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Effects of nutrition education on the nutrition knowledge of future aerobic dance instructors

Abbe Michelle Breiter

Florida International University

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FLORIDA INTERNATIONAL UNIVERSITY

Miami, Florida

EFFECTS OF NUTRITION EDUCATION ON THE NUTRITION KNOWLEDGE OF FUTURE
AEROBIC DANCE INSTRUCTORS

A thesis submitted in partial satisfaction of the
requirements for the degree of
MASTER OF SCIENCE
IN
DIETETICS AND NUTRITION

by

Abbe Michelle Breiter

1997

To: Dean Judith A. Blucker
College of Health

This thesis, written by Abbe Michelle Breiter, and entitled Effects of Nutrition Education on the Nutrition Knowledge of Future Aerobic Dance Instructors, having been approved in respect to style and intellectual content, is referred to you for judgment.

We have read this thesis and recommend that it be approved.

Susan P. Himburg

Michele W. Keane

Fatma Huffman, Major Professor

Date of Defense: March 27, 1997

The thesis of Abbe Michelle Breiter is approved.

Dean Judith A. Blucker
College of Health

Dr. Richard L. Campbell
Dean of Graduate Studies

Florida International University, 1997

I dedicate this thesis to my entire family. Without their support, understanding, and most of all their love, the completion of this work would not have been possible.

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ABSTRACT OF THE THESIS

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AEROBIC DANCE INSTRUCTORS

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Abbe Michelle Breiter

Florida International University, 1997

Miami, Florida

Professor Fatma G. Huffman, Major Professor

The effectiveness of nutrition education on the nutrition knowledge of future aerobic instructors was studied. Forty-seven subjects participated in the study. The experimental group (n=31) chose to and paid for a two-hour per week session of structured nutrition education for four weeks, the control group (n=16) did not. A nutrition knowledge test was completed by all subjects before and after the intervention. Results were analyzed for relationships between subject's nutrition knowledge and age, gender, educational background, income, and body mass index. No significant differences were found between the groups. The results showed that prior to any formal nutrition education, fitness instructors in the experimental and control groups had low nutrition knowledge ($8.06\% \pm 16.4\%$ and $4.38\% \pm 4.12\%$, respectively). Post-intervention nutrition knowledge significantly improved ($p < 0.001$) for the experimental group ($42.6\% \pm 19.3\%$) as compared to the control group ($8.5\% \pm 19.5$). Thirty-one out of fifty questions showed significant improvement for experimental subjects ($p < 0.05$). The data suggest that with formal nutrition education, the nutrition knowledge of future aerobic instructors can be significantly improved.

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INTRODUCTION

The majority of consumers in the United States know the fundamentals of nutrition but are less familiar with the specifics (1). Americans need and want information that builds upon their foundation of knowledge, and they are ready for more specific, more sophisticated information about nutrition and health (1). The next most logical question is, from whom will consumers seek to obtain this information.

Two studies by Barr (2) and Kunkel et al. (3) asked active people to identify their sources of nutrition information and which were the most useful. Barr (2) discovered that fitness class participants are more likely to turn to their fitness instructors than to physicians or dietitians for nutrition information. They also viewed the instructor as the most useful resource. Kunkel et al., (3) found similar results. In their study of 867 South Carolina adults these researchers found that women, whites, and persons under the age of 49 were more likely to identify their fitness instructors as a source of nutrition information, and cited those instructors as a credible source of nutrition information.

With so many people turning to fitness instructors as their primary source of nutrition information, it is important to determine the level of nutrition knowledge of this group. A concern arises because surveys by the Aerobics and Fitness Association of America concluded that only 10% of 100,000 instructors in the United States have formal nutrition training or certifications (4). Previous studies of nutrition knowledge have focused on athletes, coaches, physicians, or those attending universities. Only one study has been conducted on the nutrition knowledge of aerobic dance instructors (9) even though they have been cited by consumers as a useful nutrition information source (2). There is a need for nutrition education for fitness instructors based on the results of the nutrition knowledge test scores (5-9). Therefore, the purpose of this study was to assess the nutrition knowledge of future aerobic instructors, and to evaluate the effectiveness of a nutrition education program designed to improve/increase their nutrition knowledge.

REVIEW OF LITERATURE

NUTRITION KNOWLEDGE

For active people, fitness instructors are a major source of nutrition information, compared to physicians or dietitians. When nutrition questions arise, or dietary advice is needed, these active people turn to their fitness instructors for the answers. However, the nutrition information that fitness instructors present to their participants may be of questionable quality (10). This notion has been raised in the past, but never studied.

Soper, et al. (9) examined the nutrition knowledge of aerobic dance instructors (ADIs), a subset of the fitness instructor population. The study was completed in two phases with two separate samples, and the data was pooled. Part I consisted of a survey of ADIs to determine which nutrition concepts were most relevant to them. Part II consisted of a questionnaire to assess nutrition knowledge of concepts within three domains (weight control, nutrient requirements, sources of nutrients) and to elicit descriptive information. ADIs were found to be lacking in nutrition knowledge in all three categories. The mean total test score for the combined samples was 59% correct (range 16%-96%), with the poorest score arising in the category of nutrient requirements (48% correct). This study indicated that the mean nutrition knowledge test scores rose with an increasing level of education, especially if that education included any formal nutrition classes.

The impact of nutrition education on nutrition knowledge has been assessed for different populations (2,10,11). These investigations fit into one of the following categories: (1) high school athletes; (2) college athletes; (3) recreational triathletes; (4) the coaches/ trainers; (5) physicians; (6) fitness class participants; or (7) those attending universities.

A multitude of studies have been completed to determine the level of knowledge in high school athletes, college athletes, and recreational athletes (2,6,7,10,12-14). High school athletes were found to have an overall higher mean score of nutrition knowledge than either college or recreational athletes. This does not support the relationship between a higher level of education

and the mean test score found in another study (9). Women achieved a higher test score in comparison to men, at all levels (6,14,15). Another common factor among the studies was that those athletes who had maintained a program of regular activity for a longer duration (greater than two years) had an overall higher score (2,10,12). The most frequent questions answered incorrectly dealt with food fallacies and misconceptions, and this concept held true across all levels (12-14).

Thirty to forty-nine percent of high school and college athletes reported that their parents were their main source of nutrition information, and only fifteen to twenty percent relied on their coaches or physical education teachers as their main source of nutrition information (6,10,12,13). Of those who considered a coach the primary source, less than five percent of the athletes felt coaches were the most useful in providing nutrition information (10). This fact is of concern because the level of nutrition knowledge that coaches have has been found to be poor, especially as it relates to physical activity (5,11,15-17).

Most studies investigating the nutrition knowledge of coaches and athletic personnel have reported a low level of nutrition knowledge and confusion amongst this group as to whether they should be responsible for disseminating nutrition information (5,11,15-17). Results from these studies revealed that this particular population scored lowest on questions concerning basic nutrition, and those relating to common nutrition misconceptions. Graves et al. (17) assessed the knowledge of sports-related nutrition concepts of high school athletic personnel. The data collected were examined for differences in knowledge among three groups: coaches, trainers, and coach/trainers. The questionnaire focused on sports nutrition principles including attitudes about nutrition as it relates to students and sports, knowledge of the respondent, and recommendations that athletic personnel might make to a young athlete. Results depicted a difference in nutrition knowledge among the three groups, and a disagreement in the perceptions of who was more important, coaches or trainers, in dispensing nutrition information to the athletes. At least one in five subjects within each group said no one could be identified as having the responsibility of

providing nutrition information to the athletes. The authors concluded that coaches are inadequately prepared to provide guidance in nutrition.

In a similar study, sports nutrition knowledge of current and prospective physical educators/coaches was assessed, and compared to the knowledge of food and nutrition students, and to the general college student population (16). The researchers focused on nutrition supplementation, fluids and hydration, pre-event nutrition, nutrient composition, nutrition terminology, general nutrition, and nutrition opinion. These topics were chosen because previous studies have shown a lack of knowledge in these areas by physical educators/coaches (5). The goal was to determine if there was a difference in the nutrition knowledge of the three groups, and if so, if there was a need for improved education in this area. The sports nutrition knowledge of physical educators/coaches was found to be inferior to that of food and nutrition students, yet slightly better than that of the general student population. The authors suggested that nutrition education for all current and prospective physical educators/coaches, be provided.

Other studies by Bedgood and Tuck (5) and Corley et al. (7) indicated similar results. The mean nutrition knowledge test scores for high school coaches were 60% and 55% for college coaches. Coaches were least knowledgeable when it came to correctly identifying the recommended distribution of fat, carbohydrate, and protein in a balanced diet (5,7). For the coaches who did score well on the test, only one-third of them indicated that they were not confident in their responses. This should be a concern because Bedgood and Tuck (5) reported that 86% of the coaches surveyed dispensed nutrition information to their athletes at least one time per month, but 73% indicated that their training in nutrition was insufficient. The participating coaches listed physicians as either their primary resource, or within the top three resources, when asked where they obtained their nutrition information (5,7,17).

While many groups of professional people influence the nutrition education of the general public, the physician is regarded as a nutrition educator by his/her associates, patients, and the general public (8). A study published in 1977 revealed that 292 physicians, serving as general

practitioners, answered only 65% of nutrition knowledge questions correctly, with a tendency to score higher on basic nutritional knowledge questions than on those relating to therapeutic nutrition (8). A significant and negative correlation was found between the years in practice and nutrition knowledge suggesting that nutrition education should be considered as an area for continuing education/postgraduate courses for physicians. If coaches are relying on physicians to provide them with accurate nutrition information, it is not surprising that these coaches, both in high school and in college, have an insufficient level of nutrition knowledge to pass on to their students/athletes.

The studies reviewed may have contained some bias in the response rate because of the self-selected nature of the study design. Two biases were repeatedly mentioned. One was that individuals who chose to participate in the studies may have been more interested in nutrition and possibly more knowledgeable. The second possible bias relates to the fact that in many situations subjects were not supervised when completing the questionnaire and may have obtained help with their answers. However, in the studies reviewed, the low scores on the nutrition knowledge tests suggest that the biases did not play a significant role.

Physicians, coaches, physical educators, and fitness instructors who give dietary advice to athletes and consumers have an insufficient level of nutrition knowledge, yet are cited as their main source of nutrition information. Referring to this problem, Parr, et al. (11) stated: "student-athletes seeking nutrition advice deserve physical educators/coaches who can accurately fulfill that responsibility". Evidently, most coaches cannot fulfill the responsibility, nor can most aerobic dance instructors. Therefore the present research was designed to answer the following: (1) Do fitness instructors have a sufficient level of nutrition knowledge to disseminate dietary advice?; and (2) Can formal nutrition education improve nutrition knowledge of fitness instructors?

EFFECT OF NUTRITION EDUCATION ON NUTRITION KNOWLEDGE

Several studies have examined the effectiveness of nutrition education on subjects' level of nutrition knowledge (18-23). Lazarus, et al. (20) studied the impact of a physician nutrition

specialist in a family-medicine residency program on residents' and faculty members' nutrition knowledge and patient-care practices. For six months, a physician nutrition specialist provided nutrition education to residents and faculty members within a family-practice residency program. The intervention resulted in a significant increase in the nutrition knowledge of those physicians who were making dietary recommendations to their patients.

Another study was conducted to determine whether the elements of basic nutrition can be taught to individuals who have no previous nutrition knowledge, and whether it is more successful if the teaching material is related to the ability of the individual to understand, and to motivational factors that might stimulate learning (18). Young, white women aged 25-34 years from lower socioeconomic classes were classified by educational status, and according to their motivation with respect to health. The baseline group did not receive any written material, while the control group was shown a video and received a colored booklet, entitled Food, What's In It For You?. The test group saw a similar video, received a similar booklet, and a colored pamphlet in the form of a 'news-sheet' which repeated several nutritional messages in the context of motivating influences. The difference in the material was the inclusion of motivational information for the test group. A fourth group also received the motivational information, plus a poster which repeated the factual contents of the booklet in a simplified format. Each group showed an increase in nutrition knowledge, but the degree of improvement was significantly greater for all three groups receiving information compared to the baseline group. The authors concluded that it is possible to educate young women in basic nutrition, and that their learning capabilities are not influenced substantially by motivation or ability. This conclusion drawn by Fine et al. (18) is supported by research on factors that influence learner readiness.

Achterberg (24) describes four major factors which include information processing capacity, affective state, prior learning and experience, and the learner's "way of knowing" or philosophy of learning. She states that the most common mistake that nutritionists make in any kind of educational presentation is "information overload". In the study by Fine et al., (18) the education

given to participants was simple and only consisted of a video and a booklet which resulted in significant learning. Also, the subjects choose to be a part of the study which would be indicative of their affective state, the second factor influencing learner readiness.

Effective education requires assessment of the dietary concerns, practices, and knowledge of a population (21). Therefore, conducting a base line nutrition knowledge test prior to nutrition education enables the educator to be more effective. In addition, a test given following the education allows for the determination of the effectiveness of that education.

OBJECTIVES

This study was designed to assess the nutrition knowledge of future aerobic instructors and examine the effectiveness of eight hours of nutrition education on the individual's nutrition knowledge. Specific objectives were:

- A. To determine the baseline nutrition knowledge of future aerobic instructors participating in an intensive training program.
- B. To evaluate the effectiveness of an eight hours of structured nutrition education on nutrition knowledge of future aerobic instructors.

HYPOTHESES TESTED

- A. Future aerobic instructors' nutrition knowledge is low.
- B. Formal nutrition education can increase aerobic instructors' nutrition knowledge.

METHODOLOGY

STUDY DESIGN

All individuals participating in an intensive aerobic instructor training program were eligible to participate in the study. Subjects were recruited to partake in the study and were in one of two groups: experimental or control group. The experimental group consisted of subjects who had chosen and paid for a nutrition education program. The control group consisted of subjects who had not chosen to receive the formal nutrition education, but were willing to participate in the study. Individuals attending the nutrition education program served as their own controls. Both groups completed a pre- and post-nutrition knowledge test, separated by a five week interval.

SELECTION OF SUBJECTS

A. Inclusion Criteria

1. The individual had to be participating in the aerobic instructor training program.
2. The participant had to continue in the program for at least 5 weeks after completing the first nutrition knowledge test.
3. Participants could not share any of the information disseminated during the nutrition education sessions with other subjects in the study.
4. Participants had to understand the importance of adherence to study guidelines.

B. Exclusion Criteria

1. Previous certification and experience in teaching aerobic classes.
2. Faculty of the aerobic training facility.

STUDY INSTRUMENT

A. Educational Materials

Educational materials were provided for the subjects in the experimental group each week. The handouts were designed by the investigator, based on the lesson plans

(Appendix C-F), and included information related to the pre- and post-test questions (Appendix G-J).

B. Tests to Measure Knowledge

The pre and post nutrition knowledge test contained 25 multiple choice questions with five possible answers including don't know, and 25 true/false questions which included a choice of not sure. The same fifty questions and choices were asked on each test, however the questions and choices were presented in different sequences to prevent recall by the subjects. The test was designed by the investigator based on information from nutrition textbooks and a test bank of questions from an instructor manual that accompanied each textbook (25-27). The test was piloted with a group of individuals in the training facility. Their information and scores results were not included in the results.

C. Scoring

Tests were scored by assigning one point for a correct answer, subtracting one point for each incorrect answer, and assigning zero points if the response "don't know or not sure" was chosen. Raw scores were then converted into percentages, therefore the possible scores on each test ranged from -100% to 100%.

STUDY PROCEDURES

- A. Subjects were instructed that by taking the pre and post test, they were consenting to participate in the study.
- B. Participants filled out a questionnaire to obtain demographic and personal background information. Data was collected on age, gender, ethnicity, height/weight, education background, total household gross income earned per year, nutrition education background, sources of nutrition information, and usual dietary pattern.
- C. Participants completed a nutrition knowledge test consisting of 25 multiple choice questions and 25 true/false statements. Topics included were as follows: basic

nutrition, general food guidelines/recommendations, nutrition for special populations, nutrition label reading, principles of energy balance and weight control, food fallacies, and common nutrition misconceptions.

- D. Subjects in the experimental group attended one, two-hour nutrition education session per week for four weeks. Each lecture was conclusive, therefore participants could begin at any time.
- E. Participants were instructed not to share any information disseminated in each session with other subjects in the study.
- F. Subjects in the control group did not attend any structured nutrition education sessions.
- G. Five weeks after the first test was taken, each subject completed a second nutrition knowledge test. Subjects in the control group had the same five week time span between the two nutrition knowledge tests to account for outside influences that may affect knowledge.

EFFICACY ASSESSMENT

The primary efficacy endpoint for the study was an increase in the nutrition knowledge score of subjects receiving the nutrition education by at least fifty percent.

STATISTICAL ANALYSIS

Descriptive analysis included determination of means, standard deviations and ranges of age, height, current body weight, and body mass index, and the frequency and number of years of education, income level, usual dietary pattern, ethnic group, and history of formal nutrition education. By means of a two-tailed t-test, post test scores on the nutrition knowledge test were compared with pre-test scores. McNemars test was performed to evaluate the effectiveness of teaching for each of the fifty questions. All statistical analyses were completed using the Statistical Package for the Social Sciences. The level of significance was set at $p < 0.05$.

RESULTS

The findings are based on the scores of the nutrition knowledge test completed by 47 individuals involved in an aerobic instructor training program in South Florida during 1996. The sample was split into two groups - experimental and control. Sixty-eight subjects began the study; 47(69%) completed the study.

Study Subjects

Table 1 depicts a description of the study population by treatment group. Thirty-one subjects in the experimental group received nutrition education and sixteen subjects in the control group did not. Eighty-one percent of the subjects were female and nineteen percent were male. The majority of subjects (61%) were between the ages of 25-34. Twenty-three percent had completed high school only, 53% had completed some college or had earned an Associate's Degree, and 23% had earned a Bachelor's Degree. Sixty-four percent of the subjects reported their ethnic background as White, Non-Hispanic, 11% were Hispanic, 13% were African American, and 12% were other. Three subjects in each group reported they had received some formal nutrition education, however only one subject in both groups reported having received that formal nutrition education within the past two years. No statistically significant differences were noted between the groups regarding gender, age, educational level, or income level determined by chi square analysis.

Table 2 presents a summary of the mean age, height, weight, and body mass index for the study population. Mean age of the experimental group was slightly higher than the control group although not statistically significant. As indicated by the mean body mass index, all subjects were considered to be at an acceptable weight for height. No statistically significant difference was found regarding age, height, weight, or body mass index between groups indicated by chi square analysis.

TABLE 1. DESCRIPTIVE DATA OF STUDY SUBJECTS¹

Variable	Experimental (N=31)		Control (N=16)		Total (N=47)	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Gender						
Male	3	9.7	6	37.5	9	19.1
<u>Female</u>	<u>28</u>	<u>90.3</u>	<u>10</u>	<u>62.5</u>	<u>38</u>	<u>80.9</u>
Total	31	100.0	16	100.0	47	100.0
Age						
<25 years	5	16.1	2	13.3	7	15.2
25-34 years	15	48.4	12	80.0	27	58.7
<u>35+ years</u>	<u>11</u>	<u>35.5</u>	<u>1</u>	<u>6.7</u>	<u>12</u>	<u>26.1</u>
Total	31	100.0	15	100.0	46	100.0
Education						
High School	9	29.0	2	12.5	11	23.4
At least 2 years of college	16	51.6	9	56.3	25	53.2
<u>Bachelor's Degree</u>	<u>6</u>	<u>19.4</u>	<u>5</u>	<u>31.3</u>	<u>11</u>	<u>23.4</u>
Total	31	100.0	16	100.0	47	100.0
Ethnic Group						
White (non-hispanic)	21	67.7	9	56.2	30	63.8
Hispanic	5	16.1	0	0.0	5	10.6
African American	3	9.7	3	18.8	6	12.8
<u>Other</u>	<u>2</u>	<u>6.5</u>	<u>4</u>	<u>25.0</u>	<u>6</u>	<u>12.8</u>
Total	31	100.0	16	100.0	47	100.0
Previous Nutrition Course						
Yes	3	9.7	3	18.8	6	12.8
<u>No</u>	<u>28</u>	<u>90.3</u>	<u>13</u>	<u>81.2</u>	<u>41</u>	<u>87.2</u>
Total	31	100.0	16	100.0	47	100.0
Income						
<\$10,000	2	6.5	3	18.7	5	10.6
\$10,000-29,999	11	35.5	7	43.8	18	38.3
\$30,000-59,999	8	25.8	2	12.5	10	21.3
>\$60,000	7	22.5	1	6.3	8	17.0
<u>no answer</u>	<u>3</u>	<u>9.7</u>	<u>3</u>	<u>18.7</u>	<u>6</u>	<u>12.8</u>
Total	31	100.0	16	100.0	47	100.0

¹No significant differences were found between the study groups for the variables examined (p<0.05)

TABLE 2. SUMMARY OF MEAN AGE, HEIGHT, WEIGHT, BODY MASS INDEX^{1,2}

Variable	Experimental (N=31)		Control (N=16)		Total (N=47)	
	Male (N=3)	Female (N=28)	Male (N=6)	Female (N=9)	Male (N=9)	Female (N=37)
Age	32.7 $\pm$ 8.4	32.3 $\pm$ 6.9	29.2 $\pm$ 5.2	28.4 $\pm$ 5.4	30.3 $\pm$ 6.1	31.3 $\pm$ 6.7
Height (inches)	69.3 $\pm$ 2.1	63.1 $\pm$ 2.5	69.5 $\pm$ 2.3	64.3 $\pm$ 3.0	69.4 $\pm$ 2.1	63.1 $\pm$ 2.5
Current Body Weight (kg)	80.8 $\pm$ 10.2	55.6 $\pm$ 7.5	81.2 $\pm$ 13.8	55.0 $\pm$ 6.0	81.1 $\pm$ 12.1	55.4 $\pm$ 7.1
BMI ³	26.0 $\pm$ 1.8	21.3 $\pm$ 2.6	25.9 $\pm$ 3.4	20.8 $\pm$ 3.5	26.0 $\pm$ 2.9	21.3 $\pm$ 2.5

¹Mean $\pm$ SD

²Means were not statistically significant at $p < 0.05$

³BMI = Wt (kg)/ Ht (m²)

Sources of Nutrition Information

Primary sources of nutrition information used by the subjects are presented in Table 3. Both groups reported obtaining information from four primary sources (magazines, books, television; nutrition labels on food; dietitians/nutritionists; other fitness professionals). Members of both groups selected non-professional sources such as books, magazines, and television most frequently for nutrition information. On the average for both treatment groups, only 13% of the subjects referred to dietitians or nutritionists when nutrition information was desired. "Other" sources of nutrition information included physicians, health food store personnel, formal weight loss program, and friends. The frequency of citing these "other" sources did not differ significantly between groups.

Nutrition Knowledge

Tests were scored by assigning one point for a correct answer, subtracting one point for each incorrect answer, and assigning zero points if the response "don't know or not sure" was chosen. Raw scores were then converted into percentages, therefore the possible scores on each test ranged from -100% to 100%. The mean pre-test score for the experimental and control groups were $8.06\% \pm 16.4\%$ (range = -22% to 34%) and $4.38\% \pm 16.5\%$ (range = -34% to 42%), respectively (Table 4). There were no significant difference in pre-test scores between the two groups before the nutrition intervention ($p=0.470$) as indicated by t-tests. There were no significant correlations found between pre-test nutrition knowledge scores and age, body mass index, education, ethnic group, or income level. Subsequent to the nutrition intervention, the mean post-test scores for the experimental and control groups were $42.58\% \pm 19.27\%$ (range = -34% to 68%) and $8.50\% \pm 19.51\%$ (range = -28% to 50%), respectively. T-tests were performed to measure differences between the two groups for an increase in nutrition knowledge. There were statistically significant differences between the post-test scores on the nutrition knowledge test ($p<0.001$).

TABLE 3. PRIMARY SOURCES OF NUTRITION INFORMATION USED BY THE SUBJECTS

	Percent of Subjects who Chose the Source		
Primary Sources of Nutrition Information	Experimental (N=31)	Control (N=16)	Total (N=47)
Books, Magazines, Television	35.5	31.1	34.0
Nutrition Labels on Food	25.8	6.3	19.1
Dietitians/Nutritionists	16.1	6.3	12.8
Other Fitness Professionals	6.5	6.3	6.4
Other	12.9	25.0	17.0
No Answer	3.2	25.0	10.7
Total	100.0	100.0	100.0

TABLE 4. NUTRITION KNOWLEDGE SCORES FOR PRE AND POST-TEST^{1,2}

	Experimental (N=31)	Control (N=16)
	MEAN $\pm$ SD	MEAN $\pm$ SD
PRE-TEST	8.06% $\pm$ 16.4% ^b	4.38% $\pm$ 4.12% ^b
POST-TEST	42.58% $\pm$ 19.27% ^a	8.50% $\pm$ 19.51% ^b

¹Reflects mean percentages of adjusted correct answers by each group

²Means within a row or column with different superscripts were significantly different at $p < 0.001$

Table 5, 6, 7, 8, and 9 show the effectiveness of teaching for each question in each group determined by McNemar test. Effectiveness was determined by calculating the number of subjects who responded with an incorrect or don't know answer on the pre-test and responded correctly to the same question on the post-test. The questions that showed the most improvement were those related to sources of particular nutrients (questions #7,13,19), general food guidelines/recommendations (question #2,39), functions and features of certain nutrients in the body (question #45), and needs for special populations (question #50). Questions that showed the least improvement were those related to food fallacies (questions #29,34,47) and certain principles of energy balance and weight control (questions #4,24,31,48).

**TABLE 5. EFFECTIVENESS OF TEACHING FOR EACH QUESTION BY TREATMENT GROUP:
IMPROVEMENTS GREATER THAN 50%**

Number	Question	Experimental (N=31)	p value	Control (N=16)	p value
45	Taking B vitamins will give you extra energy	77.42%	0.000	0.00%	1.000
7	Which of the following foods contains cholesterol?	67.74%	0.000	12.50%	0.500
39	The Food Guide Pyramid has 4 groupings of food	61.29%	0.000	0.00%	0.125
50	Vegetarians may need to supplement with zinc because it is only found in animal products	61.29%	0.001	6.25%	1.000
13	Which of the following foods is highest in folate?	54.84%	0.003	18.75%	1.000
19	What is the greatest single source of sodium in the diet?	54.84%	0.001	18.75%	0.625
2	Approximately what level of fat in the diet is considered to promote optimal health for most people?	51.61%	0.001	31.25%	0.453
41	There are 2,000 calories in one pound of fat	51.61%	0.000	31.25%	0.219

p<0.05 is considered statistically significant

**TABLE 6. EFFECTIVENESS OF TEACHING FOR EACH QUESTION BY TREATMENT GROUP:
IMPROVEMENTS <50% AND >40%**

Number	Question	Experimental (N=31)	p value	Control (N=16)	p value
20	Which of the following is NOT a feature of the fat-soluble vitamins?	48.39%	0.000	18.75%	1.000
25	The major nutritional need that is increased in the diet of athletes compared with non-athletes is	48.39%	0.000	12.50%	1.000
28	Protein supplements are necessary in addition to diet, for muscle growth & development	48.39%	0.000	12.50%	1.000
36	Even if you eat a variety of healthy foods, you probably need vitamin supplements	48.39%	0.000	6.25%	1.000
44	It is important that an individual meet the Recommended Dietary Allowances for all nutrients every day	48.39%	0.000	18.75%	0.250
10	General characteristics of the water-soluble vitamins include all of the following except	45.16%	0.004	12.50%	1.000
46	One of the richest sources of vitamin B-6 is meat	45.16%	0.000	18.75%	1.000
14	What percentage of the day's total energy intake is recommended to be furnished by carbohydrates?	41.94%	0.002	50.0%	0.109
18	Which of the following is NOT a function of water in the body?	41.94%	0.000	12.50%	1.000
38	The serving size of a product is determined by the manufacturer	41.94%	0.096	18.75%	1.000

p<0.05 is considered statistically significant

**TABLE 7. EFFECTIVENESS OF TEACHING FOR EACH QUESTION BY TREATMENT GROUP:
IMPROVEMENTS <39% AND >30%**

Number	Question	Experimental (N=31)	p value	Control (N=16)	p value
1	Which of the following nutrients does NOT yield energy when metabolized by the body?	38.71%	0.003	18.75%	0.625
12	Olive oil contains abundant amounts of which type of fatty acid?	38.71%	0.003	12.50%	1.000
17	What should be the maximum daily intake of cholesterol?	38.71%	0.000	18.75%	1.000
22	Which of the following is NOT a feature of high-fiber foods?	38.71%	0.013	0.00%	0.250
21	Besides dairy products, which of the following is a good source of dietary calcium?	35.48%	0.022	18.75%	1.000
23	Which of the following is NOT recommended in the Dietary Guidelines for Americans	35.48%	0.006	12.50%	1.000
37	Chicken without the skin contains about the same amount of cholesterol as lean pork or beef	35.48%	0.006	25.0%	0.688
6	Which of the following does NOT describe a function of fat?	32.26%	0.092	18.75%	0.727
16	Which of the following is considered a major source of polyunsaturated fat?	32.26%	0.012	18.75%	0.727
30	Margarine contains fewer calories than butter	32.26%	0.039	18.75%	1.000
33	Saturated fats are found mostly in meat and dairy products	32.26%	0.092	12.50%	1.000

p<0.05 is considered statistically significant

**TABLE 8. EFFECTIVENESS OF TEACHING FOR EACH QUESTION BY TREATMENT GROUP:
IMPROVEMENTS <30% AND >20%**

Number	Question	Experimental (N=31)	p value	Control (N=16)	p value
5	What is the recommended daily intake of dietary fiber?	29.03%	0.004	18.75%	0.250
42	Sugar, not fat, is the main cause of obesity	29.03%	0.146	18.75%	0.625
8	What component accounts for the usually sweet taste of fruit?	25.81%	0.109	12.50%	1.000
9	Gram for gram, which provides the most energy?	25.81%	0.109	18.75%	1.000
43	When an individual stops exercising, all muscle gains will turn to fat	25.81%	0.039	12.50%	1.000
26	Cheese is a good source of potassium	22.58%	0.344	6.25%	1.000
32	Fruit juice contains the same amount of fiber as whole fruit	22.58%	0.016	12.50%	1.000
35	If sugar is the first ingredient listed on a box of cereal, it means that there is more sugar in the cereal than any other ingredient	22.58%	0.016	0.00%	0.500
40	Weight loss of 5 pounds/week is a reasonable weight loss goal	22.58%	0.344	31.25%	0.219
49	Apples are a good source of vitamin C	22.58%	0.180	12.50%	0.688

p<0.05 is considered statistically significant

**TABLE 9. EFFECTIVENESS OF TEACHING FOR EACH QUESTION BY TREATMENT GROUP:
IMPROVEMENTS <20%**

Number	Question	Experimental (N=31)	p value	Control (N=16)	p value
4	What is the minimum daily amount of dietary carbohydrate necessary to spare body protein from breakdown?	19.35%	0.508	12.50%	1.000
34	Cholesterol is the same thing as fat	16.13%	0.219	37.50%	0.754
48	It is okay to eat bread, rice, and potatoes while on a weight loss diet	16.13%	0.219	12.50%	0.453
3	In which of the following are carbohydrates almost always found?	12.90%	0.754	12.50%	1.000
15	Which of the following foods is a good source of vitamin A?	12.90%	1.000	0.00%	1.000
24	What is the major factor that determines basal metabolic rate?	12.90%	1.000	12.50%	1.000
27	A combination of corn and wheat provides a balanced mixture of the essential amino acids	12.90%	1.000	18.75%	1.000
29	Canned vegetables have approximately the same nutritive value as fresh, cooked ones	12.90%	0.688	6.25%	1.000
47	There is no protein in plant foods (vegetables, fruits, grains)	12.90%	1.000	12.50%	1.000
31	Most of the weight in "quick weight loss" diets is water, not fat	6.45%	1.000	12.50%	1.000
11	Which of the following foods provides iron in the most absorbable form?	3.23%	0.003	0.00%	0.125

p<0.05 is considered statistically significant

DISCUSSION

This study revealed that the nutrition knowledge of future aerobic instructors can significantly be improved with formal nutrition education. Since there are no other studies in the literature conducted using future aerobic instructors, this study is best compared to studies involving practicing aerobic instructors and recreational or college athletes (2,6-7,9-10,12,14,23). In one study completed on practicing aerobic instructors, the mean nutrition knowledge test score was 26.5 ± 6.8 (59%) correct (each correct answer received one point, with a maximum score of 45 points), however 86% of the subjects had received some formal nutrition education in the past (9). A review of the literature on nutrition knowledge of athletes and active people revealed that the mean score on the nutrition knowledge tests ranged from 42.6 to 56.5. Some of the studies scored the tests by assigning one point for each correct answer and zero points for an incorrect answer or don't know, other studies scored the tests by assigning one point for each correct answer, subtracting one point for each incorrect answer, and assigning zero points for a response of don't know/not sure, and a few studies measured nutrition knowledge by a 5-point scale indicating degrees of certainty. In three of the studies mentioned in the review, most, if not all of the subjects had received some formal nutrition education in the past (7,12,13). In contrast, only 13% of the subjects in the present study had received some formal nutrition education in the past and only one person had received that education in the past two years. The difference in test scores between this study and other studies may also be explained by testing atmosphere. Unlike most other studies (2,8-10,14,15,17,25,26) subjects in the present study were supervised while completing the nutrition knowledge test and could not have obtained help with the answers.

The resulting increase in nutrition knowledge following nutrition education intervention is in agreement with the results of a study conducted by other investigators (33). The effects of nutrition education on the nutrition knowledge of female adolescents was studied by Green et al (33). After only three days of nutrition education, the experimental group significantly increased their nutrition knowledge when compared to the control group. One month following completion of

the program, significant differences in nutrition knowledge scores were still present between the groups. In the present study there was retention of knowledge as the post-test was administered one week following the final lecture.

Results of the pre-test in this study indicated that 51% of the subjects did not recognize the correct function of fat as compared to the study done by Shoaf et al (13), in which 64% of the subjects did not recognize the correct function of fat. A common finding among other similar studies revealed that subjects were least knowledgeable about popular food fallacies, i.e. good sources of vitamins and minerals, and the best energy sources for active people (12-14). Research conducted by Worme et al (14) found that the majority of the participants chose iron as the predominant nutrient in spinach, and greater than 20% of participants selected peanut butter as high in cholesterol. Similar results were found in the present study. Only 2.1% of the total population were able to correctly identify a food that provided iron in the most absorbable form (most chose spinach) and only 6.4% of the total population could correctly identify foods that contained cholesterol (most chose roasted peanuts) on the pre-test.

In general, both groups in the present study were least knowledgeable (less than 25% of subjects correctly answered the question) about recommendations for and features of fiber, food sources of iron, food sources and recommendations for dietary cholesterol, energy values of the three main nutrients, facts about vitamins, both water and fat-soluble, carbohydrate needs, sources of sodium, certain weight control issues, the different needs for individuals following a vegetarian diet, and public health guidelines. In addition, the control group subjects had limited knowledge about vitamin supplementation and certain nutrition misconceptions concerning margarine and butter. As expected, there was no change in nutrition knowledge of the control group in any area covered in the intervention with the exception of one question; "There are 2000 calories in one pound of fat (True/False or Not Sure)". This is most likely due to outside influences such as media attention to weight loss or the little bit of nutrition information covered during the instructor training lectures by other teachers.

Subjects in the experimental group, on the other hand, displayed a significantly greater knowledge post-intervention in the areas covered during the nutrition class. The most significant improvements were questions about water soluble vitamins, cholesterol, public health guidelines, the needs for individuals following a vegetarian diet, sodium, and weight control issues. The nutrition intervention was effective in improving knowledge in thirty-one out of fifty questions asked on the nutrition knowledge test. This was due to the fact that the investigator designed the lectures to emphasize areas covered on the nutrition knowledge test. The questions that showed the least improvement or those in which teaching was least effective (<30%) were questions that greater than sixty percent of the subjects answered correctly on the pre-test, therefore there was little room for further improvement. There were six questions (4,9,15, 24,27,49) which less than fifty percent of the subjects answered correctly, on the pre-test, and did not show significant improvement on the post-test. The areas for those questions may not have been covered as thoroughly as other areas and were reflected in subjects' responses.

The effects of the nutrition education on the nutrition knowledge of the subjects cannot be explained by differences between groups because treatment groups were homogenous. There was no statistically significant differences for pre-test scores of nutrition knowledge, age, education level, income, ethnicity, height, weight, or body mass index, therefore no obvious bias existed. Other issues to consider were that the subjects receiving the nutrition education chose to attend and pay for the program. This group was probably more motivated and ready to learn however many of the subjects in the control group have also completed the nutrition education program following completion of the study. A second issue to consider is the primary source of nutrition information used by the subjects. The test data indicate that sixteen percent of the subjects in the experimental group sought out dietitians/nutritionists to obtain nutrition information as compared to only six percent of the subjects in the control group. This may indicate that there was a high degree of interest in nutrition among the participants and a desire for more nutrition information. Soper et al. (9) identified similar findings with a population of practicing aerobic

instructors. Sixteen percent of the subjects in their study chose dietitians/nutritionists as their primary source of nutrition information.

Non-professional sources such as books, magazines, and television were cited as the most frequently (by 34% of participants) as their primary sources of nutrition information. Although other studies (2,3,5,7,10,13,15) have reported higher numbers and percentages of subjects choosing the same sources, multiple responses were allowed. In the present study, only one choice was allowed.

CONCLUSIONS AND RECOMMENDATIONS

While results of the present study cannot be extrapolated to all aerobic instructors, the findings indicate a need for a structured nutrition education program for those striving to become a certified aerobic instructor. The nutrition knowledge of fitness instructors appears to be inadequate. Since previous studies (2,3) have indicated that most fitness class participants turn to their fitness instructor for nutrition information it is important to insure that these people obtain accurate information and recognize dietitians as the experts in this subject. And since only 10% of approximately 100,000 aerobic instructors working in the United States have received formal nutrition education (4), it is an area where nutrition educators can make a big impact.

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APPENDICES

Appendix A

NUTRITION KNOWLEDGE QUESTIONNAIRE

PART I - Socio-Demographic Data.

Please fill in, circle, or check the appropriate answer.

1. Name: _____
2. Date: ____/____/____
3. Date of birth: ____/____/____
4. Gender: M F
5. Height (inches): _____
6. Current body weight (pounds): _____
7. Desired body weight (pounds): _____
8. Highest level of education completed:

_____ Grade 9	_____ some college	_____ BS
_____ Grade 10	_____ AAS	_____ MS
_____ Grade 11	_____ BA	_____ Doctorate
_____ Grade 12		
9. If you have earned a degree or are in the process of earning a degree, what field was/is it in?

_____ Nutrition	_____ Exercise Physiology
_____ Nursing	_____ Medical Doctor
_____ Physical Therapy	_____ Other
10. Please check any of the following licenses or certifications you currently hold. Mark all that apply

_____ RN	_____ MD	_____ AFAA	_____ None
_____ RD	_____ ACE	_____ ATC	_____ Other
_____ PT	_____ NSCA		
11. Total Household Gross Income Earned (per year):

_____ less than \$10,999	_____ \$60,000 - 69,999
_____ \$10,000 - 19,999	_____ \$70,000 - 79,999
_____ \$20,000 - 29,999	_____ \$80,000 - 89,999
_____ \$30,000 - 39,999	_____ \$90,000 - 99,999
_____ \$40,000 - 49,999	_____ \$100,000 or more
_____ \$50,000 - 59,999	
12. Are you a vegetarian? Yes No
If yes, please indicate which of the following foods ARE included in your diet

_____ Eggs	_____ Fish
_____ Dairy products	_____ Poultry
_____ Fruit	_____ Nuts/Beans

13. Ethnic background:

☐ White (non-Hispanic)

☐ Hispanic

☐ African American

☐ Native American

☐ Asian

☐ Other

14. Are you currently employed? Yes No

If yes, what is your current job? _____

15. Have you ever taken a college level nutrition course? Yes No

If yes, when did you take the course?

☐ 0-6 months ago

☐ 7-12 months ago

☐ 13-24 months ago

☐ greater than 2 years ago

16. Who is responsible for the cooking and shopping in your household?

Cooking: _____

Shopping: _____

17. Choose the top three (3) sources of nutrition information. Place a one (1) next to the item you use most frequently. Place a two (2) next to the item you consider secondary, and a three (3) next to the third most often used source of nutrition information for yourself. CHOOSE ONLY 3...PLEASE DO NOT RATE THE CHOICES.

☐ professional journals

☐ magazines

☐ books

☐ newspaper

☐ fitness professionals

☐ physicians

☐ dietitians/nutritionists

☐ health food store

☐ Feel free to write a source in the space provided that is not listed above:

☐ university course

☐ friends

☐ radio

☐ nutrition labels on foods

☐ television

☐ videos

☐ seminars/workshops

☐ formal weight loss diet

Appendix B

NUTRITION KNOWLEDGE QUESTIONNAIRE

PART II - Multiple Choice and Belief Statements.

Please circle the appropriate answer to each question. If you are unsure of an answer please circle the don't know or not sure selection. Thank you for your time!

Name: _____ Date: _____

1. Which of the following nutrients does NOT yield energy when metabolized by the body?
 - a) Fat
 - b) Protein
 - c) Vitamins
 - d) Carbohydrates
 - e) Don't know
2. Approximately what level of fat in the diet is considered to promote optimal health for most people?
 - a) 10-20% of energy intake
 - b) 30% of energy intake
 - c) 45% of energy intake
 - d) 50-60% of energy intake
 - e) Don't know
3. In which of the following are carbohydrates almost always found?
 - a) Plant foods
 - b) Health foods
 - c) Animal products
 - d) Protein-rich foods
 - e) Don't know
4. What is the minimum daily amount of dietary carbohydrate necessary to spare body protein from breakdown?
 - a) 10-25 grams
 - b) 50-100 grams
 - c) 150-175 grams
 - d) 200-400 grams
 - e) Don't know
5. What is the recommended daily intake of dietary fiber?
 - a) 20-35 grams
 - b) 40-50 grams
 - c) 55-70 grams
 - d) 75-100 grams
 - e) Don't know
6. Which of the following does NOT describe a function of fat?
 - a) Adds flavor to food
 - b) Carrier of fat-soluble vitamins
 - c) Best source of energy for the brain
 - d) Essential constituent of body tissues
 - e) Don't know
7. Which of the following foods contains cholesterol?
 - a) Corn
 - b) Olives

- c) Roasted turkey
 - d) Roasted peanuts
 - e) Don't know
8. What component accounts for the usually sweet taste of fruit?
- a) Fats
 - b) Fiber
 - c) Simple sugars
 - d) Complex carbohydrates
 - e) Don't know
9. Gram for gram, which provides the most energy?
- a) Fats
 - b) Alcohol
 - c) Proteins
 - d) Carbohydrates
 - e) Don't know
10. General characteristics of the water-soluble vitamins include all of the following EXCEPT
- a) they must be consumed daily
 - b) excesses are eliminated by the kidneys
 - c) they are absorbed directly into the blood
 - d) toxic levels in the body are rarely found
 - e) Don't know
11. Which of the following foods provides iron in the most absorbable form?
- a) Rice
 - b) Spinach
 - c) Hamburger
 - d) Corn
 - e) Don't know
12. Olive oil contains abundant amounts of which type of fatty acid?
- a) Saturated
 - b) Monounsaturated
 - c) Polyunsaturated
 - d) Partially hydrogenated
 - e) Don't know
13. Which of the following foods is highest in folate?
- a) Meats
 - b) Starches
 - c) Dairy products
 - d) Green leafy vegetables
 - e) Don't know
14. What percentage of the day's total energy intake is recommended to be furnished by carbohydrates?
- a) 10-15%
 - b) 30-35%
 - c) 55-60%
 - d) 90-95%
 - e) Don't know
15. Which of the following foods is a good source of vitamin A?
- a) Corn
 - b) Pumpkin pie
 - c) Baked potato
 - d) Whole-grain bread
 - e) Don't know

16. Which of the following is considered a major source of polyunsaturated fat?
- a) Corn oil
 - b) Palm oil
 - c) Peanut oil
 - d) Chicken fat
 - e) Don't know
17. What should be the maximum daily intake of cholesterol?
- a) 50 mg
 - b) 150 mg
 - c) 300 mg
 - d) 1,000 mg
 - e) Don't know
18. Which of the following is NOT a function of water in the body?
- a) Lubricant
 - b) Source of energy
 - c) Regulate body temperature
 - d) Participant in chemical reactions
 - e) Don't know
19. What is the greatest single source of sodium in the diet?
- a) Processed foods
 - b) Unprocessed foods
 - c) Natural salt content of foods
 - d) Salt added during cooking and at the table
 - e) Don't know
20. Which of the following is NOT a feature of the fat-soluble vitamins?
- a) Irregularly excreted from the body
 - b) Found in the fat and oily parts of foods
 - c) Needed daily
 - d) Pose a greater risk for developing toxicity than water-soluble vitamins
 - e) Don't know
21. Besides dairy products, which of the following is a good source of dietary calcium?
- a) Fruits
 - b) Breads
 - c) Enriched grains
 - d) Green vegetables
 - e) Don't know
22. Which of the following is NOT a feature of high-fiber foods?
- a) Effective in weight control
 - b) Provide feeling of fullness
 - c) usually lower in fat and simple sugars
 - d) Provide more energy per pound than processed foods
 - e) Don't know
23. Which of the following is NOT recommended in the Dietary Guidelines for Americans
- a) Eat a variety of foods
 - b) Maintain an ideal body weight
 - c) Drink 1-2 ounces of red wine each day
 - d) Limit consumption of salt and sodium
 - e) Don't know
24. What is the major factor that determines basal metabolic rate?
- a) age
 - b) gender
 - c) amount of fat tissue

- d) amount of lean body/muscle tissue
 - e) don't know
25. The major nutritional need that is increased in the diet of athletes compared with non-athletes is
- a) protein
 - b) energy/calories
 - c) B vitamins
 - d) iron
 - e) don't know

BELIEFS QUESTIONNAIRE
Circle the most appropriate answer

26. Cheese is a good source of potassium	True	False	Not Sure
27. A combination of corn and wheat provides a balanced mixture of the essential amino acids	True	False	Not Sure
28. Protein supplements are necessary in addition to diet, for muscle growth & development	True	False	Not Sure
29. Canned vegetables have approximately the same nutritive value as fresh, cooked ones	True	False	Not Sure
30. Margarine contains fewer calories than butter	True	False	Not Sure
31. Most of the weight in "quick weight loss" diets is water, not fat	True	False	Not Sure
32. Fruit juice contains the same amount of fiber as whole fruit	True	False	Not Sure
33. Saturated fats are found mostly in meat and dairy products	True	False	Not Sure
34. Cholesterol is the same thing as fat	True	False	Not Sure
35. If sugar is the first ingredient listed on a box of cereal, it means that there is more sugar in the cereal than any other ingredient	True	False	Not Sure
36. Even if you eat a variety of healthy foods, you probably need vitamin supplements	True	False	Not Sure
37. Chicken without the skin contains about the same amount of cholesterol as lean pork or beef	True	False	Not Sure
38. The serving size of a product is determined by the manufacturer	True	False	Not Sure
39. The Food Guide Pyramid has 4 groupings of food	True	False	Not Sure
40. Weight loss of 5 pounds/week is a reasonable weight loss goal	True	False	Not Sure
41. There are 2,000 calories in one pound of fat	True	False	Not Sure

42. Sugar, not fat, is the main cause of obesity	True	False	Not Sure
43. When an individual stops exercising, all muscle gains will turn to fat	True	False	Not Sure
44. It is important that an individual meet the Recommended Dietary Allowances for all nutrients every day	True	False	Not Sure
45. Taking B vitamins will give you extra energy	True	False	Not Sure
46. One of the richest sources of vitamin B-6 is meat	True	False	Not Sure
47. There is no protein in plant foods (vegetables, fruits, grains)	True	False	Not Sure
48. It is okay to eat bread, rice, and potatoes while on a weight loss diet	True	False	Not Sure
49. Apples are a good source of vitamin C	True	False	Not Sure
50. Vegetarians may need to supplement with zinc because it is only found in animal products	True	False	Not Sure

Appendix C

Lesson 1: The Seven Basic Nutrients

General Objective: To provide participants with sufficient knowledge of the nutrients, their functions, sources, and requirements.

Specific Objectives:

1. Describe the seven classes of nutrients.
2. Define which nutrients yield energy.
3. List and explain the functions of each nutrient class.
4. Describe the health effects of fiber.
5. List and explain the uses for each type of fiber.
6. Define recommended intakes for each nutrient class, including water.
7. Name three major classes of lipids and describe each.
8. Identify sources of simple and complex carbohydrates.
9. Identify sources of saturated, monounsaturated, and polyunsaturated fats.
10. Identify sources of dietary cholesterol.
11. Identify sources of high biological value protein.
12. Explain significant food sources of vitamins and minerals.
13. List the functions of water in the body.

Appendix D

Lesson 2: Recommended Intakes and Diet-Planning Guides

General Objective: To provide participants sufficient knowledge that will enable them to select nutritious diets for healthy Americans.

Specific Objectives:

1. Define and explain the purposes of the Recommended Dietary Allowances.
2. Describe the limitations of the Recommended Dietary Allowances.
3. List the seven Dietary Guidelines for Americans.
4. List the six exchange lists and identify foods within each list.
5. Describe the limitations of the exchange lists for diet planning.
6. Name the five food groups in the Food Guide Pyramid and the amount of each group recommended daily for adults.
7. Compare the guidelines and recommendations for endurance and strength athletes.
8. Describe the nutritional requirements for a pregnant woman.

Lesson 3: Deciphering Food and Nutrition Labels

General Objective: To provide participants with sufficient knowledge about food and nutrition labels to enable them to make informed decisions.

Specific Objectives:

1. List four items which must appear on food labels.
2. Express the amounts of energy available to the body from carbohydrate, protein, and fat in calories per gram.
3. Given the nutrient composition of a food in grams, calculate the caloric content of the food.
4. Define and explain the purpose of the Nutrition Labeling and Education Act of 1990.
5. Describe what has changed on the nutrition label since the implementation of the Nutrition Labeling and Education Act of 1990.
6. Explain how to read the ingredient list on a nutrition label.
7. List the nutrient content claims currently allowed on a food product.
8. Define and explain percent daily value.

Appendix F

Lesson 4: Energy Balance and Weight Control

1. Define energy, metabolic rate, hunger, appetite, satiety.
2. List and explain the factors which affect basal metabolic rate.
3. Given a height and weight of a person, calculate their body mass index.
4. List and explain three causes of obesity and two causes of underweight.
5. Identify and explain three hazards of obesity and three hazards of underweight.
6. Identify critical periods for the development of obesity and those individuals who are likely to become obese.
7. Outline factors other than diet which play a part in the successful treatment of obesity.
8. List and explain the dangers of fad reducing diets.
9. Define anorexia nervosa and bulimia nervosa.

Appendix G

The Seven Basic Nutrients

- Carbohydrate
- Fat
- Protein
- Vitamins
- Minerals
- Fiber
- Water

By: Abbe M. Breiter

Carbohydrates

Structure and Function

- ✓ Simple Carbohydrates

 - Monosaccharides

 - Disaccharides

- ✓ Complex Carbohydrates

 - Glycogen

 - Starch

Carbohydrates

Sources

- ✓ Starch/Bread Group
- ✓ Milk Group
- ✓ Fruit Group
- ✓ Vegetable Group

Recommendations

- ✓ 55-60% of total calories
- ✓ <10% from refined sugars
- ✓ Increase intake of vegetables, grains, legumes, & fruits

Fiber:

Functions, Sources & Recommendations

Functions of Fiber

- ✓ Lower cholesterol
- ✓ Softened stools
- ✓ Increase transit time

Types of Fiber

- ✓ Water Soluble
- ✓ Water Insoluble

Desirable Intake

- ✓ 25-30 grams/day

Fats:

Structure & Function

Three classes of fats

- ✓ Triglycerides
 - saturated
 - unsaturated
- ✓ Phospholipids
- ✓ Sterols

Four functions of fat

- ✓ Temperature regulation
- ✓ Energy reserve
- ✓ Shock absorption
- ✓ Store & carry fat soluble vitamins

Fats

Sources

- ✓ Milks
- ✓ Cheeses
- ✓ Meats
- ✓ Added Fats

Recommendations

- ✓ $<30\%$ of total calories
- ✓ $<10\%$ from saturated fat
- ✓ ≤ 300 mg cholesterol
- ✓ Increase intake of fruits & vegetables, substitute lower fat products

Proteins:

Structure & Function

Amino Acids

- ✓ Essential
- ✓ Non-essential

Quality of Protein

- ✓ High biological value
- ✓ Complementary protein

Four Functions of Proteins

- ✓ Structural
- ✓ Help regulate body process
- ✓ Acid-base regulation
- ✓ Fluid balance

Proteins

Sources

- ✓ High biological value

Eggs, Milk, Beef, Fish, Rice

- ✓ Low biological value

Corn, Legumes, Grains, Seeds, Nuts

Recommendations

- ✓ 15% of total calories
- ✓ 0.8 grams/kg body weight
- ✓ Factors Determining Need

Health of Individual

Stage of Growth (Age)

Total Energy Intake

Quality of Protein Consumed

Daily Losses

Any Metabolic Stresses

Vitamins:

Functions

- × Do not yield energy
- × Act singly
- × Assist enzymes with energy production
- × Help cells multiply
- × Amounts consumed are measure in micrograms or milligrams

Water Soluble Vitamins:

Structure & Function

- × Absorbed directly into blood
- × Travel freely in blood
- × Freely circulate into water-filled compartments of body
- × Excreted in urine
- × Needed in frequent small doses
- × Unlikely to reach toxic levels

Classification

Thiamine (B-1)

Riboflavin (B-2)

Niacin

Pyroxidine (B-6)

Folate

Cobalamin (B-12)

Ascorbic Acid (C)

Water Soluble Vitamins:

Sources

Thiamine (B-1)

- ✧ Animal products, whole grains, enriched breads/cereals, legumes

Riboflavin (B-2)

- ✧ Dairy products, green leafy veggies, enriched cereal, meat

Niacin

- ✧ Protein-rich foods, some whole grain products

Pyroxidine (B-6)

- ✧ Meat, fish, poultry, green leafy veggies

Folate

- ✧ Green leafy veggies/fruits, legumes, seeds

Cobalamin (B-12)

- ✧ Animal products

Ascorbic Acid (C)

- ✧ Citrus fruits, dark green leafy veggies, canteloupe, potatoes, strawberries, peppers

Fat Soluble Vitamins:

Structure & Function

- × Found in the fat & oily parts of foods
- × Insoluble in water
- × Stored in liver & adipose tissue
- × Average daily intake is needed
- × Risk of toxicity

Classification

Vitamin A

Vitamin D

Vitamin E

Vitamin K

Fat Soluble Vitamins:

Sources

Vitamin A (Retinol)

- ✕ Milk, cheese, cream, butter, eggs, liver

Vitamin A (Beta-carotene)

- ✕ Spinach, dark green leafy veggies, orange/yellow fruits & veggies

Vitamin D

- ✕ Fortified milk & margarine, egg yolk, liver, fatty fish, sunlight

Vitamin E

- ✕ Plant oils, green leafy veggies, wheat germ, liver, egg yolks, nuts

Vitamin K

- ✕ Bacterial synthesis in GI tract, liver, green leafy veggies, milk

Minerals:

Functions

- All major minerals strongly influence the body's fluid balances & blood pressure
- Individual minerals...
 - ✓ contribute to structure of bones
 - ✓ serve as cofactors to enzymes
 - ✓ assist in nerve impulse transmission

Classification

Sodium

Potassium

Calcium

Zinc

Magnesium

Iron

Minerals:

Sources

Sodium

- ✕ Processed foods, smoked meats & fish, canned soup, cheeses

Potassium

- ✕ Fresh fruits, veggies, legumes

Calcium

- ✕ Milk & milk products, small fish with bones, tofu, greens, legumes

Zinc

- ✕ Shellfish, meats, liver

Magnesium

- ✕ Legumes, seeds, nuts

Iron

- ✕ Red meats, fish, poultry, shellfish, eggs, legumes, dried fruit

Water:

Functions

- ▲ Carry nutrients & waste products throughout the body
- ▲ Fill the cells & the spaces between them
- ▲ Participate in chemical reactions
- ▲ Act as a lubricant & cushion for joints & vital organs
- ▲ Maintain body temperature
- ▲ 55-60% of adult body weight

Water:

Balance--intake vs. excretion

Intake

- ✓ Liquids consumed (water, milk, other beverages)
- ✓ Water with solid foods (fruit & veggie group)
- ✓ Water generated from metabolic process

Excretion

- ✓ Urine
- ✓ Stool
- ✓ Respiration losses through lungs
- ✓ Losses from skin evaporation & sweat

Water:

Requirements

Factors determining needs:

- ✓ Level of physical activity
- ✓ Air temperature & humidity
- ✓ Presence of metabolic stresses

Standard Recommendations

- ✓ 1 quart for each 1,000 calories
- ✓ 6-8 glasses liquid water/day

Appendix H

Recommended Intakes & Diet- Planning Guides

**Presented by:
Abbe M. Breiter**

OUTLINE

- Public Health Policy & Recommendation History
- Recommended Dietary Allowances
- Exchange Lists
- Dietary Guidelines
- Food Guide Pyramid
- Specific Groups/Populations
 - ✓ General Public
 - ✓ Athletes
 - ✓ Pregnancy

Recommended Dietary Allowances (RDA)

- Purpose/Definition
 - ✓ To provide standards to serve as a goal for good nutrition
 - ✓ The levels of intake of essential nutrients, that, on the basis of scientific knowledge, are judged by the Food & Nutrition Board to be adequate to meet the known nutrient needs of proactively all healthy persons.
- Uses of the RDA's
 - ✓ Planning and procuring food supplies for population subgroups
 - ✓ Interpreting food consumption records
 - ✓ Establishing standards for food assistance programs
 - ✓ Evaluating adequacy of food supplies in meeting national nutritional needs
 - ✓ Designing nutrition education programs
 - ✓ Developing new products in industry
- Limitations
 - ✓ The RDA are intended to be met through diets composed of a variety of foods
 - ✓ The RDA are not minimal requirements, nor are they necessarily optimal levels of intake for all individuals
 - ✓ The RDA are most appropriately used for populations

Dietary Guidelines for Americans

- Eat a variety of foods
- Balance the food you eat with physical activity -- maintain or improve your weight
- Choose a diet with plenty of grain products, vegetables, and fruits
- Choose a diet low in fat, saturated fat, and cholesterol
- Choose a diet moderate in sugars
- Choose a diet moderate in salt and sodium
- If you drink alcoholic beverages, do so in moderation

Diet Planning Guidelines

- Adequacy
 - ✓ provide all essential nutrients & energy necessary
- Balance
 - ✓ be careful not to eat foods rich in one area that do not provide others
- Calorie Control
 - ✓ management of energy intake
- Moderation
 - ✓ portion size
- Variety
 - ✓ use different foods for same nutrient value

Exchange Lists

- Concentrate on calorie control & moderation
- Originally developed for diabetic patients
- Pays special attention to:
 - ✓ calories
 - ✓ proportions of carbohydrate, fat, protein
 - ✓ portion sizes
- Based on 6 lists of food
 - ✓ each food has an associated number of calories, which is not exact, but an average for the group
 - ✓ each food can vary greatly in amounts of vitamins and minerals

Milk (90 calories)

Meat (55 calories)

Vegetables (25 calories)

Fruits (60 calories)

Starch/bread (80 calories)

Fat (45 calories)

Food Guide Pyramid

- Based on the concepts of variety, moderation, & balance
- Addressed overnutrition as well as undernutrition
- 5 major food groups
 - ✓ bread, cereal, rice & pasta
 - ✓ vegetable
 - ✓ fruit
 - ✓ milk, yogurt, & cheese
 - ✓ meat, poultry, fish, dry beans, eggs, & nuts
- Uses a range of servings for each group
- Gives general guidelines to define serving sizes
- Fats, oils, & sweets section on the top is a reminder that these items are to be used “sparingly”
- Triangle & circle symbols in food groups indicate those foods may contain fat or added sugars

Guidelines for Athletes

● Endurance Athletes

- ✓ Higher calorie needs
- ✓ Higher fluid needs
- ✓ Same ratio of carbohydrate, fat, & protein
- ✓ No increase in vitamins or minerals needed

● Strength Athletes

- ✓ May need more calories
- ✓ Same ratio of carbohydrate, fat, & protein
- ✓ No increase in vitamins or minerals needed

Guidelines for Pregnancy

- Increased calorie needs by 200-300 only in the 2nd & 3rd trimester
- Increased protein need by 10 grams/day
- Increased need for folate -- 400 mcg/day
- Increased need for iron -- 30 mg/day
- Increased need for calcium -- 1200 mg/day
- No changes necessary for vitamins A, D, E, K, B's, C, or any other minerals
- Avoid/Moderate intake of caffeine, alcohol, saccharin, aspartame

Appendix I

Deciphering Food & Nutrition Labels

By: Abbe M. Breiter, A.T., C

Nutrition Labeling and Education Act of 1990

PURPOSE

- ✓ to clear up confusion that has prevailed on supermarket shelves for years
- ✓ to help consumers choose more healthful diets
- ✓ to offer an incentive to food companies to improve nutritional qualities of their products

RESULTS

- ✓ nutrition information will be virtually universal (90% of products)
- ✓ information will be up-to-date with dietary needs of Americans in the 1990's
- ✓ labels will show how each food fits into an overall healthy diet, nutrient by nutrient
- ✓ credibility will be restored to marketing claims

EXEMPTIONS

- ✓ foods with minimal nutritional value
- ✓ some spices and flavorings
- ✓ bulk foods not resold
- ✓ ready-to-eat food prepared primarily on site
- ✓ restaurant food
- ✓ food produced by small businesses

Ingredient Labeling

BEFORE NLEA

- ✓ Standard of Identity: prescribed recipes for food products, which manufacturers had to follow, therefore, no list of ingredients was necessary
- ✓ No requirement to list flavorings, spices, or colorings to be identified by their common name; instead they were listed collectively

AFTER NLEA

- ✓ Requirement to list ingredients in standardized foods
- ✓ Color additives certified for food use by the FDA (Yellow #5, #6; Red #2, #3, #40; Blue #1; Green #3) must be declared except in butter, cheese, and ice cream
- ✓ Caseinate must be identified as a milk derivative in ingredient statement when used in foods claiming to be nondairy
- ✓ Protein hydrolysates added to foods for any reason must be identified by its specific source
- ✓ Voluntary inclusion of food source in names of sweeteners
- ✓ Juice containing beverages must declare the percent of total juice

Nutrition Panel: What has changed?

- Title - Nutrition Facts
- Serving sizes
 - ✓ more consistent across product lines
 - ✓ stated in both household and metric measures
 - ✓ reflect the amounts people actually eat
 - ✓ based on reference amounts (139 categories)
- Amount per serving
 - ✓ total calories
 - ✓ calories from fat
- List of nutrients
 - ✓ focuses on those most important to the health of today's consumers
 - ✓ added amount of saturated fat, cholesterol, dietary fiber, sugars
 - ✓ removed amount of potassium, thiamine, riboflavin, niacin
- Percent daily value
 - ✓ replaced % U.S. RDA
 - ✓ shows how a foods fits into the overall daily diet
- Daily reference values
 - ✓ based on 2,000 or 2,500 calories)
- Calories per gram

Nutrient Content Claims

- any term used to describe the nutrient content of a food will mean the same on every product on which it appears
- acceptable claims include:
 - ✓ free
 - ✓ low and very low
 - ✓ light
 - ✓ reduced or less
 - ✓ high
 - ✓ lean and extra lean
 - ✓ good source of
 - ✓ more or added
 - ✓ percent fat free
 - ✓ fresh
 - ✓ healthy

Health Claims

- Claims linking a nutrient or a food to the risk of a disease or health-related condition are allowed only under certain circumstances
- Exemptions:
 - ✓ infant formulas
 - ✓ foods intended for children under 2 years
 - ✓ medical foods
 - ✓ foods regulated as drugs
- To qualify foods must contain:
 - ✓ a nutrient whose consumption at a specified level as part of an appropriate diet will have a positive effect on the risk of disease **OR**
 - ✓ a nutrient of some concern below a specified level
 - ✓ at least 10% of the Daily Value of one or more of vitamin A, vitamin C, iron, calcium, protein, fiber, and must occur naturally in the food
 - ✓ 20% or less of the Daily Value of fat (13g), saturated fat (4g), cholesterol (60mg), and sodium (480mg)

Raw Fruits, Vegetables, Meats, and Fish

● Fruits, Vegetables, and Fish

- ✓ Voluntary point-of-purchase nutrition information program for the 20 most frequently eaten raw fruits, vegetables, & fish
- ✓ Must include the following:
 - name
 - serving size and calories per serving
 - amount of protein, total carbohydrates, total fat, and sodium per serving
 - percent of the USRDA for iron, calcium, vitamin A, and vitamin C per serving

● Meats

- ✓ Voluntary point-of-purchase nutrition information program for 45 of the best-selling cuts of raw meat and poultry
- ✓ Must include the following:
 - name of the meat or poultry cut
 - serving size and calories per serving
 - calories from total fat per serving
 - amount per serving of total fat, saturated fat, cholesterol, sodium, total carbohydrate, and dietary fiber
 - percentage of Daily Values per serving for vitamins A & C, iron, calcium
 - amount by weight of sugars and protein

Dietary Supplements

- Dietary Supplement Health and Education Act of 1994 (P.L. 103-417)
 - ✓ defines a dietary supplement as a product added to the total diet that contains at least one of the following: a vitamin, mineral, herb, botanical, amino acid, another dietary substance for use to supplement the diet, or a concentrate, metabolite, constituent, extract, or combination of ingredients
 - ✓ allows the ingredient in a supplement, regardless of its form or composition, to be excluded from regulation as a food additive or drug, both of which require premarket approval
 - ✓ allows manufacturers to make nutritional benefit claims that are not disease-related claims, if they do not profess to diagnose, prevent, mitigate, treat, or cure a specific disease
 - ✓ required to state the name and quantity of each ingredient or the total quality of ingredients in proprietary blends; the products must be identified as a supplement
 - ✓ supplement purveyors may not make wild health claims; any specific health claim is subject to approval by the FDA and must be backed by scientific evidence

Energy Balance & Weight Control

Presented by:
Abbe M. Breiter

Energy Balance

- Change in energy stores = energy in minus energy out
- 1 lb body fat = 3500 calories
- 1 g carbohydrate = 4 calories
- 1 g protein = 4 calories
- 1 g fat = 9 calories

Total Energy Needs

- Basal Metabolic Rate

Age

Height

Weight

Gender

Genetics

- Activity Level

5 - 200% BMR

- Stress

physical not psychological

- Thermic Effect

Body Weight & Body Composition

- Body Weight
 - ✓ Weight for height
 - ✓ Body mass index
- Body Composition
 - ✓ Skinfold measurement
 - ✓ Waist-to-hip ratio
- Obesity
 - ✓ Definition
 - ✓ Causes
 - ✓ Health Hazards
- Underweight
 - ✓ Definition
 - ✓ Health Hazards

Vocabulary

- Hunger

- ✓ the physiological need to eat; a negative, unpleasant sensation

- Appetite

- ✓ the desire to eat, which normally accompanies hunger; by itself a pleasant sensation

- Satiety

- ✓ the feeling of fullness of satisfaction at the end of a meal, which prompts a person to stop eating

- Cellulite

- ✓ supposedly a lumpy form of fat; actually a fraud

Weight Loss

- Diet

- ✓ No magic plan
- ✓ No foods are avoided or included
- ✓ Put nutritional adequacy first
- ✓ Emphasize nutrient dense foods
- ✓ Eat regularly

- Exercise

- ✓ Increase energy output
- ✓ Long term increase in BMR
- ✓ Appetite control

- Behavior Modification

- ✓ Change in behavior
- ✓ Change in attitude
- ✓ $A \longrightarrow B \longleftrightarrow C$

Alternative Unsafe Weight Loss Options

● Pills

- ✓ Water pills
- ✓ Caffeine pills
- ✓ Amphetamines
- ✓ Bulk producers or fillers
- ✓ Hormones

● Procedures

- ✓ Salons and spas
- ✓ Steam and sauna baths
- ✓ Machines that juggle the body
- ✓ Brushes, sponges, massages
- ✓ Surgery -- staple or liposuction

● Very-Low-Calories-Diets

- ✓ Between 400 - 800 calories
- ✓ Vitamin & mineral supplements
- ✓ Powdered formula

Dangers of Fad Reducing Diets

- Weight cycling
- Psychological problems
 - ✓ Anorexia Nervosa
 - ✓ Bulimia Nervosa
 - ✓ Decreased self-esteem
- Destruction of body protein/ lean body mass

Popular Weight Loss Programs

- Weight Watchers
- Nutri-system
- Jenny Craig
- The Atkins Diet
- Dean Ornish Program
- Diet Center
- Overeaters Anonymous
- Optifast/Medifast
- The Zone
- Grapefruit Diet
- Cabbage Soup Diet