

THE RELATIONSHIP BETWEEN NUTRITIONAL KNOWLEDGE AND EATING
HABITS OF UNDERGRADUATE ATHLETIC TRAINING AND WELLNESS &
FITNESS MAJORS

A THESIS

Submitted to the Faculty of the School of Graduate Studies
and Research

of

California University of Pennsylvania in partial
fulfillment of the requirements for the degree of

Master of Science

by

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California, Pennsylvania

2010

CALIFORNIA UNIVERSITY of PENNSYLVANIA
CALIFORNIA, PA

THESIS APPROVAL

Graduate Athletic Training Education

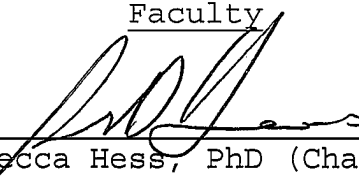
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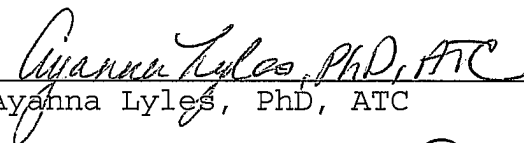
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ACKNOWLEDGEMENTS

First and foremost, I would like to thank my parents for their constant love, support, and encouragement throughout my entire education. Both of you have provided me with opportunity to always pursue my dreams and achieve my goals. It's because of you two that I am the person I am today. I cannot thank you enough for everything, I love you both.

I would also like to thank my committee members, Dr. Rebecca Hess, Dr. Ayanna Lyles and Dr. Ellen West. I would especially like to thank Dr. Hess for her enthusiasm, patience and support throughout this entire process; I don't know how I would have made it to this point without all of your help. Additionally, I must thank Dr. Thomas F. West, who has been there throughout the entire process continually providing guidance and support; I truly appreciate all of your help.

I must also thank my friends from home for always being there for me through the rough times and continually listening to my complaints. I truly appreciate all of your support throughout this year.

Finally, I would like to thank my fellow classmates for a great year. We have so many memories and I can't thank all of you enough for making this year as enjoyable as it has been. I don't know how I would have made it through this year without all of the fun we had. Congratulations!

TABLE OF CONTENTS

	Page
SIGNATURE PAGE	ii
ACKNOWLEDGEMENTS	iii
TABLE OF CONTENTS	v
LIST OF TABLES	viii
INTRODUCTION	1
METHODS	7
RESEARCH DESIGN	7
SUBJECTS	7
INSTRUMENTS	8
PROCEDURES	11
HYPOTHESES	12
DATA ANALYSIS	12
RESULTS	14
DEMOGRAPHIC DATA	14
HYPOTHESIS TESTING	15
ADDITIONAL FINDINGS	17
DISCUSSION	18
DISCUSSION OF RESULTS	18
CONCLUSIONS	23
RECOMMENDATIONS	24
REFERENCES	26
APPENDICES	28

APPENDIX A: Review of Literature	29
Introduction	30
General and Sports Nutrition Guidelines	31
Health and Fitness Professional Preparation	36
Athletic Training	36
Clinical Education	39
Wellness and Fitness Professionals	40
College Students Perception of Diet	42
Diet Inadequacies	45
Gender Differences	48
Summary	51
APPENDIX B: The Problem	55
Statement of the Problem.	56
Definition of Terms	57
Basic Assumptions	58
Limitations of the Study	59
Significance of the Study	59
APPENDIX C: Additional Methods	61
Cover Letter (C1)	62
Revised Nutritional Knowledge and	
Eating Habits Questionnaire(C2)	64
Demographics Information (C3)	68
IRB California University of Pennsylvania (C4)	70
Old Nutritional Knowledge and Eating Habits	

Questionnaire (C5)	86
Scoring Key: Old Nutritional Knowledge and Eating Habits Questionnaire (C6).	90
Scoring Key: Revised Nutritional Knowledge and Eating Habits Questionnaire.	94
REFERENCES	97
ABSTRACT	100

LIST OF TABLES

Table	Title	Page
1	Descriptive Statistics for Nutritional Knowledge and Eating Habits scores	16
2	Correlation between Nutritional Knowledge and Eating Habits, regardless of group . .	17

INTRODUCTION

Sports nutrition is defined as the application of nutrition knowledge to a practical daily eating plan focused on providing fuel for physical activity, facilitating the repair and rebuilding process following hard physical work, and optimizing athletic performance in competitive events, while promoting overall health and wellness.^{1(p4)} Proper implementation of sports nutrition principles is essential to achieving optimal athletic performance.^{1,2}

Optimal athletic performance is a key component in sports and is promoted by ensuring adequate energy intake.² Energy is created through ingesting food and beverages, which consist of six major nutrients vital to growth and development regulating body process, as well as preventing deficiency and degenerative diseases.¹ These nutrients include carbohydrates (CHO), fats, proteins, vitamins, minerals and water.

Essential nutrients cannot be manufactured within the body and need to be consumed as either micro- or macro-nutrients.¹ Vitamins and minerals fall into the micronutrient category whereby daily requirements of each are required in limited amounts. Macronutrients include

carbohydrates (CHO), fats and proteins which are required in larger quantities daily.

The American College of Sports Medicine (ACSM) recommends acceptable macronutrient ranges for active individuals set at 45-65% of daily calories to be carbohydrates, 20-35% calories to come from fat sources and 10-35% coming from protein sources.^{1,2} Carbohydrates are the main source of fuel for all physical activity as they are converted into glucose in the body, providing four calories per gram.¹ ACSM recommends athletes consume six-10 g/kg per day during activity to maintain blood glucose levels and replace muscle glycogen.² Carbohydrates can be found in sources such as grains, fruits, vegetables, soy, rice, and nuts.^{1,2}

Fat is primarily used as a fuel at rest and during low-to-moderate intensity exercise, as well as being involved in providing structure to cell membranes, aiding in the production of hormones, lining of nerves for proper functioning and facilitating the absorption of fat-soluble vitamins.^{1(p.5)} Fats provide nine calories of energy per gram and should be consumed in moderation.¹ Fat intake should be monitored with less than 10% of the calories from sources of saturated fatty acids.^{2,3} Most fat intake should come from polyunsaturated and monounsaturated fatty acids, such

as fish, nuts, and vegetable oils.³ Assumptions that decreasing fat intake to a minimum increases performance is not supported. Fat intake of less than 20% or above 35% of total dietary intake are not recommended for athletes.²

Proteins are involved in the development, growth, and repair of muscle and other bodily tissues and are critical for recovery from intense physical training.^{1(p.5)} While protein can be used for energy, providing four calories per gram, it is not used efficiently, and not the preferred energy source.¹ Protein sources include meats, beans, nuts, and soy.^{1,4} In regards to types of athletes, differences arise when determining the acceptable protein consumption range for strength/power and endurance athletes. It has been determined that the range for protein intake is from 1.2 to 1.7 g/kg per day.²

Water is a key component for temperature regulation, joint lubrication, and transportation of nutrients to active tissues. Water makes up of 55-60% of the human body.¹ Dehydration occurs when a water deficit of more than of two to three percent of body weight is present , yet a loss of one to two percent of body weight begins to compromise physiologic function and negatively influence performance.^{2,5} If more than three percent of body weight is lost through dehydration, physiologic function is further

disturbed and the athlete is more at risk for exertional heat illnesses.⁵ This is a serious concern for active individuals, therefore it is important to be knowledgeable about the proper amount of water consumption before, during and after exercise. Proper pre-exercise hydration includes 500-600ml (17-20 fl oz) of water or a sports drink two to three hours before exercise, along with 200-300ml (7-10 fl oz) 20 minutes before the exercise begins.⁵ Post-exercise hydration should be ideally be accomplished within two hours after the activity has concluded, drinking 450-675ml (16-24 oz) of fluid for every pound of body weight lost during exercise, to ensure optimal hydration is achieved after athletic activities.²

Caloric intake differs for each individual as variables such as gender, physical activity, and age have an impact on caloric consumption. Women generally consume fewer calories per day when compared to men, as well as consuming less as one ages.⁶ This is based on the individual's weight and how many calories must be consumed in order to fuel the body properly to perform daily functions. The American Heart Association (AHA) recommends that the average sedentary female between the ages of 19 and 30 years old consume about 2000 calories per day; as males should consume about 2400 calories.⁶ Caloric intake

depends on activity level as well. For someone who is more active than the average sedentary individual, a larger amount of calories needs to be consumed to ensure caloric intake equals caloric expenditure. Also, caloric intake should be somewhat reduced to take into account for any decrease in physical activity to avoid an increase in weight.⁶

Both certified athletic trainers and wellness & fitness professionals acquire nutritional knowledge through the course of their undergraduate courses and need to be knowledgeable on how to implement the information for their athletes and clients. Most often, these students only take one class where nutrition is discussed, even for a sport period of time within a class, to gain a baseline knowledge of how certain foods or nutrients interact in the body and affect sports performance. For athletic training students, specific competencies have been established by the NATABOC which focus on nutrition education; however, sports nutrition is not a required course for these students. Sports nutrition is sometimes covered for a short period of time in other classes, but this information may be their only exposure to the content. However, a more extensive undergraduate education in nutrition or continuing

education courses may be needed to grasp concepts and be able to give proper nutritional recommendations.

The purpose of this study was to test nutritional knowledge and eating habits of undergraduate athletic training and wellness & fitness students. The aims of this study were to determine if eating habits correlated to amount of nutritional knowledge acquired, determine if there was a difference in nutritional knowledge between each group (athletic training/wellness & fitness students), and assess nutritional knowledge of these individuals to determine if knowledge had an effect on eating habits.

METHODS

Research Design

A descriptive research design was used for this study. The dependent variables were nutritional knowledge and eating habits. The independent variable was major field of study (athletic training/wellness & fitness).

Participants were asked to complete the Revised Nutritional Knowledge and Eating Habits Questionnaire revised by Shepard⁷ (APPENDIX C1) which was set up through SurveyMonkey.com. Information was then separated by major and compared independently. The results may be limited to undergraduate students in the athletic training and wellness & fitness programs at California University of Pennsylvania.

Subjects

Subjects were recruited from California University of Pennsylvania's undergraduate degree programs in athletic training (n ~ 30) and wellness & fitness (n ~ 182) through a list obtained from the program directors. Subjects

included juniors and seniors only, since these students have already taken a Sports Nutrition course and/or covered sports nutrition in Physiology of Exercise.

All students were contacted by e-mail (APPENDIX C1) outlining the purpose of the study and link to the survey. Once the student decided to partake in the survey, the results were obtained and all answers were kept strictly confidential as the results were only available to the researcher and the researcher's advisor. Informed consent was implied since the survey was voluntary. As the wellness & fitness program is an on-line program offered through California University of Pennsylvania, all students were asked to participate through e-mail to ensure equity of volunteerism. Selection of criteria included individuals in the health and fitness professions since general nutrition knowledge is needed to pass on to future clients.

Instruments

The instruments used in this study included the revised Nutritional Knowledge and Eating Habits Questionnaire (APPENDIX C2) along with a Demographic Information (APPENDIX C3) sheet. Demographic information was completed by each subject prior to filling out the

survey and included information on subject's age, academic major, year in college (junior/senior), housing assignment (on- and off- campus), meal plan possession (yes/no, if yes, frequency), and a list of prior nutrition courses or courses in which nutrition was addressed (Sports Nutrition, Physiology of Exercise, Other(s)).

Nutritional knowledge and eating habits were assessed through the use of the revised version of the two-part questionnaire. The original questionnaire was developed by Marino⁸ in 2001 to study female collegiate gymnasts. The revised questionnaire was modified by Shepard⁷ in 2007 to reflect the current nutritional recommendations set by the United States Department of Agriculture (USDA) at www.mypyramid.gov. Shepard studied the nutritional knowledge and eating habits of female swimmers at a Division II university. Requirements of the questionnaire were based on female athletes, age 18-25, who participated in at least 60 minutes of exercise each day. After pilot research was performed, the study revealed reliability coefficients of 0.88 and 0.81 for nutrition knowledge and eating habits respectively.

Part one of the questionnaire contains 22 questions intended to test the nutritional knowledge of each subject. Subjects were asked to indicate to what degree they agreed

with each statement using a four-point Likert-type scale; answers ranged from Strongly Agree (4) to Strongly Disagree (1). Subjects were also asked questions about pre-event meals, breakfast habits, individual nutrient effect on performance, vitamin consumption and food group choices according to www.mypyramid.gov.

All questions in part one (nutritional knowledge section) were scored by a key according to their value (APPENDIX C7). Therefore, when the subject answered with a (4), four points were awarded for the question. Scores ranged from (22-88) points. A percentage was then established by dividing each subjects score by (88). Nutritional knowledge was scored as: excellent (85 - 100%), good (70 - 84%), fair (55-69%), or poor (54% or below). Higher scores for this section indicated increased nutrition knowledge among individuals.⁸

The second section of the questionnaire contained 10 questions intended to test the quality of eating habits of each subject. Participants were asked to indicate how often they consumed particular foods or engaged in certain eating habits using a four-point Likert-type scale; Answers included: Always (4), Often (3), Sometimes (2), and Never (1). Always (4) indicates that a habit occurs 5-7 days per week, Often (3) indicates a habit that occurs 3-4 days per

week, Sometimes (2) indicates a habit which occurs 1-2 days per week, and Never (1) indicates a habit that does not occur at all.

In section two, questions 2, 3, and 6 were reverse scored. Reverse scoring occurred when a subject answers a question with a 1, but received 4 points. All other questions were scored according to their value; when the subject answered with a 4, they were awarded 4 points. Scores in this section ranged from 10-40 points. Each subject's total was divided by 40 and reported as: excellent (85 - 100%), good (70 - 85%), fair (55 - 69%), and poor (54% or below). Higher scores on this section indicated that a subject exhibited increased positive eating habits.

Procedures

The researcher applied for and received approval from the Institutional Review Board (IRB) of California University of Pennsylvania to perform this study (APPENDIX C4).

Potential volunteers were recruited from California University of Pennsylvania's undergraduate athletic training and wellness & fitness programs. All students were

contacted by e-mail, through a list obtained from the program directors of each major. The e-mail (APPENDIX C1) outlined the purpose for the study as well as a link to the survey. The survey was available through the SurveyMonkey.com. Demographic Information (APPENDIX C3) was also included in the survey. Informed consent was implied since the survey was voluntary. By completing the survey, the participant agreed to the terms and conditions and answers remained anonymous. Once the survey was completed, the results were available to the researcher, along with the researcher's advisor. Results were then analyzed.

Hypotheses

The following hypotheses were assumed:

1. There will be no difference between the groups on Knowledge of Nutrition and Eating Habits.
2. Eating habits will not correlate with the Knowledge of Nutrition regardless of group.

Data Analysis

SPSS 17.0 was used for statistical analysis of the hypotheses assuming a $P \leq .05$.

1. A MANOVA was used to determine differences between the groups on Knowledge of Nutrition and Eating Habits.

2. A Pearson Product Moment Correlation was used to determine any relationship between Eating Habits and Knowledge of Nutrition regardless of group.

RESULTS

Demographic Data

A total of 53 responses (18 athletic training and 35 wellness & fitness) were collected. Out of the 53 responses collected, 10 were discarded as three completed the demographic information only and seven failed to answer the survey in its entirety, leaving a total at 43 responses for analysis (14 athletic training and 29 wellness & fitness).

All participants were volunteers and students at California University of Pennsylvania; of these participants, 15 were male and 28 were female. Academic year in college revealed 12 in their junior year and 31 in their senior year. Thirty-seven students had taken a prior nutrition course (12 athletic training and 25 wellness & fitness students) while six have not. Also, when asked about possessing a meal plan, 14 students had one while 29 did not (athletic training- 6 yes, 10 no; wellness & fitness- 8 yes, 19 no). Results also revealed 24 of the participants were concerned with their weight while 19 were not, including 34 individuals that were currently watching their diet or modifying what was consumed.

Hypothesis Testing

Hypothesis testing was completed with an alpha level of ≤ 0.05 . Descriptive statistics were computed for nutritional knowledge (K percent) and eating habits (H percent) and were then analyzed using inferential statistics.

Hypothesis 1: There will be no difference between the groups on knowledge of nutrition and eating habits. A MANOVA was calculated examining the differences between groups (majors) for the dependent variables (nutritional knowledge and eating habits). Effect size for the MANOVA was also reported.

Conclusion: No significant effect was found ($\Lambda(4,28) = 0.152, P > 0.05$). Neither nutritional knowledge nor eating habits were influenced by major, thus accepting the null hypothesis. The partial Eta Squared for effect size was 0.001 (knowledge) and 0.072 (eating behavior) which represented no true effect due to different sample size.

Table 1. Descriptive Statistics for Nutritional Knowledge and Eating Habits scores.

	Major	Mean	Std. Deviation	N	Classification
Kpercent	1	85.714	8.9446	14	Excellent
	2	85.149	8.6964	29	Excellent
	Total	85.333	8.6749	43	Excellent
Hpercent	1	70.893	5.5128	14	Good
	2	75.431	8.6620	29	Good
	Total	73.953	8.0036	43	Good

Major: 1= Athletic Training; 2= Wellness & Fitness

Hypothesis 2: Eating habits will not correlate with the Knowledge, regardless of group. A Pearson correlation coefficient was calculated for any relationship between nutritional knowledge and eating habits. A low positive significant correlation was found ($r = .349$, $P = 0.022$). Subjects who scored higher for nutritional knowledge exhibited better eating habits, thus rejecting the null hypothesis.

Conclusion: There was no significant different difference between nutritional knowledge and eating habits when comparing the groups. However, there was a significant low positive correlation between nutritional knowledge and eating habits regardless of group when compared as a whole (Table 2). The difference between sample size was not a factor.

Table 2. Correlation between Nutritional Knowledge and Eating Habits, regardless of group.

		Kpercent	Hpercent
Kpercent	Pearson Correlation	1	.349*
	Sig. (2-tailed)		.022
	N	43	43
Hpercent	Pearson Correlation	.349*	1
	Sig. (2-tailed)	.022	
	N	43	43

*Correlation is significant at the 0.05 level (2-tailed).

Additional Findings

Additional one-way ANOVA's were performed to look at the differences between gender regardless of group (15 male, 28 female) for nutritional knowledge and eating habits, meal plan (yes or no), and between academic year (junior or senior). No significant differences were reported overall for any of the additional variables.

DISCUSSION

Discussion of Results

The main findings of this study revealed no significant difference in nutritional knowledge or eating habits when comparing group (athletic training and wellness & fitness). However, there was a significant low positive correlation among those who scored higher on the nutritional knowledge section, as their eating habits were shown to be better, regardless of group.

Hypothesis one was supported, which stated that there will be no difference between the groups on knowledge and habits, and it must be noted that at least one course where nutrition information is covered is required for each major. Athletic training students, however, are required only to take physiology of exercise where wellness & fitness students are required to take both sports nutrition and physiology of exercise. Results did however reveal that the wellness & fitness majors scored better on eating habits, although the results were not significant. Results from the demographic information collected revealed that 10 juniors had taken a nutrition course while 27 seniors completed a nutrition course. Although it was not asked in

the demographics information, the year students were enrolled in the nutrition course may have impacted the results. It has been shown that nutrition intervention in a college student's freshman year would assist in preventing weight gain during the first 16 months of college.⁹ Results from this study⁹ also demonstrated that these students yielded improved knowledge of nutrition, energy metabolism, and physiologic mechanisms of energy balance for those students who were enrolled in the nutrition courses.⁹ Also, as a point of interest, students retained the more complex concepts one year after the end of the course intervention, yet the more simple information (such as concepts about the food guide pyramid, food labels, nutrients and energy density) were not retained when tested again.⁹

We wondered if year in college would have a significant effect on the dependent variables and included academic year in college in the demographic information collected. The results revealed 12 juniors and 31 seniors surveyed in our study. Results showed that senior students did score slightly higher on the two portions of the survey, but these results did not present any significant findings.

There are numerous variables that came into play when coming to our results. We believe another reason for

slightly higher scores recorded for eating habits by wellness & fitness majors may be due to the fact that they are "non-traditional" students. Data revealed that ages ranged from 22 to 49 years old. Although these students may not have had previous formal nutrition education, many are working professionals in the field that may have been taught "good" eating habits through development of their career, have the means to obtain nutritious foods or more of an opportunity to engage in these beneficial eating habits.

Although there is no direct research on athletic training or wellness and fitness majors' knowledge or habits when it comes to nutrition, research does indicate the poor eating habits of college students. Reasons for these poor eating habits include environment/atmosphere¹⁰ and availability or convenience¹¹. A key point from the current study which intrigued the researcher was how both groups scored in the "excellent" range on the nutritional knowledge portion of the survey, yet scores were "good" in the eating habits section. It is understood that individuals in the health and fitness majors have a greater awareness of nutrition information due to the required coursework, yet eating habits do not necessarily reflect how much knowledge has been obtained. A key concept here

would be that the importance of eating habits should be further discussed and instilled for these students. Another important key issue is that students pursuing a degree in wellness & fitness from our university have had a formal four-year education concluding with a certification exam. For those who choose not to pursue a degree in this field, there is the option to seek certification through other methods, such as in a classroom setting for a certain amount of hours or obtaining materials from the certifying body, study on their own, and sit for the test.

When comparing gender, it has been observed that females tend to eat more fatty foods than male students, although fruit and vegetable consumption trends remain similar.¹² Barr¹³ tested the general and sports related nutritional knowledge of female varsity teams with females who did not participate on any teams.^{12,13} It was concluded that athletes on the cross-country/track-and-field teams scored higher on the nutrition knowledge test than those on the volleyball team.¹³ These results, along with results from other studies, suggests that female runners may be more knowledgeable about the role of nutrition in sports performance.¹² The results of this study¹² indicate that female varsity athletes had levels of general and sports-

related nutrition knowledge that were similar to those of female university students.¹²

Additional studies¹⁴ attempted to uncover ways in which female and male college students differed in involvement concerning food decisions and to address how male students' food decisions may be driven, partly due to the issues related to masculinity. Males sometimes feel that "real men" eat what they want, when they want. Our results show that there is no significance when comparing the nutritional knowledge and eating habits between genders. Both mean scores and standard deviations were similar, with only a small percentage separating the two. Since there was no significance when looking at major (athletic training and wellness & fitness), it is believed that these students in the health and fitness profession are focused on "good" eating habits because they are aware of the benefits of a healthy diet, and the risks of unhealthy eating rituals.

Universities most often offer students the opportunity to purchase a meal plan by year or semester while at the institution. Those who choose to have a meal plan are allowed to eat on-campus without having to pay with cash at the time they purchase meals. Many institutions have a "food court" concept where students can choose from a variety of fast food establishments.¹⁵ Sites such as these

allow for a greater amount of choices per meal, but the variety of food is usually more limited¹⁵, as well as a substandard when it comes to quality. Possession of a meal plan was compared between those who did and did not possess a meal plan in the current study performed by the researcher, as past research had been performed to determine if unhealthy eating may be due to university food services.¹⁵ Findings revealed no significance when comparing if one who possessed a meal plan ate better/worse than those who did not acquire a meal plan.

Conclusions

After comparing nutritional knowledge and eating habits between athletic training and wellness & fitness majors, it was determined that there is no significant difference based on major. However, in limited cases, better knowledge of nutrition coincides with better eating behavior in undergraduate students majoring in the health and exercise sciences. Furthermore, health and fitness majors reported better eating habits overall than the average college student according to the literature.¹³ It is believed to be the case because individuals in these majors must be able to not only pass along accurate nutrition

information to their athletes/clients, but also serve as healthy role models. Additionally, possessing a meal plan, gender, nor year in college affects nutritional knowledge or eating habits.

Recommendations

Throughout the course of undergraduate curriculum, athletic training education students are required to take sports nutrition or physiology of exercise to meet specific competencies established by the NATABOC. Wellness & fitness students are also required to take both courses. Findings of this study suggest that although nutritional knowledge scores were reported as "excellent", eating habits were scored as "good". For undergraduates in these majors (athletic training and wellness & fitness) it would be beneficial to provide more emphasis on the importance of excellent eating habits during these courses.

Future studies may also look at the year the nutrition course is implemented for these students. Individuals in these majors must possess nutrition knowledge to pass on to athletes or clients and retaining information is essential. It would be interesting to determine if the year the

nutrition course is taken has a significant effect on the results and also on students own health.

Other studies have looked at the effect of the number of hours spent awake as a predictor of eating habits, specifically because there are more opportunities to engage in unhealthy eating rituals. Health and exercise students may spend countless hours at clinical rotations, studying or hanging out with friends until all hours of the night. In situations such as these, unhealthy eating habits are extremely likely to take place due to time constraints, stress, or even peer pressure. Further studies may be able to look at trends in regards to sleeping patterns to determine if there is correlation between number of hours sleeping and eating habits.

REFERENCES

1. Fink HH, Burgoon LA. Mikesky AE. Introduction to Sports Nutrition. In: Fink HH. Burgoon LA. Mikesky AE. *Practical Applications in Sports Nutrition*. Sudbury MA: Jones and Bartlett Publishers; 2006:2-24
2. American College of Sports Medicine, American Dietetic Association, and Dietitians of Canada. Joint position statement. Nutrition and athletic performance. *Medicine and Science in Sports and Exercise*. 2009;709-730
3. U.S. Department of Health and Human Services and U.S. Department of Agriculture. Dietary Guidelines for Americans, 2005. 6th Edition, Washington, DC: U.S. Government Printing Office, January 2005.
4. Otten J. Hellwig J. Meyers L. *Dietary Reference Intakes: The Essential Guide to Nutrient Requirements*. Washington (DC): The National Academies Press; 2006.
5. Casa DJ. Armstrong LE. Hillman SK. Montain SJ. Reiff RV. Rich BSE. Roberts WO. Stone JA. National athletic trainers position statement: Fluid replacement for athletes. In: *Position, Consensus, Official and Support Statements, National Athletic Trainers' Association Reference Series*. Canada. National Athletic Trainers' Association; 2008. 27-40.
6. Know How Many Calories You Should Eat. American Heart Association Web site. <http://www.americanheart.org>. Accessed September 24, 2009.
7. Shepard MW. *A Nutritional Profile of Female NCAA Division II Swimmers*. [master's thesis]. California, PA: California University of Pennsylvania; 2007
8. Marino SA. *The Role Nutrition Plays in the Eating Habits of Female College Gymnasts*. [master's thesis]. California, PA: California University of Pennsylvania; 2001.
9. Matvienko O. Lewis DS. Schafer E. A college nutrition science course as an intervention to prevent weight

- gain in female college freshmen. *Journal of Nutrition Education*. 2001;33:95-101.
10. Makino M. Hashizume M. Yasushi M. Tsubio Y. Dennerstein L. Factors associated with abnormal eating attitudes among female college students in Japan. *Archives of Womens Mental Health*. 2006;9:203-208.
 11. Horacek TM. Betts NM. Students cluster into 4 groups according to the factors influencing their dietary intake. *Journal of Marketing Research*. 1994;31:1464-1467.
 12. Deshpande S. Basil MD. Basil DZ. Factors influencing healthy eating habits among college students: An application of the health belief model. *Health Marketing Quarterly*. 2009;26:145-164.
 13. Barr SI. Nutrition knowledge of female varsity athletes and university students. *Journal of the American Dietetic Association*. 1987;12:1660-1664.
 14. Levi A. Chan KK. Pence D. Real men do not read labels: The effects of masculinity and involvement on college students' food decisions. *Journal of American College Health*. 2006;55:91-98.
 15. Boyle JR. LaRose NR. Personal beliefs, the environment and college students' exercise and eating behaviors. *American Journal of Health Studies*. 2008;23:195-200.

APPENDICES

APPENDIX A

Review of Literature

Introduction

Nutrition is an important aspect of daily living. It is important for health care professionals to be knowledgeable about healthy eating habits in order to maintain a healthy lifestyle. Poor diet and nutrition combined with inactivity can be linked to cardiovascular disease, type 2 diabetes, hypertension, osteoporosis, and certain cancers.¹ However, maintaining a healthy diet assists with preventing obesity, chronic diseases such as coronary heart disease, non-insulin dependent diabetes mellitus, some types of cancers, strokes, and osteoporosis.²

Athletic training is a multi-faceted field and nutrition knowledge is only one aspect in which a certified athletic trainer must be both knowledgeable and confident in one's ability to give advice. Many athletes and coaches rely on the information provided by these professionals and therefore, advice needs to be accurate and beneficial for these individuals to attain optimal sports performance and engage in healthy eating habits.

Health and wellness professionals, also known as personal trainers, interact with patients and clients on daily basis. These qualified individuals must also be

informed on ways to maintain a healthy diet and be able to correctly provide information to clients.

The purpose of this review of the literature is to present the reader with information on the components of a healthy diet, enhancing athletic performance and determine if there is a correlation between nutrition knowledge and eating habits between these two groups.

General and Sports Nutrition Guidelines

For health professionals such as certified athletic trainers or personal trainers, it is imperative to be knowledgeable on the subject of nutrition. Athletes, coaches and clients rely on these individuals to provide superior knowledge to achieve maximum performance. These health professionals must also ensure their own eating habits are optimal to maintain health as well as be a role model for the athletes who are in their care.

Diet should be tailored to each individual since activity has a big impact on caloric intake. Caloric intake for athletes should be somewhat higher than the average sedentary individual given that there is a larger amount of caloric expenditure. According to the American Heart Association (AHA), the average sedentary female between the

ages of 19 and 30 years old should consume about 2000 calories per day, as males between the same age range should consume about 2400 calories.³ Caloric intake depends on activity level in addition to age. For someone who is more active than the average sedentary individual, a larger amount of calories needs to be consumed to ensure caloric intake equals equal caloric expenditure.³ This is also true as individual ages. Caloric intake should be somewhat reduced to take into account for a decrease in physical activity.³ If the older individual consumes a greater amount of calories than needed, the excess builds up and eventually causes an increase in weight.

It is important for athletes to consume an adequate amount of calories in the days leading up to and the day of the event. Optimal athletic performance is promoted through adequate energy intake⁵ and it is imperative for these individuals to ensure they have enough energy to last throughout the duration of their event in order to maximize training effects.

Foods and beverages are composed of six major nutrients which are vital to the human body for producing energy, contributing to the growth and development of tissues, regulating body process, and preventing deficiency and degenerative diseases.^{6(p4)} These nutrients include

carbohydrates (CHO), fats, proteins, vitamins, minerals and water. These essential nutrients cannot be manufactured within the body and needed to be consumed as either micro- or macro-nutrients.⁶ Vitamins and minerals fall into the micronutrient categories and daily requirements of each are required in limited amounts. However, macronutrients are required in greater quantities and included are carbohydrates, fats and proteins.

Carbohydrates are the main source of fuel for all physical activity for the body and provide four calories per gram of CHO.⁶ The American College of Sports Medicine (ACSM) recommends athletes consume six-10 g/kg kilogram body weight per day during activity to maintain blood glucose levels and replace muscle glycogen.⁵ This amount equates to about 45-65% of total caloric intake and grains, fruits, vegetables, soy, rice, nuts, etc. are good sources of CHO.^{5,6}

Proteins are critical for the body during times recovery from intense physical training as they are involved in the development, growth, and repair of muscle and other bodily tissues.⁶ Protein can be used for energy, providing four calories per gram, yet it is not used efficiently and is not a good source of preferred energy for the body.⁶ It is suggested the acceptable macronutrient

distribution range (AMDR) of protein intake for adults over 18 years old is 10-35% of total dietary calories which can be found in sources such as meats, beans, nuts, soy, etc.^{6,7} However, there are differences in protein recommendations when it comes to the type of athlete (strength/power athletes and endurance athletes). It has been determined that the range for protein intake is from 1.2 to 1.7 g/kg body weight per day.⁵

Fats are a concentrated source of energy and provide nine calories per gram.⁶ Fat, commonly referred to as a lipid, is primarily used as a fuel at rest and during low-to-moderate intensity exercise.⁶ Other uses for fats include involvement in providing structure to cell membranes, aiding in the production of hormones, lining of nerves for proper functioning, and facilitating the absorption of fat-soluble vitamins.⁶ Fat intake should range anywhere from 20-35% of total energy intake and consumption of less than 20% does not assist in enhancing athletic performance.⁵ Conversely, high fat diets above 35% of total dietary intake are not recommended for athletes, and do not aid in performance in any way.⁵ Some concentrated sources of fat include butter, margarines, salad dressings, oils, as well as meats, dairy products, nuts, seeds, and avocados.⁶

The human body is made up of 55-60% water, and is key in temperature regulation, joint lubrication, and transportation of nutrients to active tissues.⁶ Dehydration is classified as a water deficit of more than of two to three percent body weight.⁵ Dehydration of one to two percent of body weight begins to compromise physiologic function and negatively influence performance.^{5,8} If more than three percent of body weight is lost through dehydration, physiologic function is further disturbed and the athlete is more at risk for exertional heat illnesses.⁸ This is a serious concern for active individuals, therefore it is important to be knowledgeable about the proper amount of water consumption before, during and after exercise. Proper pre-exercise hydration includes 500-600 ml (17-20 fl oz) of water or a sports drink two to three hours before exercise, along with 200-300 ml (7-10 fl oz) 20 minutes before the exercise begins.⁸ Post-exercise hydration should be ideally be accomplished within two hours after the activity has concluded, drinking 450-675 ml (16-24 oz) of fluid for every pound of body weight lost during exercise.⁵

Although athletes may claim to understand how important it is to eat properly and hydrate before athletic practices and events, it is important for health and fitness professionals to try to monitor those under their

care. This will hopefully assist with decreasing the chances of dehydration and exertional heat illnesses.

Health and Fitness Professional Preparation

The following sections describe the athletic training and wellness & fitness professions, outlining the ways to become a member of these fields through education, clinical rotations and certifications.

Athletic Training

Certified Athletic Trainers are health care professionals who collaborate with physicians to optimize activity and participation of patients and clients.⁹ Athletic training encompasses the prevention, diagnosis, and intervention of emergency, acute, and chronic medical conditions involving impairment, functional limitations, and disabilities.⁹ Along with these responsibilities, certified athletic trainers are responsible for providing information about nutrition as well. Through the course of an undergraduate athletic training education program (ATEP), students are required to enroll in at least one nutrition class to gain a better sense of a healthy diet,

as well as a better grasp of information to relay to other misinformed members.

Athletic training students (ATS) must engage in a meticulous curriculum throughout the years in the ATEP program. Each year, the student learns new information and is expected to execute these skills in the clinical setting as well as in the classroom. All institutions offering an ATEP must be accredited by CAATE, the Commission on Accreditation of Athletic Training Education, in order for the students to be eligible for the Board of Certification exam at the completion of the program.

Athletic training is a profession which relies heavily on hands on knowledge. To ensure that all students are qualified to take care of athletes, patients, etc., the National Athletic Trainers Association (NATA) has set domains which encompass a variety of areas where ATS's must be competent. By meeting all criteria, an athletic training student will be considered "competent" by the Commission on Accreditation of Athletic Training Education (CAATE). The domains include prevention; clinical evaluation and diagnosis; immediate care; treatment, rehabilitation and reconditioning; organization and administration; and professional development.⁹

Certified athletic trainers are health care professionals who specialize in preventing, recognizing, managing and rehabilitating injuries that result from physical activity.¹⁰ Therefore, the certified athletic trainer is most often the first responder and the individual who takes care of the athlete afterwards, including treatment and rehabilitation/reconditioning the athlete to return to play. It is important for ATS to gain a working knowledge of the duties that come along with these domains. Certified athletic trainers also must be responsible for conversing with physicians, nurses and other health care professionals along with documenting appropriate information (such as SOAP notes, treatment logs, etc.) on a daily basis. When it comes to professional responsibility, the athletic trainer or athletic training student must understand the issues of compliance with ethical, legal and other professional standards whose purpose is to protect the public.¹⁰ It is imperative for an athletic trainer to abide by these standards to maximize the quality of care given to each individual.

All of the previous mentioned domains occur in an ATC's daily duties. It is vital for these domains to be met when performing tasks to ensure that the health care provided is the most beneficial, legal and professional.

Clinical Education

One reason as to why athletic training students may have inadequacies when it comes to dietary intake because of the clinical hours which allow students to gain hands on experience and practice classroom skills. Athletic training students spend countless hours developing clinical skills in the classroom as well as the clinic. While in these settings, these students integrate, apply and master these skills during the clinical experiences.¹¹ These experiences occur within the athletic department at the college or university, local high schools and clinics and are intended to provide ATS's the opportunity to integrate competencies, proficiencies and foundations of professional practice into daily clinical hours.¹¹

Clinical rotations also allow students to gain firsthand experience in the field while under the supervision of a clinical instructor (CI). The CI's supervising the ATS's must always be within visual and auditory distance from the students in order for the program to continually meet the standards of the accrediting body.

Through the course of the student's clinical experience, proficiencies must be completed as well. Students must be evaluated by an approved clinical

instructor (ACI) who has completed the appropriate training. These proficiencies include material that the student has been taught in the previous semester, as well as the current class they are taking. By completing these proficiencies, students are displaying confidence in the skills they have been taught and are competent if asked to perform the tasks individually.

Wellness and Fitness Professionals

The term "wellness and fitness professional" (WFP) is interchangeable with the terms personal trainer and fitness instructor. Personal trainers are skilled practitioners who are able to pursue careers in many settings, including universities, corporate locations, hospitals, health and fitness clubs, along with other places around the community.¹² These individuals are able to work with clients in one-on-one settings as well as small group environments and are skilled in many different areas including physical fitness assessments, constructing appropriate exercise prescriptions, motivating those with medically controlled diseases as well as other healthy individuals to begin and maintain healthy lifestyles.^{12,13}

Not just anyone can become a certified WFP, as there are certain requirements which need to be met. One way to

attain these requirements is through the Commission on Accreditation of Allied Health Education Programs (CAAHEP). This is the governing body which establishes, maintains and promotes appropriate standards of quality for educational programs for Personal Fitness Training, and to provide recognition for educational programs that meet or exceed the minimum standards outlined in the standards for accreditation.¹³ The CAAHEP works in conjunction with the ACSM and for an individual to become certified by this organization, an associates or bachelors degree in a health related field from a regionally accredited institution must be obtained.¹² There are numerous options for this person to choose as their undergraduate major, including exercise science, kinesiology, exercise physiology, athletic training, physical education, as well as a copious amount of others.

There are many other ways for students to achieve the title of certified fitness trainer. However, another or an additional way for these students to attain this title is through the National Academy of Sports Medicine (NASM). Students must take required classes throughout their undergraduate curriculum and pass a certification exam at the end which is given through the NASM. Once the test has been passed and the degree is completed, the students will

be a Certified Personal Trainer (CPT), allowing them to work in a variety of settings with a wide array of clients.

Professionals are also required to be certified in cardiopulmonary resuscitation (CPR) in case of an emergency.¹² Being a first responder is important in this field in case an emergency were to arise. Acceptable institutions to be certified by include the American Heart Association and the American Red Cross.¹²

Wellness & fitness specialists interact with a diverse amount of clients in a variety of settings and need to be able to be role models for clients. It is not likely that a client will take criticism from a professional who does not model the lifestyle they are promoting. Personal trainers who have come from the accredited institutions have followed a curriculum, which most often encompasses at least one nutrition class. Knowledge of nutrition is important for the personal trainer to allow suggestions to be made specific diets to gain muscle mass, lose fat, etc.

College Students Perception of Diet

The transition to college life is often a difficult time for students. It is a time where they are forced to learn how to live on their own, especially when choosing to

live away from home. It may even be the first time individuals must make independent decisions for themselves. These decisions also consist of choosing acceptable foods to maintain a healthy diet and lifestyle. Makino et al.¹⁴ suggested living environment may play an important role in maintaining normal eating attitudes. Reasons for this most likely include individuals having to make difficult choices without parents present. The decisions may not always include a variety of foods included in the food guide pyramid or adequate consumption of each food group may not occur.

Many studies have shown that college students have poor eating habits and it is widely known that the diet of these individuals does not always consist of the healthiest choices. Horacek and Betts¹⁵ concluded that students choose food based on taste, time sufficiency, convenience, and budget. The meals are also high in fat, saturated fat, cholesterol and sodium, while being low in fiber, vitamins A,C, and E, folate, iron and calcium.¹⁶

Haberman and Luffey¹⁷ concluded that many college students have a lack of variety in daily diets, reported by students who lived on and off campus. Reasons for this may include lack of cooking experience and perceptions of low-calorie foods therefore, limiting food choices.¹⁷

Stress also impacts the choices of students. When there is a multitude of events occurring in the academic setting, whether its athletics, examinations, presentations, or other assignments, students have a tendency to lean toward foods which may not always be the best choice. Quick meals to take on the go are always convenient for a student always on the run; however, quick meals may not always be the finest choice.

Many students may also believe that going to the gym will cancel out unhealthy food intake. Although the effects physical activity (PA) are nothing but positive on the body, the effects of the unhealthy food are not completely eliminated. It is imperative that individuals remember that PA and healthy eating are two important components of a healthy lifestyle.

Boyle and LaRose¹⁸ hypothesized that students who engage in PA more frequently will have a more positive personal beliefs and more positive environmental perceptions than students who engage in PA less frequently. This hypothesis yielded results that healthy-weight students exhibited a greater amount of confidence when creating a PA program on their own.¹⁸

Another hypothesis made by Boyle and LaRose¹⁸ included students who reported eating more healthfully would have

more positive personal beliefs and environmental perceptions than students who reported eating less healthfully. This study was also partially supported as healthy-weight students with a greater confidence in choosing nutritious foods were more associated with more healthful eating. Boyle and LaRose support the reasoning to include nutrition education as part of core curriculum.¹⁸ If students are educated about nutrition information through their journey of higher education courses, choices will more than likely reflect better eating habits and an overall good feeling about body image.

Eating habits established throughout college have an impact on how individuals will continue eating after graduation and continue making food choices on their own. Habits are easily formed and are hard to break, so the earlier these healthy choices are initiated, the better chance of maintaining a healthy diet.

Diet Inadequacies

College students are busy individuals, while athletic training students are most often busier. Students must meet the demands of attending classes at different times of the day, in different buildings or even at different campuses at the institution. Time constraints such as these may

cause students to choose snacks on the go, rather than ensuring the healthiest choice.

Another reason contributing to unhealthy eating may be due to university food services.¹⁷ Many institutions have a "food court" concept where students can choose from a variety of fast food establishments. Sites such as these allow for a greater amount of choices per meal, but the variety of food is usually more limited,¹⁷ as well as a substandard when it comes to quality. In regards to the frequency of eating fast food, Sneed and Holdt¹⁹ have noted that the average male college student eats fast food on average 2.5 times per week, as females consumed about 1.9 per week.

Makino et al¹⁴ suggested the type of living environment impacts on eating attitude and concluded fewer hours of sleeping may be associated with abnormal eating habits for students. Students with fewer hours sleeping have more opportunities to eat and visit bars and restaurants. Makino et al¹⁴ also concluded that irregular meal habits, such as skipping meals, were found to be associated with abnormal eating attitudes and is inversely related to obesity.

Matvienko et al²⁰ performed a study to determine if nutrition intervention in a college student's freshman year would help prevent weight gain during the first 16

months of college. Results of the study yielded improved knowledge of nutrition, energy metabolism, and physiologic mechanisms of energy balance for those students who took the course.²⁰ Interestingly, these students retained the more complex concepts one year after the end of the course intervention, yet information about the food guide pyramid, food labels, nutrients and energy density were not retained one year later.²⁰ A major finding of this experiment was that the intervention had an overwhelming effect on the subgroup of students who were at a greater risk for weight gain, specifically students with a higher baseline body mass index (BMI), higher parental BMI, or higher fat intakes.²⁰ These students may have felt dietary changes needed to be carried out because they were at a higher risk.

Another problem with the diet of college students is the frequency of skipping meals. Researchers have noted that many college students skip breakfast, approximating about 21% of all students.²¹ It has been suggested that the general failure to meet the recommended amount of serving of all food groups, with the exception of the meat group, is due to the percentage of students who skip meals and consume fast foods often.²¹

Gender Differences

It is apparent that females are more concerned with body image as Hollywood and the media have portrayed the image of females who are slender and petite to be "attractive". Many young females strive for this "perfect" look and sacrifice nutritious foods to achieve this image.

Healthy eating habits are important for all individuals alike, however it is imperative that women focus on eating a variety of foods. Many females do not realize the importance of healthy eating and many female athletes appear to lack the nutritional knowledge, or fail to comply with recommendations.²² Athletes do however have a positive attitude toward nutrition, as they may feel that what gets put into their body affects their athletic performance, which is true to some extent.

For females, it is important to understand the reasoning behind the importance of nutrition. Women must take into account the female athlete triad consisting of amenorrhea, osteoporosis and disordered eating. Proper nutrition must be maintained to ensure health not only in the present, but future as well. Reinking and Alexander's²³ study was performed to determine if college athletes were more at risk for acquiring eating disorders when compared to collegiate non-athletes based on the Eating Disorders

Inventory test. The findings were not supported, however the authors did find athletes who participated in lean sports, such as cross country and gymnastics, showed a greater amount of disordered-eating symptoms.²³

A study completed by Barr²⁴ was performed to test the general and sports related nutrition knowledge of female varsity teams with females who did not participate on any teams. Barr²⁴ has concluded that athletes on the cross-country/track-and-field teams scored higher on the nutrition knowledge test than those on the volleyball team. These results, along with results from other studies, suggest that runners may be more knowledgeable about the role of nutrition in sports performance.²⁴ The results of this study indicate that female varsity athletes had levels of general and sports-related nutrition knowledge that were similar to those of female university students.²⁴

It was reported by Deshpande and colleagues²⁵ that females tend to eat more fatty foods than male students, although fruit and vegetable consumption trends remain similar. Also, triglyceride levels and the ratio of total cholesterol to high-density lipoproteins were elevated in those who resided off campus.²¹ Deshpande²⁵ has also concluded that dietary intake between gender was influenced by a variety of factors.

The goal of Levi, Chan and Pence's²⁶ study was to uncover ways in which female and male college students differed in involvement concerning food decisions and to address how male students' food decisions may be driven, partly due to the issues related to masculinity. The authors concluded that male and females students did indeed have different levels of involvement when it comes to food decisions.²⁶ The involvement level may have to do with the issue that "real men" do not display feminine characteristics, such as caring about what types of food enter the body or other issues related to body issues.

Male students participating in the survey had admitted to not caring about what type of food enters the body, but determined what to eat by the cost of the food.²⁶ It was also apparent, by the responses given by the male subjects, that they seemed to have a sense of power by being able to eat what they want, when they chose to. Conversely, female students taking part in the study were more like to choose food based on the components, as well as considering the choices important and relevant to a healthy lifestyle.²⁶

Also, cultural coding of high involvement in food decisions as feminine actively discourages men from being highly involved in accessing and acting on nutritional information, such as reading product labels and recognizing

their meaning.²⁶ It is important for men to be involved in choosing foods for a healthy lifestyle, especially since we know how some foods impact the body as compared to many years ago.

The bottom line is for these students to learn about eating habits and the difficulties associated with breaking them. Males that do not having a high concern for what goes into their body's places them at risk for weight-related problems in the future.²⁶ Problems such as these can only add to the prevalence of obesity in the future.

Summary

Poor diet and nutrition combined with inactivity can be linked to cardiovascular disease, type 2 diabetes, hypertension, osteoporosis, and certain cancers.¹¹ However, maintaining a healthy diet assists with preventing obesity, chronic diseases such as coronary heart disease, non-insulin dependent diabetes mellitus, some types of cancers, strokes, and osteoporosis.²

Diet should be tailored to each individual since activity has a big impact on caloric intake. According to the AHA, the average sedentary female between the ages of 19 and 30 years old should consume about 2000 calories per

day, as males between the same age range should consume about 2400 calories.³

There are six major nutrient categories that make up foods and beverages, including carbohydrates, fats, proteins, vitamins, minerals and water. These nutrients are vital to the human body as they produce energy, contribute to the growth and development of tissues, regulate body process, and prevent deficiency and degenerative diseases.⁶ The transition to college life is often a difficult time where students must adjust to maintaining a healthy diet on their own, without parents to look over them and ensure a healthy, well rounded diet is consumed. It is important for these young students to maintain a diet where all food groups are consumed to confirm a well balanced diet.

There have been a variety of factors proposed as reasons why college student have these attitudes or behaviors about foods as they enter this new period in their lives. Housing assignments have been shown to play an important role in maintaining normal eating attitudes.¹⁴ Studies also reveal students choose food based on taste, time sufficiency, convenience, and budget. Reasons for these poor choices include lack of cooking experience and perceptions of low-calorie foods therefore, limiting food choices.¹⁸ Also, many institutions have a "food court"

concept where students can choose from a variety of fast food establishments.¹⁷ These meals are also high in fat, saturated fat, cholesterol and sodium, while being low in fiber, vitamins A,C, and E, folate, iron and calcium.^{15,16} Finally, another hypothesis as to why these diet inadequacies occur is due to the amount of sleep a student gets.¹⁴ Since there are less hours sleeping and more hours awake, students have more of an opportunity to eat unhealthily.¹⁴ Another contributing factor to these unhealthy eating habits may be due to skipping meals, as abnormal eating habits have been found to be inversely proportional to obesity.¹⁴

Gender differences also have an impact when it comes to nutrition and healthy eating habits. Many females do not realize the importance of healthy eating and many female athletes appear to lack the nutritional knowledge, or fail to comply with recommendations.²⁶ Athletes do however have a positive attitude toward nutrition, as they may feel that what gets put into their body affects their athletic performance. Women must take into account the female athlete triad consisting of amenorrhea, osteoporosis and disordered eating. These conditions are unique on their own, but together can cause detrimental health problems for women when combined.

Authors have shown that men had admitted to not caring about what type of food enters the body, but determined what to eat by the cost of the food.²⁶ Conversely, female students taking part in the study were more like to choose food based on what the components, as well as considered the choices important and relevant to a healthy lifestyle.²⁶

APPENDIX B

The Problem

THE PROBLEM

Statement of the Problem

Nutrition education is an important aspect in any allied health profession. Athletic trainers and personal trainers alike are educated on the subject of nutrition, as sports nutrition classes are incorporated throughout the curriculum. It is important for these students and professionals to engage in proper eating behaviors to ensure adequate energy through the course of the day, as well as be a role model for athletes, coaches, clients, etc. Students and professionals must be a guide to individuals under their care as well as provide correct information to those who desire to enhance athletic performance. Although many individuals have been provided proper nutrition knowledge to achieve these goals, many do not seem to carry over information into personal lives. The aim of this study was to examine the relationship between the nutritional knowledge and eating habits of undergraduate athletic training and wellness & fitness majors and determine if there was a relationship between each of these variables, regardless of group.

Definition of Terms

To better understand this specific study, some terms are operationally defined below.

1. Athlete - in this study, the term athlete refers to any individual who is regularly active,⁶ participating in moderate activity for at least 60 minutes, two-three times per week.
2. National Athletic Trainers' Association - the professional membership association for certified athletic trainers and others who support the athletic training profession.⁴ The mission of the National Athletic Trainers' Association is to enhance the quality of health care provided by certified athletic trainers and to advance the athletic training profession.⁴
3. Commission on Accreditation of Athletic Training Education, (CAATE) - Governing board on accreditation of and ATEP which sets standards and guidelines to be followed by the program.
4. Dietary Guidelines - an analysis of new scientific information providing science-based advice to promote health and to reduce risk for major chronic diseases through diet and physical activity. Key nutrient recommendations are for ages two and older.

5. Nutritional Knowledge - reported as a score (%), set out to measure the quality and background of knowledge of each participant in the undergraduate athletic training and wellness & fitness major field of study.²⁷
6. Nutritional habits - reported as a score (%), used to determine the perceived quality of current eating habits each participant possesses.²⁷

Basic Assumptions

The following were the basic assumptions for the study:

1. All subjects will participate without persuasion from another source (teacher, peer, etc.)
2. The Nutritional Knowledge and Eating Habits Questionnaire²² is a valid and reliable test.
3. It is assumed participants will answer all questions honestly and to the best of their ability, without input from other individuals.
4. The use of additional demographic information will be predictive of predisposing factors or habits that contribute to unhealthy eating.

Limitations of the study

The following was a possible limitation of the study: Data gathered may not be an appropriate predictor of the relationship between nutritional knowledge and eating habits of all undergraduate athletic training and wellness & fitness majors throughout the United States. There may be a variation due to the expectations and level of difficulty of classes within each major or institution.

Significance of the Study

Sports nutrition is a growing field and many athletes look to members of the health care profession, such as athletic trainers and personal trainers, for expert knowledge. It is important for these professionals to know appropriate sports nutrition to help these athletes obtain optimal athletic performance. Members of these fields must partake in a healthy lifestyle to be role models for athletes, coaches, clients and even family members. By performing this study, both athletic trainers and wellness & fitness professionals will be better able to see how eating habits may not be up to par.

The results of this study will hopefully enlighten members within these professions on how much of an impact they have in regards to individuals under their care and

how they should utilize the nutritional knowledge obtained throughout the course of their schooling to benefit themselves in maintaining a healthy lifestyle.

APPENDIX C

Additional Methods

APPENDIX C1

Survey Cover Letter



California University of Pennsylvania

March 8, 2010

Dear Undergraduate Student:

My name is Amanda Greco and I am currently a graduate student at California University of Pennsylvania pursuing a Master of Science in Athletic Training. Part of the graduate study curriculum is to complete a research thesis through conducting research. I am conducting survey research to determine if there is a correlation between nutritional knowledge and eating habits of undergraduate athletic training and wellness & fitness majors. This information is being used for research purposes only and will not be accessed by anyone except the researcher and the researcher's advisor.

Undergraduate athletic training and wellness & fitness majors in their junior and senior year are being asked to participate in the survey; however, your participation is voluntary and you do have the right to choose not to participate. You also have the right to discontinue participation at any time during the survey completion process at which time your data will be discarded. The California University of Pennsylvania Institutional Review Board has reviewed and approved this project. The approval is effective 02/15/10 and expires 02/15/11.

All survey responses are anonymous and will be kept confidential. Also, by completing this survey, you give consent to use the data collected. Aggregate survey responses will be housed in a password protected file on the CalU campus. Minimal risk is posed by participating as a subject in this study. I ask that you please take this survey within one week from receiving this e-mail as it will take approximately 20 minutes to complete. If you have any questions regarding this project, please feel free to contact the primary researcher, Amanda Greco at gre7256@calu.edu. You can also contact the faculty advisor for this research, Dr. Rebecca Hess, PhD., 724-938-4359, hess_ra@calu.edu. Thanks in advance for your participation. Please click the following link to access the demographics sheet and survey <http://www.surveymonkey.com/s/RPDFMDL>.

Thank you for taking the time to take part in my thesis research. I greatly appreciate your time and effort put into this task!

Sincerely,

Amanda Greco, ATC, PES
Primary Researcher
California University of Pennsylvania
250 University Avenue
California, PA 15419
(917) 535-1527
gre7256@calu.edu

APPENDIX C2

Revised Nutritional Knowledge and Eating Habits
Questionnaire

Revised Nutritional Knowledge and Eating Habits Questionnaire

Section 1: Please circle the number for each statement indicating to what extent you agree or disagree with each of the following statements.

- 4 - Strongly Agree
- 3 - Agree Somewhat
- 2 - Disagree Somewhat
- 1 - Strongly Disagree

1. Skipping breakfast can negatively affect athletic performance.
4 3 2 1
2. Nutrition can affect mental performance.
4 3 2 1
3. Calcium excretion from the body increases with alcohol consumption.
4 3 2 1
4. According to mypyramid.gov, it is recommended that females, age 18-25, who engage in more than 60 minutes of exercise per day, should consume 8 daily ounce equivalents from the grains group.
4 3 2 1
5. According to mypyramid.gov, females age 18-25, who engage in more than 60 minutes of exercise per day, should consume 2 cups of fruit daily.
4 3 2 1
6. According to mypyramid.gov, females age 18-25, who engage in more than 60 minutes of exercise per day, should consume 3 servings from the dairy group per day.
4 3 2 1
7. According to mypyramid.gov, females ages 18-25, who engage in more than 60 minutes of exercise per day, should consume 6.5 ounce equivalents from the meat/bean group every day.
4 3 2 1
8. Eating breakfast can improve concentration.
4 3 2 1
9. Excess vitamin consumption can be toxic.
4 3 2 1
10. Anemia is a deficiency of iron.
4 3 2 1
11. Average percent of body fat in females is 20-25%.
4 3 2 1
12. Cereal, bread, bagels, and pasta are good sources of carbohydrates.
4 3 2 1
13. Tofu, nuts, and beans are good sources of protein.
4 3 2 1

14. Athletes tend to consume twice as much protein as recommended.
4 3 2 1
15. The best sources of iron come from animal products and fish.
4 3 2 1
16. Eating cereals or breads enriched with iron should be eaten with a source of vitamin C to enhance absorption of iron.
4 3 2 1
17. Proteins act to repair and build muscle tissue and make hormones to boost the immune system.
4 3 2 1
18. Fats are essential in all diets.
4 3 2 1
19. If a diet is lacking in carbohydrates, proteins are then used for energy.
4 3 2 1
20. Oatmeal, legumes, and fruits are sources of soluble fiber.
4 3 2 1
21. The recommended amount of iron for females is 18-32 milligrams per day.
4 3 2 1
22. Vitamin C is also known as ascorbic acid.
4 3 2 1

Section 2: Please circle the number that applied to each of the following questions. Refer to the scale below to determine the number of days per week defined in each rating. **All of the results will be kept strictly confidential.** Thank you for your cooperation.

- 4 - Always: Occurs 5-7 days per week
3 - Often: Occurs 3-4 days per week
2 - Sometimes: Occurs 1-2 days per week
1 - Never: Does not occur at all

1. How often do you eat breakfast in the morning?
4 3 2 1
2. How often do you take vitamin supplements?
4 3 2 1
3. How often do you take mineral supplements?
4 3 2 1
4. How often do you eat three base meals per day?
4 3 2 1
5. How often do you record what you eat?
4 3 2 1
6. How often are you on a "diet"?

4 3 2 1

7. How often do you eat fruits, such as apples, bananas, or oranges?

4 3 2 1

8. How often do you eat vegetables, such as broccoli, carrots or salad?

4 3 2 1

9. How often do you consume dairy products such as milk, yogurt or cheese?

4 3 2 1

10. How often do you seek out nutritional information?

4 3 2 1

APPENDIX C3
Demographics Information

Please **DO NOT** include your name anywhere in this questionnaire. Please answer all of the following questions honestly and to the best of your knowledge. **All of your responses and the results of this study will be kept strictly confidential.** Thank you for your time.

1. Age _____

2. Major

Athletic Training _____ Wellness and Fitness _____

3. Academic year in college

Junior _____ Senior _____

4. Have you ever taken a nutrition course?

Yes* _____ No _____

* If yes, which course were you enrolled?

Sports Nutrition _____ Physiology of Exercise _____ Other _____

5. What is your housing assignment?

On Campus* _____ Off Campus _____

If on campus, do you currently have a meal plan?

Yes _____ No _____

If yes, how often do you eat meals from the dining hall?

2-3 times per week _____

4-8 times per week _____

8-10 times per week _____

More than 10 times per week _____

6. Are you currently concerned with your weight?

Yes _____ No _____

7. Are you currently watching what you eat/modifying diet or caloric intake?

Yes _____ No _____

APPENDIX C4

Institutional Review Board -
California University of Pennsylvania

Institutional Review Board
California University of Pennsylvania
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instreviewboard@calu.edu
Robert Skwarecki, Ph.D., CCC-SLP, Chair

Amanda,

Please consider this email as official notification that your proposal titled "The Relationship Between Nutritional Knowledge and Eating Habits of Undergraduate Athletic Training and Wellness & Fitness Majors" (Proposal #09-041) has been approved by the California University of Pennsylvania Institutional Review Board, with the following stipulation:

The cover letter for the survey must include a statement that completion of the survey constitutes consent to use the data.

Once you have you have made this change, you may immediately begin data collection. You do not need to wait for further IRB approval. [At your earliest convenience, you must forward a copy of the revised document for the Board's records].

The effective date of the approval is 2-15-2010 and the expiration date is 2-15-2011. These dates must appear on the consent form.

Please note that Federal Policy requires that you notify the IRB promptly regarding any of the following:

- (1) Any additions or changes in procedures you might wish for your study (additions or changes must be approved by the IRB before they are implemented)
- (2) Any events that affect the safety or well-being of subjects
- (3) Any modifications of your study or other responses that are necessitated by any events reported in (2).
- (4) To continue your research beyond the approval expiration date of 2-15-2011 you must file additional information to be considered for continuing review. Please contact instreviewboard@cup.edu

Please notify the Board when data collection is complete.

Regards,
Robert Skwarecki, Ph.D., CCC-SLP
Chair, Institutional Review Board

Proposal Number
Date Received



California University of Pennsylvania

PROTOCOL for Research
Involving Human Subjects

Institutional Review Board (IRB) approval is required before
beginning any research and/or data collection involving human subjects

(Reference IRB Policies and Procedures for clarification)

Project Title *The Relationship Between Nutritional Knowledge and Eating Habits of Undergraduate Athletic Training and Wellness & Fitness Majors.*

Researcher/Project Director *Amanda Greco*

Phone # *(917)535-1527*

E-mail Address *gre7256@cup.edu*

Faculty Sponsor (if required) *Rebecca Hess*

Department *Health Science*

Project Dates *January 2010* to *December 2010*

Sponsoring Agent (if applicable) _____

Project to be Conducted at *California University of Pennsylvania (web-based survey)*

Project Purpose: *Thesis* *Research* *Class Project* *Other*

Keep a copy of this form for your records.

Please attach a typed, detailed summary of your project AND complete items 2 through 6.

1. *Provide an overview of your project-proposal describing what you plan to do and how you will go about doing it. Include any hypothesis(es) or research questions that might be involved and explain how the information you gather will be analyzed. For a complete list of what should be included in your summary, please refer to Appendix B of the IRB Policies and Procedures Manual.*

The purpose of this study will be to determine the relationship between nutritional knowledge and eating habits of undergraduate athletic training students and undergraduate wellness & fitness majors. Undergraduate students in their junior and senior years from each of the aforementioned majors at California University of Pennsylvania are expected to participate in this survey. These students have been chosen since they have already taken a course in Sports Nutrition or Physiology of Exercise. Each student who agrees to participate in this study will be asked to fill out demographic information (see attached) and the two-part revised Nutritional Knowledge and Eating Habits Questionnaire (see attached). Part one of the questionnaire is intended to test the nutritional knowledge of each participant, and part two will be used to test the quality of their eating habits. Each part of the questionnaire will be scored separately and the results will be compared to each other. This will allow the researcher to determine if there is a relationship between nutritional knowledge and eating habits. The students' answers will remain confidential throughout the course of the study.

A descriptive research design will be used for this study. Dependent variables in this study include (1) nutritional knowledge and (2) eating habits. The independent variable would be major field of study (athletic training/wellness & fitness). Once students complete the questionnaire, the results will then be separated by major and compared independently. Once these results have been established, the researcher will determine if there is a link between nutritional knowledge and eating habits.

Two hypotheses will be tested throughout this study.

1. There will be no difference between the groups on Knowledge of Nutrition and Eating Habits. To test this hypothesis, a MANOVA will be used to determine if there is a difference between each of the groups.
 2. The second hypothesis is that eating habits will not correlate with the Knowledge of Nutrition regardless of group. For this hypothesis, a Pearson Product Moment Correlation will be used to determine if any relationship is present, regardless of group.
2. *Section 46.11 of the Federal Regulations state that research proposals involving human subjects must satisfy certain requirements before the IRB can grant approval. You should describe in detail how the following requirements will be satisfied. Be sure to address each area separately.*
 - a. *How will you insure that any risks to subjects are minimized? If there are potential risks, describe what will be done to minimize these risks. If there are risks, describe why the risks to participants are reasonable in relation to the anticipated benefits.*

There are no risks associated with completing this survey. All subject's answers will be kept confidential. No research will be carried out before the research gains approval by the IRB.

- b. *How will you insure that the selection of subjects is equitable? Take into account your purpose(s). Be sure you address research problems involving vulnerable populations such as children, prisoners, pregnant women, mentally disabled persons, and economically or educationally disadvantaged persons. If this is an in-class project describe how you will minimize the possibility that students will feel coerced.*

All subjects will be volunteers 18 years or older at California University of Pennsylvania. All of these volunteers will be recruited from the undergraduate athletic training (n~30) and wellness & fitness (n~30) majors. E-mails addresses will be obtained from the program directors of each major and e-mails will be sent to the students from the researcher. Prior to completing the survey, the participants will receive an e-mailed coverletter (see attached) explaining the purpose of the study, along with their cooperation to volunteer.

- c. *How will you obtain informed consent from each participant or the subject's legally authorized representative and ensure that all consent forms are appropriately documented? Be sure to attach a copy of your consent form to the project summary.*

The e-mailed cover letter (see attached) will state that all subjects have the right to choose not to participate in the survey. Therefore, informed consent is implied upon completing and returning the survey to the researcher.

- d. *Show that the research plan makes provisions to monitor the data collected to insure the safety of all subjects. This includes the privacy of subjects' responses and provisions for maintaining the security and confidentiality of the data.*

Data will be collected during the spring semester. All students will receive an e-mail asking for participation in the study. The survey will be accessible through SurveyMonkey.com and upon completion, the subjects identity will remain anonymous. All results and information containing subject identity will be kept in a secure location in which only the researcher, Amanda Greco, and research advisor, Dr. Rebecca Hess, can access the information.

3. *Check the appropriate box(es) that describe the subjects you plan to use.*

<input type="checkbox"/> <i>Adult volunteers</i>	<input type="checkbox"/> <i>Mentally Disabled People</i>
<input checked="" type="checkbox"/> <i>CAL University Students</i>	<input type="checkbox"/> <i>Economically Disadvantaged People</i>
<input type="checkbox"/> <i>Other Students</i>	<input type="checkbox"/> <i>Educationally Disadvantaged People</i>
<input type="checkbox"/> <i>Prisoners</i>	<input type="checkbox"/> <i>Fetuses or fetal material</i>
<input type="checkbox"/> <i>Pregnant Women</i>	<input type="checkbox"/> <i>Children Under 18</i>
<input type="checkbox"/> <i>Physically Handicapped People</i>	<input type="checkbox"/> <i>Neonates</i>

4. *Is remuneration involved in your project?* *Yes* or *No*. *If yes, Explain here.*
5. *Is this project part of a grant?* *Yes* or *No* *If yes, provide the following information:*

Title of the Grant Proposal _____

Name of the Funding Agency _____

Dates of the Project Period _____

6. *Does your project involve the debriefing of those who participated?* *Yes* or *No*

If Yes, explain the debriefing process here.

7. *If your project involves a questionnaire interview, ensure that it meets the requirements of Appendix_____in the Policies and Procedures Manual.*

California University of Pennsylvania Institutional Review Board
Survey/Interview/Questionnaire Consent Checklist (v021209)

This form **MUST** accompany all IRB review requests

Does your research involve **ONLY** a survey, interview or questionnaire?

- YES**—Complete this form
- NO**—You **MUST** complete the “Informed Consent Checklist”—skip the remainder of this form

Does your survey/interview/questionnaire cover letter or explanatory statement include:

- (1) Statement about the general nature of the survey and how the data will be used?
- (2) Statement as to who the primary researcher is, including name, phone, and email address?
- (3) **FOR ALL STUDENTS:** Is the faculty advisor’s name and contact information provided?
- (4) Statement that participation is voluntary?
- (5) Statement that participation may be discontinued at any time without penalty and all data discarded?
- (6) Statement that the results are confidential?
- (7) Statement that results are anonymous?
- (8) Statement as to level of risk anticipated or that minimal risk is anticipated? (NOTE: If more than minimal risk is anticipated, a full consent form is required—and the Informed Consent Checklist must be completed)
- (9) Statement that returning the survey is an indication of consent to use the data?
- (10) Who to contact regarding the project and how to contact this person?
- (11) Statement as to where the results will be housed and how maintained? (unless otherwise approved by the IRB, must be a secure location on University premises)
- (12) Is there text equivalent to: “Approved by the California University of Pennsylvania Institutional Review Board. This approval is effective nn/nn/nn and expires mm/mm/mm”? (the actual dates will be specified in the approval notice from the IRB)?

(13) FOR ELECTRONIC/WEBSITE SURVEYS: Does the text of the cover letter or explanatory statement appear before any data is requested from the participant?

(14) FOR ELECTONIC/WEBSITE SURVEYS: Can the participant discontinue participation at any point in the process and all data is immediately discarded?

**California University of Pennsylvania Institutional Review Board
Informed Consent Checklist (v021209)**

This form MUST accompany all IRB review requests

Does your research involve ONLY a survey, interview, or questionnaire?

- YES**—DO NOT complete this form. You MUST complete the “Survey/Interview/Questionnaire Consent Checklist” instead.
- NO**—Complete the remainder of this form.

1. Introduction (check each)

- (1.1) Is there a statement that the study involves research?
- (1.2) Is there an explanation of the purpose of the research?

2. Is the participant. (check each)

- (2.1) Given an invitation to participate?
- (2.2) Told why he/she was selected.
- (2.3) Told the expected duration of the participation.
- (2.4) Informed that participation is voluntary?
- (2.5) Informed that all records are confidential?
- (2.6) Told that he/she may withdraw from the research at any time without penalty or loss of benefits?
- (2.7) 18 years of age or older? (if not, see Section #9, Special Considerations below)

3. Procedures (check each).

- (3.1) Are the procedures identified and explained?
- (3.2) Are the procedures that are being investigated clearly identified?
- (3.3) Are treatment conditions identified?

4. Risks and discomforts. (check each)

- (4.1) Are foreseeable risks or discomforts identified?
- (4.2) Is the likelihood of any risks or discomforts identified?
- (4.3) Is there a description of the steps that will be taken to minimize any risks or discomforts?
- (4.4) Is there an acknowledgement of potentially unforeseeable risks?
- (4.5) Is the participant informed about what treatment or follow up courses of action are available should there be some physical, emotional, or psychological harm?
- (4.6) Is there a description of the benefits, if any, to the participant or to others that may be reasonably expected from the research and an estimate of the likelihood of these benefits?
- (4.7) Is there a disclosure of any appropriate alternative procedures or courses of treatment that might be advantageous to the participant?

5. Records and documentation. (check each)

- (5.1) Is there a statement describing how records will be kept confidential?
- (5.2) Is there a statement as to where the records will be kept and that this is a secure location?
- (5.3) Is there a statement as to who will have access to the records?

6. For research involving more than minimal risk (check each),

- (6.1) Is there an explanation and description of any compensation and other medical or counseling treatments that are available if the participants are injured through participation?
- (6.2) Is there a statement where further information can be obtained regarding the treatments?
- (6.3) Is there information regarding who to contact in the event of research-related injury?

7. Contacts.(check each)

- (7.1) Is the participant given a list of contacts for answers to questions about the research and the participant's rights?
- (7.2) Is the principal researcher identified with name and phone number and email address?
- (7.3) FOR ALL STUDENTS: Is the faculty advisor's name and contact information provided?

8. General Considerations (check each)

- (8.1) Is there a statement indicating that the participant is making a decision whether or not to participate, and that his/her signature indicates that he/she has decided to participate having read and discussed the information in the informed consent?
- (8.2) Are all technical terms fully explained to the participant?
- (8.3) Is the informed consent written at a level that the participant can understand?
- (8.4) Is there text equivalent to: "Approved by the California University of Pennsylvania Institutional Review Board. This approval is effective nn/nn/nn and expires mm/mm/mm"? (the actual dates will be specified in the approval notice from the IRB)

9. Specific Considerations (check as appropriate)

- (9.1) If the participant is or may become pregnant is there a statement that the particular treatment or procedure may involve risks, foreseeable or currently unforeseeable, to the participant or to the embryo or fetus?
- (9.2) Is there a statement specifying the circumstances in which the participation may be terminated by the investigator without the participant's consent?
- (9.3) Are any costs to the participant clearly spelled out?
- (9.4) If the participant desires to withdraw from the research, are procedures for orderly termination spelled out?
- (9.5) Is there a statement that the Principal Investigator will inform the participant or any significant new findings developed during the research that may affect them and influence their willingness to continue participation?
- (9.6) Is the participant is less than 18 years of age? If so, a parent or guardian must sign the consent form and assent must be obtained from the child
 - Is the consent form written in such a manner that it is clear that the parent/guardian is giving permission for their child to participate?

- Is a child assent form being used?
- Does the assent form (if used) clearly indicate that the child can freely refuse to participate or discontinue participation at any time without penalty or coercion?
- (9.7) Are all consent and assent forms written at a level that the intended participant can understand? (generally, 8th grade level for adults, age-appropriate for children)

California University of Pennsylvania Institutional Review Board
Review Request Checklist (v021209)

This form **MUST** accompany all IRB review requests.
 Unless otherwise specified, **ALL** items must be present in your review request.

Have you:

(1.0) **FOR ALL STUDIES:** Completed **ALL** items on the Review Request Form?

Pay particular attention to:

(1.1) Names and email addresses of all investigators

(1.1.1) **FOR ALL STUDENTS:** use only your CalU email address)

(1.1.2) **FOR ALL STUDENTS:** Name and email address of your faculty research advisor

(1.2) Project dates (must be in the future—no studies will be approved which have already begun or scheduled to begin before final IRB approval—**NO EXCEPTIONS**)

(1.3) Answered completely and in detail, the questions in items 2a through 2d?

2a: **NOTE:** No studies can have zero risk, the lowest risk is “minimal risk”. If more than minimal risk is involved you **MUST**:

i. Delineate all anticipated risks in detail;

ii. Explain in detail how these risks will be minimized;

iii. Detail the procedures for dealing with adverse outcomes due to these risks.

iv. Cite peer reviewed references in support of your explanation.

2b. Complete all items.

2c. Describe informed consent procedures in detail.

2d. **NOTE:** to maintain security and confidentiality of data, all study records must be housed in a secure (locked) location **ON UNIVERSITY PREMISES**. The actual location (department, office, etc.) must be specified in your explanation and be listed on any consent forms or cover letters.

(1.4) Checked all appropriate boxes in Section 3? If participants under the age of 18 years are to be included (regardless of what the study involves) you **MUST**:

(1.4.1) Obtain informed consent from the parent or guardian—consent forms must be written so that it is clear that the parent/guardian is giving permission for their child to participate.

(1.4.2) Document how you will obtain assent from the child—This must be done in an age-appropriate manner. Regardless of whether the parent/guardian has given permission, a child is completely free to refuse to participate, so the investigator must document how the child indicated agreement to participate (“assent”).

- (1.5) Included all grant information in section 5?
- (1.6) Included ALL signatures?

- (2.0) FOR STUDIES INVOLVING MORE THAN JUST SURVEYS, INTERVIEWS, OR QUESTIONNAIRES:
 - (2.1) Attached a copy of all consent form(s)?
 - (2.2) FOR STUDIES INVOLVING INDIVIDUALS LESS THAN 18 YEARS OF AGE: attached a copy of all assent forms (if such a form is used)?
 - (2.3) Completed and attached a copy of the Consent Form Checklist? (as appropriate—see that checklist for instructions)
- (3.0) FOR STUDIES INVOLVING ONLY SURVEYS, INTERVIEWS, OR QUESTIONNAIRES:
 - (3.1) Attached a copy of the cover letter/information sheet?
 - (3.2) Completed and attached a copy of the Survey/Interview/Questionnaire Consent Checklist? (see that checklist for instructions)
 - (3.3) Attached a copy of the actual survey, interview, or questionnaire questions in their final form?

- (4.0) FOR ALL STUDENTS: Has your faculty research advisor:
 - (4.1) Thoroughly reviewed and approved your study?
 - (4.2) Thoroughly reviewed and approved your IRB paperwork? including:
 - (4.2.1) Review request form,
 - (4.2.2) All consent forms, (if used)
 - (4.2.3) All assent forms (if used)
 - (4.2.4) All Survey/Interview/Questionnaire cover letters (if used)
 - (4.2.5) All checklists
 - (4.3) IMPORTANT NOTE: Your advisor's signature on the review request form indicates that they have thoroughly reviewed your proposal and verified that it meets all IRB and University requirements.
- (5.0) Have you retained a copy of all submitted documentation for your records?

Project Director's Certification
Program Involving HUMAN SUBJECTS

The proposed investigation involves the use of human subjects and I am submitting the complete application form and project description to the Institutional Review Board for Research Involving Human Subjects.

I understand that Institutional Review Board (IRB) approval is required before beginning any research and/or data collection involving human subjects. If the Board grants approval of this application, I agree to:

1. Abide by any conditions or changes in the project required by the Board.
2. Report to the Board any change in the research plan that affects the method of using human subjects before such change is instituted.
3. Report to the Board any problems that arise in connection with the use of human subjects.
4. Seek advice of the Board whenever I believe such advice is necessary or would be helpful.
5. Secure the informed, written consent of all human subjects participating in the project.
6. Cooperate with the Board in its effort to provide a continuing review after investigations have been initiated.

I have reviewed the Federal and State regulations concerning the use of human subjects in research and training programs and the guidelines. I agree to abide by the regulations and guidelines aforementioned and will adhere to policies and procedures described in my application. I understand that changes to the research must be approved by the IRB before they are implemented.

Professional Research

Project Director's Signature

Department Chairperson's Signature

Student or Class Research

Student Researcher's Signature

Supervising Faculty Member's
Signature if required

Department Chairperson's Signature

ACTION OF REVIEW BOARD (IRB use only)

The Institutional Review Board for Research Involving Human Subjects has reviewed this application to ascertain whether or not the proposed project:

1. provides adequate safeguards of the rights and welfare of human subjects involved in the investigations;
2. uses appropriate methods to obtain informed, written consent;
3. indicates that the potential benefits of the investigation substantially outweigh the risk involved.
4. provides adequate debriefing of human participants.
5. provides adequate follow-up services to participants who may have incurred physical, mental, or emotional harm.

Approved[_____]

Disapproved

Chairperson, Institutional Review Board

Date

Appendix C5

Old Nutritional Knowledge and Eating Habits Questionnaire

Old Nutritional Knowledge and Eating Habits Questionnaire

SECTION 1: Please circle the number for each statement indicating to what extent you agree or disagree with each of the following statements.

- 4 - Strongly Agree
 3 - Agree Somewhat
 2 - Disagree Somewhat
 1 - Strongly Disagree

Athlete # _____

1. Skipping breakfast can negatively affect athletic performance.
 4 3 2 1
2. Proteins are the best and most efficient source of energy.
 4 3 2 1
3. Nutrition affects mental performance.
 4 3 2 1
4. The pre-event meal should be eaten 3-4 hours prior to competition.
 4 3 2 1
5. Calcium excretion from the body increases with alcohol consumption.
 4 3 2 1
6. According to mypyramid.gov, it is recommended that females, age 18-25, who engage in more than 60 min. of exercise per day, should consume 8 daily ounce equivalents from the grains group.
 4 3 2 1
7. According to mypyramid.gov, it is recommended that females, age 18-25, who engage in more than 60 min. of exercise per day, should consume 2 cups of fruit daily.
 4 3 2 1
8. According to mypyramid.gov, it is recommended that females, age 18-25, who engage in more than 60 min. of exercise per day, should consume 3 servings from the dairy group daily.
 4 3 2 1
9. According to mypyramid.gov, it is recommended that females, age 18-25, who engage in more than 60 min. of exercise per day, should consume 6.5 ounce equivalents from the meat/bean group every day.
 4 3 2 1
10. Eating breakfast can improve concentration.
 4 3 2 1
11. Carbohydrates are less fattening than fatty foods.
 4 3 2 1
12. At least 60% of total calories should come from carbohydrates.
 4 3 2 1
13. Carbohydrates are easier to digest than fats or proteins.
 4 3 2 1
14. Excess vitamin consumption can be toxic.
 4 3 2 1

15. Anemia is a deficiency of iron.
4 3 2 1
16. Average percentage of body fat in females is 20-25%.
4 3 2 1
17. Cereal, bread, bagels, and pasta are good sources of carbohydrates.
4 3 2 1
18. Tofu, nuts, and beans are good sources of proteins.
4 3 2 1
19. Athletes tend to consume twice as much protein as recommended.
4 3 2 1
20. Over-consumption of protein is beneficial for athletes.
4 3 2 1
21. The best sources of iron come from animal products and fish.
4 3 2 1
22. Eating cereals or breads enriched with iron should be eaten with a source of vitamin C to enhance the absorption of iron.
4 3 2 1
23. Proteins act to repair and build muscle tissue and make hormones to boost the immune system.
4 3 2 1
24. Fats are essential in all diets.
4 3 2 1
25. If a diet is lacking in carbohydrates, proteins are then used for energy.
4 3 2 1
26. Oatmeal, legumes, and fruits are sources of soluble fiber.
4 3 2 1
27. The recommended amount of iron for females is 18-23 milligrams per day.
4 3 2 1
28. Vitamin C is also known as ascorbic acid.
4 3 2 1
29. If you are not thirsty, then you must not be dehydrated.
4 3 2 1

SECTION 2: Please circle the number that applies to the following questions. Refer to the scale below to determine the number of days per week defined in each rating. **All of the results will be strictly confidential.** Thank you for your cooperation.

- 4 - Always: Occurs 5-7 days per week.
3 - Often: Occurs 3-4 days per week.
2 - Sometimes: Occurs 1-2 days per week.
1 - Never: Does not occur at all.

1. How often do you eat breakfast in the morning?
4 3 2 1
2. Based on three meals per day, how often do you skip at least one meal per day?
4 3 2 1
3. How often do you take vitamin supplements?
4 3 2 1
4. How often do you take mineral supplements?
4 3 2 1
5. How often do you eat three meals per day?
4 3 2 1
6. How often do you record what you eat?
4 3 2 1
7. How often do you drink water?
4 3 2 1
8. How often do you drink carbonated beverages?
4 3 2 1
9. How often are you on a "diet"?
4 3 2 1
10. How often do you eat breads, cereals, pasta, potatoes or rice?
4 3 2 1
11. How often do you eat fruits, such as apples, bananas, or oranges?
4 3 2 1
12. How often do you eat vegetables, such as broccoli, carrots, or salad?
4 3 2 1
13. How often do you eat dairy products such as milk, yogurt or cheese?
4 3 2 1
14. How often do you eat berry jams, cookies, candies, or other sweets?
4 3 2 1
15. How often do you snack on foods like potato chips, cakes, candies, donuts, or soda?
4 3 2 1
16. How often do you snack on foods like bagels, yogurt, popcorn, pretzels, or fruits?
4 3 2 1
17. How often do you eat fast foods?
4 3 2 1
18. How often do you seek out nutritional information?
4 3 2 1

APPENDIX C6

Scoring Key: Old Nutritional Knowledge and Eating Habits
Questionnaire

Old Nutritional Knowledge and Eating Habits Questionnaire

SECTION 1: Please circle the number for each statement indicating to what extent you agree or disagree with each of the following statements.

- 4 - Strongly Agree
- 3 - Agree Somewhat
- 2 - Disagree Somewhat
- 1 - Strongly Disagree

Athlete # _____

2. Skipping breakfast can negatively affect athletic performance. 4
2. Proteins are the best and most efficient source of energy. 1
3. Nutrition affects mental performance. 4
4. The pre-event meal should be eaten 3-4 hours prior to competition. 4
5. Calcium excretion from the body increases with alcohol consumption. 4
6. According to mypyramid.gov, it is recommended that females, age 18-25, who engage in more than 60 min. of exercise per day, should consume 8 daily ounce equivalents from the grains group. 4
7. According to mypyramid.gov, it is recommended that females, age 18-25, who engage in more than 60 min. of exercise per day, should consume 2 cups of fruit daily. 4
8. According to mypyramid.gov, it is recommended that females, age 18-25, who engage in more than 60 min. of exercise per day, should consume 3 servings from the dairy group daily. 4
9. According to mypyramid.gov, it is recommended that females, age 18-25, who engage in more than 60 min. of exercise per day, should consume 6.5 ounce equivalents from the meat/bean group every day. 4
10. Eating breakfast can improve concentration. 4
11. Carbohydrates are less fattening than fatty foods. 4
12. At least 60% of total calories should come from carbohydrates. 4
13. Carbohydrates are easier to digest than fats or proteins. 4
14. Excess vitamin consumption can be toxic. 4
15. Anemia is a deficiency of iron. 4
16. Average percentage of body fat in females is 20-25%. 4
17. Cereal, bread, bagels, and pasta are good sources of carbohydrates. 4
18. Tofu, nuts, and beans are good sources of proteins. 4
19. Athletes tend to consume twice as much protein as recommended. 4

20. Over-consumption of protein is beneficial for athletes. 1
21. The best sources of iron come from animal products and fish. 4
22. Eating cereals or breads enriched with iron should be eaten with a source of vitamin C to enhance the absorption of iron. 4
23. Proteins act to repair and build muscle tissue and make hormones to boost the immune system. 4
24. Fats are essential in all diets. 4
25. If a diet is lacking in carbohydrates, proteins are then used for energy. 4
26. Oatmeal, legumes, and fruits are sources of soluble fiber. 4
27. The recommended amount of iron for females is 18-23 milligrams per day. 4
28. Vitamin C is also known as ascorbic acid. 4
29. If you are not thirsty, then you must not be dehydrated. 1

RANGE OF SCORES: 29-116

SECTION 2: Please circle the number that applies to the following questions. Refer to the scale below to determine the number of days per week defined in each rating. **All of the results will be strictly confidential.** Thank you for your cooperation.

- 4 - Always: Occurs 5-7 days per week.
- 3 - Often: Occurs 3-4 days per week.
- 2 - Sometimes: Occurs 1-2 days per week.
- 1 - Never: Does not occur at all.

1. How often do you eat breakfast in the morning? 4
2. Based on three meals per day, how often do you skip at least one meal per day? 1
3. How often do you take vitamin supplements? 1
4. How often do you take mineral supplements? 1
5. How often do you eat three meals per day? 4
6. How often do you record what you eat? 4
7. How often do you drink water? 4
8. How often do you drink carbonated beverages? 1
9. How often are you on a "diet"? 1
10. How often do you eat breads, cereals, pasta, potatoes or rice? 4

11. How often do you eat fruits, such as apples, bananas, or oranges?
4
12. How often do you eat vegetables, such as broccoli, carrots, or salad? 4
13. How often do you eat dairy products such as milk, yogurt or cheese?
4
14. How often do you eat berry jams, cookies, candies, or other sweets?
1
15. How often do you snack on foods like potato chips, cakes, candies, donuts, or soda? 1
16. How often do you snack on foods like bagels, yogurt, popcorn, pretzels, or fruits? 4
17. How often do you eat fast foods? 1
18. How often do you seek out nutritional information? 4

RANGE OF SCORES: 18-72

CLASSIFICATIONS:

Excellent = 85-100%
Good = 70-85%
Fair = 55-69%
Poor = 54% or below

APPENDIX C7

Scoring Key: Revised Nutritional Knowledge and Heating
Habits Questionnaire

Revised Nutritional Knowledge and Eating Habits Questionnaire

Section 1: Please circle the number for each statement indicating to what extent you agree or disagree with each of the following statements.

- 4 - Strongly Agree
- 3 - Agree Somewhat
- 2 - Disagree Somewhat
- 1 - Strongly Disagree

1. Skipping breakfast can negatively affect athletic performance. 4
2. Nutrition can affect mental performance. 4
3. Calcium excretion from the body increases with alcohol consumption. 4
4. According to mypyramid.gov, it is recommended that females, age 18-25, who engage in more than 60 minutes of exercise per day, should consume 8 daily ounce equivalents from the grains group. 4
5. According to mypyramid.gov, females age 18-25, who engage in more than 60 minutes of exercise per day, should consume 2 cups of fruit daily. 4
6. According to mypyramid.gov, females age 18-25, who engage in more than 60 minutes of exercise per day, should consume 3 servings from the dairy group per day. 4
7. According to mypyramid.gov, females ages 18-25, who engage in more than 60 minutes of exercise per day, should consume 6.5 ounce equivalents from the meat/bean group every day. 4
8. Eating breakfast can improve concentration. 4
9. Excess vitamin consumption can be toxic. 4
10. Anemia is a deficiency of iron. 4
11. Average percent of body fat in females is 20-25%. 4
12. Cereal, bread, bagels, and pasta are good sources of carbohydrates. 4
13. Tofu, nuts, and beans are good sources of protein. 4
14. Athletes tend to consume twice as much protein as recommended. 4
15. The best sources of iron come from animal products and fish. 4
16. Eating cereals or breads enriched with iron should be eaten with a source of vitamin C to enhance absorption of iron. 4
17. Proteins act to repair and build muscle tissue and make hormones to boost the immune system. 4

18. Fats are essential in all diets. 4
19. If a diet is lacking in carbohydrates, proteins are then used for energy. 4
20. Oatmeal, legumes, and fruits are sources of soluble fiber. 4
21. The recommended amount of iron for females is 18-32 milligrams per day. 4
22. Vitamin C is also known as ascorbic acid. 4

RANGE OF SCORES: 22-88

Section 2: Please circle the number that applied to each of the following questions. Refer to the scale below to determine the number of days per week defined in each rating. **All of the results will be kept strictly confidential.** Thank you for your cooperation.

- 4 - Always: Occurs 5-7 days per week
- 3 - Often: Occurs 3-4 days per week
- 2 - Sometimes: Occurs 1-2 days per week
- 1 - Never: Does not occur at all

1. How often do you eat breakfast in the morning? 4
2. How often do you take vitamin supplements? 1
3. How often do you take mineral supplements? 1
4. How often do you eat three base meals per day? 4
5. How often do you record what you eat? 4
6. How often are you on a "diet"? 1
7. How often do you eat fruits, such as apples, bananas, or oranges? 4
8. How often do you eat vegetables, such as broccoli, carrots or salad? 4
9. How often do you consume dairy products such as milk, yogurt or cheese? 4
10. How often do you seek out nutritional information? 4

RANGE OF SCORES: 10-40

CLASSIFICATIONS:

- Excellent = 85-100%
- Good = 70-85%
- Fair = 55-69%
- Poor = 54% or below

REFERENCES

1. U.S. Department of Health and Human Services and U.S. Department of Agriculture. Dietary Guidelines for Americans, 2005. 6th Edition, Washington, DC: U.S. Government Printing Office, January 2005.
2. U.S. Department of Health and Human Services. The Surgeon General's Report on Nutrition and Health. 2008. Public Health Service. DHHS (PHS) Publication No. 88-50210.
3. Know How Many Calories You Should Eat. American Heart Association Web site. <http://www.americanheart.org>. Accessed September 24, 2009.
4. National Athletic Trainer's Association. What is an Athletic Trainer? 2009. Available at nata.org. Accessed September 22, 2009.
5. American College of Sports Medicine, American Dietetic Association, and Dietitians of Canada. Joint position statement. Nutrition and athletic performance. *Official Journal of the American College of Sports Medicine*. 2009;709-730.
6. Fink HH, Burgoon LA, Mikesky AE. Introduction to Sports Nutrition. In: Fink HH, Burgoon LA, Mikesky AE. *Practical Applications in Sports Nutrition*. Sudbury MA: Jones and Bartlett Publishers; 2006:2-24.
7. Otten J, Hellwig J, Meyers L. *Dietary Reference Intakes: The Essential Guide to Nutrient Requirements*. Washington (DC): The National Academies Press; 2006.
8. Casa DJ, Armstrong LE, Hillman SK, Montain SJ, Reiff RV, Rich BSE, Roberts WO, Stone JA. National Athletic Trainers Position Statement: Fluid replacement for athletes. In: *Position, Consensus, Official and Support Statements, National Athletic Trainers' Association Reference Series*. Canada. National Athletic Trainers' Association; 2008:27-40.
9. National Athletic Trainers' Association Board of Certification. *Role Delineation Study*. Fifth Edition. Nebraska. Board of Certification, Inc. 2004

10. Perrin DH. Athletic Training: From physical education to allied health. *Quest*. 2007;59:111-132.
11. Weidner TG. Noble GL. Pipkin JB. Athletic training students in the college/university setting and the scope of clinical education. *Journal of Athletic Training*. 2006;41:422-426.
12. American College of Sports Medicine. Become an ACSM certified health fitness specialist. Available at: www.acsm.org. Accessed October 15, 2009.
13. Standards and Guidelines for the Accreditation of Educational Programs for Personal Fitness Training. Commission on Accreditation of Allied Health Education Programs Web site. (<http://www.caahep.org/index?>.) Accessed November 30, 2009.
14. Makino M. Hashizume M. Yasushi M. Tsubio Y. Dennerstein L. Factors associated with abnormal eating attitudes among female college students in Japan. *Archives of Womens Mental Health*. 2006;9:203-208.
15. Horacek TM. Betts NM. Students cluster into 4 groups according to the factors influencing their dietary intake. *Journal of Marketing Research*. 1994;31:1464-1467.
16. Ha EJ. Caine-Bish N. Effect of nutrition intervention using a general nutrition course for promoting fruit and vegetable consumption among college students. *Journal of Nutrition Education Behavior*. 2009;41:103-109.
17. Haberman S. Luffey D. Weighing in college students' diets and exercise behaviors. *Journal of American College Health*. 1998;46.
18. Boyle JR. LaRose NR. Personal beliefs, the environment and college students' exercise and eating behaviors. *American Journal of Health Studies*. 2008;23:195-200.
19. Sneed J. Holdt CS. Many factors influence college students' eating patterns. *American Journal of College Health*. 1991;91:1380.

20. Matvienko O. Lewis DS. Schafer E. A college nutrition science course as an intervention to prevent weight gain in female college freshmen. *Journal of Nutrition Education*. 2001;33:95-101.
21. Huang Y. Song WO. Shemmel RA. Hoerr SM. What do college students eat? Food selection and meal patterns. *Nutritional Research*. 1994;14:1143-1153.
22. Zawila LG. Steib CSM. Hoogenboom B. The female collegiate cross-country runner: Nutritional knowledge and attitudes. *Journal of Athletic Training*. 2003;38:67-74.
23. Reinking MF. Alexander LE. Prevalence of disorder-eating behaviors in undergraduate female collegiate athletes and nonathletes. *Journal of Athletic Training*. 2005;40:47-51.
24. Barr SI. Nutrition knowledge of female varsity athletes and university students. *Journal of the American Dietetic Association*. 1987;12:1660-1664.
25. Deshpande S. Basil MD. Basil DZ. Factors influencing healthy eating habits among college students: An application of the health belief model. *Health Marketing Quarterly*. 2009;26:145-164.
26. Levi A. Chan KK. Pence D. Real men do not read labels: The effects of masculinity and involvement on college students' food decisions. *Journal of American College Health*. 2006;55:91-98.
27. Shepard MW. *A Nutritional Profile of Female NCAA Division II Swimmers*. [master's thesis]. California, PA: California University of Pennsylvania; 2007

ABSTRACT

TITLE: THE RELATIONSHIP BETWEEN NUTRITIONAL KNOWLEDGE AND EATING HABITS OF UNDERGRADUATE ATHLETIC TRAINING AND WELLNESS & FITNESS MAJORS

Researcher: Amanda Nicole Greco

Advisor: Dr. Rebecca Hess

Date: April 2010

Research Type: Master's Thesis

Context: There is no previous research comparing the nutritional knowledge and eating habits of undergraduate athletic training and wellness & fitness majors.

Objective: The purpose of this study was to examine any differences in nutritional knowledge and eating habits of undergraduate athletic training and wellness & fitness students as well as determine if there was a correlation between two variables regardless of group.

Design: Descriptive research study.

Setting: California University of Pennsylvania's undergraduate athletic training and wellness & fitness majors. All participants completed the study through the use of SurveyMonkey.com.

Participants: A total of 53 responses were collected (18 athletic training and 35 wellness & fitness). Of these, 10 responses were discarded, leaving a total of 43 responses for data analysis (14 athletic training and 29 wellness & fitness). All of the participants were students from California University of Pennsylvania.

Interventions: The researcher obtained e-mail addresses of the undergraduate students after receiving approval from the program directors. An e-

mailed cover letter was sent explaining the study and link to the survey. It was clearly explained in the cover letter that the survey was voluntary and the participant had the opportunity to discontinue the survey at any time, at which the results would be discarded. By completing the survey, consent was given for use of data.

Main Outcome

Measures: Nutrition knowledge and eating habits scores were obtained through the use of a two part survey, the Revised Nutritional Knowledge and Eating Habits Questionnaire.

Results: Neither nutritional knowledge nor eating habits were influenced by major (athletic training and wellness & fitness). However, a significant low positive correlation was reported between nutritional knowledge and eating habits regardless of group.

Conclusion: Health and fitness majors have a higher content of nutrition knowledge and eating habits than the average college student according to the literature.

Word count: 300