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Comparison of nutritional knowledge and attitudes toward purported misconceptions of athletes and nonathletes

Donna Eleanora Diefenbach
The University of Montana

A COMPARISON OF NUTRITIONAL KNOWLEDGE AND ATTITUDES TOWARD PURPORTED MISCONCEPTIONS OF ATHLETES AND NONATHLETES

By

Donna E. Diefenbach

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Thomas R. Wilder
Chairman, Board of Examiners

Dean, Graduate School

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ABSTRACT

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It was the purpose of this study to survey the nutritional knowledge and attitudes toward misconceptions of athletes and nonathletes at the University of Montana. Specifically, the study investigated the existence of misconceptions purported in Nutrition for Athletes (38) and Food for Fitness (4) and whether significant differences existed between athletes' and nonathletes' attitudes toward these misconceptions. A nutrition questionnaire was developed and administered to 100 undergraduate students, 49 athletes and 51 nonathletes, with 95 questionnaires being utilized. The questionnaire consisted of three parts: a personal inventory for biographical data, a likert scale to assess attitudes toward nutritional statements, and a nutrition knowledge test.

The data were analyzed using SPSS: Statistical Package for the Social Sciences (16) program Frequencies and ANOVA as the statistical procedure. The program Frequencies was used to get absolute frequencies, relative frequencies, means, variances, and standard deviations. The ANOVA was utilized to compute the one-way analysis of variance which determined the F ratios for the athletes and nonathletes.

The following conclusions were supported by the research: (1) Substantial percentages of the athletes and nonathletes supported the purported misconceptions; (2) a majority of the athletes and nonathletes did not support the five nutrition facts; (3) differences seem to exist between athletes and nonathletes regarding attitudes toward misconceptions; and (4) no significant difference in nutrition knowledge was found as measured by the nutrition knowledge test.

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D.E.D.

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INTRODUCTION

Coaches and athletes have refined skill techniques and training methods primarily as a result of the advancements in the fields of biomechanics and exercise physiology. Consequently, athletic performances have continued to improve as is evidenced by the large number of four-minute milers, perfect scores in gymnastics, and world records which seldom last a season. In spite of the "high performances," coaches and athletes continue to seek new areas that will enhance even greater human performance endeavors. One such area of interest deals with the "ultimate diet" necessary to excel in athletics.

There has been much controversy over the diet to be ingested by the athlete. In the search for excellence, coaches and athletes have turned frequently to hearsay instead of utilizing sound scientific knowledge in the formation of an athlete's diet. In the article "Nutrition and Athletic Performance," Darden (23) stated, ". . . coaches and athletes are still being victimized by various food fallacies and nutrient misinformation. . . . athletes and coaches have so much drive that they'll try almost anything to improve performance."

One must first take into consideration whether the nutritional needs of the athlete are any different than another individual. It is well documented that the human body, in order to stay physically sound, must ingest various quantities of protein, fat, carbohydrate, vitamins, minerals and water (1, 5, 10). The National Academy of Sciences,

National Research Council (1) has established recommended daily allowances for all individuals, except those with specific illnesses requiring modified diets. According to the National Research Council and researchers, athletes do not have special nutritional needs. Smith (14), Darden (23), Karpovich and Sinning (9), and Astrand (2) stated that the athlete only requires a well-nourished diet to achieve peak performance. DeVries (6) concluded, ". . . there is no scientific evidence at the present time to indicate that athletic performance can be improved by modifying a basically sound diet."

Too often the prior successes of other athletes whose training regimen included dietary fads have apparently influenced other athletes and their coaches. Dietary fads and misconceptions are generally created through an overwhelming desire to achieve athletic perfection and a lack of scientifically based reasoning. There is some evidence to suggest that diet misconceptions are widespread. Mayer (11) stated that ". . . from conversations and correspondence with a number of coaches, deans of colleges of physical education, athletic directors and team physicians, we have become convinced that the athletic variety of diet faddism is extremely widespread." The authors of Nutrition for Athletes (38) and Food for Fitness (4) implied that athletes have some specific misconceptions about nutrition. In both books, the authors divided the misconceptions into five major categories consisting of food energy related to performance, protein needs, beverages, desirable body weight, and pre-event eating. Specific statements relating to each category were as follows:

> No candy, sweets, pastries, or cakes should be eaten during training; bread and potatoes should be restricted.

Protein is a primary source of muscular energy.

Milk decreases speed of movement and "cuts wind".

Tea is the preferred pregame beverage. (4, 38)

While these statements have little if any scientific support, a review of the literature failed to find any substantiation that these purported misconceptions were athletic myths. Due to insufficient data related to athletes' knowledge and attitudes toward nutrition, more research is needed to determine whether alleged misconceptions are prevalent among athletes.

THE PROBLEM

The main purpose of this study was to investigate nutritional knowledge and attitudes possessed by athletes and nonathletes at the University of Montana. Specifically, this study investigated whether misconceptions on athletic nutrition existed among the athletes and whether these misconceptions also existed among the nonathletes.

The investigation consisted of the following three main problems: (1) to discover whether purported misconceptions exist among the athletes and nonathletes at the University of Montana, (2) to compare the attitudes of athletes and nonathletes toward purported misconceptions, and (3) to compare the nutritional knowledge of athletes and nonathletes.

Hypothesis I

There will be no significant difference in attitudes toward misconceptions between athletes and nonathletes.

Hypothesis II

There will be no significant difference in mean scores on the knowledge section between athletes and nonathletes.

DEFINITION OF TERMS

For purposes of this study, the following definitions are assumed to be pertinent and relevant:

1. Athlete--Any undergraduate students at the University of Montana who have participated on an intercollegiate team during the 1975-1976 school year.

2. Intercollegiate Sport--A sport recognized by the University of Montana Athletic Departments, which is supported by them and participated in regularly scheduled meets.

3. Misconceptions--Any incorrect belief which is valued as truth without supported scientific data and sound knowledge. Specifically, utilizing the statements purported as misconceptions in Nutrition for Athletes (38) and Food for Fitness (4).

4. Nonathlete--Any undergraduate student enrolled at the University of Montana who did not participate in an intercollegiate sport during the 1975-1976 school year.

5. Special Training or Courses in Nutrition--Any course or training which involves the science of nutrition or the utilization of foodstuffs by an organism such as: chemistry, biology, physiology, home economics courses, and agricultural courses.

Chapter II

REVIEW OF RELATED LITERATURE

Research into nutritional needs has been extensive. It is not uncommon to pick up a magazine and find new data regarding nutritional needs or diet. However, needs are basically the same for everyone except for caloric demands for specific occupations or illnesses. To simplify the selection process, the United States Department of Agriculture formulated the Basic Four Food Guide to allow an individual an easy choice of foods which will meet his or her nutritional requirements. With such a guide available to the individual, adequate nutrition and good health should be easily obtained. But this is not so in the American society, as is evidenced by the widespread problems of obesity, heart disease, atherosclerosis, hypertension, cirrhosis, fad dieting, misuse of dietary supplements, drugs, and malnutrition in general.

Several researchers have suggested that one of the principal reasons for malnutrition among many Americans is that their diet is based more on misconceptions than scientific and sound knowledge (6, 11, 25, 28). Kilander (28) evaluated the data of a study which he administered in 1942-43 to 5,000 adults. The majority of the adults were high school graduates and about 30 percent of the total subjects tested were also college graduates. About 85 percent of those tested were women. He reported that 50 percent of the subjects were not sufficiently

informed to select adequate diets for themselves and that 75 percent of the subjects were not well enough informed to plan adequate meals for other people. Kilander went on to state, "Many people, including some of the more intelligent and better educated individuals, still hold many misconceptions about foods, some of these beliefs bordering on being superstitions."

Several variables seem to influence an individual's misconceptions as shown in the following two studies. Jalso, et al. (27) designed a test of nutritional opinions and practices which was administered to 340 subjects who were members of various community organizations in New York. Of these subjects 53 were classified as fadists while 48 were nonfaddists. These 101 subjects were then personally interviewed and it was found that the faddist group was composed of persons with less formal education, were of an older age group, and had a lower income. The researchers concluded that ". . . one approach to combating food 'faddism' is to present valid nutritional information in a form that has popular appeal." Wilson and Lamb (37) administered a questionnaire to 146 women of which 119 were judged suitable for study. The researchers found fewer correct responses among the older age group (40 years and older) than their younger counterparts. They concluded that most food beliefs were related to participant's education, parents' education, professional occupation, and age, but there were beliefs held by the participants which were not related to biographical variables.

Various studies relating to college students' nutritional misconceptions and their attitudes toward nutrition have been reviewed. Heflin and Pangle (25) administered the Dearborn Health Knowledge Test

to 243 college students enrolled in health education courses. The Dearborn Health Knowledge Test is divided into 11 categories related to all areas of health education. Nutrition and diet comprised 15 questions out of 100 questions asked. Forty percent of these 15 questions were characterized by substantial student misconception. A mean misconception score of 7.12 was computed for the entire test. The researcher concluded that this revealed an alarming prevalence of health misconceptions among the college population. Baker, et al. (19) also utilized the Dearborn Health Knowledge Test to study the effect of a health education course on changing nutrition and health knowledge of the 119 students enrolled in Health Education 133 at George Peabody College for Teachers. In order to facilitate analysis, of the 100 questions, 67 were retained for study because these had the highest degree of misconception. A percent of misconception was obtained for each item by putting the number misconceived over the total certainty expressed by the subjects for that item. A total of 38 questions resulted in a percent of misconception greater than 20 percent. The researchers concluded that recency of health instruction was not a factor in reducing the prevalence of health misconceptions and that students with no prior health instruction did not possess a greater amount of misconceptions than those who had.

McCarthy and Sabry (31) studied the nutritional misconceptions of freshmen at the University of Guelph in Canada. A true-false questionnaire was mailed to a random sample of 495 students with 274 questionnaires utilized. The mean misconception score was 18.5, the mean correct answer score 37.8, and the mean 'don't know' score 13.6. The combined misconceptions and 'don't know' responses totaled 46 percent

which represents a prevalence toward misconceptions. The authors concluded that students entering the University hold many nutritional misconceptions and that misconceptions arise not only from inadequate learning or insufficient information, but from wrong learning or misinformation.

Research in the area of nutritional attitudes of university students was also done by Bremer and Weatherholtz (20) who mailed a nutritional questionnaire to assess attitudes, beliefs, and behaviors of 2,000 randomly selected students at the University of Massachusetts. A total of 33 percent of the subjects responded, with approximately 50 percent consuming the "typical American diet," 10 percent utilizing health foods in their diets, and 17 percent eating whatever was available at the time. The researchers found that the students who professed an interest in nutrition scored higher on factual questions and expressed more confidence in the relationship between diet and general health status.

Several researchers have focused on high school students to assess the relationship of nutritional knowledge and attitudes, in an attempt to evaluate the various trends toward the beliefs and practices of teenagers. Dwyer, et al. (24) administered questionnaires on attitudes and knowledge of nutrition to 1,338 high school students from five high schools in Massachusetts. The mean score on the knowledge test was 55.9 out of a possible 100, with the girls and college-bound students scoring higher. It was concluded that cognitive skills were not an effective assessment on the maintenance or improvement of good dietary practices. Schwartz (34) studied the nutritional knowledge, attitudes, and practices of high school graduates in Ohio. Question-

naires were mailed to 1,000 randomly selected graduates. Three hundred and thirteen respondents completed the questionnaires with 171 having been enrolled in home economics courses. Schwartz reported that although her subjects had had nutrition units in their home economics courses they did not apply their knowledge of nutrition in their choice of food (there was not a significant correlation between nutritional knowledge and practices). She concluded that students should not only be taught the principles and concepts of nutrition, but also how to apply this knowledge in nutritional practices.

Washnik (36) administered the Shaw-Troyer Health Knowledge and Application Test to seniors in 20 schools in New Jersey. A total of 1,171 students were randomly selected from these 20 schools. The students found the nutrition section very difficult with only the safety and first aid section receiving lower scores. It was discovered also that there was only a moderate correlation (.42) between health knowledge and the application of knowledge.

The food habits of adolescents' lifestyles as related to their behavioral patterns were investigated by several researchers. Schorr, et al. (33) studied a random sample of 118 adolescents who completed questionnaires and kept a three-day food record. A Guttman scale was utilized to evaluate the different levels of complexity of their eating patterns. The researchers employed rank correlations with the tau beta statistic and found that the complexity of an adolescent's diet increased significantly in relationship to the father's and mother's occupational level, his mother's educational level, the extent of his social participation, and with his employment. Factors which appeared unrelated to diet were age, sex, family size, or the number of his

nutritional information channels. A similar study was designed by Campbell and Early (21) who compared the health knowledge of young adults and their parents. They administered the Kilander Health Knowledge Test to young adults in a freshman health science course and to the parent of the same sex. It was found that the parents' health knowledge was superior to their children's knowledge. In the area of nutrition the parents' mean score was 8.49 and even after nutrition instruction the students' mean score was only 6.73. The researchers concluded that little, if any, relationship exists between a parent's knowledge and that of the child.

Litman, et al. (30) used the Lewin Food Anchorage Test and a nutritional information questionnaire to study the food habits of 5,700 Minnesota school children. Food habits were defined ". . . as the ways in which individuals, or groups of individuals, in response to social and cultural pressures, select, consume, and utilize portions of the available food supply." The students were required to keep a three-day record of their food intake. From this group 1,039 were randomly selected. The results of this survey showed that 44.6 percent of the students' diets were good, 31.77 percent were fair, and 23.62 percent were poor. The mother was found to be the biggest influence on food selection. There was also a moderate reliance on erroneous information concerning nutrition. In conclusion, the authors felt there should be a greater emphasis on adult education directed toward the homemaker.

Extensive research in the area of health and nutritional knowledge has demonstrated that there is a definite prevalence of misconceptions existing in the American society. Yet the author found no reported research to support this concept as related to athletes, even

though there have been numerous articles and books published reporting the various nutritional theories and eating practices to be utilized by the athlete. Misconceptions and superstitions are reported with no scientific research done to support these claims. The authors of Nutrition for Athletes and Food for Fitness made specific references to various misconceptions that the athlete tends to believe in. Some of the misconceptions listed were:

(1) honey is a quick energy food

(2) protein is a primary source of energy to the body

(3) water should not be consumed during practice

(4) steak is the best pre-event meal (4, 38)

Astrand (2) did a substantial amount of study on the effect of nutrition on physical performance capacity. He referred to the dietary superstitions which are affecting the present-day athlete and coach. Some of the drastic measures Astrand reported that the athlete has followed are: the consumption of large quantities of meat to replenish the loss of muscular substances during prolonged heavy muscular work, fluid restriction, bloodletting, the use of laxatives, ingestion of protein tablets, and the use of vitamin and mineral supplementation.

Coaches and athletes are continually searching for truths regarding nutrition and diet in order to enhance physical performance. In an article entitled "Nutrition and Athletic Performance," Darden (23) responded to many of the nutritional questions most frequently asked by coaches and athletes. The questions were categorized under the following nutritional headings: carbohydrates and fats, proteins, vitamins, minerals, and beverages. Some of the questions he answered are as follows:

> Which nutrient does the body prefer for energy?
>
> Is a massive intake of protein essential to an athlete's training program?
>
> Do athletes in hard training require supplementary vitamins?
>
> Do certain minerals help prevent the severe leg cramps often suffered by cyclists, runners, and football players after an extreme effort?
>
> Is there any basis for the concept of "eat first, drink later'?

Darden concluded that ". . . the average athlete's optimum diet should not differ essentially from that of any healthy individual" (23). He went on to state that ". . . the hard-working athlete will naturally need to consume more calories than the non-athlete, but these should be 'balanced' calories" (23).

Van Itallie, et al. (35), in an article "Nutrition and Athletic Performance," reviewed the psychological factors as well as the physiological factors affecting diet and physical performance. They found that food has an emotional impact on the athlete as well as the nutrients it supplies. ". . . By affecting the psychology of the athlete, the training diet and the pre-event meal can affect his performance" (35). When considering the physiological demands of the body, four ways the diet may influence muscular performance were listed, as follows:

> reviewing the supply of energy-yielding nutrients
>
> facilitating the energy-yielding reactions
>
> counteracting physical-chemical changes in the body identified with fatigue, and
>
> reducing any appreciable excess in fat content of the body (35).

The researchers went on to state that extensive research has been conducted pertaining to the search for the optimum diet. They concluded:

> . . . Although there is considerable doubt whether manipulation of an adequate diet can enhance performance, there is no doubt whatever that performance can be significantly impaired when a less than adequate diet is consumed. The best diet for the athlete is one he enjoys and one that, at the same time, provides a variety of nutritious foods in amounts adequate to maintain his weight at an optimum level (35).

The most extensive work done in the area of athletic nutrition was completed by Dr. Nathan J. Smith at the University of Washington in 1976. Dr. Smith's published work, Food for Sport, is the athlete's guide to good nutrition whether he be a professional or an amateur. Dr. Smith stated that ". . . through the increase in the knowledge of nutrition and exercise physiology that certain dietary recommendations can be made pertaining to the particular needs of particular athletes" (14). This book includes chapters on nutrients, the basic diet, supplements, and weight control. The author also refers to the various requirements of elementary school athletes, the older adult athlete, and even gives specific information on various sports and their nutritional demands. There is a chapter dealing exclusively with nontraditional diets and poor dietary practices. Smith stated, ". . . our experience with the intensely competitive athlete has shown that he or she often pursues (with enthusiasm) nutrition-related practices which are ineffective, counterproductive, or even dangerous" (14). He went on to say that ". . . among American athletes' least desirable dietary practices is the use of expensive, useless, and potentially dangerous vitamin and protein supplements" (14). Smith concluded that an athletes' nutrient requirements can be met by an adequate and balanced diet, with supplemented foods of the athlete's choice to be consumed for needed energy.

SUMMARY OF REVIEW

The majority of the researchers reported that the average American has a poor knowledge of nutrition and many harbor misconceptions about food and its consumption. The studies were not in total agreement as to specific characteristics which identify the individual who believes in nutritional misconceptions. Variations in the nutritional knowledge, attitudes, beliefs, and practices were revealed to the researchers at each level of study--adult, college, high school, and elementary school. The studies on adults showed that an individual with less education, a lower income, and of an older age has the least knowledge and poorest dietary practices. Research findings of university and college students revealed that nutritional misconceptions are prevalent at that educational level. Furthermore, it was discovered that cognitive skill and nutritional knowledge background had a low correlation with the application of this knowledge at the high school level. Elementary school children were found to be influenced most by their mothers and the occupational level of the family.

The literature, reported on by the author, pertaining to the athlete's knowledge and practices revealed five concepts. These were as follows:

athletes believe in nutritional misconceptions

athletes' dietary practices are sometimes drastic and dangerous

food affects the athlete psychologically as well as physiologically

vitamin and protein supplementation are the least desirable dietary practices of the athlete

> the athletes' optimum diet does not differ from the diet of any healthy individual except in caloric demands. (2, 4, 14, 35, 38)

The number of nutrition studies was insufficient in the area of nutritional knowledge and attitudes and many of the existing ones were incorporated in general health knowledge tests such as the Dearborn (19, 25), Shaw-Troyer (36), and Kilander Health Knowledge (21, 28) tests. The data revealed that different age groups have certain nutritional knowledge, attitudes, beliefs, and practices typical of that group. No research was discovered by the author pertaining to the athletes' nutritional knowledge and attitudes, yet there are numerous books and articles published annually about the athletes' diet practices. Extended research in this area is warranted.

Chapter III

METHOD AND PROCEDURE

This study was designed to survey nutritional knowledge and attitudes toward misconceptions of athletes and nonathletes at the University of Montana. A nutritional questionnaire was developed and administered to 100 undergraduate students. Forty-nine athletes and 51 nonathletes were tested with 95 questionnaires being utilized in the study. The main objectives of this study were to investigate attitudes toward purported misconceptions and compare nutritional knowledge and attitudes toward misconceptions between athletes and nonathletes.

THE SUBJECTS

Undergraduate students at the University of Montana were selected as subjects for the study. Undergraduates were used for two reasons. First, graduate students could not be represented equally in the athletic group since they are ineligible to participate in intercollegiate athletics. Second, a consistent age grouping was needed to avoid biasing the data because of the potentiality of higher formal education and experiences.

The University of Montana's telephone directory was utilized as a complete list of students attending the University. Rosters of both the men's and women's teams were obtained from the Men's and Women's Athletic Departments. One hundred and fifty students, 75 athletes and 75 nonathletes, were randomly selected using a random number table. If

an athlete's or graduate student's name was selected from the directory, the next name was selected which met the criteria for subjects. A letter was formulated asking for cooperation with the study and sent out with a self-addressed and stamped postcard enclosed specifying whether the student was willing or not to participate in the study and the times and dates he or she could take the survey (see Appendix A).

THE INSTRUMENT

The Nutrition Information Questionnaire consisted of three parts: personal inventory, an attitude instrument, and a nutrition knowledge test (Appendix B). A standard answer sheet was attached to the end of the survey to facilitate the administration of the survey.

Personal Inventory

The personal inventory was developed to collect data regarding biographical information and sports participation. Information concerning the student's year in college, age, sex, sport or sports participated in, and courses or special training in nutrition taken or done prior to the survey was needed for each subject who participated in the study.

Attitude Instrument

This section evaluated students' attitudes toward purported misconceptions. A likert scale with five possible choices was selected. The choices were as follows:

SA	A	U	D	SD
Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree

A list of 20 statements, 15 of which were misconceptions directly quoted from Food for Fitness (4) and Nutrition for Athletes (38) were given to the student to rate according to his or her attitudes.

The measurement of attitudes toward various areas of interest which portray a person's character and personality has been going on for a very long time. Attitudes are measured because they are indicative to one's behavior and offer researchers an indirect method to measure behaviors. Over the years many methods and scales have been employed to measure social behavior and attitudes. Formulating an accurate method of measurement has been difficult due to the problem of generality and specificity of character traits or simply whether social habits are functionally independent.

Likert theorized that an attitude, innate or learned, ". . . is not an inflexible and rigid element in personality, but rather a certain range within which responses move" (29). In order to devise the best possible method of measuring attitudes, Likert and Murphy (29) put together a series of questions dealing with one issue with various questionnaire forms. The investigators discovered that by offering the subject five alternatives to choose from, a distribution resembling a normal distribution was yielded. The responses closer to one extreme or the other show a strong influence toward a specific reaction. The authors reported that this method allows the researcher to obtain the most typical method of an individual's attitude and the dispersion of his attitude (29).

Nutritional Knowledge Test

The nutritional knowledge test was the third section of the survey. Finding a valid nutritional questionnaire was undertaken by

researching the literature. A test developed by Marielle Préfontaine was eventually selected as the instrument to evaluate knowledge because it was objective, reliable, valid, based on basic nutritional concepts and was applicable to a variety of adult groups (32). Préfontaine developed this nutritional test during 1971-73 at the Institut de Diététique et de Nutrition, Université de Montréal. The 30-item questionnaire was administered to four adult groups including 169 home economics teachers, 668 freshman students at the University enrolled in a health science course, 127 mothers, and 208 immigrants. Twenty-five of the 30 items had the required discrimination indices (above the 0.30 level). The coefficient of reliability was 0.68 for the home economics teachers, 0.64 for the health science students, 0.67 for the mothers, and 0.69 for the immigrants. The 25 items were formulated from the nutritional goals and behavioral objectives developed from the four nutritional concepts presented by the Interagency Committee on Nutrition Education (ICNE) (32). The four concepts on nutrition were as follows:

(1) Nutrition is the food you eat and how the body uses it.

(2) Food is made up of different nutrients needed for growth and health.

(3) All persons, throughout life, have need for the same nutrients but in varying amounts.

(4) The way food is handled influences the amount of nutrients in food, its safety, appearance and taste (32).

The format of the test was a statement with four multiple-choice items following. The student had to read each statement and then pick the appropriate item by checking the corresponding space on the answer sheet.

SURVEY PROCEDURE

Upon receiving the postcards acknowledging the cooperation of subjects, the tests were administered in room 214 in the University Field House. The subjects were contacted after the postcard was received to confirm the testing date. There were four testing dates, all on which the nutritional questionnaire was administered.

Due to the fact that there was an inadequate response to the postcards to meet the scope of the study, the tester was forced to seek athletic and nonathletic subjects from health and physical education classes. Two University classes were utilized with permission from the teachers of the classes and the students. The entire procedure yielded a total of 49 athletes and 46 nonathletes.

All subjects were tested using the same procedure whether during the designated test dates or in the classroom tests. The nutritional questionnaire was administered to each subject and they were given as much time as needed to complete the questionnaire. The questionnaire was divided into three parts: information inventory, attitude scale, and knowledge test. Directions were supplied with each section, with examples given for both the attitude and knowledge sections. The answer sheet was attached to the end of the questionnaire, with all questionnaires being anonymous.

Statistical Procedure

After all the data were collected, it was coded on 80-column IBM punch cards using an IBM 029 key punch. The cards were batch processed using Frequencies and ANOVA from SPSS: Statistical Package for the Social Sciences (16). The program Frequencies were used to get

absolute frequencies, relative frequencies, means, variances, and standard deviations. The ANOVA was utilized to compute the one-way analysis of variance which determined the F ratios for athlete and nonathlete subjects.

Chapter IV

ANALYSIS OF DATA

The Nutrition Information Questionnaire was administered to 95 subjects, 49 athletes and 46 nonathletes. Data were collected and analyzed from the three parts of the questionnaire: the personal inventory, attitude scale and nutritional knowledge test.

PERSONAL INVENTORY

The personal inventory supplied the biographical data on each subject, including age, sex, year in college, participation in sports, and nutritional education. Age and year in school are listed in Tables 1 and 2, respectively.

Table 1

Distribution of Ages of the Athletes and Nonathletes

	Age of Subjects							
	18	19	20	21	22	23	24	Mean Age
Athletes	2	11	11	11	7	4	3	20.69
Nonathletes	0	8	6	6	12	2	12	21.66
Total	2	19	17	17	19	6	15	21.16

The range in age was between 18 and 24 years old for the total population, with the mean age being 21.16. The athletes' mean age was

20.69 and the largest percentage of subjects were between the ages of 19 and 21, with a total number of 33. The nonathletes' ages ranged between 19 and 24, and the mean age was 21.65.

The population consisted of 56 males and 37 females, which totaled 60.4 percent and 39.6 percent, respectively. The male athletes totaled 69.4 percent and male nonathletes totaled 52.2 percent, while the females totaled 30.6 percent and 47.8 percent, respectively.

Table 2

Percentages and Numbers of the Class Year of the Male and Female Athletes and Nonathletes

	Freshman		Sophomore		Junior		Senior		Total Percent	
	M[a]	F[b]	M	F	M	F	M	F	M	F
Athlete	10	4	7	3	6	4	11	4	69.4	30.6
Nonathlete	2	6	1	5	3	5	18	6	52.2	47.8
Total	12	10	8	8	9	9	29	10	60.4	39.6

[a]Male

[b]Female

The 49 athletes who participated in the study had played in eight different sports. The largest number were wrestlers with eleven participants. The other sports in which the athletes had participated and their respective numbers were: football (seven), track (six), basketball (five), volleyball (five), gymnastics (one), swimming (one), and tennis (one). Twelve athletes had played in more than one sport (see Appendix C).

The subjects, both athletes and nonathletes, had very little training in the area of nutrition. Sixty-eight subjects had no training at all with 32 being athletes and 36 nonathletes. Twenty-eight of the subjects, 14 athletes and six nonathletes, had taken Home Economics 146, an elementary nutrition course (Appendix D).

ATTITUDE SCALE

The 95 subjects were given 15 misconceptions as purported in the literature and five true nutritional statements supported by the literature, to evaluate on a likert scale (29). The choices following each statement were: strongly agree, agree, undecided, disagree, and strongly disagree.

The purpose of administering the attitude scale was twofold. The primary reason was to discover whether the statements purported in Food for Fitness (4) and Nutrition for Athletes (38) were misconceptions of athletes. The other reason was to test the hypothesis, there will be no significant difference in attitudes toward misconceptions between athletes and nonathletes. When the results of the attitude scale were analyzed, it was found that certain misconceptions did exist among the tested population (Appendix E). For discussion of the data, strongly agree and agree categories were combined and labeled as agree; strongly disagree and disagree were labeled as disagree. This left three categories which were agree, undecided, and disagree. Agreement with a purported misconception was a showing of support for the misconception, while disagreement showed nonsupport of the misconception. Agreement with the five true nutritional statements also showed support of the statement, but disagreement meant that the subject did not

support the statement although it was true. The results of the attitudes toward misconceptions and the true nutritional statements have been compiled in Table 3.

Athletes' Misconceptions

A majority of the athletes strongly supported three of the purported misconceptions. The largest percentage of athletes, 73.4 percent, supported the statement, "Protein and amino acid supplements are needed for muscle building" (38). There were also 4.1 percent of the athletes who were undecided about the use of protein and amino acids. Since the undecided category reflects uncertainty by the respondent, it shows a lack of concise attitudes about the statement, which suggests inadequate knowledge.

In the area of protein it was discovered that 53 percent of the athletes supported the concept of protein as a primary source of muscular energy and 14.3 percent of the respondents were undecided. The final statement supported by a majority of the athletes was, "Honey, glucose, or other 'quick energy' foods taken before events of short duration enhance performance" (38). There were 57.2 percent in agreement and 10.2 percent undecided.

There were also three purported misconceptions that the athletes had a wide variety of feelings toward. The percent scores in the categories of agree, undecided, and disagree showed varied attitudes toward these misconceptions. The first misconception with an almost equal amount of support as nonsupport was, "Milk 'curdles' in the stomach, causing sour stomach and interfering with performance" (38). A total of 44.9 percent of the athletes supported or agreed, 14.3 percent were undecided, and 40.8 percent disagreed or were unsupportive. Milk

Table 3

Percentages of Athletes and Nonathletes Who Agreed and Disagreed with Selected Purported Misconceptions and True Nutritional Statements

Nutritional Statements and Purported Misconceptions	Athletes			Nonathletes		
	A*	U*	D*	A	U	D
1. Honey, glucose, or other "quick energy" foods taken before events of short duration enhance performance.	57.2	10.2	30.6	76.1	4.30	19.5
2. Protein is a primary source of muscular energy.	53.0	14.3	30.6	60.8	15.2	23.9
3. No candy, sweets, pastries, or cakes should be eaten during training; bread and potatoes should be restricted.	16.3	10.2	73.4	30.4	19.6	50.0
4. Pickles, lemons, vinegar and other acid or sour foods have no miracle "reducing power."	12.2	32.7	55.1	10.9	15.2	73.9
5. No fats, no fried foods, no oily dressing should be eaten.	28.5	14.3	57.1	52.2	15.2	32.6
6. Protein and amino acid supplements are needed for muscle building.	73.4	4.1	22.5	69.6	13.0	32.6
7. Steak is the best source of protein for athletes.	30.6	16.3	53.1	23.9	21.7	54.4
8. Low concentrations of alcohol in the body can impair judgments and neuromuscular coordination.	30.6	14.3	55.1	17.4	15.2	67.4
9. Milk causes "cotton mouth" (dryness and discomfort in the mouth due to decrease in activity of salivary glands).	44.9	20.4	34.7	39.2	21.7	39.1

(continued)

Table 3 (continued)

Nutritional Statements and Purported Misconceptions	Athletes			Nonathletes		
	A	U	D	A	U	D
10. Milk decreases speed of movement and "cuts wind".	26.5	22.4	51.0	4.3	28.3	67.4
11. Eat first, drink later.	26.5	28.6	44.9	41.3	30.4	28.2
12. Drink no water during practice. (Suck on ice cubes only; rinse out mouth only.)	38.8	6.1	55.1	39.2	10.9	50.0
13. The crash diet is an effective way to reduce.	20.4	8.2	71.4	10.9	6.5	82.6
14. Stay away from "irritating" foods such as spices and "bulky" foods such as lettuce and bran because they may hinder performance.	14.3	22.4	63.2	19.5	21.7	58.7
15. Fasting may cause fatigue, muscle soreness, and nausea during intense exercise.	4.0	12.2	83.7	15.2	6.5	78.2
16. Tea is the preferred pregame beverage.	28.5	32.7	38.8	30.4	41.3	28.2
17. Vitamin B12 supplementation does not aid performance in the well-nourished individual.	6.1	44.9	49.0	15.2	43.5	41.3
18. Milk "curdles" in the stomach, causing sour stomach and interfering with performance.	44.9	14.3	40.8	39.1	23.9	37.0
19. Excess amounts of vitamin C will reduce the likelihood of bruising and minimize athletic injuries.	18.3	36.7	44.9	17.4	23.9	58.7
20. High intakes of certain vitamins may be harmful.	8.0	22.4	69.4	10.8	6.5	82.6

A* = Agree U* = Undecided D* = Disagree

causing "cotton mouth" also yielded a wide degree of responses, with 44.9 percent agreeing, 20.4 percent undecided, and 34.7 percent disagreeing. The final misconception, "Tea is the preferred pregame beverage," resulted in 28.5 percent in agreement, 32.7 percent undecided, and 38.8 percent in disagreement. Nearly 60 percent of the athletes were either uncertain or agreed with these three purported misconceptions which suggested that they seem to be misconceptions among a substantial percent of the athletes.

The five true nutritional statements which were randomly placed among the purported misconceptions suggested additional nutritional misconceptions as they were not supported by the athletic population. Disagreement with these true statements showed a lack of support on the part of the athletes although the statements were nutritional facts taken from the literature. The statement with the largest percent of athletes disagreeing was, "Fasting may cause fatigue, muscle soreness, and nausea during intense exercise" (4). A total of 83.7 percent of the athletes were in disagreement with this statement and 12.2 percent were undecided. Another statement with a high percent of disagreement, 69.4 percent, was, "High intakes of certain vitamins may be harmful" (1, 5). A 22.4 percent of undecided responses was also recorded.

Other valid nutritional statements that had a substantial percent of athletes who disagreed with them were, "Pickles, lemons, vinegar and other acid or sour foods have no miracle 'reducing power'" and "Low concentrations of alcohol in the body can impair judgments and neuromuscular coordination" (14). A total of 55.1 percent of the athletes disagreed with each of these statements. A large undecided score of 32.7 percent was found for the statement about the miracle reducing

power of certain foods, and only 14.3 percent of the athletes were undecided about the effect of alcohol on judgment and neuromuscular coordination. The final nutrition statement that was not supported by the athletes was, "Vitamin B12 supplementation does not aid performance in the well-nourished individual" (14). Forty-nine percent disagreed with this statement and a high percentage, 44.9 percent, were undecided.

Nonathletes' Misconceptions

There were four purported misconceptions supported by the nonathletes. The misconception supported by the largest percent of nonathletes, 76.1 percent, was, "Honey, glucose or other 'quick energy' foods taken before events of short duration enhance performance" (38). An undecided response of only 4.3 percent was found. Two of the misconceptions pertaining to protein and its uses had a high percent of support from the nonathletes. There were 60.8 percent of the nonathletes who believed that protein is a primary source of muscular energy and 69.6 percent who supported the use of protein as a supplement for muscle building (38). An undecided response of 15.2 percent and 13.0 percent was obtained for the respective protein misconceptions. The final misconception supported by the nonathletes was, "No fats, fried foods, no oily dressing should be eaten" (38). There were 52.2 percent who agreed with the statement and 15.2 percent were undecided.

There were also five purported misconceptions on the consumption of beverages which reflected a near equal percentage of nonathletes who agreed and disagreed. Two of the misconceptions involved the use of milk during performance. One was concerned with milk causing "cotton mouth" and the other misconception dealt with the curdling of milk in the stomach. In response to milk creating "cotton mouth," 39.2 percent

agreed with the misconception, 21.7 percent were undecided, and 39.1 percent disagreed. Milk curdling in the stomach yielded a 30.1 percent agreement response, 23.9 percent undecided, and 37 percent who were in disagreement. Two other misconceptions which showed an equal amount of support as nonsupport among the nonathletes dealt with the use of tea before a game and whether fluid should be before or after a meal. "Tea is the preferred pregame beverage" (38) resulted in 30.4 percent of the nonathletes in agreement, 41.3 percent undecided, and 28.2 percent in disagreement. "Eat first, drink later" (38) yielded responses of 41.3 percent in agreement, 30.4 percent undecided, and 28.2 percent who were in disagreement. The final misconception, "Drink no water during practice (Suck on ice cubes only; rinse out mouth only)" (38) resulted in 39.2 percent in agreement, 10.9 percent undecided, and 50 percent in disagreement. At least 50 percent of the nonathletes were either undecided or agreed with these five purported misconceptions which suggested that they may be misconceptions among the majority of nonathletes.

The nonathletes, similar to the athletes, tended to disagree with the five nutritional facts. The statement with the least amount of support was, "High intakes of certain vitamins may be harmful" (1, 5). A total of 82.6 percent of the nonathletes were in disagreement with this statement and only 6.5 percent were undecided. Two of the nutritional facts had disagreement responses of more than 70 percent suggesting a high degree of nonsupport. One of these statements dealt with foods which did not possess miracle "reducing powers" and the other dealt with the effects of fasting during intense exercise. A disagreement response of 73.9 percent was obtained for the reducing foods and 78.2 percent for the effects of fasting. The undecided

responses for these statements were fairly small with 15.2 percent and 6.5 percent, respectively. Another statement with a high percent of disagreement, 67.4 percent, was, "Low concentrations of alcohol in the body can impair judgments and neuromuscular coordination" (14). A 15.2 percent of undecided responses was also recorded. The final nutrition statement which was not supported by the nonathletes was, "Vitamin B12 supplementation does not aid performance in the well-nourished individual" (14). A total of 41.3 percent disagreed with this statement and a high percentage of nonathletes were undecided, 43.5 percent.

Testing of Null Hypothesis I

One-way ANOVA was used to determine whether to accept or reject the null hypothesis I of no difference in attitudes toward misconceptions between athletes and nonathletes. The results of the one-way analysis of variance of the attitude scale are reported in Table 4.

A significant difference was obtained for three of the purported misconceptions at the .05 level. The first significant misconception (No. 3) was, "No candies, sweets, pastries, or cakes should be eaten during training; bread and potatoes should be restricted" (38), resulting in a significant difference ($F = 3.960$, $p = .05$) between the athletes and nonathletes. The mean score for the athletes was 3.755 and the nonathletes' mean score was 3.283. "No fats, fried foods, no oily dressing should be eaten" (38) was the next misconception (No. 5) found to have a significance ($F = 4.687$, $p = .033$) between athletes and nonathletes. The athletes' mean score was 3.347 and the nonathletes' mean score was 2.826. The athletes tended to disagree with this

Table 4

One-Way Analysis of Variance Results on the Attitude Scale

Nutritional Statements and Purported Misconceptions	Sum of Squares	Mean Square	F Ratio	p*
1	2.249	2.249	1.480	0.227
2	0.095	0.095	0.056	0.814
3	5.297	5.297	3.960	0.050*
4	1.302	1.302	1.401	0.240
5	6.437	6.437	4.687	0.033*
6	0.049	0.049	0.036	0.850
7	0.499	0.499	0.410	0.524
8	2.885	2.885	2.051	0.155
9	0.975	0.975	0.641	0.425
10	4.449	4.449	4.968	0.028*
11	3.766	3.766	3.533	0.063
12	2.489	2.489	1.490	0.225
13	2.140	2.140	1.565	0.214
14	0.183	0.183	0.173	0.678
15	1.282	1.282	1.575	0.213
16	0.493	0.493	0.532	0.468
17	0.657	0.657	0.963	0.329
18	0.089	0.089	0.073	0.787
19	1.130	1.130	1.027	0.314
20	0.174	0.174	0.150	0.699

* p = .05 df = 1

statement more than the nonathletes. An F value of 4.968 was significant ($p = .028$) between athletes and nonathletes concerning the misconception (No. 10), "Milk decreases speed of movement and 'cuts wind'" (38). The mean score of the athletes and nonathletes was 3.306 and 3.739, respectively (Appendix F).

Null hypothesis I of no significant difference between athletes and nonathletes in attitudes toward misconceptions was rejected on the basis of these three significant differences.

NUTRITIONAL KNOWLEDGE TEST

A nutritional knowledge test developed by Marielle Préfontaine was selected to determine the extent of nutritional knowledge of athletes and nonathletes at the University of Montana. It consisted of a 25-item questionnaire with four multiple-choice answers following. The subject had to read each statement and then pick the appropriate answer by checking the corresponding space on the answer sheet (Appendix B).

Testing of Null Hypothesis II

Null hypothesis II dealt with the knowledge of nutrition as measured by the nutritional knowledge test. The null hypothesis was:

> II. There will be no significant difference in mean scores on the knowledge section between athletes and nonathletes.

The nonathlete and athlete females' mean percentage scores were higher than either of the male subgroups (Appendix G). The total score of the female athlete was 72 percent and the female nonathletes' score was 70 percent, while the males, athlete and nonathlete, scored 62 percent and 61 percent, respectively. The combined female and male scores

of the athletes were slightly lower, 65.14 percent, than the combined scores of the nonathletes, 65.54 percent. Table 5 contains the scores of the males and females for both athletes and nonathletes and their participation in a nutrition course.

Table 5

Mean Percent Scores on the Knowledge Test of the Male and Female Athletes and Nonathletes

	Athletes		Nonathletes	
	Male	Female	Male	Female
With a nutrition course	69.71	77.71	68.80	75.20
Without a nutrition course	60.51	67.00	59.16	68.44

Enrollment in a nutrition course seemed to create a difference in test scores among the subgroups. The females who participated in at least one nutrition course scored higher than their male counterparts on the knowledge test. The female athletes' mean percent score was 77.71 percent, while the males' mean percent score was only 69.71 percent. The nonathlete females' mean score was 75.20 percent and the males obtained a score of 68.80 mean percent. A high percentage of the population had had no formal nutrition education; 65.3 percent of the athletes and 78.3 percent of the nonathletes had never enrolled in a nutrition course. Home Economics 146, an elementary nutrition course, received the highest enrollment with 28.6 percent of the athletes and 13.0 percent of the nonathletes participating in the course. Table 6 contains a total course enrollment breakdown for the athletes and nonathletes.

Table 6

Number and Percent of Population Enrolled in a Nutrition or Related Course

Course	Athletes		Nonathletes	
	Number	Percent	Number	Percent
None	32	65.3	36	78.3
Home Economics 146	14	28.6	6	13.0
Home Economics 246			1	2.2
Chemistry	2	4.1		
Two or More	1	2.0	3	6.5

A one-way ANOVA was used to determine whether to accept or reject null hypothesis II of no difference in mean scores on the knowledge test between athletes and nonathletes (Appendix H).

An F value of .010 was obtained for the total scores on the knowledge test with a significance of .92. Table 7 lists the results of the one-way analysis of variance for the total score on the nutritional knowledge test.

Table 7

One-Way Analysis of Variance on the Total Score for the Knowledge Test

Sum of Squares	df	Mean Square	F Ratio	p
0.167	1	0.167	0.010	0.920

A significant difference was obtained for only one of the questions on the knowledge test at the .05 level (Appendix I). An F value of 4.681 was significant ($p = .03$) between the athletes and nonathletes concerning question fifteen, which read as follows:

15. An adolescent who eats well and practices sports

a. has a well developed musculature
b. avoids overweight
c. keeps his whole system functioning well
d. the above three answers are true (correct)

A greater percent of the athletes answered this question correctly, 85.7 percent, while 71.7 percent of the nonathletes answered the question correctly.

The null hypothesis II of no difference in the total scores on the knowledge test between athletes and nonathletes was accepted as there was no significant difference for the total test scores.

SUMMARY

In conclusion, the results of the attitude scale support the assumption that certain misconceptions on nutrition and athletic performance are prevalent among a majority of not only athletes, but also nonathletes. As the nonathletes possessed one more purported misconception than the athletes, there is evidence to suggest the population at large lacks adequate nutritional information and its influences on athletics. The misconception which was supported by the nonathletes, but not the athletes, was, "No fats, fried foods, no oily dressing should be eaten" (38). Both the athletes and nonathletes supported the misconceptions dealing with protein as a source of muscular energy (53 percent and 60.8 percent agreed, respectively) and its use as a supplement to build muscle mass (73.4 percent of the athletes agreed

and 69.6 percent of the nonathletes agreed). They also agreed with the idea that there are "quick energy" foods which can enhance performance in short duration events, with 57.2 percent of the athletes and 76.1 percent of the nonathletes in agreement with this idea. The fact that the athletes and nonathletes also did not support all five of the nutrition facts showed that these statements represented additional nutritional misconceptions. The nonathletes tended to be less supportive of the five nutrition facts with three of their responses being above 73 percent disagreement, while the athletes had only one disagreement response above 69 percent.

In reference to nutritional education of the population tested, it may be stated that very few subjects had any formal training at all in nutrition. Only 34.7 percent of the athletes had taken a nutrition course, while the nonathletes had only 21.7 percent enrolled in a course. The nutritional knowledge mean scores for the total population were low, 65.14 percent for the athletes and 65.54 percent for the nonathletes. A percent score of 70 is average, so scores below 70 percent are poor or below average. The small percent of the total population who had taken a nutrition course did score better than those who had not. The total athletic population who had enrolled in a nutrition course, did better than their counterparts who had no nutrition background. The athletes with a course had a mean score of 77.71 percent for the females and a mean score of 69.71 percent for the males. Those without any nutrition education averaged 67 percent for the females and 60.51 percent for the males. Similar scores were also found in the nonathletes who averaged 75.2 percent for the females and 68.8 percent for the males who had participated in a nutrition course. The mean

scores of 68.44 percent for the females and 59.16 percent for the males were found for those with no nutrition background. The knowledge scores appear to be borderline with a general lack of nutrition information. No difference in total knowledge scores was found.

Chapter V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

SUMMARY

This study was designed to survey nutritional knowledge and attitudes toward misconceptions of athletes and nonathletes at the University of Montana. It also investigated the existence of purported misconceptions as reported in the literature and whether significant differences existed between the athletes' and nonathletes' attitudes toward these misconceptions. A nutrition questionnaire was developed and administered to 100 undergraduate students. Forty-nine athletes and 51 nonathletes were tested with 95 questionnaires being utilized in the study.

There were three main objectives in this study. The primary objective was to discover whether misconceptions purported in Nutrition for Athletes (38) and Food for Fitness (4) actually represented misconceptions among athletes. Secondly, this study compared the attitudes of athletes and nonathletes toward these purported misconceptions. The final objective of the study was to compare the nutritional knowledge of athletes and nonathletes.

The data were analyzed using SPSS: Statistical Package for the Social Sciences (16) program Frequencies and ANOVA as the statistical procedure. The program Frequencies was used to get absolute frequencies, relative frequencies, means, variances, and standard deviations. The

ANOVA was utilized to compute the one-way analysis of variance which determined the F ratios for the athletes and nonathletes.

Listings of Findings

The study investigated purported misconceptions, attitudes toward these athletic nutritional misconceptions, and the extent of nutritional knowledge of the tested population. The data of the study support the following findings:

1. Of the fifteen misconceptions listed in Nutrition for Athletes (38) and Food for Fitness (4) more than 50 percent of the athletes supported only three misconceptions. The three supported misconceptions were:

   a. Honey, glucose, or other "quick energy" foods taken before events of short duration enhance performance.

   b. Protein is a primary source of muscular energy.

   c. Protein and amino acid supplements are needed for muscle building. (38)

   More than 50 percent of the nonathletes supported not only the above three misconceptions, but one additional misconception, which was as follows:

   a. No fats, fried foods, no oily dressing should be eaten. (38)

2. Five additional nutrition facts were found to be misconceptions among the majority of the athletes and nonathletes. The five nutrition facts were as follows:

   a. Pickles, lemons, vinegar and other acid or sour foods have no miracle "reducing power."

   b. Fasting may cause fatigue, muscle soreness, and nausea during intense exercise.

c. Vitamin B12 supplementation does not aid performance in the well-nourished individual.

d. Low concentrations of alcohol in the body can impair judgments and neuromuscular coordination.

e. High intakes of certain vitamins may be harmful. (1, 5, 14)

3. A significant difference ($p \leq .05$) between the athletes' and nonathletes' attitudes toward misconceptions was found for three of the purported misconceptions. These misconceptions were as follows:

a. No candy, sweets, pastries, or cakes should be eaten during training; bread and potatoes should be restricted.

b. No fats, fried foods, no oily dressing should be eaten.

c. Milk decreases speed of movement and "cuts wind". (38)

The misconception concerned with the ingestion of sugars and starches had an F value of 3.960 ($p = .05$). The second misconception yielded a difference in responses between the athletes and nonathletes. The athletes disagreed with this idea, while the nonathletes agreed or supported the misconception. An F value of 4.687 ($p = .033$) was recorded. The final misconception dealt with milk and its effect on performance with an F value of 4.968 ($p = .028$).

4. There was no significant difference in scores on the knowledge test between the athletes and nonathletes. Only one question on the knowledge test resulted in a significant difference ($F = 4.861$, $p = .03$) between athletes and nonathletes. The question was as follows:

a. An adolescent who eats well and practices sports

1. has a well developed musculature
2. avoids overweight
3. keeps his whole system functioning well
4. the above three answers are true (correct)

CONCLUSIONS

This study was undertaken to determine if purported misconceptions existed among athletes, if there were significant differences in the attitudes toward misconceptions between athletes and nonathletes, and whether there were significant differences on the scores of the nutritional knowledge test between athletes and nonathletes. The results supported three conclusions about the athletes and nonathletes at the University of Montana.

First, only three of the purported misconceptions in Nutrition for Athletes (38) and Food for Fitness (4) were found to exist among a majority of the athletes. These misconceptions also exist among the majority of nonathletes as well as one additional misconception. Additional misconceptions seem to exist among both groups as they tended to disbelieve the five nutrition facts.

Second, differences seem to exist between athletes and nonathletes regarding misconceptions.

Third, no significant difference in nutrition knowledge was found as measured by the nutritional knowledge questionnaire. The two groups seem to have approximately the same basic information level. Those who had enrolled in a nutrition course tended to have a greater nutritional knowledge than those who had no classes in nutrition.

RECOMMENDATIONS

The following are the recommendations pertaining to this study.

1. The findings of this study suggest that misconceptions are substantial among the athletes and nonathletes at the University of Montana. Therefore, it is recommended that a study be conducted to identify the various misconceptions and inform athletes about nutritional principles and their relationship to athletic performance.
2. Factual knowledge about nutrition was low for both the athletes and the nonathletes with mean scores of 65.14 percent and 65.54 percent, respectively. Consequently, it is recommended that athletes and nonathletes receive nutritional information during their college careers.

Recommendations for Future Research

The present investigation has compiled data which will aid in the understanding of nutritional knowledge and attitudes toward misconceptions of athletes at the university level. The study revealed that nutritional misconceptions seem to exist among athletes and further research can be done utilizing the data supplied from the study as a basis.

It is uncertain from this study whether the attitudes toward misconceptions reflect nutritional behavior. Therefore, athlete's misconceptions need to be identified and then tested to see if these misconceptions are put into practice. The relationship of nutritional knowledge and its influence on attitudes and practices should be studied.

Another area of importance that this study suggested is the influence of the coach on his athletes. Development of studies for entire teams and their coaches needs to be devised with emphasis on specific sport areas, such as team sports, individual sports, or a specific sport like basketball or football. The correlations between the coach's knowledge, attitudes, and practices and that of his athletes' should be investigated. Along the same line, a study needs to be devised to determine if athletes of different sport areas possess similar misconceptions.

Finally, studies should be conducted in other areas of the country to determine whether the misconceptions are widespread or provincial. Only through more research throughout the country can the nutritional knowledge of athletes and their nutritional misconceptions be dealt with effectively.

SELECTED BIBLIOGRAPHY

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BOOKS

1. Arlin, M. T. The Science of Nutrition. New York: The Macmillan Company, 1972.

2. Astrand, P. O., and E. Rodahl. Textbook of Work Physiology. New York: McGraw-Hill Company, 1970.

3. Best, J. W. Research in Education. Englewood Cliffs, New Jersey: Prentice-Hall Inc., 1959. pp. 157-160.

4. Bike World Magazine. Food for Fitness. California: World Publications, 1975.

5. Bogert, Briggs, and Calloway. Nutrition and Physical Fitness. Philadelphia: W. B. Saunders Company, 1966.

6. deVries, H. A. Physiology of Exercise. Dubuque, Iowa: Wm. C. Brown Company, 1974. pp. 456-464.

7. Edwards, A. L. Techniques of Attitude Scale Construction. New York: Appleton-Century-Crofts, Inc., 1957.

8. Goldblith and Joslyn. Milestones in Nutrition. Connecticut: The Avi Publishing Company, 1964.

9. Karpovich, P. V., and W. E. Sinning. Physiology of Muscular Activity. Philadelphia: W. B. Saunders Company, 1971. pp. 72-89.

10. Mayer, J. Human Nutrition. Springfield, Illinois: Charles C. Thomas, Publisher, 1972.

11. _____. Human Nutrition: Its Physiological, Medical, and Social Aspects. Springfield, Illinois: Charles C. Thomas, Publisher, 1972. pp. 189-205.

12. McCall, R. B. Fundamental Statistics for Psychology. New York: Harcourt, Brace, Jovanovich, Inc., 1975.

13. Sharkey, B. J. Physiology and Physical Activity. New York: Harper and Row, Publishers, 1975.

14. Smith, N. J. Food for Sport. Palo Alto, California: Bull Publishing Company, 1976.

15. Turney, W., and G. Robb. Research in Education: An Introduction. Hinsdale, Illinois: The Dryden Press, Inc., 1971. pp. 140-141.

16. Vie, N., D. H. Bent, and C. H. Hull. SPSS: Statistical Package for the Social Sciences. New York: McGraw-Hill Book Company, 1970.

17. Webster's Seventh New Collegiate Dictionary. Springfield, Massachusetts: G. & C. Merriam Company, 1970.

18. Wierman, W. Research Methods in Education, an Introduction. New York: J. P. Lippincott Company, 1969. pp. 207-211.

PERIODICALS

19. Baker, B., J. Frank, and R. Pangle. "A New Approach in Determining Health Misconceptions," Journal of School Health, 38:300-302, 1968.

20. Bremer, M., and W. M. Weatherholtz. "Nutrition Attitudes in a University Community," Journal of Nutrition Education, 7:60-64, April-June 1975.

21. Campbell, D. E., and R. G. Early. "Comparison of Health Knowledge of Young Adults and Their Parents," Research Quarterly, 40: 676-681, 1969.

22. Carruth, B. R., and H. L. Anderson. "Scaling Criteria in Developing and Evaluating an Attitude Instrument," Research Quarterly, 70:42-47, January 1977.

23. Darden, E. "Nutrition and Athletic Performance," Scholastic Coach, 44:88, April 1975.

24. Dwyer, J. T., J. J. Feldman, and J. Mayer. "Nutritional Literacy of High School Students," Journal of Nutrition Education, 2: 59-66, Fall 1970.

25. Heflin, B., and R. Pangle. "Health Misconceptions of College Students," American College Health Association, 14:154-157, 1966.

26. Jakobovits, C., P. Halstead, L. Kelley, D. A. Roe, and C. M. Young. "Eating Habits and Nutritient Intakes of College Women Over a Thirty-Year Period," Research Quarterly, 71:405-411, October 1977.

27. Jalso, S. B., M. M. Burns, and J. M. Rivers. "Nutritional Beliefs and Practices," Journal of the American Dietetic Association, 47:263-268, October 1965.

28. Kilander, H. F. "What the Public Knows About Nutrition," Research Quarterly, 15:188, 1944.

29. Likert, R. "A Technique for the Measurement of Attitudes," Archaeological Psychology, 22:5-43, June 1932.

30. Litman, T. J., J. P. Cooney, and R. Stief. "The Views of Minnesota School Children on Food," Journal of the American Dietetic Association, 45:433-440, 1963.

31. McCarthy, M. E., and J. H. Sabry. "Canadian University Students' Nutrition Misconceptions," Journal of Nutrition Education, 5:193, July-September 1973.

32. Préfontaine, M. "Construction and Validation of a Nutrition Test," Journal of Nutrition Education, 7:152-154, October-December 1975.

33. Schorr, B. C., D. Sanjur, and E. C. Erickson. "Teen-age Food Habits," Journal of the American Dietic Association, 61:415-420, October 1972.

34. Schwartz, N. E. "Nutritional Knowledge, Attitudes, and Practices of High School Graduates," Journal of the American Dietetic Association, 66:28-30, January 1975.

35. Van Itallie, T. B., L. Sinisterra, and F. J. Stare. "Nutrition and Athletic Performance," Journal of the American Medical Association, 162:1120-1126, November 17, 1956.

36. Washnik, W. M. "What the High School Senior Knows About Health," Research Quarterly, 28:178, May 1957.

37. Wilson, M. M., and M. W. Lamb. "Food Beliefs: As Related to Ecological Factors in Women," Journal of Home Economics, 60: 115-118, February 1968.

OTHER PUBLICATIONS

38. A.A.H.P.E.R. Nutrition for Athletes: Handbook for Coaches. Washington, D.C., 1971.

39. Picardi, S. M. "Development and Multidimensional Evaluation of a Food Chemistry and Nutrition Minicourse for High School Students." Ph.D. Dissertation, Massachusetts Institute of Technology, Cambridge, Massachusetts, February 1976.

40. Smith, N. J. "Diet Questionnaire for Athletes." Questionnaire utilized in the Athletic Department at the University of Washington, Seattle, Washington, February 1976.

APPENDIX A

PRELIMINARY LETTER AND POSTCARD

PRELIMINARY LETTER

Dear

As part of the work to complete a Master of Science degree, I am conducting a survey to determine the level of nutritional knowledge and attitudes of the students at the University. Furthermore, the study will investigate differences in nutritional knowledge and attitudes between students who participate in intercollegiate athletics and students who do not. Using this procedure it is hoped that a better understanding of nutritional information and attitudes may be obtained.

Your name was randomly selected from the 1975-76 University of Montana Directory. Consequently, I am seeking your cooperation in this study. If you decide to participate, which I earnestly hope you will, you will complete a fifty statement questionnaire taking approximately thirty minutes. The questionnaire will be given in the Field House, Room 214. All responses on the test will be anonymous.

Please indicate on the enclosed card whether you will participate in the study or not. Also indicate the time(s) which will be most suitable for you.

I sincerely hope you will choose to participate. Thank you very much for your anticipated cooperation.

Sincerely,

Donna E. Diefenbach
Field House, Office 215
243-4211

POSTCARD

Dear Donna,

I am____ am not____ willing to participate in your study. The date or dates most convenient for me to take the questionnaire are:

May 20	9 am__	May 21	1 pm__
	10 am__		2 pm__
	6 pm__		3 pm__
May 24	9 am__	May 26	9 am__
	11 am__		11 am__
	6 pm__		6 pm__

Other:_____ (time and date)

Signature:_____

APPENDIX B

NUTRITION INFORMATION QUESTIONNAIRE

Nutrition Information Questionnaire

Part I

1. Carefully complete the blanks or circle the appropriate response.

2. Age_____ 3. Sex: Male Female

4. Year in College: Freshman Sophomore Junior Senior

5. Have you participated in an intercollegiate sport in the 1975-1976 school year? _____

6. Indicate below the specific intercollegiate sport or sports which you participated in during the 1975-1976 season, number of years that you have participated in the sport or sports, and the letters you have received.

	Participation 1975-1976	Number of Years (1,2,3,4)	Letter(s)
Baseball			
Basketball			
Bowling			
Cross Country Skiing			
Football			
Gymnastics			
Handball			
Skiing			
Swimming			
Tennis			
Track			
Volleyball			
Wrestling			

7. Indicate any special courses or training which you have had in nutrition:

_____

_____

_____

Part II

Directions:

Twenty statements are listed below which you should express your feelings toward. Read each statement carefully and then circle on the answer sheet the response which best reflects your feeling toward each statement.

Here is an example of how to use the scale:

21. Protein gives you a quick lift before an event.

SA	A	U	D	SD
Strongly agree	Agree	Undecided	Disagree	Strongly disagree

Important: In indicating your choice, be sure the number of the statement which you are answering corresponds with the number on the answer sheet.

1. Honey, glucose, or other "quick energy" foods taken before events of short duration enhance performance.

2. Protein is a primary source of muscular energy.

3. No candy, sweets, pastries, or cakes should be eaten during training; bread and potatoes should be restricted.

4. Pickles, lemons, vinegar and other acid or sour foods have no miracle "reducing power".

5. No fats, no fried foods, no oily dressing should be eaten.

6. Protein and amino acid supplements are needed for muscle building.

7. Steak is the best source of protein for athletes.

8. Low concentrations of alcohol in the body can impair judgments and neuromuscular coordination.

9. Milk causes "cotton mouth" (dryness and discomfort in the mouth due to decrease in activity of salivary glands).

10. Milk decreases speed of movement and "cuts wind".

11. Eat first, drink later.

12. Drink no water during practice. (Suck on ice cubes only; rinse out mouth only).

13. The crash diet is an effective way to reduce.

(continued)

14. Stay away from "irritating" foods such as spices and "bulky" foods such as lettuce and bran because they may hinder performance.

15. Fasting may cause fatigue, muscle soreness, and nausea during intense exercise.

16. Tea is the preferred pregame beverage.

17. Vitamin B12 supplementation does not aid performance in the well-nourished individual.

18. Milk "curdles" in the stomach, causing sour stomach and interfering with performance.

19. Excess amounts of vitamin C will reduce the likelihood of bruising and minimize athletic injuries.

20. High intakes of certain vitamins may be harmful.

Part III

Directions:

There are twenty-five incomplete statements in this section, on the answer sheet select the number which corresponds with the word or words which best completes the statement and indicate it by checking the appropriate space.

Following is an example:

26. The calorie is the unit of measurement for:

a. minerals
b. vitamins
c. energy
d. protein

26. a. ( )
b. ( )
c. (✓)
d. ( )

BE SURE THE NUMBERS CORRESPOND.

1. The best way to be sure one is properly fed is:
   a. to try recipes published in magazines and newspapers
   b. to take one's own family eating habits as a model
   c. to follow one's own instinct
   d. to follow the recommendations given in the Food Guide

2. Cream soups, dishes containing grilled cheese and milk desserts:
   a. are good sources of vitamin C
   b. have the same nutritive value as milk
   c. are less nutritious than milk
   d. are good sources of iron

3. It is recommended to eat meat, fish or one of their substitutes:
   a. every day
   b. three times a week
   c. rarely
   d. occasionally

4. Which of the following two foods contain the same number of calories:
   a. a piece of cake and an apple
   b. a potato and a tomato
   c. a glass of whole milk and a glass of skim milk
   d. a pat of butter and a pat of margarine (square)

(continued)

5. It is recommended to take vitamin D from extracts of cod liver oil or from other forms of supplements because:
   a. vitamin D prevents anemia
   b. vitamin D protects against infection
   c. foods are low in vitamin D
   d. more vitamin D is needed during increased energy expenditure

6. Among the following groups of food, which contain many calories but few vitamins and minerals are:
   a. hamburgers and hot dogs
   b. candies and pastries
   c. potatoes and beets
   d. meat pies and pastas

7. A well balanced food intake is one which:
   a. allows a person to maintain a desirable weight
   b. contains sufficient amounts of proteins, sugars and fats
   c. contains the nutrients needed by the body
   d. includes three meals a day, taken at regular intervals

8. A good breakfast in the morning:
   a. is especially recommended during cold weather
   b. makes one more alert and more effective at work
   c. makes it easier to properly distribute the foods required in one day
   d. both answers number b and c are true

9. A good breakfast in the morning could include a fruit juice, tea or coffee, and
   a. buttered toasts and banana
   b. buttered toasts and jam
   c. buttered toasts with cheese or other protein food
   d. danish pastry with honey or syrup

10. Cholestrol is
   a. a harmful substance present in blood when one has heart disease
   b. a fatty substance made by the body or present in foods and found in the blood of everybody, even of healthy individuals
   c. a protein which is deposited in the blood vessels and which can cause heart problems
   d. a fatty substance found in vegetable oils

11. In planning daily menus for the family, it is important to:
   a. include foods from all the following groups: milk and milk products, fruits and vegetables, meats, bread and cereals
   b. consider the food preferences of the family members
   c. vary the foods included in the meals
   d. the above three answers are true (correct)

12. Which vitamin is required to utilize calcium and phosphorus for bone growth during childhood?
   a. vitamin A
   b. vitamin B
   c. vitamin C
   d. vitamin D

(continued)

13. The energy expenditure required for intellectual work is
    a. enormous
    b. high
    c. moderate
    d. negligible

14. Adults gain weight because
    a. they eat more than they use up
    b. overweight is hereditary
    c. they like sweets
    d. overweight is unavoidable with age

15. An adolescent who eats well and practices sports
    a. has a well developed musculature
    b. avoids overweight
    c. keeps his whole system functioning well
    d. the above three answers are true (correct)

16. It is recommended to use the liquid of canned vegetables because it contains:
    a. only vitamins
    b. vitamins and minerals
    c. salt only
    d. only proteins

17. During cooking, fruits retain more nutrients than vegetables because
    a. fruits are cooked at a lower temperature than vegetables
    b. the cellulose in fruits is more resitant than the cellulose in vegetables
    c. fruits are usually less acid than vegetables
    d. the fruit juice or syrup is usually served with the fruit

18. Freezing certain foods is a method to
    a. keep their nutritive value
    b. make them easier to digest
    c. keep them indefinitely
    d. improve their flavor and color

19. The major daily contribution toward one's vitamin requirements comes from:
    a. a varied and well balanced diet
    b. green vegetables
    c. milk
    d. liver

20. Which group of foods is generally regarded as a good source of vitamin C
    a. bread and cereals
    b. citrus fruits and green vegetables
    c. milk and milk products
    d. fruits and vegetables in general

21. Cod liver oil is an excellent source of
    a. thiamine
    b. riboflavin
    c. vitamin C
    d. vitamin D

(continued)

22. Sunlight can help one stock up on
    a. vitamin A
    b. vitamin B
    c. vitamin C
    d. vitamin D

23. Water is an essential part of our diet because
    a. it replaces the two cups of water lost dialy by the body
    b. after oxygen, it is the most vital need of the body
    c. it accounts for 1/3 of the body weight
    d. it is a very good source of minerals

24. Energy is
    a. a reaction pattern
    b. a regulatory substance in the body
    c. a force derived from the transformation of foods within the body
    d. an essential part of each cell in the body

25. Vegetable proteins are of a poorer quality than animal proteins because
    a. they contain less energy
    b. they slow down digestion
    c. they lack certain amino acids
    d. they contain less fat

ANSWER SHEET

Part II

1.	SA	A	U	D	SD
2.	SA	A	U	D	SD
3.	SA	A	U	D	SD
4.	SA	A	U	D	SD
5.	SA	A	U	D	SD
6.	SA	A	U	D	SD
7.	SA	A	U	D	SD
8.	SA	A	U	D	SD
9.	SA	A	U	D	SD
10.	SA	A	U	D	SD
11.	SA	A	U	D	SD
12.	SA	A	U	D	SD
13.	SA	A	U	D	SD
14.	SA	A	U	D	SD
15.	SA	A	U	D	SD
16.	SA	A	U	D	SD
17.	SA	A	U	D	SD
18.	SA	A	U	D	SD
19.	SA	A	U	D	SD
20.	SA	A	U	D	SD

Part III

1. a. ( )	10. a. ( )	19. a. ( )
b. ( )	b. ( )	b. ( )
c. ( )	c. ( )	c. ( )
d. ( )	d. ( )	d. ( )
2. a. ( )	11. a. ( )	20. a. ( )
b. ( )	b. ( )	b. ( )
c. ( )	c. ( )	c. ( )
d. ( )	d. ( )	d. ( )
3. a. ( )	12. a. ( )	21. a. ( )
b. ( )	b. ( )	b. ( )
c. ( )	c. ( )	c. ( )
d. ( )	d. ( )	d. ( )
4. a. ( )	13. a. ( )	22. a. ( )
b. ( )	b. ( )	b. ( )
c. ( )	c. ( )	c. ( )
d. ( )	d. ( )	d. ( )
5. a. ( )	14. a. ( )	23. a. ( )
b. ( )	b. ( )	b. ( )
c. ( )	c. ( )	c. ( )
d. ( )	d. ( )	d. ( )
6. a. ( )	15. a. ( )	24. a. ( )
b. ( )	b. ( )	b. ( )
c. ( )	c. ( )	c. ( )
d. ( )	d. ( )	d. ( )
7. a. ( )	16. a. ( )	25. a. ( )
b. ( )	b. ( )	b. ( )
c. ( )	c. ( )	c. ( )
d. ( )	d. ( )	d. ( )
8. a. ( )	17. a. ( )	
b. ( )	b. ( )	
c. ( )	c. ( )	
d. ( )	d. ( )	
9. a. ( )	18. a. ( )	
b. ( )	b. ( )	
c. ( )	c. ( )	
d. ( )	d. ( )	

APPENDIX C

PERCENTAGES AND NUMBERS OF SPORT PARTICIPATION FOR THE ATHLETIC POPULATION

Appendix C

Percentages and Numbers of Sport Participation for the Athletic Population

Sport	Number	Frequency
Basketball	5	10.2
Football	7	14.3
Gymnastics	1	2.0
Swimming	1	2.0
Tennis	1	2.0
Track	6	12.2
Volleyball	5	10.2
Wrestling	11	22.4
More than one	12	24.5

APPENDIX D

NUMBER AND PERCENT OF POPULATION ENROLLED IN A NUTRITION OR RELATED COURSE

Appendix D

Number and Percent of Population Enrolled in a Nutrition or Related Course

	Athletes		Nonathletes	
	Number	Percent	Number	Percent
None	32	65.3	36	78.3
Home Economics 146	14	28.6	6	13.0
Home Economics 246			1	2.2
Chemistry	2	4.1		
Two or More	1	2.0	3	6.5

APPENDIX E

PERCENTAGES OF ATHLETES AND NONATHLETES WHO AGREED AND DISAGREED WITH SELECTED PURPORTED MISCONCEPTIONS AND TRUE NUTRITIONAL STATEMENTS

Appendix E

Percentages of Athletes and Nonathletes Who Agreed and Disagreed With Selected Purported Misconceptions and True Nutritional Statements

---

1. Honey, glucose, or other "quick energy" foods taken before events of short duration enhance performance.

Athletes					Nonathletes				
SA*	A*	U*	D*	SD*	SA	A	U	D	SD
18.4	38.8	10.2	18.4	12.2	17.4	58.7	4.5	15.2	4.3

2. Protein is a primary source of muscular energy.

SA	A	U	D	SD	SA	A	U	D	SD
16.3	36.7	14.3	16.3	14.3	13.0	47.8	15.2	10.9	13.0

3. No candy, sweets, pastries, or cakes should be eaten during training; bread and potatoes should be restricted.

SA	A	U	D	SD	SA	A	U	D	SD
4.1	12.2	10.2	51.0	22.4	8.7	21.7	19.6	32.6	17.4

4. Pickles, lemons, vinegar and other acid or sour foods have no miracle "reducing power".

SA	A	U	D	SD	SA	A	U	D	SD
2.0	10.2	32.7	36.7	18.4	2.2	8.7	15.2	52.2	21.7

5. No fats, fried foods, no oily dressing should be eaten.

SA	A	U	D	SD	SA	A	U	D	SD
6.1	22.4	14.3	44.9	12.2	8.7	43.5	15.2	21.7	10.9

6. Protein and amino acid supplements are needed for muscle building.

SA	A	U	D	SD	SA	A	U	D	SD
22.4	51.0	4.1	18.4	4.1	28.3	41.3	13.0	10.9	6.5

7. Steak is the best source of protein for athletes.

SA	A	U	D	SD	SA	A	U	D	SD
8.2	22.4	16.3	44.9	8.2	4.3	19.6	21.7	43.5	10.9

(continued)

Appendix E (continued)

8. Low concentrations of alcohol in the body can impair judgments and neuromuscular coordination.

Athletes					Nonathletes				
SA	A	U	D	SD	SA	A	U	D	SD
10.2	20.4	14.3	34.7	20.4	2.2	15.2	15.2	45.7	21.7

9. Milk causes "cotton mouth" (dryness and discomfort in the mouth due to decrease in activity of salivary glands).

SA	A	U	D	SD	SA	A	U	D	SD
20.4	24.5	20.4	26.5	8.2	10.9	28.3	21.7	30.4	8.7

10. Milk decreases speed of movement and "cuts wind".

SA	A	U	D	SD	SA	A	U	D	SD
6.1	20.4	22.4	38.8	12.2	--	4.3	28.3	56.5	10.9

11. Eat first, drink later.

SA	A	U	D	SD	SA	A	U	D	SD
2.0	24.5	28.6	38.8	6.1	10.9	30.4	30.4	21.7	6.5

12. Drink no water during practice. (Suck on ice cubes only; rinse out mouth only).

SA	A	U	D	SD	SA	A	U	D	SD
8.2	30.6	6.1	26.5	28.6	10.9	28.3	10.9	45.7	4.3

13. The crash diet is an effective way to reduce.

SA	A	U	D	SD	SA	A	U	D	SD
4.1	16.3	8.2	24.5	46.9	2.2	8.7	6.5	28.3	54.3

14. Stay away from "irritating" foods such as spices and "bulky" foods such as lettuce and bran because they may hinder performance.

SA	A	U	D	SD	SA	A	U	D	SD
--	14.3	22.4	46.9	16.3	4.3	15.2	21.7	37.0	21.7

(continued)

Appendix E (continued)

15. Fasting may cause fatigue, muscle soreness, and nausea during intense exercise.

Athletes					Nonathletes				
SA	A	U	D	SD	SA	A	U	D	SD
2.0	2.0	12.2	51.0	32.7	--	15.2	6.5	54.3	23.9

16. Tea is the preferred pregame beverage.

SA	A	U	D	SD	SA	A	U	D	SD
2.0	26.5	32.7	34.7	4.1	6.5	23.9	41.3	21.7	6.5

17. Vitamin B12 supplementation does not aid performance in the well-nourished individual.

SA	A	U	D	SD	SA	A	U	D	SD
2.0	4.1	44.9	44.9	4.1	4.3	10.9	43.5	34.8	6.5

18. Milk "curdles" in the stomach, causing sour stomach and interfering with performance.

SA	A	U	D	SD	SA	A	U	D	SD
6.1	38.3	14.3	36.7	4.1	6.5	32.6	23.9	28.3	8.7

19. Excess amounts of vitamin C will reduce the likelihood of bruising and minimize athletic injuries.

SA	A	U	D	SD	SA	A	U	D	SD
6.1	12.2	36.7	30.6	14.3	2.2	15.2	23.9	41.3	17.4

20. High intakes of certain vitamins may be harmful.

SA	A	U	D	SD	SA	A	U	D	SD
2.0	6.1	22.4	30.6	38.8	6.5	4.3	6.5	41.3	41.3

---

* SA = Strongly Agree
A = Agree
U = Undecided
D = Disagree
SD = Strongly Disagree

APPENDIX F

MEANS, MEDIANS, AND STANDARD DEVIATIONS OF ATHLETES AND NONATHLETES TOWARD THE PURPORTED MISCONCEPTIONS AND NUTRITIONAL STATEMENTS

Appendix F

Means, Medians, and Standard Deviations of Athletes and Nonathletes Toward the Purported Misconceptions and Nutritional Statements

Purported Misconceptions & Nutritional Statements	Athletes			Nonathletes		
	$\bar{X}$*	Md**	s***	$\bar{X}$	Md	s
1	2.612	2.263	1.367	2.304	2.056	1.072
2	2.694	2.361	1.372	2.630	2.273	1.236
3	3.755	3.960	1.071	3.283	3.500	1.241
4	3.592	3.639	0.977	3.826	3.958	0.950
5	3.347	3.659	1.147	2.826	2.450	1.198
6	2.306	2.040	1.140	2.261	2.026	1.182
7	3.224	3.568	1.141	3.370	3.600	1.062
8	3.347	3.647	1.300	3.696	3.881	1.051
9	2.776	2.750	1.279	2.978	3.000	1.183
10	3.306	3.526	1.122	3.739	3.808	0.713
11	3.224	3.321	0.963	2.826	2.786	1.102
12	3.367	3.692	1.395	3.043	3.500	1.173
13	3.939	4.375	1.265	4.239	4.580	1.058
14	3.653	3.783	0.925	3.565	3.735	1.128
15	4.102	4.160	0.848	3.870	4.020	0.957
16	3.122	3.156	0.927	2.978	2.974	1.000
17	3.449	3.477	0.738	3.283	3.300	0.911
18	2.939	2.857	1.088	3.000	2.955	1.116
19	3.347	3.361	1.071	3.565	3.711	1.025
20	3.980	4.133	1.031	3.065	4.289	1.124
Total:	66.08	67.73		64.35	66.39	
$\bar{X}$	3.304	3.387		3.218	3.320	

* Mean ** Median ***Standard Deviation

APPENDIX G

MEAN AND INDIVIDUAL NUTRITIONAL KNOWLEDGE TEST SCORE RESULTS

Appendix G

Mean and Individual Nutritional Knowledge Test Score Results

Athletes		Nonathletes	
Male	Female	Male	Female
%*	%	%	%
80	68	68	76
64	52	32	68
60	60	60	100
52	60	80	64
64	68	48	76
64	92	56	76
76	72	64	32
48	56	64	80
68	84	76	68
84	84	72	64
76	40	56	92
60	84	68	72
72	84	48	72
60	88	64	64
72	88	60	64
56		60	52
44		48	88
24		48	52
20		56	88
64		44	64
84		80	76
24		84	52
56		52	68
52		80	
56			
88			
88			
44			
64			
56			
64			
84			
84			
60			
Total 2112	1080	1468	1608
$\bar{X}$ 62.12%	72.00%	61.17%	69.91%

* Percent score received on test

APPENDIX H

MEANS, MEDIANS, AND STANDARD DEVIATIONS OF SCORES ON THE NUTRITIONAL KNOWLEDGE TEST

Appendix H

Means, Medians, and Standard Deviations of Scores on the Nutritional Knowledge Test

Knowledge Questions	Athletes			Nonathletes		
	x*	Md**	s***	x	Md	s
1	3.694	3.888	0.713	3.783	3.910	0.554
2	2.408	2.290	0.574	2.435	2.293	0.620
3	1.408	1.221	0.734	1.587	1.420	0.805
4	2.633	2.325	1.167	2.545	2.196	1.130
5	2.714	2.920	1.021	2.652	2.875	1.016
6	2.102	2.024	0.586	2.130	2.025	0.619
7	2.633	2.788	0.668	2.739	2.833	0.535
8	3.265	3.710	1.036	3.413	3.733	0.884
9	2.388	2.673	0.953	2.413	2.714	0.884
10	2.224	2.108	0.621	2.087	2.043	0.551
11	2.714	3.593	1.472	2.848	3.679	1.460
12	2.980	3.625	1.233	3.217	3.758	1.191
13	2.959	3.000	0.865	2.848	2.909	0.842
14	1.143	1.033	0.577	1.217	1.048	0.728
15	3.816	3.917	0.527	3.457	3.803	1.005
16	2.102	2.013	0.684	2.130	2.041	0.619
17	2.878	3.558	1.285	2.565	2.250	1.148
18	2.020	2.000	1.031	2.109	2.500	1.120
19	1.122	1.057	0.389	1.261	1.105	0.648
20	2.286	2.069	0.866	2.261	2.068	0.773
21	3.449	3.872	1.119	3.326	3.758	1.055
22	2.898	3.520	1.279	3.130	3.580	1.147
23	2.245	2.130	0.925	2.109	2.109	0.706
24	2.857	2.986	0.791	3.022	3.043	0.614
25	2.735	2.897	0.884	2.935	2.984	0.680
Total: Average:	2.547	2.689		2.569	2.667	

* Mean ** Median *** Standard Deviation

APPENDIX I

ONE-WAY ANALYSIS OF VARIANCE ON THE NUTRITIONAL KNOWLEDGE TEST

Appendix I

One-Way Analysis of Variance on the Nutritional Knowledge Test

Knowledge Question	Sum of Squares	Mean Square	F Ratio	p
1	0.187	0.187	0.454	0.502
2	0.017	0.017	0.047	0.829
3	0.758	0.758	1.283	0.260
4	0.189	0.189	0.143	0.706
5	0.092	0.092	0.088	0.767
6	0.019	0.019	0.053	0.819
7	0.269	0.269	0.730	0.395
8	0.518	0.518	0.555	0.458
9	0.015	0.015	0.018	0.894
10	0.449	0.449	1.297	0.258
11	0.423	0.423	0.197	0.658
12	1.342	1.342	0.912	0.342
13	0.294	0.294	0.403	0.527
14	0.132	0.132	0.308	0.580
15	3.072	3.072	4.861	0.030*
16	0.019	0.019	0.045	0.833
17	2.315	2.315	1.553	0.216
18	0.185	0.185	0.160	0.690
19	0.455	0.455	1.618	0.207
20	0.015	0.015	0.022	0.883
21	0.358	0.358	0.302	0.584
22	1.282	1.282	0.866	0.354
23	0.440	0.440	0.644	0.424
24	0.643	0.643	1.272	0.262
25	0.950	0.950	1.514	0.222

* $p \leq .05$ df = 1