicated they were employed in full-time athletic department positions. RDs who were employed full-time in athletic departments were most frequently classified in an independent sports nutrition department (N=3), the strength and conditioning department (N=1), or classified in joint appointments through both sports medicine and strength and conditioning (N=1).

Additionally, five RDs reported having full-time joint appointments through the university, which included part-time appointments with the athletic department. Reporting these results in aggregate form, full-time joint appointment RDs were classified as 30% time within the athletic department and 70% time in another university department. Table B-1, in appendix B, highlighted itemized percentages of time classification devoted to each department for the five full-time joint appointment RD participants.

One part-time RD reported his classification as 50 percent time strength and conditioning. In summary, of 11 RDs participating in this research, 10 were employed full-time at the university. Five of 10 full-time employed RDs were classified as 100% time in the athletic department.

RD participants reported their position titles to include: Sports Nutritionist (N=4), Director of Sports Nutrition (N=2), Sports Nutrition Intern (N =1), Nutrition Counselor (N= 1), Coordinator of Sports Nutrition (N=1), Coordinator of Nutrition, Fitness, and Health Majors (N=1), Registered Dietitian (N=1), Health Center Dietitian

(N=1), and Dietetic Internship Director (N=1). Two participants stated they had two titles for their position. Thus, 13 titles were reported.

Table B-2, located in appendix B, highlighted the number of years participants were employed in their current position. This table indicated that athletic departments had relatively new relationships with their current RDs. To further distinguish between the athletic departments relationship with their current RD, and whether there had been a prior relationship with another RD, participants were asked to specify the number of years their current position was offered at the university. Similarities emerged when comparing Table B-3, number of years the registered dietitian position was offered within athletic departments, and table B-2, years of employment of registered dietitians in their current position. This strongly indicated RDs created their current position. Three participants who specified their position available for greater than seven years noted their current positions had been offered for eight, nine, and 10 years. One participant did not specify the total number of years greater than seven. Table B-4, located in appendix B, showed that of the RDs currently employed by athletic departments, over half (N=6) had less than 4 years experience. Thus, most RDs currently employed by athletic departments were new professionals in the field of sports nutrition.

The mean salary range of RDs participating in this survey ranged between $39,000 - $ 41,000. The mode salary ranges were less than $30,000, $36,000-$40,000, and $41,000-$45,000 (n=3). Table B-5, located in appendix B, summarized the salaries reported by participants. All 11 participants indicated that fringe benefits were provided with their position.

Attributes that participating RDs indicated as critical for accomplishing the objectives of their position were recorded. Higher-ordered themes that emerged from raw data responses were as follows: a) time management, b)knowledgeable and effective communications in an outgoing, enthusiastic, and confident manner, c) excellent relational skills including listening, good rapport with athletes and support staff, and d) opportunities for meeting with athletes, SCCs, and ATCs that were flexible and available.

ROLES AND RESPONSIBILITIES OF REGISTERED DIETITIANS

Participating RDs responded to a number of questions regarding their roles and responsibilities. Appendix B-6 summarized the services provided by RDs within the athletic departments. Of these services, individual nutritional counseling was the most highly utilized service. RDs most frequently provided it on a daily basis (N=8). Of the 11 participants in the RD survey, all 11 stated they were available to provide nutritional counseling for all sports. Considering raw data, one participant indicated that counseling occurred most frequently, "...seasonally with sports that are in-season. Football occurs year round." Another participant indicated, "I am available to all athletes, but the female athletes are the ones referred."

Table B-9, located in appendix B, summarized the frequency of nutritional consults occurring per week. A higher-ordered theme that emerged was the frequency of consults depended on the season of year, and it varied between weeks. Considering raw data reports, participants noted, "...the fall season had more consults. Teams that were competing during in-season competition had more frequent nutrition consults." The most

frequently reported response for the frequency of nutritional consults per week was 6 – 10 consults per week (N=5).

The location where nutritional consults occurred most frequently was in private offices (N=8) and in the cafeterias (N=3). One participant stated consults occurred in the, "... MDs office that I am allowed to utilize on mornings each week." Two other participants stated consults, "...also, occurs in the training room, weight room, and training table."

Confidentiality of nutrition consults were summarized from open ended questions in the RD survey. Higher-ordered themes that emerged from questions regarding the nature of the confidentiality agreement between the athlete and RD were a) no formal agreement (N=2), b) case specific confidentiality agreement (N=2), c) verbal agreement (N=2), d) strict written confidentiality agreement (N=3), and e) no response (N=2). Selected raw data representing responses to questions were summarized according to higher-ordered themes. These responses were a)"...no formal agreement, though I do not release athlete-specific info. to coaches." b) "...some highly confidential; others very open. It is agreed upon in the first meeting and throughout our sessions." c) "...information is released only after verbal agreement has been met. They (athletes) give me verbal permission to discuss sessions with coach, MD (medical doctor), trainer, etc." d) "...some information shared with athletic trainer can be found in medical record. No coaches have access to any medical files. All information is confidential unless the athlete provides permission or presents an emergency medical condition."

When questioned on how nutrition consults were documented, six participants noted they use the Subjective, Objective, Assessment, and Plan (SOAP note) formatting style of documenting nutrition consults. Additionally, these participants noted this SOAP note was included in the athlete's permanent medical records.

The other five participants noted nutrition consults were not included in the athlete's permanent medical record. In these five participants, notes were kept in the RDs nutrition files using file maker software (N=1), transcribing SOAP notes, which were emailed back to the RD and approved (N=1), or handwritten notes in narrative form (N=3). Also, food frequency questionnaires, 24 hour recalls, personal information, duplication of meal plans and copies of goal sheets were utilized to keep record of nutrition consults in addition to the methods described above.

Participants indicated that nutrition education was most frequently accomplished through printed handouts and posters on a daily (N=3) and weekly (N=4) basis. Athletic Training Table menu management occurred most frequently on a daily basis (N=5.5). In appendix B-6, RDs involvement with supplements was reported. Supplement evaluating and recommending occurred most frequently on a daily (N=3) and weekly (N=4) basis. RDs reported both frequently managing and distributing supplements daily (N=3) or weekly (N=2), or they reported no involvement with distributing supplements at all (N=5). Interestingly, the participants who reported no involvement with supplement distribution were in full-time joint appointment positions with part-time appointments with athletics. ATCs and SCCs were identified as professionals who most frequently helped with distributing supplements. Most RDs (N=9) were not responsible for

purchasing supplements or retaining corporate sponsorships from supplement manufactures.

Other questions asked to participants dealt with RDs involvement in the conditioning portion of weight management programs and involvement with eating disorder treatments. Five participants indicated they were involved with the conditioning of weight management student-athletes. Three participants stated that no program exists and three participants stated they were not responsible for the conditioning of weight management athletes. Figure B-1, located in appendix B, reported RDs were most frequently classified as somewhat involved with the treatment of eating disorders (N=6).

Recruiting of prospective student-athletes was a responsibility RDs reported. RDs were asked to indicate all responsibilities they had with recruiting. Responsibilities most frequently reported were one on one contacts with student-athletes (N=6), group talks during official recruiting visit weekends (N=4), and public liaison and media spokesperson for nutrition related issues (N=4). One participant noted that they only recruited football student-athletes. Table B-7, in appendix B featured a complete listing of recruiting responsibilities provided.

Participants answered open and closed ended questions regarding nutritional assessment, which included anthropometrical, biochemical, clinical, and dietary assessment. Anthropometrical assessments that were utilized included body weights, skinfold assessments, air displacement plethysmography using the Bod Pod®, and dual energy x-ray absorptiometry (DEXA). Three participants said they were not involved with anthropometrics. Three participants said that all sports received specific

measurements that varied by team and athletes. Three participants said that all sports received a Bod Pod® assessment three times per year with each athlete. Two participants said that anthropometrics were performed on request but not routinely.

Table B-8, in appendix B, summarized the clinical and/or biochemical lab tests utilized by RDs. Ferratin levels (N=7) and complete blood count (CBC) (N=7) were among the most utilized biochemical test. Participants noted "...not all athletes are required to have labs." Another participant specified, "...labs are drawn as needed per athletes individual needs...labs are done as needed per MD discretion."

Table B-10, located in appendix B, highlighted the frequency of dietary assessments provided by RDs per week for student-athletes. Most RDs (N=7) nutritionally analyzed between two and 10 diets per week. One participant indicated they analyzed half of the 700 athletes per semester they were made available to. Through deductive analysis, this frequency was estimated to equal approximately 29 diets per week. Participants specified three day food records, dietary analysis software such as Food Processor®, food frequency questionnaires, food logs, and 24 hour diet recalls as the methods for analyzing diets.

Outside of their athletic department responsibilities, RDs noted a number of services they provide including: instructor (N=3), writer or speaker (N=3), private practice consultant RD (N=3), guest lecture (N=2), student health services RD (N=2), dietetic internship director (N=1), and other duties as stated in their contract (N=4). Many of these duties were reported by full-time joint appointment RDs.

FACTORS INFLUENCING EMPLOYMENT OF REGISTERED DIETITIANS

RDs and SCCs were asked questions regarding factors influencing RD's employment. Their responses were divided into separate sections of RDs and SCCs to compare differences and similarities between responses.

Strength and Conditioning Coaches, Athletic Trainers, and Athletic Directors

Of the participating SCCs (N=10) not employing a full-time RD, the following barriers for preventing full-time RD employment were indicated as: a) lack of priority (N=4), b) lack of funding (N=2), c) needs of athletes were met with current staff (N=1), d) RDs are not qualified to work with athletes (N=1), and e) no comment (N=2). A further inquire of these SCCs was conducted to determine if they had ever received a proposal to employ a full-time RD. Six SCCs indicated they had not received a proposal for a full-time RD, two SCCs indicated that they had received a proposal for a full-time RD, and two SCC participants chose not to answer the question.

Registered Dietitians

Currently employed RDs were asked what factors were most important in hiring them for their position. This open-ended question allowed respondents to elaborate. Higher-ordered themes that emerged were content analyzed by a) qualifications of RDs including certifications, licensures, prior experience working with athletes, and prior athletic participation, b) development of a proposal for job description, c) meeting the needs of the athletic department, and d) no comment. Raw data for each theme included a) "...I had a huge support base with Sports Medicine, Strength and Conditioning, and Football/Basketball Programs." b) "...I created my job and wrote my own job

description. The position did not exist. There was a need to have a nutritionist on campus. Before being hired, I was a consultant. Being on campus has increased the interest in nutrition by athletes, coaches, and trainers." c) "...monitoring supplement legislations, providing sound nutrition recommendations, restructuring the Athletic Training Table, and gaining a performance advantage on competition through sports nutrition."

RESOURCES AVAILABLE TO IMPLEMENT SPORTS NUTRITION SERVICES

RDs were asked to specify the staff that they manage in implementing sports nutrition services. With some participants indicating that they are available to over 700 athletes, it was interesting to determine if RDs had adequate staffing to help meet the needs of the athletic department. Of 11 RD participants, six indicated they did not have a staff or assistant. One participant mentioned they occasionally have a volunteer or dietetic intern. Four participants mentioned they had a sports nutrition staff that they managed. The staff ranged from two part-time assistants (N=1), a combination of a graduate assistant, volunteer, and dietetic interns (N=2), or one full-time assistant with one dietetic or nutrition intern (N=1).

PERCEPTIONS OF NUTRITION NEEDS OF ATHLETES AND BENEFITS OF NUTRITION FOR ATHLETES

In this section, identical questions were asked to both SCCs and RDs on a two-part survey to compare differences and similarities between responses of SCCs and RDs. The questions were open ended and allowed for elaboration by participants. SCCs and RDs were asked to specify their greatest perceived nutrition needs of the athletes they

coached, and they were asked to specify their greatest perceived benefits they expected to receive or have received from implementing nutrition programs. Table B-11 and B-12 summarized higher-ordered themes and raw data extrapolated from both SCCs and RDs responses for comparison of perceptions of nutrition needs of athletes. Most notably, SCCs responded most frequently that the delivery of meals and improvements in the athletic training table were the greatest nutrition needs of their athletes (N=4). Raw data comments consisted of "...need a better training table...need two or three training table meals per day..need quality meals." Also, SCCs mentioned a need for improved nutrition education and utilization of nutrition knowledge (N=3). SCCs provided ten total responses for the open-ended question regarding nutrition needs of athletes.

RDs most frequently specified factors influencing positive nutrition choices as the greatest nutrition needs of athletes (N=17). Their responses were in agreement with SCCs that improvements in nutrition knowledge and nutrition education was the most frequently noted nutrition need of athletes (N=5). Other frequently mentioned themes were improved meal frequency, meal timing and meal planning (N=4), improved health through healthy eating (N=3), and improvements in the athletic training table quality and delivery of meals (N=3). RDs provided a total 28 responses for the open-ended question regarding nutrition needs of athletes. Their responses were much more detailed including such topics as body composition and weight management (N=1), disordered eating (N=1), nutrition for practice and competition (N=1), eating out and eating on the road (N=1), hydration (N=2), fruit and vegetable intake (N=1), reducing alcohol intake (N=1),

supplement and banned substance use and abuse (N=1), time management, budgeting, and other life skills (N=1), and re-enforcement (N=1).

Table B-13 and B-14 summarized higher-ordered themes and raw data extrapolated from both SCCs and RDs responses for comparison of perceptions of benefits received or expected benefits from implementing a nutrition program for athletes. SCCs responses dealt most frequently with the higher-ordered theme of factors influencing athletic performance (N=6). SCCs either had experienced nutrition to improve athletic performance, or they expected nutrition to improve athletic performance. Notably, six responses from SCCs pertained to no response given, feelings of insignificance of nutrition, OR feelings that nutrition is important but overemphasized concerning supplements. SCCs provided a total 14 responses to the perceptions of the benefits of nutrition for athletes.

RDs response to their perception of the benefits of nutrition were equally frequent regarding the higher ordered themes of factors influencing athletic performance (N=15), and factors influencing academic performance, life-skills, health, and health related quality of life (N=16). Their responses were in agreement with SCCs that athletic performance (N=8) was the most frequently identified benefit of nutrition for athletes. However, their responses were much more detailed and developed including such topics as weight management and body weight (N=2), energy levels (N=3), academic performance and concentration (N=4), injury prevention and rehabilitation (N=2), health (N=3), and mood self esteem, and confidence (N=4). Their responses developed the higher-ordered theme of factors influencing academic performance, life-skills, health, and

health related quality of life in much more detail than SCCs. RDs provided a total 36 responses to their perception of the benefits of nutrition for athletes.

ADDITIONAL COMMENTS

SCCs and RDs were provided the opportunity to voice any additional comments in this section. SCCs provided no additional comments. Responses of RDs were content analyzed into three higher-ordered themes a) comments of clarification of current position, b) comments of offering suggestions, and c) comments of appreciation and closure.

The higher-ordered theme of a) comments of clarification consisted of raw-data from RDs who wished to clarify the description of their current position. Examples included comments such as: "...training table is something that athletics would like for me to be involved in, but time has been the limiting factor thus far...no training table is available at my university...I rarely talk with my ATC about travel, game-day, and pre-game meal management...I have been defining the duties to the job here because I'm the first Sports Dietitian they have had-which is a positive and negative. It's also a matter of feeling things out as an "Intern" vs. a full-time employee, especially with getting to know and work with administration and sports medicine regarding what I'm able to do and decisions I can make with no budget...our athletic department has been extremely receptive to have an RD work solely with athletes. It has been a great experience working with a variety of people in a variety of issues...my position here is still new. Each year as the coaches gets to know me and as I develop trust/stronger relationships with the athletes my responsibilities are increasing...I worry that most nutrition advice is

dispensed to athletes by well meaning but mislead staff. RDs should play a larger roll in the training of these athletes."

Comments offering suggestions were comments that provided feedback for clarifying the survey questions. Raw data for this higher-ordered theme consisted of examples such as: "...you may want to define "objective" in question number 10. Do you mean have team win (performance), prevent injury (dehydration), or help with weight management?"

Comments of appreciation and closure were short comments that thanked the researcher for conducting the survey. Comments included raw-data themes such as, "...Good Luck."

CHAPTER V
DISCUSSION

INTRODUCTION

The purpose of this study was to investigate the sports nutrition practices of NCAA Division I elite-level college athletic departments. This chapter examines the results presented in Chapter IV, Results, and compares these findings to the advances of science and the services offered by registered dietitians (RDs) as described in Chapter II, Review of Literature. This chapter includes a discussions of the limitations of this study, and it provides helpful considerations and recommendations for future study.

IMPLICATIONS OF THIS STUDY

Assertions of the literature review regarding the advances of sports nutrition and dietetics are compared with current applications of sports nutrition practices reported in this study. In this section, assertions from the literature review are indicated in italics to provide easier comparison with current applications of sports nutrition practices found in this research. The implications of this study will be discussed in standard type font formatting.

RDs with specialties in sports nutrition have pursued advanced training to ensure the implementation of effective nutrition and interventions that target elite-level athletes.

The results of the education level of RD indicates that they are seeking advanced degrees with over half of the responders (N=7) attaining a Master's degree or higher.

Thus, three qualities are characteristic in reliable Sports Nutritionists, 1) The RD credential, 2) Hands on Practical Work Experience in the Specific Sports Industry, and 3) and Advanced Degrees in Human Performance, Sports Nutrition, or a related field.

In this survey, all 11 participants indicated as the principal provider of sports nutrition exhibited all 3 criteria.

The salary range of Sports Nutritionist with five years of experience or less was $31,000 - $48,800 per year (12). Those positions that held a master's degree or higher ranged from $40,100 - $67, 900. Dietetics professionals as a whole enjoy considerable fringe benefits from their work.

The mean salaries reported in these results are consistent with the salary ranges of previous literature. However, the overall mean salary of RDs employed full-time by universities who also had a master of science degree was between $39.000 and $41,000. This information indicates RDs are not being compensated for their advanced training.

Dietitians can provide medical nutrition therapy services for such specialized problems as injury recovery, diabetes, hypertension, hypercholesterolemia, and the treatment of eating disorders. Dietitians are available for the assessment, evaluation, and recommendations of dietary supplements. They can also aide in menu planning and cost controls for management of food service meals such as pre-game meals, athletic training table meals, and special banquets.

The results of this survey indicate that RDs are not being utilized for the medical nutrition therapy services they can provide. However, they are being utilized for responsibilities involving food service management.

It is vital for athletic departments to utilize the services of dietitians in implementing sports nutrition strategies, because RDs have formal training in the physiological demands of many sports. Also, they have training in specific sports nutrition strategies for providing the increased nutritional needs created by the physiological demands of elite competitive athletics.

This issue was not directly addressed in the survey. However, it is noted that no coach perceived this skill as a benefit of RDs.

RDs offers individualized nutrition plans to address the barriers preventing athletes from incorporating positive nutrition habits in their lives.

While this service was reported as being most frequently provided by RDs on a daily basis (N=8), this service is being under utilized by athletic departments. Most RDs responding in this survey indicated that they analyze less than 10 diets per week. That equals analyzing 2 diets per day. An average dietary analysis takes 30 minutes, so RDs only spend 1 hr per day assessing diets, a skill they are specifically trained to perform.

Elite-level athletic departments need the expertise of an RD to both manage the appropriate assessment of body weight and guide the development of realistic body weight goals.

Only two RDs were integrally involved with the management body weight assessment even though all but two athletic departments required week body weight assessments. RDs are currently being under utilized for these services.

RDs can educate coaches to remain current on issues concerning nutrition, diet, and weight control. RDs can educate coaches and athletes about safe weight control and weight loss measures such as 1) defining optimum performance weight, but not overplaying the impact on performance, 2) setting a reasonable time frame for weight reduction with a maximum goal of two pounds lost per week, 3) modifying energy expenditure at a moderate rate, not more than 1,000 calories per week above the total caloric intake, and 4) making appropriate referrals of athletes at high risk for injuring themselves, or identifying athletes with distorted body image, or disordered eating (40). RDs can offer elite level athletics departments a written protocol for athletics department personnel to confront the athlete once disordered eating behaviors are detected. In this way, RDs can lead effective interventions in reducing the prevalence of negative health behaviors associated with nutrition and diet. RDs offer guidelines for realistic and healthy anthropometrical goals.

The use of RDs to educate coaches was not evaluated in this survey. However, if RDs are not involved with athletes body weight assessment, chances are they are not involved with the interpretation of this data and the planning of interventions and setting realistic goals.

RDs using valid and reliable methods of assessment of anthropometrics can help athletes set realistic goals for body composition changes over reasonable periods of time.

The use of anthropometrics by RDs in this study was reported to be quite low. Only two RDs in 72 athletic departments were indicated as principally responsible for anthropometric measurements.

RDs are uniquely qualified to provide the most valid and reliable anthropometrical assessments. Furthermore, they are trained to apply these results in directing an effective weight management program (42).

It was encouraging to see a few athletic departments (N=3) using the Bod Pod and DEXA to assess body composition, because these are considered to be the gold standard. There is much room for future development of RDs utilization in this category.

RDs have training in evaluating biochemical assessments to normal values, and developing treatments to address the disparities.

Many common labs are completed with the order from an MD. Most RDs have access to this information and are applying it to their nutrition plans.

RDs play a role in educating all athletic department employees such as coaches and health care professionals on physical conditions that warrant clinical assessment and treatment.

This service was not evaluated in the present study.

It is imperative that elite-level athletic departments employ an RD that can detect the clinical symptoms associated with nutritional deficiencies and eating disorders.

This skill was not evaluated in the present study.

Dietary assessment includes services that are most commonly provided on a day-to-day basis by RDs for athletes (16).

This service was re-enforced by this study. RDs provided many forms of dietary services daily. The most frequently provided services by RDs related to dietary services. However, overall time per week allocated for RDs in general was not adequate.

RDs create handouts and printed materials such as posters to pass out nutrition information. They hold team talks and seminars to discuss common nutrition problems of athletes. They provide hands on cooking demonstrations, grocery shopping trips, and demonstrations on selecting from menus at local restaurants (19). RDs also train coaches and healthcare professionals such as athletic trainers (ATC), to make more educated decisions regarding policies that effect the student-athletes food supply.

The use of print material and team talks were utilized most frequently by RDs in performing nutrition education (N=9). More hands on methods such as cooking demonstrations were not reported to be as frequently used. This finding disturbs me, because these forms of education engage the learner more than lectures or handouts.

RDs are uniquely qualified to overcome life-skills barriers athletes face preventing them from having better nutrition practices. RDs are trained to develop solutions addressing these needs.

This skill was not directly questioned in this survey, but the topic was discussed in the final open ended questions of RDs regarding nutrition needs of athletes and benefits of nutrition for athletes. Unfortunately, the use of RDs to overcome the barriers athletes face was not mentioned by coaches indicating a disparity between coaches and RDs perceptions.

RDs have extensive training in menu development, effective counseling strategies, marketing, and communication. This training is extremely useful in developing nutrition interventions that are effective at improving athletes nutrition related behavior.

Athletic departments are utilizing this service as indicated by RDs involvement in game day and travel meal planning (N=6).

RDs have specialized training in cost control of foodservice operations. RDs can be a tremendous asset for university athletic departments seeking fiscal integrity.

Again, this service is utilized heavily as indicated in RDs daily involvement in foodservice management issues (N=6).

RDs possess unique practical culinary skills to enhance nutrient intake through functional food preparation. For example, RDs offer practical hands on cooking demonstration to educate athletes on the basics of cooking healthy foods.

This skill is being under utilized as evident by the lack of handouts on nutrition education interventions (N=1). These skills could produce the greatest behavior changes, because athletes would be engaged in learning.

RDs can provide a wealth of information to athletes, coaches, and administrators to objectively evaluate the claims of sports supplements. Elite-level athletic departments can benefit from RDs evaluations of products and their ability to sort the "Quack" from the "Quality" products.

This service is utilized to some degree on a weekly and monthly frequency, but this service could be increased due to the prevalence of supplements in sports (N=7).

In the current study, it was disturbing to learn the reasons two schools chose to formally decline participation. One school stated they would compromise their recruiting advantage if they disclosed their training practices. This finding is disturbing, because this research provided an option for an unanimous responses. The second school formally declined participation stating a lack of internal and external validity. When the

researcher asked if the school representative could provide a specific example of such flaws in the survey design, no response was given. In some ways, it should be noted that the business of athletics can be somewhat ego driven, especially when research and information in this industry is considered to be proprietary. Researchers must be aware of these difficulties when surveying participants.

FUTURE STUDY

For future studies, it is recommended that researchers use the information developed in the current study to synthesize questions into five point Likert scales and check boxes. It is postulated that one of the reasons athletic coaches received a mere 16% response rate was because the survey was too length and required too much time. Even some of the coaches surveys that were returned reflected an increasingly incomplete answer to questions are the number of questions increased. During the telephone confirmation of this survey, coaches seemed eager to participate in this research. It was disturbing to receive only 16% of the coaches surveys after all but two coaches confirmed during a telephone conversation of their willingness to participate. Coaches seemed interested in receiving the results of this study. However, during repeated telephone calls encouraging participation, their seemed to be a negative attitude towards completing a formal written survey, even when the survey was specified at requiring no more than 15 minutes for completion. Future studies should consider having a list of need to know information and ask that information in form of a question requiring a short answer during telephone confirmation. In this way, researchers will receive a minimum standard of pertinent information. It would be inappropriate to jump to the conclusion that

because SCCs did not provide their perceptions of the benefits of nutrition for athletes, that they do not exist. Remember, RDs specified that their relationships with SCCs and ATCs were critical for the obtainment of their full-time employment with the athletic department. In some cases, SCCs and ATCs were the professionals championing the effort to introduce full-time employment of RDs within their athletic departments.

For future studies, alternative criteria for determining the definition of elite-level athletic departments need to be determined. Basketball has the potential to be a revenue generating sport (31). Other criteria for identifying financial prosperity of an athletic department should be identified and used as a criteria for participation.

Additionally, future studies repeating the survey used in this study should change the wording of question number one of the strength and conditioning coach's surveys. Instead of asking, "Does your university employ a full-time dietitian?" the question would be more accurate in asking, "Does your athletic department employ a full-time dietitian?" Some universities employ full-time dietitians. Yet, these RDs may never come in contact with athletes or athletic department employees. Because this research was identifying how RDs impact athletic departments with the nutrition services they provide, this modification to question number 1 will receive a more accurate answer to the information desired.

In formatting questions in this survey, some questions were not answered or not understood by participants. In future studies, researchers should provide a follow-up telephone interview asking participants if they understood the questions being asked. This final telephone interview would clarify the responses of some surveys.

Additional formatting of the survey questions are mentioned. In developing the survey for dietitians, the survey almost cornered participants in an all or none position regarding potential services provided. Some questions were worded in such a way that it falsely assumed the RD provided the service. For example, in Survey Part B question 21, the question states, "List those who assist you with supplement distribution?" This questions assumes that the RD is responsible for supplement distribution. This assumption may not be the case. In revising future surveys for qualitative research, it is important not to lead participants to answers.

Researchers wanting to duplicate this study should consider adding participants to specify which sports they most frequently survey. The current study limited its focus to simple inquiring if a service was provided to the athletic department in general. It would be of interest to RDs, SCCs, ATCs and administrators to know to whom are the services directed. Does a particular sport receive more attention than another. Also, the percent time RDs provide each service would be of interest in describing the RD position in athletic departments.

Additional research questions not examined in this study are needed to flourish the body of knowledge of sports nutrition. The costs associated with providing sports nutrition services were not evaluated in this study. With college athletic departments facing significant financial pressures and keenly aware of fiscal integrity, this information would be useful when determining the cost: benefit ratio of providing sports nutrition services at college athletic departments by employing RDs. Further research needs to be done to document the disparities between the financial commitment the NCAA allows

athletic departments to allocate for meeting athletes nutritional needs, and the cost associated with the increased nutrition needs of athletes over the general population. Furthermore, it would be of interest to RDs to assess to perception of demand for their services at universities that currently employee RDs. Determining the perception of value is important for RDs, because it influences the credibility and how well the nutrition message is received by the athletic department.

It is of interest to note that the source and credentials of the participant filling out the survey effects the answers received in the survey, even when surveys were returned from the same athletic department. ATCs, SCCs, RDs, and athletic directors all have varying formal educations and practical career experiences. While diversity in background strengthens an athletic department, future research should provide an area for the participant to specify their position in the athletic department. It would be of particular interest to the body of knowledge regarding sports nutrition to know the correlation between responses and the qualifications of the respondent

It is important to note that in SCCs returning surveys that did not employ an RD at their university, their was a perception that RDs were not experts in working with athletes. One participant stated that RDs were not qualified to work with athletes. To some degree, RDs must educate SCCs, ATCs, and RDs, on their qualifications as the leading authority of food and nutrition related services.

In this study, the specific nutritional needs and physiological demands of each sport was briefly glossed. For sports nutritionist practicing in collegiate athletics, it is highly imperative that they are experts in the varying needs and demands created by each

sports, so that they can provide nutrition plans that will be nutritionally adequate at meeting needs. The specific nutritional needs of college athletes are highly specialized.

Furthermore, outcomes based research or evidenced based practice research is needed to develop more support for the assertion that RDs provide superior sports nutrition services to SCC, ATCs, or sport coaches. The quality, validity, and accuracy of sports nutrition services provided by RDs, SCCs, ATCs, and ADs need to by evaluated to substantiate the claim that RDs are the leading provider of sports nutrition services.

In the history of NCAA college sports, all support services have a unique history of how they began and were implemented in the college athletic department. Future research should compare and contrast the history of support services such as athletic training, sports rehabilitation, sports psychology, and strength & conditioning to gain incite in successfully integrating the field of sports nutrition within the NCAA college athletic department.

CHAPTER VI
CONCLUSION

The purpose of this study was to investigate the sports nutrition practices of NCAA Division I elite-level college athletic departments. The group dynamics of NCAA Division I athletic departments are individually unique. While having similar tendencies, no two athletic departments function in the same way. This study examined the sports nutrition services of college athletic departments through a two part survey containing fixed and opened ended responses targeted for completion by the principal provider of sports nutrition services.

While this study showed that athletic departments were beginning to utilize the services of registered dietitians (RDs) as the principal provider of sports nutrition services, it also sheds light on the wealth of possible services provided by RDs that still have the potential to improve athletic performance and health related quality of life of student-athletes. 19 of 72 athletics departments stated they employed an RD in their athletic department. Of those 19 RDs, 11 participated in this study stating that 10 of 11 were in full-time classification at the university. Of those 10 full-time RDs, five RDs were classified 100% time in athletics. The other five full-time joint appointment RDs averaged 30% time in athletics.

RDs are the experts on food and nutrition related issues impacting college athletes. RDs currently employed by athletic departments were new professionals in the field of sports nutrition specifying four or less years of employment in their current position (N=8) and four or less years full-time experience in the field of sports nutrition (N=6). Six of 11 RDs who participated in this research stated that they had

responsibilities recruiting prospective student-athletes by meeting with athletes in one on one contacts and providing group talks during official recruiting weekends.

Currently employed RDs stated that relationships with athletic directors, strength and conditioning coaches (SCCs) and athletic trainers (ATCs) were critical factors in the decision to hire them to a full-time position. RDs noted that relationships with SCCs and ATCs were of critical importance to successfully accomplishing the objectives of their positions. Perceptions of nutritional needs of athletes and benefits of nutrition needs of athletes were similar between SCCs and RDs. Both stated an increased need for nutrition education, nutritional counseling, and improved delivery and quality of Athletic Training Table meals. Both specified that nutrition improves health and athletic performance. However, the specified needs and benefits outlined by RDs were much more developed and detailed. The ability of RDs to offer improvements to the Athletic Training Table and provide nutrition education effective at achieving positive behavior changes were specified as critical factors for hiring them to their position in the athletic department.

RDs are uniquely trained and qualified to provide sports nutrition services to athletes. Seven of 11 RDs currently employed by athletic departments have an advanced degree of Master of Science, Master of Arts, or Master of Public Health in Sports Nutrition, Human Performance or a related field. Some (N=3), have dual certifications in an exercise related field. Others (N=5) are licensed nutritionists through their state's public health department.

This research highlighted the disparities that exist between recommendation that are advanced through sports nutrition science and recommendations that are actually

implemented in an applied athletic department setting. This research indicated that the advanced techniques of body composition assessment, accurately estimating lean body mass and establishing safe and healthy body weight change goals were not being utilized. Only three universities stated they are utilizing the advances in this field of study. Furthermore, many times RDs were not consulted when establishing these weight management goals, despite their advanced training in this area of study.

In many ways, this research showed that RDs are underemployed at NCAA Division I elite-level athletic departments, and they are not being utilized to their full potential. 53 out of 72 universities do not utilize the services of RDs. Of the RDs surveyed, only five were classified 100 percent full-time with athletics. Of the other five full-time joint appointment RDs, only 12 hrs per week were allocated to athletics. Many current RDs do not have a nutrition staff to work, even though they are available to over 500 athletes. The mean salary range of RDs participating in this survey ranged between $39,000 - $41,000, while the mean salary range of RDs with a Master of Science degree ranged between $40, 100 - $67, 900. All 11 RD participants noted their position had fringe benefits. While RDs are specifically trained to provide nutritional counseling and dietary assessment, RDs reported only analyzing six to 10 diets per week. This frequency equates to only three to five hours per week spent analyzing diets and developing and monitoring nutrition plans. RDs stated that providing nutrition consults was the service they most frequently provide on a daily bases (N=8). However, this service was provided only one hour per day on average. RDs specified that they were only somewhat active in the treatment of eating disorders (N=6).

This research provides an initial contribution to the body of knowledge on sports nutrition practices of college athletic departments. It serves as a reference to administrators, ATCs, and SCCs who are responsible for hiring competent personnel in the area of sports nutrition services. These results indicate that athletic departments are beginning to hire qualified professionals to provide sports nutrition services. Yet, these results indicate a certain hesitancy athletic departments have in providing the necessary resources to RDs, and allocating the necessary time for RDs to frequently provide sports nutrition services. This finding could be explained by the lack of full-time experience that RDs currently employed have. It also could be explained by perceptions of a lack of priority (N=4) or lack of funding (N=2) as noted by SCCs and ATCs. Change in successful athletic departments can seem slow, because athletic departments steeped with a rich tradition of success do not want to place themselves in an unnecessarily risky position. The "if it's not broke don't fix it" argument could be at work. More research is needed to identify standards of "best practice" of RDs employed by college athletic departments. More research is also needed to explore reason why 53 out of 72 athletic departments are not utilizing the services of an RD. One possible reason is that athletic departments do not know about the possible services that RDs provide. Six of 10 strength and conditioning coaches who did not employ a full-time RD stated that they had never received a proposal for a full-time RD in their athletic department.

This research calls for practicing RDs to participate in evidenced-based practice research. Evidenced-based practice research, consisting of objective measures of the outcomes of the services RDs provide will help add credibility to the field of sports

nutrition and validate RDs employment in athletic departments. Also, this research will help grow the field of sports nutrition and develop standards of best practice.

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APPENDICES

APPENDIX A: SURVEY MATERIAL

Survey for Strength and Conditioning Coaches, and Athletic Trainers

SECTION A: Strength and Conditioning Coach, and Athletic Trainer

Directions: For each number check all that apply. Some questions provide space for your expertise. Specific examples, supporting documents, and explanations of answers are appreciated and valued. Please feel free to write additional comments.

1. **If you answer "yes" to either question in #1, please stop this survey and have the Dietitian or Nutritionist indicated continue with section B.**

Do you employ a full-time nutritionist or registered dietitian at your university?	❑ **Yes**	❑ **No**
Do you contract with a part time nutrition consultant?	❑ **Yes**	❑ **No**

2. Check all services you provide to athletes (Indicate the frequency of services provided on a daily, weekly, biweekly, monthly basis, or not available basis.)

	Daily	Weekly	Biweekly	Monthly	Bi-Annual	NA
Nutrition Education						
Print handouts & posters	❑	❑	❑	❑	❑	❑
Team Talks	❑	❑	❑	❑	❑	❑
CHAMPS life skills Lectures or workshops	❑	❑	❑	❑	❑	❑
Sports Nutrition class	❑	❑	❑	❑	❑	❑
Hands on cooking / shopping demonstrations	❑	❑	❑	❑	❑	❑
Website administration	❑	❑	❑	❑	❑	❑
Training Table						
Athletic Training Table Menu Management or Consultation	❑	❑	❑	❑	❑	❑
Game Day						
Travel, Game day, and pre-game meal management	❑	❑	❑	❑	❑	❑
Nutritional Counseling						
Individual nutritional counseling	❑	❑	❑	❑	❑	❑
Supplements						
Supplement Evaluating and Recommending	❑	❑	❑	❑	❑	❑
Supplement Managing, Controlling, and Distributing	❑	❑	❑	❑	❑	❑
Supplement purchasing and corporate sponsorship retaining	❑	❑	❑	❑	❑	❑
Recruiting						
Meeting with incoming recruits	❑	❑	❑	❑	❑	❑

3. Which sports are provided individual nutritional counseling?
___All Sports ___ Selected Sports (please specify)

4. Number of athletes counseled per week?

❑ <5	❑ 6-10	❑ 11-20	❑ >20 (please specify) ___

5. Nutritional consults occur most frequently at the following location:

❑ Private Office	❑ Cafeteria	❑ Practice Facility
❑ Other (please specify) _____		

6. Confidentiality (please specify agreement between athlete and counselor)

7. Are SOAP notes and documentation of the consult included in the athletes medical record? ___Yes ___No

8. Please describe how nutrition consults are documented:

Supplement involvement -

9. Please list those who assist you with supplements distribution:

Recruiting of athletes -

10. In what areas are you involved in recruiting?

❑ One on One contacts	❑ Group talks
❑ Public liaison and Media spokesperson for nutrition related issues	❑ Website announcements
❑ Media guide bio	❑ Clinic speaker
❑ Community outreach committee person	
❑ Other (please specify) _____	

Weight management program

11. Are you involved with the conditioning of athletes in a weight management program? ___Yes ___No ___No program exists

Anthropometrics -

12. What sports receive anthropometrics assessments?
___All Sports ___ Selected Sports (please specify)

_____

_____

_____

_____

13. Identify the frequency per year athletes are evaluated using the following tests:

Anthropometrical Test	0	1	2	3	4	>4 please specify
Body circumference or girths	❑	❑	❑	❑	❑	
Body weights	❑	❑	❑	❑	❑	
Skin fold assessments	❑	❑	❑	❑	❑	
Air Displacement Plethysmography – Ex. Bod Pod	❑	❑	❑	❑	❑	
Bioelectrical impedance analysis (BIA)	❑	❑	❑	❑	❑	
Dual energy x-ray absorptiometry (DEXA)	❑	❑	❑	❑	❑	
Underwater weighing	❑	❑	❑	❑	❑	

14. Clinical and/or biochemical assessments: (Select all tests utilized)

❑ Ferratin levels	❑ Complete blood count (CBC)
❑ Albumin	❑ Pre-albumin
❑ Nitrogen balance	❑ Indirect calorimitry
❑ Estimation of RER- resting metabolic rate w/ body gem	
❑ Other (please specify)_____	

15. Dietary Analysis – How many diets do you assess per week? (Please specify):

_____

16. Eating Disorders: To what extend are you involved with the assessment and treatment of athletes with eating disorders.

❑ Highly involved	❑ Somewhat Involved	❑ Neutral	Somewhat uninvolved	Highly uninvolved

17. Who is the main provider of nutrition services to your athletes? (Select all that apply)

❑ Director of Operations	❑ Athletic Trainer
❑ Strength & Conditioning Coach	❑ Assistant Athletic Trainer
❑ Assistant Strength Coach	❑ Position Coach
❑ Head Coach	❑ Director of Student Life
❑ Other (please specify) _____	

18. What is their specific position title (please specify)_____

19. What is the salary range of this position?

❑ <$30K	❑ $30-35K	❑ $36-40K	❑ $41-45K	❑ $46-50K	❑ $51-55K	❑ >$55K

20. Are benefits provided with this position? ___Yes ___No

21. What are the greatest barriers preventing you from adding or increasing the services of a nutritionist or registered dietitian:

❑ Lack of Funding	❑ Lack of Priority
❑ Current Facilities Projects	❑ Creating Budget cuts
❑ Needs of athletes currently met by staff	
❑ Others (please specify) _____	

22. Have you received a proposal for a full-time registered dietitian or nutritionist? ___Yes ___ No

23. What do you feel your greatest nutrition needs are of your athletes?

_____

_____

_____

24. What benefits do you feel nutrition has in the development of student – athletes?

Recommendations:

25. Would you like to receive the results of this survey? __No __Yes (Please include):

Name:_____Telephone:_____

Address:_____

Fax#:_____Email:_____

26. Additional Comments:

SECTION B: Survey for Dietitians and Nutritionists

Directions: For each number, check all that apply. Some questions provide space for your expertise. Specific examples, supporting documents, and explanations of answers are appreciated and valued. Please feel free to write additional comments.

Position description:

1. Which name best describes your department

❑ Sports Medicine	❑ Strength & Conditioning
❑ Sports Nutrition	❑ Student Life
❑ Academic	❑ Athletic Association
❑ Other (please specify)	

2. How many years have you been employed in your current position?

❑ 0-2	❑ 3-4	❑ 5-7	❑ 7+ (please specify) _____

3. What is your position title (please specify)_____

4. Is your employment best classified as

❑ ¼ time athletics	❑ Full-time athletics 9 month appointment
❑ ½ time athletics	❑ Full-time athletics 12 month appointment
❑ ¾ time athletics	
❑ Paid Consultant (please specify hours per week) _____	
❑ Joint appointment with another university department (please specify time allotment and department) _____	

5. How many years has this position been available to the university?

❑ 0-2	❑ 3-4	❑ 5-7	❑ 7+ (please specify) ___

6. What formal degrees, certifications, and licenses do you hold?

❑ MD	❑ PhD
❑ MA or MS degree	❑ BA or BS degree
❑ RD	❑ LD
❑ SPN	❑ SCCC
❑ ATC	❑ PT
❑ CSCS	

7. How many years of full-time experience do you have in this field?

❑ 0-2	❑ 3-4	❑ 5-7	❑ 7+ (please specify) ___

8. What is the salary range of your position?

❑ < $30K	❑ $30-$35K	❑ $36-40K	❑ $41-45K	❑ $45-50K	❑ $50-55k	❑ >$55k

9. Are benefits provided with this position? ___Yes ___No

10. What do you consider your critical success factors for accomplishing the objective of your position? (Please explain):

_____

_____

_____

11. What factors were most important in hiring you for this position? (Please explain):

_____

_____

_____

Nutrition Staff:

12. Do you have any staff ___Yes ___No; If yes, please list the number of:

Full-time Assistants _____	Graduate Assistants _____
Part-time Assistants _____	Volunteers _____
Dietetic or nutrition interns _____	

Duties Outside of Athletic Department:

13. What responsibilities do you perform outside of your athletic department? (Check all that apply)

❑ Professor, Assistant Professor, Adjunct Professor	❑ Instructor
❑ Student Health Services Dietitian	❑ Dining Services Dietitian
❑ Clinical Dietitian	❑ Wellness Clinic Director
❑ Student Life Coordinator	❑ Writer and Speaker
❑ Weight management programmer	❑ Strength Coach
❑ Athletic Trainer	❑ Private practice Consultant Dietitian
❑ No duties outside athletic department	
❑ Other (please specify).	

Duties:

14. Check all services you provide to athletes (Indicate the frequency of services provided on a daily, weekly, biweekly, monthly basis, or not available basis.)

		Daily	Weekly	Biweekly	Monthly	Bi-Annual	NA
Nutrition Education							
	Print handouts & posters	❑	❑	❑	❑	❑	❑
	Team Talks	❑	❑	❑	❑	❑	❑
	CHAMPS life skills Lectures or meetings	❑	❑	❑	❑	❑	❑
	Sports Nutrition class	❑	❑	❑	❑	❑	❑
	Hands on cooking / shopping demonstrations	❑	❑	❑	❑	❑	❑
	Website administration	❑	❑	❑	❑	❑	❑
Training Table							
	Athletic Training Table Menu Management or Consultation	❑	❑	❑	❑	❑	❑
Game Day							
	Travel, Game-day, and pre-game meal management	❑	❑	❑	❑	❑	❑
Nutritional Counseling							
	Individual nutritional counseling	❑	❑	❑	❑	❑	❑
Supplements							
	Supplement Evaluating and Recommending	❑	❑	❑	❑	❑	❑
	Supplement Managing, Controlling, and Distributing	❑	❑	❑	❑	❑	❑
	Supplement purchase and corporate sponsorship retaining	❑	❑	❑	❑	❑	❑
Recruiting							
	Meeting with incoming recruits	❑	❑	❑	❑	❑	❑

Individual nutritional counseling

15. Which sports are provided individual nutritional counseling?
___All Sports ___Selected Sports (please specify)

_____

_____

16. Number of athletes counseled per week:

❑ <5	❑ 6-10	❑ 11-20	❑ >20 (please specify) ___

17. Nutritional consults occur most frequently at the following location:

❑ Private Office	❑ Cafeteria	❑ Practice Facility
❑ Other (please specify) _____		

18. Confidentiality (please specify agreement between athlete and counselor)

_____

19. Are SOAP notes and documentation of the consult included in the athletes medical record. ___Yes ___No

20. Please describe how nutrition consults are documented:

_____

_____

_____

_____

Supplement involvement

21. Please list those who assist you with supplements distribution:

_____

Recruiting of athletes

22. In what areas are you involved in recruiting?

❑ One on One contacts	❑ Group talks
❑ Public liaison and Media spokesperson for nutrition related issues	❑ Website announcements
❑ Media guide bio	❑ Clinic speaker
❑ Community outreach committee person	
❑ Other (please specify) _____	

Weight management program

23. Are you involved with the conditioning of athletes in a weight management program? ___Yes ___No ___No program exists.

Anthropometrics

24. What sports receive anthropometrics assessments?
___All Sports ___Selected Sports (please specify)

---

25. Identify the frequency per year athletes are evaluated using the following tests:

Anthropometrical Test	0	1	2	3	4	>4 please specify
Body circumference or girths	❑	❑	❑	❑	❑	
Body weights	❑	❑	❑	❑	❑	
Skin fold assessments	❑	❑	❑	❑	❑	
Air Displacement Plethysmography – Ex. Bod Pod	❑	❑	❑	❑	❑	
Bioelectrical impedance analysis (BIA)	❑	❑	❑	❑	❑	
Dual energy x-ray absorptiometry (DEXA)	❑	❑	❑	❑	❑	
Underwater weighing	❑	❑	❑	❑	❑	

26. Clinical and/or biochemical assessments: (Select all tests utilized)

❑ Ferratin levels	❑ Complete blood count (CBC)
❑ Albumin	❑ Pre-albumin
❑ Nitrogen balance	❑ Indirect calorimitry
❑ Estimation of RER- resting metabolic rate w/ body gem	
❑ Other (please specify)_____	

27. Dietary Analysis – How many diets do you assess per week? (Please specify):

---

28. Eating Disorders - To what extend are you involved with the assessment and treatment of athletes with eating disorders.

❑ Highly involved	❑ Somewhat Involved	❑ Neutral	❑ Somewhat uninvolved	❑ Highly uninvolved

Recommendations

29. Would you like to receive the results of this survey? __No __Yes (Please include):
Name: _____ **Telephone**_____
Address:_____
Fax#:_____ **Email:**_____

30. What do you feel your greatest nutrition needs are of your athletes?

_____
_____
_____
_____

31. What benefits do you feel nutrition has in the development of student – athletes?

_____
_____
_____
_____

32. Additional Comments:

_____
_____
_____
_____
_____
_____

Letter accompanying survey explaining directions for completion of the survey

<Date>

Dear Coach :

Sports Nutrition has become increasingly utilized in the training of Division I student-athletes. Since your athletic program is one of the premier programs in the nation, I would like to invite you to participate in a study that explores the sports nutrition services offered to student-athletes in elite-level athletic programs throughout the nation. I ask that you set aside 10-15 minutes to complete the enclosed survey. Your expertise is needed to make this study successful. Only the elite athletic programs are invited to participate in this survey. Since there has been no summary of sports nutrition services provided by college athletic departments, the information in this survey will be valuable to all participants interested in the implementation of collegiate sports nutrition services.

This survey consists of two sections. Section A should be completed by the Athletic Director, Strength Coach, or Athletic Trainer who is responsible for overseeing nutritional services for your student athletes. If your program employs a Nutritionist or Dietitian, either full-time or part-time, please forward Section B of this survey to that employee. Your participation is completely voluntary. There are no penalties for not answering some or all of the questions. Completion of this survey constitutes your consent to participate. In the event that anyone declines participation, or if you do not employ a nutritionist or dietitian, I would ask that you return the uncompleted surveys for my records.

At the completion of this survey, I will be happy to share the results of this study with you. While I intend to publish this study, your identity and your institutional affiliation will remain confidential during the reporting of all results. In addition, responses will never be linked to an individual or institution. All data will be published in aggregate form.

I want to thank you in advance for taking 15 minutes out of your busy day to provide valuable knowledge about the sports nutrition provided to your student-athletes. Please return all completed and uncompleted surveys by mail to the address listed above, or fax them to (865) 974-4969. Any supporting documents or further explanations of answers are appreciated and valued. Thank you once again for helping to advance the sports nutrition services provided to student-athletes.

Sincerely,
Brian Lehmann, RD
Graduate Assistant, Sports Nutrition

Letter of appreciation reporting results of the current study in aggregate form.

<Date>

Dear Coach < >:

I sincerely appreciate your willingness to participate in the research regarding the current sports nutrition services offered at elite Division I college athletic departments. Your participation made this study possible, and added value to this work.

I have enjoyed collaborating with you on this study. I truly believe this research helps advance our profession, and ultimately improves the lives of the athletes we coach. I look forward to continuing our relationship in developing the best standards of practices in training and developing athletes.

As promised, enclosed you will find the results of this research reported in aggregate form. If I can answer any questions, please don't hesitate to contact me at 865-974-1221, or blehmann@utk.edu

Good Luck in your upcoming season and God Bless.

Sincerely,

Brian Lehmann, RD/LDN, SCCC, CSCS
Sports Nutritionist

Enclosures (1)

APPENDIX B: SUMMARY OF TABLES AND FIGURES

Table B-1: Percent time classification of full-time joint appointment registered dietitians reported in aggregate form^

Athletic Department			Other University Department		
Strength and Conditioning	Sports Medicine	Athletics General*	Academics*	Student Health	Student Life
0%	125%	25%	210%	90%	50%
150% Total Athletic Department Classification			350% Total Other University Department Classification		

*The category "Academics" included the departments of Foods and Nutrition, School of Medicine, and Nutrition. The "Athletics General" category was developed for participants who indicated athletic department classification, but did not specify to what department within the athletic department they were best classified.
^ N = 5.

Table B-2: Years of employment of registered dietitians in their current positions*

Years in current position	0 – 2 yrs	3 – 4 yrs	5 – 7 yrs	7 + yrs
Responses	6	2	1	2

*N = 11.

Table B-3: Number of years the registered dietitian positions were offered within athletic departments*

Years Position Offered	Unknown	0 – 2 yrs	3 – 4 yrs	5 – 7 yrs	7 + yrs
Responses	1	4	2	0	4

* N = 11

Table B-4: Years of full-time experience as registered dietitians^

Years of Experience	0 – 2 yrs*	3 – 4 yrs	5 – 7 yrs	7 + yrs*
Responses	4	2	3	2

*One participant indicated they had 3-4 years as a clinical RD, but only 0 – 2 years in sports nutrition. Also, one participant indicated they had 9 years in sports nutrition but 23 years in cardiovascular/wellness.
^ N = 11

Table B-5: Salary of registered dietitians employed at NCAA Division I elite-level athletic departments*

Salary	<$30K	$36-40K	$41-45K	$45-50K	$51-55K	>$55K
Responses	3	3	3	0	0	2

*N=11

Table B-6: Frequency of services provided by registered dietitians*

		Daily	Weekly	Biweekly	Monthly	Bi-Annual	NA
Nutrition Education							
	Print handouts & posters	3	4	2	1	1	0
	Team Talks	0	3	1	5	2	0
	CHAMPS life skills Lectures or meetings	0	0	1	0	6	4
	Sports Nutrition class	0	1	0	1	3	6
	Hands on cooking / shopping demonstrations	0	0	1	1	2	7
	Website administration	0	0	0	0	2	9
Training Table							
	Athletic Training Table Menu Management or Consultation	5.5	.5	0	0	2	3
Game Day							
	Travel, Game-day, and pre-game meal management	0	3	0	3	2	3
Nutritional Counseling							
	Individual nutritional counseling	8	2	1	0	0	0
Supplements							
	Supplement Evaluating and Recommending	3	4	0	3	0	1
	Supplement Managing, Controlling, and Distributing	3	2	0	1	0	5
	Supplement purchase and corporate sponsorship retaining	1	0	0	1	0	9
Recruiting							
	Meeting with incoming recruits	0	3	0	1	3	4

*For each row n_{tot}=11.

Table B-7: Registered Dietitians recruiting responsibilities*

Responsibilities	Responses
1. One on one contacts	6
2. Featured media guide bios^	6
3. Group talk presentations	4
4. Public liaison and media spokesperson for nutrition related issues	4
5. Website announcements	4
6. Clinic speaker	3
7. Community Outreach participation	2
8. No recruiting responsibilities	2
9. Other#	3

*N=11

^ Two participants noted that they were included in only selected sports media guides

This category included managing recruiting banquets (N=1), and speaking to concerned parents (N=2).

Table B-8: Clinical and/or biochemical lab tests utilized by registered dietitians*

Biochemical lab tests	Responses
1. Complete blood count	7
2. Ferratin levels	7
3. Albumin	3
4. Pre-albumin	2
5. Resting energy expenditure	2
6. Other^	1

* N = 11

^ Labs were drawn only in certain instances for specific medical problems

Table B-9: Total nutritional consults provided to athletes per week*

Number of consults	≤ 5	6-10	11-20	>20
Responses	2	5	3	1

*N=11

Table B-10: Frequency of dietary assessments per week^

Number per week	2 – 10 per week	> 10 per week	Other response*
Responses	7	3	1

* Participant indicated that per semester he analyzed half of the 700 athletes he was available to.

^ N = 11

Table B-11: Registered Dietitians perceptions of nutrition needs of athletes

Higher-ordered theme	Subsection of each higher-ordered theme specifying what improvements relating to nutrition were needed:	Raw data relating to higher-ordered theme
A) Factors influencing outcomes of nutrition (N=7)	1) Body composition and weight management (N=1) 2) Disordered eating (N=1) 3) Health and healthy eating through nutrition (N=3) 4) Nutrition for practice and competition (N=1)	"...weight control, disordered eating, general heath issues such as: cholesterol, anemia, etc...nutrition for recovery from practice and competition...how to eat healthy in the cafeteria...prioritizing health (food, sleep, etc.)"
B) Factors influencing positive nutrition choices (N=17)	5) Eating out and eating on the road (N=1) 6) Hydration (N=2) 7) Nutrition knowledge through nutrition education (N=5) 8) Meal frequency, meal timing, and meal planning (N=4) 9) Fruit and vegetable intake (N=1) 10) Portion control (N=1) 11) Reducing alcohol intake (N=1) 12) Supplement and banned substance use and abuse (N=1) 13) Time management, budgeting, and other life skills (N=1)	"...hydration...eating more frequently—many go for 5+ hours without eating or snacking...clarifying myths and fads...overall nutrition education regarding portions, timing of food intake, alcohol intake, and its effect on food intake, and healthy eating in general...how nutrition effects performance just as practice, rehab., and strength does...supplement education is always needed...helping them with time management and most of all how to budget their finances to buy the proper/enough food."
C) Factors influencing how nutrition services are provided to athletes (N=4)	14) Athletic training table and delivery of meals (N=3) 15) Re-enforcement of positive nutrition choices (N=1)	"...having food during off-peak (non-meal) hours...re-enforcement...adequate selection at the Athletic training table."
D) None listed (N=0)	16) None listed (N=0)	

Table B-12: Strength and Conditioning Coaches perceptions of nutrition needs of athletes

Higher-ordered theme	Subsection of each higher-ordered theme specifying what improvements relating to nutrition were needed:	Raw data relating to higher-ordered theme
A) Factors influencing outcomes of nutrition (N=1)	1) Body composition and weight management (N=1) 2) Disordered eating (N=0) 3) Health and healthy eating through nutrition (N=0) 4) Nutrition for practice and competition (N=0)	"...helps with body composition and weight management."
B) Factors influencing positive nutrition choices (N=3)	5) Eating out and eating on the road (N=0) 6) Hydration (N=0) 7) Nutrition knowledge through nutrition education (N=3) 8) Meal frequency, meal timing, and meal planning (N=0) 9) Fruit and vegetable intake (N=0) 10) Portion control (N=0) 11) Reducing alcohol intake (N=0) 12) Supplement and banned substance use and abuse (N=0) 13) Time management, budgeting, and other life-skills (N=0)	"...need more constant use of the knowledge we supply them (athletes)...education needed on the importance of breakfast."
C) Factors influencing how nutrition services are provided to athletes (N=4)	14) Athletic training table and delivery of meals (N=0) 15) Athletic training table and delivery of meals (N=4)	"...need a better training table situation...need two or three training table meals per day...need quality meals...best method of providing meals to athletes (cash versus meals)."
D) None listed (N=2)	16) None listed (N=2)	

Table B-13: Registered Dietitians perceptions of benefits of nutrition for athletes

Higher-ordered theme	Subsection of each higher-ordered theme specifying to what improvements occurred relating to nutrition	Raw data relating to higher-ordered theme
A) Factors influencing athletic performance N=15	1) Recovery (N=1) 2) Performance (N=8) 3) Energy level (N=3) 4) Athletic development (N=1) 5) Weight management and body weight (N=2)	"...nutrition is a critical component of athletic development and performance...key to meeting weight goals...weight management, gains and losses in body weight"
B) Factors influencing academic performance, life skills, health, and health related quality of life N=16	6) Lifestyle habits (N=3) 7) Academic performance and concentration (N=4) 8) Injury rehabilitation and prevention (N=2) 9) Health (N=3) 10) Mood, self-esteem, and confidence (N=4)	"...nutrition plays a role with injury rehab...in the long run, hopefully (athletes) have some nutrition information and good habits that can be utilized in their lives...huge benefits!...nutrition can improve academic performance and self esteem...proper nutrition education during an athletes four or five year career can make a large impact on the rest of their adulthood...improves confidence...a well nourished athlete will perform better socially and emotionally...nutrition prevents injuries, especially with hydration."
C) Factors influencing nutrition knowledge, nutrition education, and meeting athletes' nutrition needs N=5	11) Nutrition knowledge (N=4) 12) Meeting total nutritional needs with improved food choices (N=1)	"...helps provide adequate proportion of carbohydrate, protein, and fat. Nutrition knowledge empowers them (athletes) to make healthy choices"
D) None listed, insignificant, or overemphasized N=0	13) None listed (N=0) 14) Insignificant (N=0) 15) Overemphasized (N=0)	

Table B-14: Strength and Conditioning Coaches perceptions of benefits of nutrition for athletes

Higher-ordered theme	Subsection of each higher-ordered theme specifying to what improvements occurred relating to nutrition	Raw data relating to higher-ordered theme
A) Factors influencing athletic performance (N=6)	1) Recovery (N=1) 2) Performance (N=3) 3) Energy level improvements (N=1) 4) Athletic development (N=1) 5) Weight management and body weight (N=0)	"...increases in recovery, which in turn increases performance...increases in energy and athletic performance...can greatly assist in maximization of athletic development."
B) Factors influencing academic performance, life-skills, health, and health related quality of life (N=2)	6) Lifestyle habits (N=1) 7) Academic performance and concentration (N= 1) 8) Injury rehabilitation and prevention (N=0) 9) Health (N=0) 10) Mood, self-esteem, and confidence (N=0)	"...sound lifestyle eating habits, habits that hopefully carry through life...academic performance increases."
C) Factors influencing nutrition knowledge, nutrition education, and meeting athletes' nutrition needs N=0	11) Nutrition knowledge (N=0) 12) Meeting total nutritional needs with improved food choices (N=0)	
D) None listed, insignificant, or overemphasized N=6	13) None listed (N=4) 14) Insignificant (N=1) 15) Overemphasized (N=1)	"...unfortunately, not enough, one of the important issues, but can be over emphasized with supplements, etc."

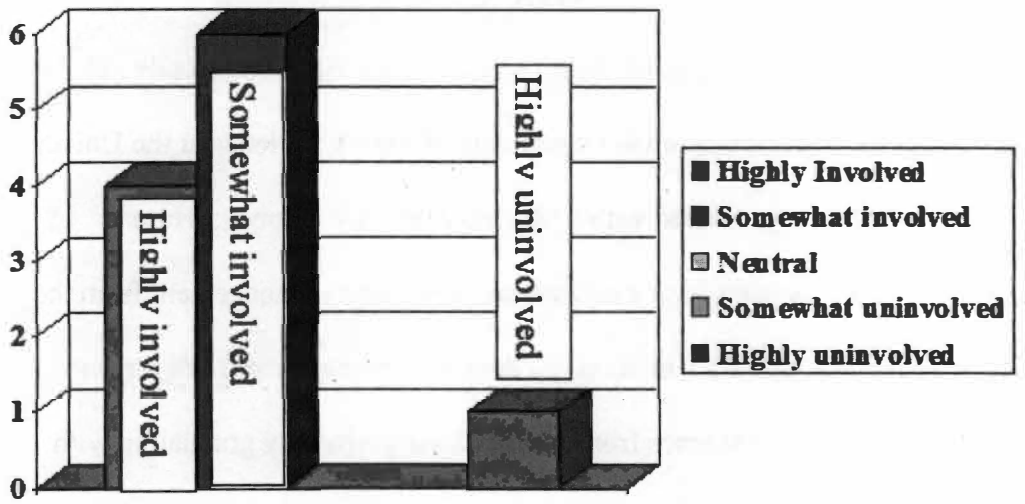

Figure B-1: Registered Dietitians involvement with eating disorders.

VITA

Brian Lehmann is accomplished both professionally and academically. He holds the position of Sports Nutritionist in the Department of Men's Athletics at the University of Tennessee. In 2003, he graduated with a Master of Science degree in Human Performance and Sports Studies with a concentration in Sports Management from the University of Tennessee. In 2000, he received dual Bachelor of Science degrees in Human Nutrition & Exercise Science from Kansas State University graduating with honors. He was a member of the Kansas State University football support staff from 1996 – 2000, and University of Tennessee football support staff from 2000- present, which had combined for a record of seven consecutive bowl game appearances, five straight 11 win seasons, two conference championship appearances, and an overall combined record of 72 – 16 (.818 winning percentage) during Lehmann's tenure. In 2000, the National Strength and Conditioning Association awarded Lehmann the Power Systems Professional Scholarship recognizing the top promising strength and conditioning professional in the nation. In the same year, the Kansas Dietetics Association recognized Lehmann as the Promising Dietetics Student of the Year. Lehmann is a frequent public speaker. He is a Registered Dietitian and Licensed Dietitian/Nutritionist in the State of Tennessee, Strength and Conditioning Coach Certified through the Collegiate Strength and Conditioning Coaches Association, Certified Strength and Conditioning Specialist through the National Strength and Conditioning Association, and Club Coach Certified through USA Weightlifting. A native of Sabetha, Kansas, he lives in Maryville, Tennessee with his wife Miranda.