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Knowledge and attitudes of high school coaches concerning nutritional ergogenics

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**KNOWLEDGE AND ATTITUDES OF HIGH SCHOOL COACHES CONCERNING
NUTRITIONAL ERGOGENICS**

**A Thesis
presented to
The Faculty of the Department of
Kinesiology
San Jose State University**

**In Partial Fulfillment
of the Requirements for the Degree
Master of Arts**

**by
Gretchen L. Carnes
December 2005**

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ABSTRACT

Knowledge and Attitudes of High School Coaches Concerning Nutritional Ergogenics

by Gretchen L. Carnes

The objective of this research is to determine coaches' knowledge and attitudes of nutritional ergogenics and to determine if a relationship exists between knowledge and attitudes. An original nutrition survey was developed and delivered to the participants via email and the Internet. The participants in the study included 36 Indiana High School Athletic Association (IHSAA) affiliated coaches. Descriptive statistics and frequencies were calculated for each question for demographic information. Attitudes were measured on Likert scale from very positive to very negative. Cross tabulations were used to assess coaches' knowledge and frequency of recommendation. Of the approximate 550 sports teams surveyed, 36 coaches responded. The average nutritional ergogenic knowledge score of the coaches as measured by the nutrition survey was eight of a possible 13.

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Chapter 1

INTRODUCTION

Throughout recorded history, athletes have concocted many recipes and combinations of substances hoping that the right regime will provide a competitive edge (Applegate & Grivetti, 1996; Burks, 1981; Perko, Cowdery, Wang, & Yesalis, 1995). Today, 62% of high school athletes believe vitamin and mineral supplements improve athletic performance (Sobal & Marquart, 1994), 52 % would consider the use of vitamin supplements, and 73 % approve of their use at the high school level (Krowchuk et al., 1989). A majority of high school athletes believe their coaches approve of the use of nutritional supplements (Krowchuk et al.), and 37% of high school athletes rate coaches as important influences in supplement use (Sobal & Marquart, 1994).

Currently, the safety and efficacy of many readily available and legal purported ergogenics is still in question by experts from several scientific concentrations (Beltz, 1993; Burks, 1981; Fox, 1999; Krowchuk, 1989). The power of coaches' influence coupled with an athlete's drive for success and the lack of scientific research of nutritional ergogenics may create a potentially harmful situation. Cancer, liver damage, diarrhea, dehydration, and muscle cramping are all potential side effects of widely available over the counter nutritional ergogenics (Burke, 1993; Dolby, 1997; Williams, 1998). Thus, due to the potential health hazards of supplements and coaches' influence over athletes, the purpose of this study is to determine coaches' knowledge regarding nutritional ergogenics and the effect their knowledge level has on their rate of recommendation of nutritional ergogenics.

The nutritional ergogenics focused on in this study are limited to five substances that are available to anyone without a prescription, regardless of age or education. These nutritional ergogenics are androstenedione, caffeine, creatine, protein, and multivitamins. These substances are recorded by the Federal Drug Administration (FDA) as nutritional supplements, dietary supplements, and food drugs. Therefore these substances are not regulated by the FDA in any way.

The survey was an original instrument created by the researcher based on a review of literature. The nutrition survey was presented in five sections: 1) demographics, 2) frequency of recommendation of nutritional ergogenics, 3) knowledge of nutritional ergogenics, 4) attitudes concerning nutritional ergogenics, and 5) reasons for recommendation. Of the approximate 550 sports teams surveyed, 36 coaches responded.

Coaches represented a variety of sports. The average knowledge score of the coaches was eight of a possible 13. No coaches reported recommending androstenedione or caffeine to any athletes. Creatine, protein, and multivitamins were recommended at some rate by the coaches to the high school athletes. Coaches in our study seemed more likely to recommend protein to boys and multivitamins to girls. Female coaches tended to be more likely to recommend vitamins and male coaches more likely to recommend protein. Coaches who had nutrition courses were more likely to recommend protein and multivitamins than coaches who had not had nutrition courses. Four of the coaches surveyed recommend supplements to their athletes because they or a friend had success with the supplement and/or professional athletes use the substance.

There are several recommendations for future research with regards to the questionnaire, protocol for electronic delivery of the survey, frequency of collecting data and establishing validity. Considering the influence high school coaches may have on their athletes, the lack of knowledge regarding nutritional ergogenics and the large number of coaches who recommend these substances, the opportunity for coaches to become educated in the areas of nutrition and nutritional ergogenics must exist. School systems and athletic associations should consider developing guidelines and policies regarding the recommendation of any nutritional substances used with the intent of enhancing sport performance.

This thesis was developed in three chapters with the intent to construct and submit an article for publication to the *Journal of Athletic Training*. Following this introduction is chapter two, the resultant article. Chapter three contains the extended support materials including the introduction chapter of the proposal, the literature review for the proposal, and the methods section. The appendices include the authors' notes from the *Journal of Athletic Training*, expert evaluation tool and cover letter, nutrition survey, email letter, copy of www.coachessurvey.com, second email letter, and human subjects individual review board approval letter.

Chapter 2
JOURNAL ARTICLE

Knowledge and Attitudes of High School Coaches Concerning Nutritional Ergogenics

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Objective: To examine coaches' knowledge and attitude of nutritional ergogenics.

Design and Setting: We developed an original nutrition survey and delivered it to the participants via email and the Internet.

Subjects: Thirty-six Indiana High School Athletic Association (IHSAA) affiliated coaches.

Measurements: We calculated descriptive statistics and frequencies for each question in the nutrition survey. Cross tabulations were used to assess coaches' knowledge and frequency of recommendation.

Results: Of the approximate 550 sports teams surveyed, 36 coaches responded. The average knowledge score of the coaches was 8 of a possible 13. The highest frequency of coaches disagrees with the statements, "I think people who use supplements and ergogenics are cheaters", "I think using supplements and ergogenics and ergogenics is just as bad as using steroids", "I think supplements should be banned in high schools", and "I think supplements and ergogenics are o.k. if the athlete has tried everything else." The highest frequency of coaches agrees with the statement, "I think supplements and ergogenics are o.k. if used by adults."

Conclusion: High school coaches can correctly answer more than 1/2 of the questions on a nutritional survey. The coaches surveyed disagree that people who use supplements are cheaters, supplements should be banned in high schools, supplements are as bad as steroids, and supplements are o.k. if the athlete has tired everything else.

Key Words: Athlete, coach, nutritional ergogenics, supplements, recommended daily allowance.

INTRODUCTION

Throughout recorded history, athletes have concocted many recipes and combinations of substances hoping that the right regime will provide a competitive edge.^{1,2,3} Nutritional ergogenics are products that can be used to address physiological or nutritional issues arising in sport.⁴ Today, 62% of high school athletes believe vitamin and mineral supplements improve athletic performance,⁵ 52 % would consider the use of vitamin supplements, and 73 % approve of their use at the high school level.⁶ A majority of high school athletes believe their coaches approve of the use of nutritional supplements,⁶ and 37% of high school athletes rate coaches as important influences in supplement use.⁵ These statistics suggest that high school athletes may be using nutritional supplements to improve athletic performance and looking to their coaches for information regarding nutritional ergogenics.

Currently, the safety and efficacy of many readily available and legal purported ergogenics is still in question by experts from several scientific orientations.^{4,6,7,8} The power of coaches' influence coupled with an athlete's drive for success and the lack of scientific research of nutritional ergogenics may create a potentially harmful situation.

Cancer, liver damage, diarrhea, dehydration, and muscle cramping are all potential side effects of widely available over the counter nutritional ergogenics.^{6,9,10} Thus, due to the potential health hazards of supplements and coaches' influence over athletes, the purpose of this study is to determine coaches' knowledge regarding nutritional ergogenics related to their attitudes concerning the use of nutritional ergogenics.

METHODS

Subjects

The subject population was composed of high school coaches from 1 Indiana County. We chose these coaches based on their membership with the Indiana High School Athletic Association (IHSAA). We included all member schools in the selected county. The average enrollment at the high schools was 1,285 students. Enrollment ranged from 64 to 3525 students. An Institutional Review Board awarded human subjects approval before data collection. Coaches' consent was implied by their responses to the survey.

Instruments

Nutrition Survey

The nutrition survey was an original instrument based on a review of literature concerning nutritional ergogenics. The purpose of the nutrition survey was to assess frequency of nutritional ergogenic recommendation by coaches, knowledge of nutritional ergogenics, attitudes concerning use of nutritional ergogenics, and reasons for recommendation of use of nutritional ergogenics. The nutrition survey was presented in 5 sections: 1) demographics, 2) frequency of recommendation of nutritional ergogenics, 3)

knowledge of nutritional ergogenics, 4) attitudes concerning nutritional ergogenics, and 5) reasons for recommendation. The demographics section investigated primary sport, years experience primary sport, gender, education, retail experience with nutritional ergogenics, and education in nutrition. The frequency of recommendation of nutritional ergogenics section pertained to the number of athletes to whom coaches' recommended/suggested androstenedione, caffeine, creatine, multivitamin/multimineral supplements, and protein supplements. Recommendation and/or suggestion frequency was assessed in survey choices: 1) I recommended/suggested this to 1-4 athletes, 2) I recommended/suggested this to 5-10 athletes, 3) I recommended/suggested this to 10 or more athletes and 4) I recommended/suggested this to all of my athletes. The nutritional ergogenic knowledge section of the present survey was based on research into nutritional ergogenics. The Attitudes Concerning Nutritional Ergogenics were evaluated on a Likert scale including choices such as: 1) strongly agree, 2) agree, 3) disagree and 4) strongly disagree. The last section included an evaluation of 5 possible reasons for coaches' explanation of or why they would or would not recommend nutritional ergogenics. Possible reasons for recommendation included: 1) Because it is part of the RDA or naturally occurring in food, 2) A friend/I had success with the substance, 3) Professional athletes improved their performance with the substance, 4) It was the last option for an athlete that wasn't getting results, and 5) Competition was approaching and the athlete wasn't quite ready. Possible reasons for not recommending the substances in the study included: 1) Because supplementation does not promote healthy nutrition, 2) A friend/I had no success with the substance, 3) The substance is banned by professional

organizations, 4) Fear of legal prosecution, and 5) I feel I don't know enough about these substances to recommend them. Coaches were asked to circle all reasons that were applicable as to why they would or would not recommend the nutritional ergogenics considered in the study.

Expert Evaluation

A panel of 12 experts evaluated the nutrition survey. The panel of experts included 4 registered dietitians, 4 certified athletic trainers, 1 college-level nutrition instructor, 1 college-level exercise physiology instructor, 1 orthopedic surgeon, and 1 nutritional ergogenic retailer. The panel of experts was mailed the nutrition survey and an evaluation with 7 questions requiring yes or no responses. The expert evaluation sheet also asked for their job title, education in nutrition and nutritional ergogenics, comments and suggestions.

Pilot Study

Before delivering the questionnaire to the coaches, we conducted a pilot study using coaches from 1 high school not listed on the IHSAA map of member schools within the chosen county. We emailed the athletic director with instructions to access the questionnaire, which he forwarded to his entire coaching staff. All coaches at the high school were asked by their athletic director to participate in the study. The coaches were asked to access the website, fill out the questionnaire, and submit it to the researcher via email. Following the pilot study, modifications were made to improve clarity of 1 question. Changes involved semantics and layout of answers the response page.

Distribution of Questionnaire

We obtained athletic directors' email addresses from the IHSAA website.¹¹ We emailed a letter to all 32 athletic directors listed on the area map for the chosen Indiana County. The letter explained the background of the researcher, the intent of the survey, and a request that the athletic directors forward the web address of the consent form and questionnaire to their entire coaching staff. Two emails were returned undeliverable. We sent a second letter reiterating the details of the first letter and a second request to forward on the website and instructions to their coaching staff.

Data Analysis

After we collected data from the respondents, frequencies and percentages of answers were calculated for each question. The SPSS 11.0¹² statistical software and a personal computer were used for statistical purposes. Cross tabulations were used to assess the coaches' knowledge and frequency of recommendation. Frequencies and percentages were used for demographic and descriptive purposes. Due to the response rate assumptions for Chi² were violated and we could not conduct a analysis beyond descriptive statistics.

RESULTS

A total of 30 athletic directors who oversaw 513 sports were contacted. Of the 30 athletic directors successfully contacted by email, 11 schools were represented. The range of surveys returned was between 1 and 7 for each school selected. The number of students per school averaged 1285 and ranged from 64 to 3525. Thirty-six coaches responded to the survey. All 36 questionnaires were included in the study although not

all had been completed. Incomplete questions were recorded as such as “did not choose,” or “did not indicate.”

Coaches represented a variety of sports including 8 basketball coaches, 5 soccer coaches, 4 cross-country coaches, 4 volleyball coaches and a selection of other sports. The majority of the coaches (n=9) had 10 or more year’s experience. Four coaches had 9 to 10 years, 5 coaches 7 to 8 years, 8 coaches 5 to 6 years, 6 coaches 3 to 4 years, and 4 coaches 1 to 2 years experience. The coaches coached boys’ (n=19) and girl’s sports (n=17) at a similar rate. Coaches were primarily male (n=29) to female (n=7). The majority coached only 1 sport (n=22), 12 coached 2 sports, and 1 coached 3 sports, 1 did not indicate. The majority of coaches had an education in nutrition. Twenty-one coaches have had nutrition courses, 12 have attended nutrition seminars, and 4 coaches have had retail experience with nutritional ergogenics.

Results for the frequency of recommendation were variable (Table 1). No coaches reported recommending androstenedione or caffeine to any athletes. One coach recommended creatine to 10 or more athletes within 1 year. The majority of coaches (n=21) did not recommend protein supplements to any athletes. Protein was recommended to 1 to 4 athletes by 7 coaches, 3 coaches to 5 to 9 athletes, 2 coaches to 10 or more athletes, and 3 coaches recommended protein to all of their athletes. Multivitamin supplements were also recommended at a variable rate. The majority of coaches (n=15) did not recommend vitamins to any athletes. A quarter of coaches (n= 9) recommended vitamins to 1 to 4 athletes, 4 coaches to 5 to 9 athletes, 2 coaches to 10 or more athletes, and 5 coaches recommended vitamins to all athletes.

Table 1. Coaches' Frequency of Recommendation of Nutritional Ergogenics (n=36)

Coaches' Recommendation	Vitamins	Creatine	Protein
	N	N	N
Skipped Question	1	0	1
Never	34	21	15
1-4 Athletes	0	7	9
5-10 Athletes	0	3	4
> 10 Athletes	1	2	2
All Athletes	0	3	5

Cross tabulations were used to evaluate the rate at which coaches recommended protein to boys versus girls. Protein was recommended to girls by 6 of 17 coaches while 9 of 19 recommended protein to boys. The results for recommendation of vitamins differed. Vitamins were recommended to girls by 12 of 17 coaches while 8 of 19 recommended vitamins to boys. Coaches' sex and rate of protein and multivitamin recommendation was also examined with cross tabulations. Protein was recommended by 13 of 29 male coaches versus 2 of 7 female coaches. Multivitamins were recommended by 15 of 28 male coaches versus 5 of 7 female coaches. Cross tabulations of coaches who had nutrition courses and coaches who had not and their rate of protein and multivitamin recommendation was also calculated. Protein was recommended by 11 of 21 coaches who had nutrition courses versus 4 of 15 coaches who had not had nutrition courses. Multivitamins were recommended by 14 of 21 coaches who had nutrition courses versus 6 of 15 who had not had nutrition courses. Coaches who had nutrition courses scored the same on average on the nutrition survey as coaches who had not had nutrition courses.

When questioned about the ergogenics coaches recommended to their athletes, coaches' scores varied. The RDA for protein was correctly identified by 21 coaches. The side effects of excessive protein intake were correctly identified by 27 coaches. When questioned about the functions of vitamins, 23 correctly identified vitamins' role in nutrition as releasing energy from food and the effects of excessive vitamin intake. Some coaches may not be aware of the lack of FDA involvement in the regulation of nutritional ergogenics. Almost half (n=17) of coaches were not aware the FDA does not regulate, test, or set production standards for nutritional ergogenics (Table 2). The average knowledge score for coaches completing the nutrition survey was 8 of a possible 13. The high score was 13 (n=1) and low of 3 (n=1).

Table 2. Coaches' Responses to Nutritional Ergogenic Knowledge Questions (n=36)

Question	N
RDA for protein is	
skipped	1
.08	4
.8*	21
8.0	9
80.0	1
Side Effects of Excessive Protein intake may include	
skipped	2
upset stomach	1
dehydration	6
all of the above*	27
Vitamins	
are direct sources of energy	7
are required in large doses	2
release energy from food*	23
all of the above	4

Excessive vitamin supplementation may	
skipped	1
increase hunger	4
cause headaches	8
cause kidney stones*	23
<hr/>	
*Correct answers indicated with asterisk	

DISCUSSION

The history of nutritional ergogenics dates back to the ancient Olympics.² The ancient Olympiads consumed a variety of substances including powdered lions' teeth and mushrooms in an attempt to gain a competitive edge over their opponent.^{1,2,13} Many substances athletes consume in an effort to enhance athletic performance are part of the Recommended Daily Allowance (RDA). However, the FDA does not regulate the supplementation or substantiate the nutritional benefits of the enormous quantities of these substances to enhance athletic performance. The 1994 Dietary Supplement Act (DSHEA) prevents the FDA from regulating any ergogenic aid that maintains food supplement status.^{2,8} In our study, 13 coaches believed the FDA tests and sets production standards for supplements as they do drugs (Table 3). The assumption the FDA regulates nutritional ergogenics means these coaches believe the FDA has proven the safety, efficacy, set standards for production, and proved the contents of the package is what is actually contained therein. In reality, these substances bypass years of standardized testing and processes drugs must undergo before marketed.⁴ Coaches and consumers take refuge in the rigorous guidelines established by the FDA but this safety net is nonexistent in regards to nutritional ergogenics.

Table 3. Coaches' Responses to Question Concerning the FDA Involvement with Nutritional Ergogenics (n=36)

Question	N
The Federal Drug Administration	
test supplements like drugs	1
sets productions standards	3
all of the above	13
none of the above *	19

*Correct answer indicated with asterisk

Trends in demographic data and rates of recommendation were examined by cross tabulation. Coaches in our study seemed more likely to recommend protein to boys (n=9 of 19) and multivitamins to girls (n=12 of 17). Female coaches tended to be more likely to recommend vitamins (n=5 of 7) and male coaches more likely to recommend protein (n=13 of 29). Coaches who had nutrition courses were more likely to recommend protein (n=11 of 21) and multivitamins (n=14 of 21) than coaches who had not had nutrition courses. Coaches who had nutrition courses scored the same on the nutrition survey as coaches who had not had nutrition courses.

Current research supports the findings of our study that there exists a lack of nutritional knowledge in the coaching community and that coaches may be unaware of RDA guidelines and nutrition for sport participants.^{14,15,16} In our study, the most frequently indicated reason for coaches' recommendation of nutritional ergogenics was the substance(s) are part of the RDA and/or naturally occurring in food (n=23), however, fifteen coaches in our survey were not aware of the RDA for protein. A study of nutritional knowledge in North Carolina reported that the coaches answered correctly 70% of the time and a third of these coaches indicated a high level of certainty in their

response.¹⁵ Eighty-six percent of coaches surveyed in Texas stated they supplied their athletes with nutritional advice on a regular basis.⁹ In a vitamin/mineral supplement use study, high school coaches were recognized by 14% of athletes as very important influences in nutritional decisions.¹⁷

Consumers are often skeptical about the actual need for supplements until a recommendation from a trusted friend or an individual who is held in high regard.^{8,9} Role model use and acknowledgment of nutritional ergogenics may be a factor in their use by the general public. High profile athletes have a major influence on the general public and young athletes.⁹ We found that 4 of the coaches we surveyed recommend supplements to their athletes because they or a friend had success with the supplement and/or professional athletes use the substance. Many adults and adolescents maintain an “if they use it, it must be okay” attitude with reference to high-profile athletes.⁹ The average nutritional ergogenic knowledge score for coaches in our study was 8 (n=8) of a possible 13 with a high score of 13 or (n=1) and a low score of 3 (n=1). Coaches are recommending protein supplements to athletes regardless of their knowledge level concerning nutritional ergogenics.

In a study of knowledge and use of nutritional supplements by high school athletes, greater knowledge was associated with less use.¹⁸ In a study involving the effects of the implementation of a multidimensional anabolic steroid prevention intervention program, education in steroid use and nutrition reduced the adolescent intent to use anabolic androgenic steroids.¹⁹ In this case, greater athlete knowledge was again

associated with less intent to use. We found that the highest rate of recommendation of protein supplements came from coaches who scored a 7 on our nutrition survey (Table 4).

Table 4. Cross Tabulation: Coaches' Knowledge Score v. Frequency of Protein Recommendation

Knowledge	Never	1-4	5-10	>10	All	Total
3	-	1	-	-	-	1
4	1	-	-	-	-	0
5	3	-	-	-	-	0
6	1	-	1	-	1	2
7	2	3	-	1	1	5
8	7	-	1	-	-	1
9	5	1	-	-	-	1
10	2	1	-	1	1	3
11	-	1	-	-	-	1
13	-	-	1	-	-	1
Total	21	7	3	2	3	15

Within this group of coaches, 3 recommended protein to 1-4 athletes, 1 to more than 10 athletes, and 1 to all athletes. These coaches may not be aware of the safety or efficacy of the nutritional ergogenics they are recommending. We found similar results regarding the recommendation of vitamin supplements. Coaches who scored 8 on the nutrition survey were recommending vitamin supplements at the highest rate (Table 5). Two coaches recommended vitamins to 1-4 athletes, 2 to 10 or more athletes, and 2 to all athletes. When questioned about the FDA's involvement in nutritional ergogenic regulation, 19 answered correctly. Of these 19 coaches, half recommended protein supplements and over half (n=9) recommended vitamins to their athletes. Coaches recommended supplements to athletes while being aware the FDA does not set production standards or test supplements like drugs. The combination of an athlete's

reliance on coaches for advice coupled with the lack of coaches' nutritional knowledge may lead to uneducated and hazardous decisions.

Table 5. Crosstabulation: Coaches' Knowledge Score v. Frequency of Vitamin Recommendation

Knowledge	Never	1-4	5-10	>10	All	Total
3	1					1
4	-	-	1	-	-	1
5	2	1	-	-	-	3
6	2	-	-	-	1	3
7	3	2	1	-	1	7
8	2	2	-	2	2	8
9	3	3	-	-	-	6
10	1	1	1	-	1	5*
11	-	-	1	-	-	1
13	1	-	-	-	-	1
Total	15	9	4	2	5	36

* 1 coach who scored 10 did not indicate frequency of vitamin recommendation

The coaches we surveyed, their nutrition and/or supplement backgrounds, and primary sport emphasis may differ from coaches in other parts of Indiana and the rest of the United States. There exists variability in level of education, college majors, and exposure to nutritional education within high school coaches. For example, while 1 coach may have received a basic education in nutrition as part of their educational background other coaches may not have pursued a college major or degree requiring the same knowledge. Inherent differences between sports may make the purported claims of 1 nutritional ergogenic more attractive to some coaches than others. This situation may have an effect on coaches' exposure to individual nutritional ergogenics. The types of nutritional ergogenics coaches are familiar with, have used, or are currently using may alter results due to self-education or research. We also acknowledge the possibility that

other school systems have guidelines and or restrictions regarding the recommendation of supplements. Limitations exist in self-reporting attitudes, which are subjective in nature and therefore may contribute to variations in reporting.

While coaches' score on our nutritional survey was low, it should be noted that the nutrition survey in our study contained an inadequate number of questions to accurately evaluate coaches' nutritional ergogenic knowledge. Coaches' attitude was difficult to evaluate due to the small number of questions involving attitude. We were unable to determine the exact response rate due to the inability to access an accurate number of coaches the survey actually reached. The delivery of the survey was dependant on the compliance of the athletic directors.

Recommendations for future research include including more questions in the knowledge section of the nutrition survey with repetitive questions to establish validity. More attitude questions should be included to more accurately assess coaches' attitude. In the case of an e-mail survey, a return receipt should be attached to the survey to record the number of coaches the survey reached and to calculate response rate. Coaches should be asked to estimate the numbers of athletes they recommended nutritional ergogenics to and respond with 1 number rather than a range of numbers. Data collection should happen once each season so that coaches may respond with respect to the sport they are currently coaching. Repeating the survey once each athletic season may also improve the response rate. The power of this research would be greatly enhanced with these changes to the nutrition survey.

CONCLUSION

Coaches were able to answer more than half of the questions on the nutrition survey correctly. The coaches surveyed disagree that people who use supplements are cheaters, supplements should be banned in high schools, supplements are as bad as steroids, and supplements are okay if the athlete has tried everything else. Coaches tend to recommend supplements that are part of the RDA but are unaware of the FDA nutritional standards or the potential side effects of supplementation of these substances. Almost half of the coaches surveyed believe the FDA regulates nutritional ergogenics like drugs. Considering the influence high school coaches may have on their athletes, the lack of knowledge regarding nutritional ergogenics and the large number of coaches who recommend these substances, the opportunity for coaches to become educated in the areas of nutrition and nutritional ergogenics must exist. School systems and athletic associations should consider developing guidelines and policies regarding the recommendation of any nutritional substances used with the intent of enhancing sport performance.

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Chapter 3

EXTENDED SUPPORT MATERIALS

Chapter 1

INTRODUCTION

Throughout recorded history, athletes have concocted many recipes and combinations of substances hoping that the right regime will provide a competitive edge (Applegate & Grivetti, 1996; Burks, 1981; Perko, Cowdery, Wang, & Yesalis, 1995). Today, 62% of high school athletes believe vitamin and mineral supplements improve athletic performance (Sobal & Marquart, 1994), 52 % would consider the use of vitamin supplements, and 73 % approve of their use at the high school level (Krowchuk et al., 1989). A majority of high school athletes believe their coaches approve of the use of nutritional supplements (Krowchuk et al.), and 37% of high school athletes rate coaches as important influences in supplement use (Sobal & Marquart, 1994).

Currently, the safety and efficacy of many readily available and legal purported ergogenics is still in question by experts from several scientific concentrations (Beltz, 1993; Burks, 1981; Fox, 1999; Krowchuk, 1989). The power of coaches' influence coupled with an athlete's drive for success and the lack of scientific research of nutritional ergogenics may create a potentially harmful situation. Cancer, liver damage, diarrhea, dehydration, and muscle cramping are all potential side effects of widely available over the counter nutritional ergogenics (Burke, 1993; Dolby, 1997; Williams, 1998). Thus, due to the potential health hazards of supplements and coaches' influence over athletes, the purpose of this study is to determine coaches' knowledge regarding

nutritional ergogenics and the effect their knowledge level has on their rate of recommendation of nutritional ergogenics.

The primary goal in any sort of competition is to best the opponent (Williams, 1998). The goal of supremacy in sport often times overrides any other fundamental concept that sport is theorized to encompass. Since athletes aspire to be the best in their chosen realm of competition, it is conceivable that some athletes may attempt to achieve this goal by any means necessary (Corley, Demarest-Litchford, & Bazzarre, 1990; Goldberg, et al., 1996) including the use of nutritional ergogenics such as androstenedione, caffeine, creatine, protein supplements, and multivitamin supplements particularly if sanctioned by the team or coach (Goldberg, et al., 1996).

The desire to vanquish the opponent may only be one of many variables that contribute to the use of ergogenics by athletes. Often an athlete's drive for success is coupled with the desire for approval or praise from the coach (Sobal & Marquart, 1994). Coaches have tremendous potential to influence the actions of their athletes (Sobal & Marquart). The influence of a coach over an athlete can be observed from the classroom, personal life, and field of play. While many athletes ultimately trust their coaches' knowledge in many areas, the degree to which coaches recommend nutritional ergogenics and coaches' knowledge regarding ergogenic supplements is unrecorded.

Sobal and Marquart (1994) acknowledge the power of high school coaches and suggest that the influence to use supplements may originate with the coaching staff. Goldberg et al. (1996) considers coaches highly influential persons in the lives of athletes as a result of authoritative position and the considerable amount of time spent with the

athlete. In addition, research suggests high school coaches may have substantial influence over athletes' decisions concerning the use of nutritional ergogenics as apparent in Krowchuk et al., (1989) which states majority of high school athletes believe their coaches would approve of nutritional supplementation. Therefore, it is reasonable to assume that coaches may play a significant role in an adolescent athlete's use of nutritional ergogenics.

Coaches may allow an athlete to prescribe to a regime of nutritional ergogenics or recommend their use believing that each athlete is an investment. The development of an athlete requires a significant investment of time and money to perfect the intricacies of their role and team position (Goldberg, et al., 1996). Each coach desires to make the most of each athlete thus receiving the most reward from each investment. To an uninformed party, nutritional ergogenics may appear to be a method beyond training and coaching to reap the greatest benefits from the performance of an athlete. To make decisions concerning performance-enhancing substances, coaches need to have knowledge of both the purported benefits and harmful side effects of nutritional ergogenics. Athletes may place great importance on the advice of a coach particularly when a coach is the ultimate decision-maker on the field of play (Goldberg, et al.; Sobal & Marquart, 1994), however, questions remain as to coaches' knowledge of nutritional ergogenics and therefore the sanctioning of supplements.

While questions remain as to the extent of high school coaches' knowledge of nutritional ergogenics, general nutrition knowledge of high school coaches has been evaluated. Traditionally coaches have lacked the foundation of general nutrition

knowledge on which to base decisions considering nutritional ergogenics. High school coaches in North Carolina answered 70% of nutrition questions correctly but reported a high level of certainty in all of their responses (Corley, et al., 1990). In Texas, the majority of those coaches evaluated scored below 70% and also believed that they were adequately informed about nutrition (Bedgood & Tuck, 1983). Wrestling coaches correctly answered 59% of questions concerning training diets in research by Sossin, Gizis, Marquart, & Sobal (1997). Nearly all coaches surveyed were interested in learning more about nutrition (Sossin, et al., 1997). High school coaches lack the general nutrition knowledge to make decisions concerning the use of nutritional ergogenics.

Coaches may recommend the use of nutritional ergogenics regardless of their level of knowledge regarding the substances (Bedgood & Tuck, 1983). Since the effects of supplement use has the potential to cause health problems, an uneducated recommendation for the use of performance enhancing substances could possibly be considered a negligent act. Considering the potential health hazard and cost involved in the use of nutritional ergogenics, coaches and athletes should possess a foundation of knowledge on which to place their decisions. The combination of lack of knowledge and the potential influence of coaches may lead an athlete into uninformed or misinformed choices regarding the use of nutritional ergogenics. Consequently, the purpose of this study will be to assess high school coaches' knowledge concerning nutritional ergogenics, their attitudes surrounding the recommendation of nutritional ergogenics, and the relationship between these two variables.

The knowledge and attitudes of high school coaches concerning nutritional ergogenics contribute to an athlete's decision of whether or not to use nutritional ergogenics. Currently, there is a lack of research on high school athletic coaches' knowledge of nutritional ergogenics. Research into coaches' knowledge of nutritional ergogenics may provide evidence that education concerning nutritional ergogenics is necessary for such influential individuals in the lives of high school athletes. The purpose of this study will be to determine the relationship between high school coach's knowledge and attitudes regarding nutritional ergogenics.

Purpose Statement

The purposes of the study will be to determine:

- 1) High school coaches' nutritional ergogenics knowledge,
- 2) Frequency of recommendation of nutritional ergogenics.

Limitations

The coaches in the study, their backgrounds, and primary sport emphasis may differ from coaches in other parts of Indiana and the rest of the United States. This situation may have an effect on exposure to nutritional ergogenics, sports, and/or athletes that are believed to benefit from the nutritional ergogenics evaluated in this study. The types of nutritional ergogenics these coaches are familiar with, have used, or are currently using may alter results due to self-education or research. There also exists variability in level of education, college majors, and exposure to education in the field of nutrition within high school coaches. For example, while one coach may have received a basic education in nutrition as part of their educational background other coaches may not have

pursued employment within a career requiring the same knowledge. Limitations exist in self-reporting attitudes, which are subjective in nature and therefore may contribute to variations in reporting.

Delimitations

The proposed study was limited to head high school athletic coaches within Marion County that are currently coaching high school athletics. These coaches will be responsible for a variety of sports including football, volleyball, tennis, gymnastics, swimming, basketball, track, baseball, softball, cross country, golf, wrestling, lacrosse, strength and conditioning, soccer, and cheerleading.

Assumptions

Assumptions for the study include:

- 1) Information from all respondents was honest and complete.
- 2) Coaches surveyed were exposed to limited formal nutrition education.
- 3) Coaches surveyed were familiar with nutritional ergogenics.

Definition of Terms

Athlete. A high school student who is trained and participates in interscholastic competition within central Indiana and Marion county in football, volleyball, tennis, soccer, basketball, wrestling, swimming, softball, baseball, cross country, golf or track and field, softball, soccer, gymnastics, lacrosse, strength and conditioning and cheerleading.

Coach. One who instructs high school athletes in the fundamentals of a competitive sport and directs team strategy.

Nutritional Ergogenics. A product that can be used to address physiological or nutritional issues arising in sport (Burke & Read, 1993) with the intent of improving sport performance. For the purpose of this study, nutritional ergogenics will include protein supplements, creatine, androstenedione, caffeine, and multivitamin/multimineral supplements. These products may provide a convenient or practical means of consuming special nutrient requirements for exercise or they may be used to prevent/reverse nutritional deficiencies that commonly occur among athletes (Burke & Read).

Recommended Daily Allowance (RDA). One of four categories for Dietary Reference Intakes. The RDA is an amount of vitamins, minerals, or food substance that meets the daily nutrient requirements of almost all (97-98%) healthy individuals.

Project Completion

Results will be compiled into a journal article to be submitted to the *Journal of Athletic Training* according to the *Authors' Notes* (see Appendix A)

Summary

The history of athlete's nutritional ergogenics use is long and the range of ingredients is extensive. High school athletes often believe that supplements improve performance, would consider using performance-enhancing supplements, and believe that their coaches approve of supplements. While athletes compete to be the best, they also desire to please their coaches. These factors make coaches highly influential in the lives of athletes. Athletes may consider their coaches as references in nutritional ergogenics. Unfortunately, coaches' knowledge in general nutrition has been explored and reported as average to below average and their education in nutritional ergogenics has yet to be fully

examined. Considering the potential side effects of nutritional ergogenics that are easily accessible, available without a prescription, and purchasable by anyone regardless of age, it is important that the knowledge level and rate of recommendation of nutritional ergogenics by high school coaches be evaluated. Thus, the purpose of this study is to evaluate the knowledge and attitudes of high school coaches regarding nutritional ergogenics and determine if a relationship exists between these two variables. Results will be compiled into a journal article for the *Journal of Athletic Training*.

Chapter 2

REVIEW OF LITERATURE

The purpose of competition is to determine the more capable participant; the primary objective, supremacy; the goal, to win (Williams, 1998). As discussed by Williams, there are two keys to achieving this supreme state: 1) genetic endowment and 2) proper training. The athlete may realize the potential of his or her athletic endowment and have had the experience of working with the best coaches and equipment but still perceive that he or she lacks a competitive advantage over the opponent. In other cases, the competition commences prior to athlete readiness, when the athlete has not spent enough time training and preparing for competition. In these situations, athletes may turn to nutritional ergogenics, particularly if their coach is a proponent of supplement use (Beltz & Doering, 1993; Goldberg, et al., 1996). The purpose of this study is to evaluate the knowledge of high school coaches on the topic of nutritional ergogenics, their attitudes toward nutritional ergogenics and the relationship that exists between these to variables.

This review of literature includes five sections: 1) the history of nutritional ergogenics in sport, 2) the nutritional ergogenics considered for this study, 3) considerations in the use of nutritional ergogenics, 4) other factors in the use of nutritional ergogenics, and 5) lack of nutritional knowledge.

The History of Nutritional Ergogenics in Sport

The history of nutritional ergogenics dates back to the ancient Olympics (Burks, 1981). The ancient Olympiads consumed a variety of substances including powdered

lions' teeth and mushrooms in an attempt to gain a competitive edge over their opponent (Applegate & Grivetti, 1997; Burks, 1981; Williams, 1989). Recently, athletes in the Nineteenth Century have been documented as using a deadly roster of substances to enhance athletic performance including, but not limited to, caffeine, alcohol, nitroglycerine, ethyl ether, strychnine, and opium (Burks, 1981). An important ergogenic issue of the Twentieth Century was the exploitation of anabolic steroids. Many researchers have documented the harmful effects of using steroids to promote muscle and strength gains and improve performance (Engel, 1989; Johnson, Jay, Shoup, & Rickert, 1989; Pope & Katz, 1988) yet many athletes continue to abuse these illegal substances. Athletes are searching for legal and safer means to supplement genetic endowment, extensive training, and the best equipment as information about the harmful effects of some of these substances is revealed (Burks, 1981). Athletes have experimented with almost every nutritional supplement imaginable, from amino acids to zinc in an attempt to gain or retain the advantage over the opposition (Williams, 1998). The athlete's ambition and drive to succeed coupled with the approval of their coaches may increase the use of nutritional ergogenics and in turn increase the incidence of harmful side effects.

Nutritional Ergogenics Considered in this Study

The nutritional ergogenics focused on in this study are limited to five substances that are available to anyone without a prescription, regardless of age or education. These nutritional ergogenics are androstenedione, caffeine, creatine, protein, and multivitamins.

Androstenedione is a precursor in the production of testosterone (Birchard, 1999). Produced in small amounts in the human adrenal gland, gonads, and present in some plant sources, androstenedione is marketed as an alternative to anabolic steroids (Birchard). Enzymes in the liver transform androstenedione into testosterone (Schrof, 1998). Side effects of the use of androstenedione are similar to those of excess doses of testosterone and the use of anabolic steroids (Fox, 1999; Schrof, 1998). These side effects may include acne, fits of rage, baldness, breast enlargement, liver damage, and cancer (Fox; Schrof). Androstenedione is especially threatening to adolescents due to its potential to permanently stunt growth, interrupt puberty, and lead to sterility (Schrof, 1998). The cost of a month's supply of androstenedione is \$50 to \$90 (Schroff). The International Olympic Committee (IOC), the National Football League (NFL), and the National Collegiate Athletic Association (NCAA) ban the use of Androstenedione (Fox, 1999; Schrof, 1998).

Caffeine has been evaluated for its potential ergogenic effect on athletic performance. Athletes may take advantage of the stimulant effect as a psychological energizer or to improve metabolic processes during exercise (Williams, 1989, 1998). Research has indicated that caffeine may improve performance in aerobic events by increasing levels of epinephrine and sparing muscle glycogen (Williams, 1998). The focus of one theory is caffeine increases utilization of free fatty acids as an energy source during exercise to spare muscle glycogen for the later stages of marathons and ultramarathons (Williams, 1998). This glycogen sparing effect has yet to be adequately supported by scientific research (Williams), yet is pervasive in the athletic community.

Caffeine does not appear to have an effect on events lasting less than 20 minutes or during sprinting lasting less than 90 seconds, though research involving short-duration high-speed activities are rare (Burke, 1998). Caffeine is found naturally in foods including the cocoa plant and in beverages such as coffee, tea, pain relievers, and cola (Burke, 1998; Williams, 1998). Possible adverse side effects of caffeine include stomach cramps and diarrhea (Dolby, 1997). Diarrhea can lead to dehydration and metabolic acidosis manifesting in headache, lethargy, decreasing level of consciousness, and compensatory hyperventilation, leading to a decrease in athletic performance (Thomas, 1997). The NCAA and The IOC ban the use of caffeine as a nutritional ergogenic (Williams, 1998). The IOC list caffeine as a “controlled substance” and ban caffeine at a level of 12 $\mu\text{g/mL}$ of urine, equal to drinking approximately five to eight cups of coffee in a short period of time (Burke, 1998; Williams, 1998).

Creatine is a nitrogen containing substance athletes supplement in an attempt to increase power and lean muscle mass (Williams, 1998). Creatine is found in red meat and fish in quantities of approximately 5 g of creatine per kilogram of meat and produced in minute amounts in the liver, kidneys, and pancreas (Burke, 1998; Schrof, 1996; Volek & Kraemer 1996). The body, on average, uses creatine at a rate of 2 g per day (Schrof, 1996). Volek & Kraemer (1996) state that supplementation of 20-30 g of creatine per day for six days can increase plasma and intramuscular levels of creatine as much as 40%. Higher supplemental levels of creatine seem to sustain high ATP turnover rates in working muscles (Burke, 1998). To maintain this dosage schedule, an athlete may spend \$35 to \$60 per month on commercial creatine products (Gola, 1998). Research suggests

that creatine supplementation may be effective and beneficial in repetitive, short-duration, and high intensity activities where there exists only a short recovery before returning to activity (Volek & Kraemer, 1996; Williams, 1998). Because creatine is a diuretic, it can lead to dehydration, and possible side effects including cramping, nausea, diarrhea and soft tissue injury (Schroff, 1996; Silverman, 1997). Research regarding creatine supplementation has been limited to small sample sizes, short duration studies, and poor methodology (Silverman, 1997). Due to lack of scientific research regarding the use of creatine as a nutritional ergogenic, many questions remain about both its efficacy and safety.

Protein supplements have been touted as a method to gain muscle mass, strength, and power (Williams, 1989). Athletes have been led to believe that the right recipe of amino acids and protein will increase lean body mass (Williams). Athletes may also supplement dietary protein in an effort to enhance nitrogen retention (Williams). In addition to claims of muscle growth, protein supplements have been suggested to athletes to prevent protein catabolism during prolonged exercise and support an increase in synthesis of hemoglobin, myoglobin, oxidative enzymes, and mitochondria (Williams). Endurance athletes may benefit from the use of supplemental protein to replace protein used in long distance training and to synthesize new enzymes (Williams). Research suggests that the ingestion of protein supplements has had no effect on strength, power, or muscle hypertrophy (Williams). Other studies have reported increases in lean body mass with supplementation of 1.6-3.5 g of protein per kilogram body weight (Lemon, 1996, 1995). These doses are two to four and a half times the 0.8 g per kilogram body

weight RDA for protein. While some researchers support the notion the adolescent athlete may need more protein than prescribed in the RDA (Lemon, 1995, 1996), Williams (1989), states that these needs can easily be met by natural foods rather than expensive supplements. A month's supply of protein can cost \$12 to \$30 depending on the type of protein supplement purchased and dosage schedule. Side effects of excessive protein supplementation include dehydration, gout, liver and kidney damage, calcium loss, and gastrointestinal distress (Beltz & Doering, 1993). These health risks are serious and involve significant threat to the health of an active adolescent. These serious side effects have the potential to sideline even the strongest athletes.

Vitamins regulate a wide range of physiologic pathways important in physical activity (Williams, 1989). Vitamins are required in very small quantities and, although they are not energy sources, they are required to release energy from food (Thomas, 1997). Other vitamins are coenzymes necessary for the synthesis of DNA, clotting factors, collagen, and hemoglobin. Krowchuk (1989) reported that the majority of high school athletes believe that supplemental vitamins can improve performance, however, as stated by Williams (1989), vitamin supplementation is unnecessary if an adequate amount of calories are consumed from a variety of sources. Excessive intake of vitamins can lead to hypervitaminosis (Thomas, 1997) impairing central nervous system functioning, interfering with absorption of other vitamins and minerals, causing kidney stones, uricosuria, hypercalcemia, nausea, vomiting, weakness, anxiety, altered renal function, and other toxic symptoms (Thomas). Hypervitaminosis is commonly caused by the

ingestion of vitamin pills and supplements (Thomas). Signs and symptoms of hypervitaminosis vary with the type of vitamin overdosed.

Most nutritional ergogenics are necessary nutrients for normal body function when taken in the recommended daily allowances or ingested naturally in food. However, the excess dosage of essential nutrients or intakes of perceived beneficial nutritional ergogenics can cause grave health problems that neither athletes nor coaches may understand or recognize.

Lack of Federal Drug Administration Involvement

Many substances athletes consume in an effort to enhance athletic performance are part of the Recommended Daily Allowance (RDA). The RDA is one of four categories of Dietary Reference Intakes (DRI) established by the Federal Drug Administration (FDA) (World Almanac, 1999). The RDA is a recommended daily intake of vitamins, minerals, and nutrients required to meet the nutritional demands of 97 to 98% of healthy individuals in the general population (World Almanac). However, the FDA does not regulate the supplementation or substantiate the nutritional benefits of the enormous quantities of these substances to enhance athletic performance. The 1994 Dietary Supplement Act (DSHEA) prevents the FDA from regulating any ergogenic aid that maintains food supplement status (Burke, 1998; Fox, 1999). Any nutritional ergogenic based on herbs, foods, food elements, or biological substances produced in the human body is not required to prove its safety, efficacy, or that what is stated on the package is actually in the container (Burke; Fox). Since substances such as protein and multivitamins are considered nutritional supplements, creatine a dietary supplement, and

caffeine a food drug (Williams, 1998), the FDA does not require research regarding their safety or efficacy for human consumption nor are they regulated on the contents of the packaging before they are available for purchase or consumption (Beltz & Doering, 1993; Fox, 1999). These products bypass years of standardized testing and processes that drugs must undergo before marketed (Burke, 1998). In this scenario, supplements are not subject to any standards for production, dosage guidelines are poor or absent, and in many cases potency is not accurately listed on the labels (Burke). These substances can be bought in drug stores, health food stores, and online via Internet resources regardless of age, education, or need. Unfortunately, this Act also means that the FDA maintains the burden of proof for the safety of nutritional ergogenics after the supplement has already been marketed and potentially caused harm rather than forcing the companies themselves to prove the safety and efficacy of their products before they profit from sales (Burke). The implication of accessibility and lack of adequate research investigating these substances is a combination with the potential for serious health problems that may not be identified until athletes have suffered the consequences.

Other Factors in the Use of Nutritional Ergogenics

In addition to poor regulation and quality control, the efficacy of nutritional ergogenics is in question (Beltz, 1993; Burks, 1981; Dolby, 1997; Fox, 1999; Krowchuk, 1989). Consumers are often skeptical about the actual need for supplements until a recommendation from a trusted friend or an individual who is held in high regard (Fox, 1999; Williams, 1998). Therefore, role model use and acknowledgment of nutritional ergogenics is a factor in their use by the general public. Many adults and adolescents

maintain an “if they use it, it must be okay” attitude (Williams, 1998) with reference to high profile athletes.

The media continues to report on the use of nutritional ergogenics among professional and elite athletes regardless of the lack of validity and safety constraints for these products. Numerous athletes acknowledge the use of various substances and sometimes attribute their successes to nutritional ergogenics. Superstar endorsements for nutritional ergogenics are often highly publicized in the media. Mark McGwire, of the St. Louis Cardinals, has been the catalyst in the recent exploitation of the use of androstenedione to build muscle and increase power (Fox, 1999; Birchard, 1999). McGwire also publicly admitted to creatine supplementation and credits to the combination of such nutritional ergogenics as part of his home-run record (Hayden & Springer, 1998; Schrof, 1998). It is McGwire’s public acknowledgement of these substances that influenced little league baseball players to locate and purchase the “wonder supplement” (Schrof, 1998). Dallas Cowboy, Troy Aikman, Baltimore Oriole Brady Anderson, and Denver Bronco Shannon Sharpe are part of a long list of professional athletes using creatine under the assumption that it builds muscle mass, strength, and power (Gola, 1998). Many other professional athletes are publicly acknowledging their beliefs in the potential for performance enhancement with the use of creatine and other nutritional ergogenics including Jose Canseco of the New York Yankees and British gold medal winner sprinter Linford Christie (Gola, 1998; Gower, 1998; Peyser, 1998). World Class sprinter, Michael Johnson also won a gold medal while using creatine and Yankee outfielder Chad Curtis gained fifteen pounds while

using the same supplement (Gola, 1998). This type of media attention may result in increased use of nutritional ergogenics in the adolescent population.

An attitude in sport embraced by the athletic community is “win at all costs” (Goldberg et al., 1996). Athletes are often portrayed as overcoming unthinkable odds to vanquish the opponent. Young athletes have embraced superheroes such as Sammy Sosa of the Chicago Cubs and Derek Bell of the Houston Astros, each of which has admitted to or been suspected of using nutritional ergogenics. High profile athletes have a major influence on the general public and young athletes who dream of being part of the same professional leagues as their idols (Williams, 1998). The harmless portrayal of sport heroes on the playground may mature into examples promoting the use of nutritional ergogenics in high school athletics.

Attitudes and beliefs inherent to young athletes may put them at risk for using nutritional ergogenics (Krowchuk, et al., 1989). High school students may believe they are invulnerable to the adverse effects of potentially harmful behaviors (Goldberg, et al.; 1996). Goldberg, et al., also sites impulsive and hostile behavior as inherent to teenagers as a risk factor for the use of ergogenics. High school students may also be more susceptible to social influences in ergogenic use (Krowchuk, et al., 1989). Many factors are present in the use of nutritional ergogenics by high school athletes.

The positive relationship between performance in sport and self-concept must be acknowledged. Salokun (1994) reports a positive relationship exists between ability in physical activities and sport and the development of positive feelings about oneself. This relationship between sport ability and positive self-image may drive adolescents toward

nutritional ergogenics based on the belief nutritional ergogenics will help them excel on the playing field. Goldberg, et al. (1996) lists “perceived lower personal athletic ability” and “poor body image” as risk factors for using ergogenics. The relationship between athletic success and positive self-image can be a powerful force in the decision-making process concerning nutritional ergogenics in the mind of young adults.

Lack of Nutritional Knowledge Among Coaches and Athletes

Current research suggests there is a lack of nutritional knowledge in the coaching community and that coaches may be unaware of RDA guidelines and nutrition for sport participants (Bedgood & Tuck, 1983; Corley et al., 1990; Sossin et al., 1997). A study of nutritional knowledge in North Carolina reported that the coaches answered correctly 70% of the time and one-third of these coaches indicated a high level of certainty in their responses (Corley et al., 1990). This evidence suggests that coaches evaluated are confident in their knowledge level but actually possess only an average nutritional knowledge. Coaches could be relaying incorrect advice about nutrition and unintentionally misleading athletes. Without a foundation of knowledge in general nutrition it is unreasonable to expect coaches to give their athletes sound advice on nutritional ergogenics.

A questionnaire designed to assess high school coaches' nutritional concept related to sport participation was delivered to coaches in Texas (Bedgood & Tuck, 1983). This questionnaire also collected background information concerning training and nutrition, sources of nutrition information, and frequency of distribution of dietary advice (Bedgood & Tuck). Eighty-five percent of coaches scored below 70% while 73% of

these coaches believed that they were adequately informed about nutrition (Bedgood & Tuck). Eighty-six percent of the coaches surveyed stated they supplied their athletes with nutritional advice on a regular basis (Bedgood & Tuck). This study provides more evidence that high school coaches may not be adequate references for information about general nutrition and therefore nutritional ergogenics yet they remain sources of nutritional information to their athletes.

Sossin, et al. (1997), studied high school wrestling coaches and their knowledge of sport nutrition, weight loss, and vitamin supplements. Fifty-nine percent of coaches' responses were correct concerning training diets and almost all coaches were interested in learning more about nutrition (Sossin, et al.). More experienced coaches were more likely to attend educational seminars and felt more informed about sport nutrition, yet still only a little more than half of the coaches were knowledgeable in this area (Sossin, et al.). In a sport such as wrestling where nutrition, weight-loss, and strength play important parts in success, it is essential that the coach relay correct nutritional and nutritional ergogenic advice to his or her athletes.

The nutritional knowledge base of high school athletes may also be poor (Schmaltz, 1993). Research suggests that high school athletes are unaware of the nutritional needs required to participate in sports (Schmaltz). As a result of the lack of nutritional knowledge, high school athletes harbor misconceptions about nutritional ergogenics such as supplemental protein and vitamins (Schmaltz). A survey of 295 high school athletes identified that the majority believe supplemental protein and multivitamins enhance performance at little or no risk to the individual (Krowchuk et al.,

1989). Although there have been few studies collected on high school athletes and nutritional ergogenics, Krowchuk et al. suggests that high school athletes are not well informed on the topic. The combination of uninformed athletes who are highly influenced by coaches and who have limited nutritional ergogenic knowledge may potentially lead to harmful health effects.

Young adults are generally not prepared to make educated decisions concerning the use of nutritional ergogenics (Krowchuk, et al., 1989). Results of several studies examining the nutritional knowledge of high school athletes (Bedgood & Tuck, 1983; Corley et al., 1990; Schmaltz, 1993; Sossin, et al., 1997) indicate that many adolescents are prescribing to the use of nutritional ergogenics regardless of their knowledge of the substances and nutrition in general. Krowchuk, et al. (1989) described a majority of adolescent subjects surveyed displayed positive views regarding the use of nutritional aids for performance enhancement. Massad, Shier, Koceja, and Ellis (1995) reported that greater subject knowledge about supplements was concurrent with less use; thus, greater knowledge concerning nutritional ergogenics and supplements can be a deterrent to use. This may be the strongest argument that the use of nutritional ergogenics for the purpose of performance enhancement may be a choice made in ignorance.

Summary

The history of nutritional ergogenics is long and continually changing with use of such highly accessible supplements such as androstenedione, caffeine, creatine, protein, and multivitamins. Although some of these products may be found naturally in food, components of the RDA, or readily available to the public, the safety and efficacy of their

use as nutritional ergogenics remains in question. Factors such as celebrity endorsement, a “win at all costs” attitude, and the relationship between sport performance and positive self-image may contribute to adolescent use of nutritional ergogenics. High school athletes may turn to coaches for information on nutritional ergogenics, however, past research has indicated that coaches may not be prepared to deliver accurate information. Thus, the purpose of this study will be to determine the relationship between a high school athletic coach’s knowledge and attitude towards nutritional ergogenics.

Chapter 3

METHODS

The purpose of this survey is to determine the relationship between high school coaches' knowledge of nutritional ergogenics and their attitude concerning nutritional ergogenics. This chapter will be presented in six sections: 1) participants, 2) instrumentation, 3) expert evaluation, 4) pilot study, 5) procedures, and 6) analysis of data.

Participants

All 32 athletic directors in Marion County were asked to participate in the project. These 32 athletic directors were responsible for 547 sports at their respective schools. These 32 athletic directors forwarded an email to their coaching staff requesting they visit a website and complete a nutritional ergogenic survey. This volunteer sample includes both men and women of various ethnic backgrounds and a wide range of ages and years of experience in coaching athletics.

Instrumentation

The purpose of the survey was to assess frequency of nutritional ergogenic recommendation by the coaches surveyed, knowledge of nutritional ergogenics, attitudes concerning use of nutritional ergogenics, and reasons for recommendation of use of nutritional ergogenics. The survey was an original instrument created by the researcher based on a review of literature. The nutrition survey was presented in five sections: 1) demographics, 2) frequency of recommendation of nutritional ergogenics, 3) knowledge of nutritional ergogenics, 4) attitudes concerning nutritional ergogenics, and 5) reasons

for recommendation. The demographics section investigated primary sport responsibility; years experience primary sport, gender, education, retail experience with nutritional ergogenics, and education in nutrition. The frequency of recommendation of nutritional ergogenics section pertained to the number of athletes to whom coaches' recommended/suggested androstenedione, caffeine, creatine, multivitamin/multimineral supplements, and protein supplements. Recommendation and/or suggestion frequency was assessed in multiple-choice responses: 1) I recommended/suggested this to 1-4 athletes, 2) I recommended/suggested this to 5-10 athletes, 3) I recommended/suggested this to 10 or more athletes, and 4) I recommended/suggested this to all of my athletes. The nutritional ergogenic knowledge section of the present survey was based on research into nutritional ergogenics. The Attitudes Concerning Nutritional Ergogenics section was evaluated on a Likert scale including choices such as: 1) strongly agree, 2) agree, 3) disagree, and 4) strongly disagree. The last section included an evaluation of 5 possible reasons for coaches' explanation of or why they would or would not recommend nutritional ergogenics. Possible reasons for recommendation included: 1) Because it is part of the RDA or naturally occurring in food, 2) A friend/I had success with the substance, 3) Professional athletes improved their performance with the substance, 4) It was the last option for an athlete that wasn't getting results, and 5) Competition was approaching and the athlete wasn't quite ready. Possible reasons for not recommending the substances in the study included: 1) Because supplementation does not promote healthy nutrition, 2) A friend/I had no success with the substance, 3) The substance is banned by professional organizations, 4) Fear of legal prosecution, and 5) I feel I don't

know enough about these substances to recommend them. The coaches were asked to circle all reasons that were applicable as to why they would or would not recommend the nutritional ergogenics considered in the study.

Expert Evaluation

A panel of 12 experts was asked to assess content accuracy, formatting, and clarity of the items. A cover letter, evaluation tool, and nutrition survey were given to the panel experts who included four registered nutritionists, four athletic trainers, one exercise physiologist, one nutrition instructor, one orthopedic surgeon, and one nutritional ergogenic retailer (see Appendix B, C, D). These experts had at least three years of experience in their field and have been exposed to at least one college level nutrition course.

Pilot Study

Following the expert evaluation, a pilot study was conducted. This pilot study included high school athletic coaches within Marion County from one high school that holds membership in the Indiana High School Athletic Association (IHSAA). Data was collected and frequencies were assessed to rule out errors in the data collection device and incorrectly entered data.

Procedures

E-mail addresses for high schools and athletic directors competing within Marion County were obtained through the IHSAA website. These e-mail addresses were publicly accessible at the IHSAA website and the main office of the IHSAA. Each athletic director at each high school received a letter via e-mail explaining the

background of the researcher, the intent of the research, and directions for accessing a web address where the nutrition survey was available (see Appendix E, F). The e-mail also included instructions to forward the e-mail to each of their coaches and an e-mail and phone number to which they could direct any questions.

One week after the first e-mail was sent, the researcher sent a second e-mail again requesting their participation in the study (see Appendix G). One week after the second email request, data was collected and no further nutrition surveys were considered for the study.

Analysis of Data

The researcher performed a descriptive analysis of the variables to assess the frequencies of recommendation, nutritional ergogenic knowledge of the coaches, attitude concerning nutritional ergogenics, and reasons why or why not they have suggested or recommended these substances to athletes. The scores for knowledge according to the nutrition survey score were determined for each participant. Attitude for each participant was determined from the nutrition survey and evaluated on Likert Scale. Each respondent had two scores, one for knowledge and one for attitude. Cross tabulations were used to assess coaches' knowledge and frequency of recommendation of each nutritional ergogenic. Data was input and analyzed using Statistical Program for Social Sciences (Version 11.0).

A total of 30 athletic directors who oversaw 513 sports were contacted. Of the 30 athletic directors successfully contacted by email, 11 schools were represented. The range of surveys returned was between one and seven for each school selected. The

number of students per school averaged 1285 and ranged from 64 to 3525. Thirty-six coaches responded to the survey. All 36 questionnaires were included in the study although not all had been completed. Incomplete questions were recorded as such as “did not choose,” or “did not indicate.”

Coaches represented a variety of sports including eight basketball coaches, five soccer coaches, four cross-country coaches, four volleyball coaches and a selection of other sports. The majority of the coaches (n=9) had 10 or more year’s experience. Four coaches had nine to 10 years, five coaches seven to eight years, eight coaches five to six years, six coaches three to four years, and four coaches one to two years experience. The coaches coached boys’ (n=19) and girl’s sports (n=17) at a similar rate. Coaches were primarily male (n=29) to female (n=7). The majority coached only one sport (n=22), 12 coached two sports, and one coached three sports, one did not indicate. The majority of coaches had an education in nutrition. Twenty-one coaches had nutrition courses, 12 had attended nutrition seminars, and four coaches had retail experience with nutritional ergogenics.

Results for the frequency of recommendation were variable (Table 1). No coaches reported recommending androstenedione or caffeine to any athletes. One coach recommended creatine to 10 or more athletes within one year. The majority of coaches (n=21) did not recommend protein supplements to any athletes. Protein was recommended to one to four athletes by seven coaches, three coaches to five to nine athletes, two coaches to 10 or more athletes, and three coaches recommended protein to all of their athletes. Multivitamin supplements were also recommended at a variable rate.

The majority of coaches (n=15) did not recommend vitamins to any athletes. A quarter of coaches (n= 9) recommended vitamins to one to four athletes, four coaches to five to nine athletes, two coaches to 10 or more athletes, and five coaches recommended vitamins to all athletes.

Cross Tabulations were used to evaluate the rate at which coaches recommended protein to boys versus girls. Protein was recommended to girls by six of 17 coaches while nine of 19 recommended protein to boys. The results for recommendation of vitamins differed. Vitamins were recommended to girls by 12 of 17 coaches while eight of 19 recommended vitamins to boys. Coaches' sex and rate of protein and multivitamin recommendation was also examined with cross tabulations. Protein was recommended by 13 of 29 male coaches versus two of seven female coaches. Multivitamins were recommended by 15 of 28 male coaches versus five of seven female coaches. Cross tabulations of coaches who had nutrition courses and coaches who had not and their rate of protein and multivitamin recommendation was also calculated. Protein was recommended by 11 of 21 coaches who had nutrition courses versus four of 15 coaches who had not had nutrition courses. Multivitamins were recommended by 14 of 21 coaches who had nutrition courses versus six of 15 who had not had nutrition courses. Coaches who had nutrition courses scored the same on average on the nutrition survey as coaches who had not had nutrition courses.

When questioned about the ergogenics coaches recommended to their athletes, coaches' scores varied. The RDA for protein was correctly identified by 21 coaches. The side effects of excessive protein intake were correctly identified by 27 coaches.

When questioned about the functions of vitamins, 23 correctly identified vitamins' role in nutrition as releasing energy from food and the effects of excessive vitamin intake. Some coaches may not be aware of the lack of FDA involvement in the regulation of nutritional ergogenics. Almost half (n=17) of coaches were not aware the FDA does not regulate, test, or set production standards for nutritional ergogenics (Table 2). The average knowledge score for coaches completing the nutrition survey was eight of a possible 13. The high score was 13 (n=1) and low of three (n=1).

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APPENDIX A
AUTHORS' NOTES

(Revised January 2004)

The mission of the *Journal of Athletic Training* is to enhance communication among professionals interested in the quality of health care for the physically active through education and research in prevention, evaluation, management, and rehabilitation of injuries.

SUBMISSION POLICIES

1. Online submission is preferred: www.jatnsubmit.net
2. Submit 6 copies of the entire manuscript (including tables and figures) to *Journal of Athletic Training* Submissions, Hughston Sports Medicine Foundation, Inc, 6262 Veterans Parkway, PO Box 9517, Columbus, GA 31908-9517. A table is an editable item that needs to be typeset. The term "figure" refers to items that are not editable, either halftones (photographs) or line art (charts, graphs, tracings, schematic drawings), or combinations of the two.
3. All manuscripts must be accompanied by a letter signed by each author and must contain the following statements: "This manuscript 1) contains original unpublished material that has been submitted solely to the *Journal of Athletic Training*; 2) is not under simultaneous review by any other publication; and 3) will not be submitted elsewhere until a decision has been made concerning its suitability for publication by the *Journal of Athletic Training*. In consideration of the NATAs taking action in reviewing and editing my submission, I the undersigned author hereby transfer, assign, or otherwise convey all copyright ownership to the NATA, in the event that such work is published by the NATA. Further, I verify that I have contributed substantially to this manuscript as outlined in item #3 of the current Authors' Guide." By signing the letter, the authors agree to comply with all statements. Manuscripts that are not accompanied by such a letter will not be reviewed. Accepted manuscripts become the property of the NATA. Authors agree to accept any minor corrections of the manuscript made by the editors.
4. The *Journal of Athletic Training* conforms to the International Committee of medical Journal Editors' Uniform Requirements for manuscripts Submitted to Biomedical Journals. Each author must be specifically identified in the published manuscript, in accordance with the Uniform Requirements for Manuscripts Submitted to Biomedical Journals: "Authorship credit should be based only on 1) substantial contributions to conception and design, or acquisition of data, or analysis and interpretation of data; 2) drafting the article or revising it critically for important intellectual content; and 3) final approval of the version to be published. Conditions 1, 2, and 3 must all be met. Acquisition of funding, the collection of data, or general supervision of the research group, by themselves, do not constitute authorship." For additional information, please visit the "Uniform Requirements" website: <http://www.icmje.org/index.html>
The authorship form, which is available at www.journalofathletictraining.org, should be completed and submitted with each new manuscript. Contribution categories include conception and design; acquisition of data; analysis and interpretation of the data; drafting of the article; critical revision of the article for important intellectual content; final approval of the article; provision of study materials or patients; statistical expertise; obtaining of funding; administrative, technical, or logistic support; and collection & assembly of data. (Categories borrowed with the permission of

the *Annals of Internal Medicine*.) Contributors to the manuscript who do not qualify for authorship should be thanked in the Acknowledgments section.

5. Financial support or provision of supplies used in the study must be acknowledged. Grant or contract numbers should be included whenever possible. The complete name of the funding institution or agency should be given, along with the city and state in which it is located. If individual authors were the recipients of funds, their names should be listed parenthetically.
6. Authors must specify whether they have any commercial or proprietary interest in any device, equipment, instrument, or drug that is the subject of the article in question. Authors must also reveal if they have any financial interest (as a consultant, reviewer, or evaluator) in a drug or device described in the article.
7. For experimental investigations of human or animal subjects, state in the "Methods" section of the manuscript that an appropriate institutional review board approved the project. For those investigators who do not have formal ethics review committees (institutional or regional), the principles outlined in the Declaration of Helsinki should be followed (41st World Medical Assembly. Declaration of Helsinki: recommendations guiding physicians in biomedical research involving human subjects. *Bull Pan Am Health Organ*. 1990;24:606-609). For investigations of human subjects, state in the "Methods" section the manner in which informed consent was obtained from the subjects. (Reprinted with permission of *JAMA* 1997;278:68, copyright 1997, American Medical Association.) If informed consent was not required because the study was exempt, provide the reason for the exemption.
8. Signed releases are required to verify permission for the *Journal of Athletic Training* to 1) reproduce materials taken from other sources, including text, figures, or tables; 2) reproduce photographs of individuals; and 3) publish a Case Report. A Case Report cannot be reviewed without a release signed by the individual being discussed in the Case Report. Release forms can be obtained from the Editorial Office and from the JAT web page, or authors may use their own forms.
9. The *Journal of Athletic Training* uses a double-blind review process. Authors should not be identified in any way except on the title page.
10. Manuscripts are edited to improve the effectiveness of communication between author and readers and to aid the author in presenting a work that is compatible with the style policies found in the *AMA Manual of Style*, 9th ed. (Williams & Wilkins), 1998. Page proofs are sent to the author for proofreading when the article is typeset for publication. It is important that they be returned within 48 hours. Important changes are permitted, but authors will be charged for excessive alterations.
11. Published manuscripts and accompanying work cannot be returned. Unused manuscripts will be returned if submitted with a stamped, self-addressed envelope.

STYLE POLICIES

12. Each page must be printed on 1 side of 8½-by-11-inch paper, double spaced, with 1-inch margins in a font no smaller than 10 points. Each page should include line counts to facilitate the review process. Do not right justify pages.
13. Manuscripts should contain the following, organized in the order listed below, with each section beginning on a separate page:
 - a. Title page
 - b. Acknowledgments

- c. Abstract and Key Words (first numbered page)
 - d. Text (body of manuscript)
 - e. References
 - f. Tables (each on a separate page)
 - g. Legends to figures
 - h. Figures
14. Begin numbering the pages of your manuscript with the abstract page as #1; then, consecutively number all successive pages.
 15. Units of measurement shall be recorded as SI units, as specified in the *AMA Manual of Style*, except for angular displacement, which should be measured in degrees rather than radians. Examples include mass in kilograms (kg), height in centimeters (cm), velocity in meters per second ($m \cdot s^{-1}$ or m/s), angular velocity in degrees per second ($^{\circ} \cdot s^{-1}$), force in Newtons (N), and complex rates (mL/kg per minute).
 16. Titles should be brief within descriptive limits (a 16-word maximum is recommended). If a disability is the relevant factor in an article, the name of the disability should be included in the title. If a technique is the principal reason for the report, it should be in the title. Often both should appear.
 17. The title page should also include the name, title, and affiliation of each author, and the name, address, phone number, fax number, and e-mail address of the author to whom correspondence is to be directed. No more than 4 credentials should be listed for each author. The "ATC" credential is under the copyright protection of the National Athletic Trainers' Association Board of Certification. Therefore, the proper listing of an additional state credential is "ATC, LAT" or "ATR, LAT".
 18. A structured abstract of no more than 250 words must accompany all manuscripts. Type the complete title (but not the authors' names) at the top, skip 2 lines, and begin the abstract. Items that are needed differ by type of article. Original Research articles: Context, Objective, Design, Setting, Patients or Other Participants, Intervention(s), Main Outcome Measure(s), Results, Conclusions, and Key Words. Literature Reviews: Objective, Data Sources, Study Selection, Data Extraction, Data Synthesis, Conclusions, and Key Words. Case Reports: Objective, Background, Differential Diagnosis, Treatment, Uniqueness, Conclusions, and Key Words. Clinical Techniques: Objective, Background, Description, Clinical Advantages, and Key Words. For the Key Words entry, use 3 to 5 words that do not appear in the title. Evidence-based Practice: Reference/Citation, Clinical Question, Data Sources, Study Selection, Data Extraction, Main Results, Conclusions, and Commentary.
 19. Begin the text of the manuscript with an introductory paragraph or two in which the purpose or hypothesis of the article is clearly stated and developed. Tell why the study needed to be done or the article written and end with a statement of the problem (or controversy). Highlights of the most prominent works of others as related to your subject are often appropriate for the introduction, but a detailed review of the literature should be reserved for the discussion section. In a 1- to 2-paragraph review of the literature, identify and develop the magnitude and significance of the controversy, pointing out differences among others' results, conclusions, and/or opinions. The introduction is not the place for great detail; state the facts in brief, specific statements and reference them. The detail belongs in the discussion. Also, an overview of the manuscript is part of the abstract, not the introduction. Writing should be in the active voice (for ex-

A

Authors' Guide

ample, instead of "Subjects were selected," use "We selected subjects") and in the first person (for example, instead of "The results of this study showed," use "Our results showed").

20. The body or main part of the manuscript varies according to the type of article (examples follow); however, the body should include a discussion section in which the importance of the material presented is discussed and related to other pertinent literature. When appropriate, a discussion subheading on the clinical relevance of the findings is recommended. Liberal use of headings and subheadings, charts, graphs, and figures is recommended.
 - a. The body of an Original Research article consists of a methods section, a presentation of the results, and a discussion of the results. The methods section should contain sufficient detail concerning the methods, procedures, and apparatus employed so that others can reproduce the results. The results should be summarized using descriptive and inferential statistics and a few well-planned and carefully constructed illustrations.
 - b. The body of a Literature Review article should be organized into subsections in which related thoughts of others are presented, summarized, and referenced. Each subsection should have a heading and brief summary, possibly one sentence. Sections must be arranged so that they progressively focus on the problem or question posed in the introduction.
 - c. The body of a Case Report should include the following components: personal data (age, sex, race, marital status, and occupation when relevant—not name), chief complaint, history of present complaint (including symptoms), results of physical examination (example: "Physical findings relevant to the rehabilitation program were..."), medical history (surgery, laboratory results, examination, etc), diagnosis, treatment and clinical course (rehabilitation until and after return to competition), criteria for return to competition, and deviation from expectations (what makes this case unique).
 - d. The body of a Clinical Techniques article should include both the *how* and *why* of the technique: a step-by-step explanation of how to perform the technique, supplemented by photographs or illustrations, and an explanation of why the technique should be used. The discussion concerning the *why* of the technique should review similar techniques, point out how the new technique differs, and explain the advantages and disadvantages of the technique in comparison with other techniques.
 - e. The purpose of the Evidence-Based Practice section is to provide a short review of current scientific literature and to apply the findings to clinical athletic training practice. All articles submitted for this section should be concise reviews of published systematic reviews or meta-analyses on topics relevant to the 7 domains of athletic training (Prevention, Assessment/Evaluation, First Aid/Treatment, Rehabilitation, Organization/Administration, Counseling, and Education). Reviews of individual, large, controlled clinical trials will also be considered. The review must begin with the complete article title and reference and a statement of the clinical question the review addresses. The rest of the review consists of a summary of the article and must include the following sections: data sources and search terms used; study selection (in-

clusion and exclusion) criteria; the methods used to extract and review data, including a list of the primary outcome measures; results of the search strategy; and primary outcome measures and conclusions. A separate commentary section should address the application of the information to the clinical athletic training setting. Authors may use supplementary scientific literature (up to a maximum of 5 references) to support the commentary.

21. Percentages should be accompanied by the numbers used to calculate them. When reporting nonsignificant results, a power analysis should be provided.
22. Communications articles, including official Position Statements and Policy Statements from the NATA Pronouncements Committee; technical notes on such topics as research design and statistics; and articles on other professional issues of interest to the readership are solicited by the *Journal*. An author who has a suggestion for such a paper is advised to contact the Editorial Office for instructions.
23. The manuscript should not have a separate summary section—the abstract serves as a summary. It is appropriate, however, to tie the article together with a summary paragraph or list of conclusions at the end of the discussion section.
24. References should be numbered consecutively, using superscripted arabic numerals, in the order in which they are cited in the text. No more than 30 references should be cited in Original Research manuscripts. Literature Reviews are limited to 50 references. References should be used liberally. It is unethical to present others' ideas as your own. Also, use references so that readers who desire further information on the topic can benefit from your scholarship.
25. References to articles or books, published or accepted for publication, or to papers presented at professional meetings are listed in numerical order at the end of the manuscript. Journal title abbreviations conform to *Index Medicus* style. Examples of references are illustrated below. See the *AMA Manual of Style* for other examples.

Journals:

1. van Dyke JR III, Von Trapp JT Jr, Smith BC Sr. Arthroscopic management of post-operative arthrofibrosis of the knee joint: indication, technique, and results. *J Bone Joint Surg Br*. 1995;19:517-525.
2. Council on Scientific Affairs. Scientific issues in drug testing. *JAMA*. 1987;257:3110-3114.

Books:

1. Fischer DH, Jones RT. *Growing Old in America*. New York, NY: Oxford University Press Inc; 1977:210-216.
2. Spencer FL, Brown QC. Immunology of influenza. In: Kilbourne ED, Gray JB, eds. *The Influenza Viruses and Influenza*. 3rd ed. Orlando, FL: Academic Press Inc; 1975:373-393.

Presentations:

1. Stone JA. Swiss ball rehabilitation exercises. Presented at: 47th Annual Meeting and Clinical Symposia of the National Athletic Trainers' Association; June 12, 1996; Orlando, FL.

Videos:

1. *Spine Injury Management* [videotape]. Champaign, IL: Human Kinetics; 2001.

Software:

1. *SPSS Base for Windows* [computer program]. Version 11.0. Chicago, IL: SPSS Inc; 2001.

Internet Sources:

1. Knight KL, Ingersoll CD. Structure of

a scholarly manuscript: 66 tips for what goes where. Available at <http://www.journalofathletictraining.org/jat/66tips.html>. Accessed January 1, 1999.

2. National Athletic Trainers' Association. NATA blood borne pathogens guidelines for athletic trainers. Available at <http://www.journalofathletictraining.org>. Accessed January 1, 1999.
26. Personal communications are cited in the text as follows: "... (J.A. Smith, written communication, January 2003)." The written or oral nature of the communication is stated, and the communication does not appear in the reference list. Authors must provide written permission from each personal-communication source. A form is available on the JAT Web site (www.journalofathletictraining.org) and from the Editorial Office.
27. Table Style: 1) Title is bold; body and column headings are roman type; 2) units are set above rules in parentheses; 3) numbers are aligned in columns by decimal; 4) footnotes are indicated by symbols (order of symbols: *, †, ‡, §, ¶, ¶); 5) capitalize the first letter of each major word in titles; for each column or row entry, capitalize the first word only. See a current issue of the *Journal* for examples.
28. Figures may be submitted as electronic figures or as hard copies only. Figures submitted electronically should conform to the requirements as described on the JAT Web site (www.journalofathletictraining.org). However, 6 paper copies of each figure must also be provided with the initial submission. Figures submitted as hard copy must be in camera-ready form. Line art should be of good quality; should be clearly presented on white paper with black ink, sans serif typeface, and no box; and should be printed on a laser printer—no dot matrix. Figures that require reduction for publication must remain readable at their final size (either 1 column or 2 columns wide). Photographs should be glossy black and white prints. Do not use paper clips, write on photographs, or attach photographs to sheets of paper. On the reverse of each figure attach a write-on label with the figure number, name of the author, and an arrow indicating the tip. (Note: Prepare the label before affixing it to the figure).
29. Authors must request color reproduction in a cover letter with the submitted manuscript. Authors will be notified of the additional cost of color reproduction and must confirm acceptance of the charges in writing.
30. Legends to figures are numbered with arabic numerals in order of appearance in the text. Legends should be printed on separate pages at the end of the manuscript.
31. The *Journal of Athletic Training* follows the redundant publication guidelines of the Council of Science Editors, Inc (CBE Views. 1996; 19:76-77; also available on the JAT web site at www.journalofathletictraining.org). Authors found in violation of redundant publication will have sanctions invoked by the Journal Committee of the National Athletic Trainers' Association, Inc.

PUBLICATION POLICIES

32. Original Research manuscripts will be categorized under the following table of contents subheadings: clinical studies, basic science, educational studies, epidemiologic studies, and observational/informational studies.
33. Only Case Reports and Clinical Techniques that define and establish the optimal standard of care or the practice of athletic training will be considered for publication in JAT. All other Case Reports and Clinical Techniques will be considered for publication in the *NATA News*.
34. Media Reviews will appear in the *NATA News*.

APPENDIX B
EXPERT EVALUATION COVER LETTER

Gretchen L. Carnes
6110 Rosslyn Ave
Indianapolis, IN. 46220
(317) 258-9277

Date

Dear _____,

I am writing my graduate thesis on high school coaches and their knowledge and attitudes concerning nutritional ergogenics at San Jose State University for my Masters in Athletic Training. I was hoping to gain your insight in the creating the final draft of my survey.

I have (finally) come to the point at which I need expert evaluation of my survey and would be very grateful for your input. Please look over the next few pages with a critical eye. The last page provided is a simple evaluation tool, but please do not feel bound to this one sheet of paper. Feel free to write on each page of the survey as you see fit.

I would also appreciate your return of your evaluation within the next two weeks. I hope to propose my thesis to my committee at the end of the month. Your prompt response will ensure that I make the best proposal possible.

Again, thank you so much for your help!

Gretchen L. Carnes, ATC

APPENDIX C

EXPERT EVALUATION TOOL

Nutritional Ergogenics Expert Evaluation

Demographic Information:

1. Job Title: _____
2. Nutrition and/or Nutritional Ergogenic Education:

High School Coaches and Nutritional Ergogenics Survey:

1. Terms are clearly defined: Yes___ No___
2. Language is clear and concise: Yes___ No___
3. Information is accurate: Yes___ No___
4. Information is easy to understand: Yes___ No___
5. Information is in a logical order: Yes___ No___
6. Nutritional Ergogenic information is appropriate for survey:
Yes___ No___
7. Information is relevant for a high school athletic setting, i.e., ergogenics easily accessible to high school students
Yes___ No___

Comments / Suggestions:

APPENDIX D
NUTRITION SURVEY

NUTRITION SURVEY

SECTION I. DEMOGRAPHICS

1. Please list the sport you will refer to in answering the questions in this study. *note: If you coached more than one sport, answer these questions with reference to the team with which you had the most responsibility or time commitment. Otherwise, choose one sport and answer each question with reference to that sport alone throughout the survey.
-
1. Year in coaching your primary sport:
1) Less than 2 years	2) 3-4 years
3) 4-6 years	4) 6 years or more
3. What is your gender?
1) Female	2) Male
4. How many sports do you coach?
1) One sport	2) Two sports
3) Three sports	4) Four sports
5. Have you ever taken any nutrition courses?
1) Yes	2) No
6. Have you attended extra-curricular nutrition seminars or courses?
1) Yes	2) No
7. Do you have retail experience with nutritional ergogenics of any kind?
1) Yes	2) No

SECTION II. NUTRITIONAL ERGOGENICS

For questions 8-12, please indicate how often you recommended or suggested any of the following supplements to your high school athletes, during the past year, using the following code:

- 1) I never recommended/suggested this during the past year.
- 2) I recommended/suggested this to 1-4 athletes during the past year.
- 3) I recommended/ suggested this to 5-10 athletes during the past year.
- 4) I recommended/suggested this to 10 or more athletes during the past year.
- 5) I recommended/ suggested this to all of my athletes last year.

8. Protein Supplements (Powder, Liquid, or Bars):	1	2	3	4	5
9. Multivitamin with minerals (One-A-Day, Centrum type supplements)	1	2	3	4	5
10. Androstenedione (Androstene, Andro):	1	2	3	4	5
11. Caffeine Pills (NoDoz, etc.) or High Caffeine Content drinks (Red Bull, Energy etc.)	1	2	3	4	5
12. Creatine (Powder, pills, or drinks)	1	2	3	4	5

SECTION III. NUTRITIONAL ERGOGENIC KNOWLEDGE
FOR QUESTIONS 13 - 26, PLEASE CHOOSE ONE ANSWER.

13. Androstenedione (Andro, Androstene, etc.,) is
- 1) an anabolic steroid
 - 2) a precursor to testosterone
 - 3) not produced naturally by the body
 - 4) all of the above
14. Androstenedione is banned by the
- 1) International Olympic Committee (IOC)
 - 2) National Football League (NFL)
 - 3) National Collegiate Athletic Association (NCAA)
 - 4) all of the above
15. Androstenedione may
- 1) stunt normal growth in adolescents
 - 2) have negative health consequences only for senior citizens
 - 3) not be effective for females
 - 4) be effective for females only
16. Caffeine is banned by the IOC at a level equal to
- 1) 2-3 cups of coffee in a short time
 - 2) 4-5 cups of coffee in a short time
 - 3) 6-7 cups of coffee in a short time
 - 4) 8-9 cups of coffee in a short time
17. Some theories say that caffeine may be used by athletes
- 1) to spare muscle glycogen
 - 2) to increase speed in sprints
 - 3) to increase red blood cell count
 - 4) to speed recovery
18. Creatine is found in
- 1) red meat
 - 2) fish
 - 3) vegetables
 - 4) red meat and fish
19. The normal daily intake of creatine is
- 1) 2 grams
 - 2) 20 grams
 - 3) 200 grams
 - 4) 20 milligrams
20. There is evidence that suggests creatine may be
- 1) analgesic
 - 2) anti-inflammatory
 - 3) diuretic
 - 4) antihistamine

21. Creatine may have side effects including
- 1) cramping
 - 2) soft tissue injury
 - 3) nausea
 - 4) all of the above
22. The Recommended Daily Allowance for protein is
- 1) .08 g/Kg body weight
 - 2) .8 g/Kg body weight
 - 3) 8.0 g/Kg body weight
 - 4) 80.0 g/Kg body weight
23. Side effects of excessive protein intake may include
- 1) upset stomach
 - 2) calcium loss
 - 3) dehydration
 - 4) all of the above
24. Vitamins
- 1) are direct sources of energy
 - 2) are required in large doses
 - 3) release energy from food
 - 4) all of the above
25. Excessive intake of vitamin supplements may
- 1) increase hunger
 - 2) improve athletic performance
 - 3) cause headaches
 - 4) cause kidney stones
26. The Federal Drug Administration (FDA)
- 1) tests nutritional supplements like drugs
 - 2) sets standards for the production of nutritional supplements
 - 3) periodically tests samples of nutritional supplements
 - 4) all of the above
 - 5) none of the above

SECTION IV. ATTITUDES CONCERNING NUTRITIONAL ERGOGENICS

27. If you recommended any of the supplements mentioned in questions 8-12 (protein, multivitamins, androstenedione, caffeine, and/or creatine), please mark reason(s). Please mark all that apply:
- 1) Because it is part of the Recommended Daily Allowance or naturally occurring in food.
 - 2) A friend/ I had success with the substance.
 - 3) Professional athletes improved their performance with it.
 - 4) It was a last option for an athlete who was not getting results.
 - 5) Competition was approaching and the athlete was not quite ready.
28. If you did not recommend any of the supplements mentioned in questions 8-12 (protein, multivitamins, androstenedione, caffeine, and/or creatine), please mark reason(s). Please mark all that apply:
- 1) Because supplementation does not promote healthy nutrition.
 - 2) A friend/ I had no success with the substance.
 - 3) The substances are banned by athletic organizations.
 - 4) Fear of legal prosecution.
 - 5) I don't feel I know enough about these substances to recommend them.

APPENDIX E
EMAIL LETTER

Marion County Athletic Director:

Hello!

I hope your winter sports season is on the way to a great finale!

I am conducting research into high school coaches' knowledge and attitudes concerning nutritional ergogenics. Not only will this research allow me to obtain my Master's Degree, it will also provide a foundation on which to build educational workshops and seminars for high school coaches on ergogenics such as androstenedione, caffeine, creatine, protein, multivitamins, and more.

Please forward this email on to your entire coaching staff

Please take 2 minutes to fill out a questionnaire at

www.coachessurvey.com

I assure you, the survey is QUICK and PAINLESS and completely CONFIDENTIAL. I will not ask your coaches for any of their personal information or addresses, only for 2-3 minutes of their time. This is purely for graduate research and not advertisement or monetary gain. As an athletic trainer, I know that you and your coaches do not have much free time!

Your time and your help is greatly appreciated.

Thanks again,

Gretchen Carnes, ATC
St. Vincent Sports Medicine
San Jose State University

APPENDIX F
WWW.COACHESSURVEY.COM

Coaches Survey.com

THANKS FOR YOUR TIME

Dear Coach:

An athlete aspires to be the best in their chosen realm of competition. With such high aspirations, athletes may attempt to achieve this goal through the use of use of nutritional ergogenics and supplements.

As a graduate student of Athletic Training at San Jose State University, I am conducting a study of the knowledge and attitudes of high school coaches concerning nutritional ergogenics. The results of this study will provide a theoretical base for establishing workshops and other sources of information for high school coaches about common nutritional ergogenics such as creatine, androstenedione, protein supplements, multivitamins, and caffeine. Please spend a few minutes to complete the following questionnaire. ***I know that your time is precious and your contribution is greatly appreciated.***

Your participation in this study is voluntary. Choosing not to participate in this study will not affect your relationship with San Jose State University (or other participating institutions). There are no foreseeable risks associated with participating in this study. Benefits include the possibility for the coaching community to have access to educational seminars about nutritional ergogenics. There v be no directly received compensation associated with completion of the study. No service of any kind, to which you would otherwise be entitled, will be lost or jeopardized should you choose not to participate.

Return of the survey indicates your voluntary consent and participation in the study. Your response and individual results will remain confidential and anonymous. You may fill out the survey below or [Click here to download the survey in .pdf format to print out and mail.](#)

If you have any questions about this study, please contact me at (317) 258-9277. If you have any questions or complaints about research subjects' rights, please contact Greg Payne, P.E.D (408) 924-3028 or Pam Stacks, Interim Associate Vice President for Graduate Studies and Research at (408) 924-2480.

Thank you for your time,

Gretchen L. Carnes, ATC

Consent

1. I have been asked by Gretchen Carnes, graduate student at San Jose

State University, to participate in a research study among high school coaches.

2. I have been asked to accurately and completely respond to the attached questionnaire concerning my knowledge and attitudes concerning nutritional ergogenics.

3. I have been told that there are no foreseeable risks or discomforts to me associated with participating in this study.

4. Benefits associated with this study include the possibility for the coaching community to have access to educational seminars about nutritional ergogenics.

5. The results of this study may be published; however, no information that could identify any individual subject will be included.

6. There will be no directly received compensation associated with completion of this study.

7. Questions concerning this research may be directed to Gretchen Carnes at (317) 258-9277. Complaints about the research may be presented to Greg Payne, P.E.D (408) 924-3028 . Questions or complaints about research, subjects' rights, or research-related injury may be presented to Pam Stacks, Interim Associate Vice President for Graduate Studies and Research at (408) 924-2480.

8. No service of any kind, to which I would otherwise be entitled, will be lost or jeopardized if I choose to "not participate" in the study.

9. I understand that consent is given voluntarily. I realize that I may refuse to participate in the study or any part of the study. If, however, I do decide to participate in the study, I understand I am free to withdraw at any time without prejudice to my relations with San Jose State University or any other participating institution.

10. If so desired, I could print a copy of this consent form. [Click here to download the survey in .pdf format to print out and mail.](#)

- A subject proceeding past this page and returning the survey to the researcher indicates agreement to participate in the study.

- Should a subject chose to proceed beyond this page, the researcher agrees to include the subject in the research and it is assumed by the researcher that the subject has been fully informed of his or her rights.

Nutrition Survey

SECTION I. DEMOGRAPHICS

Please list the sport you will refer to in answering the questions in this study. *Note: If you coached more than one sport, answer these questions with reference to the team with which you had the most responsibility or time commitment. Otherwise, choose one sport and answer each question with reference to that sport alone throughout the survey.

1. Number portion of your school's street address:	<input type="text"/>
2. Primary Sport Responsibility:	<input type="text"/>
3. Gender of athletes:	☐ Girls ☐ Boys
4. Years in coaching your primary sport:	<input type="text"/>
5. What is your gender?	<input type="text"/>
6. How many sports do you coach?	<input type="text"/>
7. Have you ever taken any nutrition courses?	☐ Yes ☐ No
8. Have you attended extra-curricular nutrition seminars or courses?	☐ Yes ☐ No
9. Do you have retail experience with nutritional ergogenics of any kind?	☐ Yes ☐ No

SECTION II. NUTRITIONAL ERGOGENICS

For questions 8-12, please indicate how often you recommended or suggested any of the following supplements to your high school athletes, during the past year, using the following code

- 1) I never recommended/suggested this during the past year.
- 2) I recommended/suggested this to 1-4 athletes during the past year.
- 3) I recommended/ suggested this to 5-10 athletes during the past year.
- 4) I recommended/suggested this to 10 or more athletes during the past year.
- 5) I recommended/ suggested this to all of my athletes last year.

8. Protein Supplements (Powder, Liquid, or Bars):	<input type="text" value="Pick One"/>
9. Multivitamin with minerals (One-A-Day, Centrum type supplements)	<input type="text" value="Pick One"/>
10. Androstenedione (Androstene, Andro):	<input type="text" value="Pick One"/>
11. Caffeine Pills (NoDoz, etc.) or High Caffeine Content drinks (Red Bull, Energy etc.)	<input type="text" value="Pick One"/>
12. Creatine (Powder, pills, or drinks)	<input type="text" value="Pick One"/>

SECTION III. NUTRITIONAL ERGOGENIC KNOWLEDGE

For questions 13-27, please choose one answer

13. Androstenedione (Andro, Androstene,	<input type="text" value="Pick One"/>
---	---------------------------------------

etc.) is	
14. Androstenedione is banned by the	Pick One
15. Androstenedione may	Pick One
16. Caffeine is banned by the IOC at a level equal to	Pick One
17. Some theories say that caffeine may be used by athletes	Pick One
18. Creatine is found in	Pick One
19. The body uses creatine at an average of ___ per day.	Pick One
20. There is evidence that suggests creatine may be	Pick One
21. Creatine may have side effects including	Pick One
22. The Recommended Daily Allowance for protein is	Pick One
23. Side effects of excessive protein intake may include	Pick One
25. Vitamins	Pick One
26. Excessive intake of vitamin supplements may	Pick One
27. The Federal Drug Administration (FDA)	Pick One
SECTION IV. ATTITUDES CONCERNING NUTRITIONAL ERGOGENICS	
For questions 28-32, please pick only one response	
28. I think people who use supplements and ergogenics are cheaters	Pick One
29. I think using supplements and ergogenics is just as bad as using steroids	Pick One
30. I think supplements and ergogenics should be banned in high schools	Pick One
31. I think supplements and ergogenics are o.k. if used by adults	Pick One
32. I think supplements and ergogenics are o.k. if the athlete has tried everything else	Pick One
SECTION V. REASONS FOR RECOMMENDING / NOT RECOMMENDING	
33. If you recommended any of the	☐ Because it is part of the Recommended Daily Allowance or naturally occurring in food. ☐ A friend/ I had success with the

<p>supplements mentioned in questions 8-12 (protein, multivitamins, androstenedione, caffeine, and/or creatine), please mark reason(s). Please mark all that apply:</p>	<p>substance.</p> <p>☐ Professional athletes improved their performance with it.</p> <p>☐ It was a last option for an athlete who was not getting results.</p> <p>☐ Competition was approaching and the athlete was not quite ready.</p>
<p>34. If you did not recommend any of the supplements mentioned in questions 8-12 (protein, multivitamins, androstenedione, caffeine, and/or creatine), please mark reason(s). Please mark all that apply:</p>	<p>☐ Because supplementation does not promote healthy nutrition.</p> <p>☐ A friend/ I had no success with the substance.</p> <p>☐ The substances are banned by athletic organizations.</p> <p>☐ Fear of legal prosecution.</p> <p>☐ I don't feel I know enough about these substances to recommend them.</p>
<p><input type="button" value="Submit"/> <input type="button" value="Reset"/></p>	

APPENDIX G
SECOND EMAIL LETTER

Hello!

I want to thank you all for taking the time to hear my story and forward my request on to your coaching staff. I have gotten responses from four of your schools. Your help is appreciated.

I am asking just one more time that you forward this on to your coaches. I have received very few responses, less than 20, in fact. Your 32 schools support 547 sports. I was hoping to receive a few more questionnaires.

Please ask your coaches to visit;

www.coachessurvey.com

Take 2 minutes to complete a nutritional ergogenics questionnaire. I assure you it is **CONFIDENTIAL, QUICK, and COMPLETELY PAINLESS!** As an athletic trainer, I know that your time is in great demand. Your help is greatly appreciated!

Not only with this research allow me to obtain my Master's Degree, it will also provide a foundation on which to build educational workshops and seminars for high school coaches on ergogenics such as androstenedione, caffeine, creatine, protein, and multivitamins, and more.

Thanks so much,

Gretchen Carnes, ATC
St Vincent Sports Medicine
San Jose State University

Please feel free to contact me with any questions (317) 258-9277

APPENDIX H
HUMAN SUBJECTS IRB APPROVAL LETTER

San José State
UNIVERSITY

**Office of the Academic
Vice President**
Academic Vice President
Graduate Studies and Research

One Washington Square
San Jose, CA 95192-0025
Voice: 408-253-7500
Fax: 408-924-2477
E-mail: gradstudies@sjsu.edu
<http://www.sjsu.edu>

To: Gretchen Carnes
6110 Rosslyn Avenue
Indianapolis, IN 46220

From: Pam Stacks,
Interim AVP, Graduate Studies & Research

Date: October 6, 2004

The Human Subjects-Institutional Review Board has approved your request to use human subjects in the study entitled:

**"Knowledge and Attitudes of High School Coaches Concerning
Nutritional Ergogenics.."**

This approval is contingent upon the subjects participating in your research project being appropriately protected from risk. This includes the protection of the anonymity of the subjects' identity when they participate in your research project, and with regard to all data that may be collected from the subjects. The approval includes continued monitoring of your research by the Board to assure that the subjects are being adequately and properly protected from such risks. If at any time a subject becomes injured or complains of injury, you must notify Pam Stacks, Ph.D. immediately. Injury includes but is not limited to bodily harm, psychological trauma, and release of potentially damaging personal information. This approval for the human subjects portion of your project is in effect for one year, and data collection beyond October 6, 2005 requires an extension request.

Please also be advised that all subjects need to be fully informed and aware that their participation in your research project is voluntary, and that he or she may withdraw from the project at any time. Further, a subject's participation, refusal to participate, or withdrawal will not affect any services that the subject is receiving or will receive at the institution in which the research is being conducted.

If you have any questions, please contact me at (408) 924-2480.

cc: Leamor Kahanov, Ed.D