EFFECTIVENESS OF AN INTEGRATED NUTRITION AND PHYSICAL FITNESS CURRICULUM ON KNOWLEDGE, ATTITUDES AND BEHAVIORS OF SELECTED COLLEGE STUDENTS

by

MARY KATE HALBERT VJEEMS, B.S. in H.E., M.S. in H.E.

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ABSTRACT

One hundred fifty nine students enrolled in nutrition and physical fitness classes were studied to assess the effectiveness of an integrated nutrition and physical fitness curriculum on the knowledge and attitudes toward nutrition and physical fitness and on the perceived and reported adequacy of nutrient intake and fitness levels. Data were collected using a pretest-posttest schedule for knowledge and attitudes toward nutrition and physical fitness scores. The second phase of the study used dietary data obtained from 24 hour diet records and measured fitness levels. Subjects in the physical fitness treatment group showed the greatest cognitive benefit from the integrated instructional unit. More moderate attitudes toward nutrition and physical fitness were reported by subjects in the treatment groups. The scores for attitudes toward physical fitness indicated stronger impact from the instructional unit than scores for attitudes toward nutrition. This implied that attitudes toward fitness may be more receptive to change than those toward nutrition.

The perceived adequacy of nutrient intake reflected popular opinions expressed by the meoia. Kilocalorie intake was perceived as high, while protein, vitamin and mineral intakes were perceived as adequate to low. Subjects in the nutrition classes perceived their nutrient intake as closer to adequate than did those in the physical

fitness classes. The reported adequacy of nutrient intake was significantly different between the subjects in the nutrition classes and those in the fitness classes in kilocalories, protein, vitamin C, and calcium. There were no significant differences in the nutrient intakes of subjects studied according to teaching strategy (control or treatment groups). Overall, the subjects reported diets reasonably adequate in all of the nutrients, except for iron. Further investigation is indicated to ascertain the factors most responsible for diet related behavior modification in the college age stuoent.

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LIST OF ABBREVIATIONS AND TERMS

Diet related behaviors: conduct related to food consumption as reported by the subject.

Exercise related behaviors: conduct related to physical activity as reported by the subject.

Fitness attitude: the value assigned to the beliefs and opinions expressed by the subjects in the area of physical fitness and the constructs applicable to them.

Fitness behaviors: conduct reported by the subject with regard to participation in exercise programs and aerobic activities.

Home Economics: refers to students enrolled in the nutrition classes.

HPE: health and physical education; refers to students enrolled in the fitness classes.

Integrated instruction unit: an educational unit concurrently presenting nutrition and physical fitness concepts in concert with individual involvement to accurately assess selected personal fitness parameters and nutrient intakes.

Kilocalorie: the amount of energy required to raise one gram of water one degree centigrade; the term used to refer to the energy available for carbohydrates, fats, proteins and alcohol.

Nutrition: series of processes by which an organism takes in and assimilates food for promoting growth, repairing and replacing worn or injured tissue and maintaining homeostasis.

Nutrition attitude: the value assigned to the beliefs and opinions expressed by the subject in the area of nutrition and the constructs applicable to them.

Nutrition knowledge: the level of nutrition information the subject attained as measured by the questionnaire.

Physical exercise or activity: bodily motion comprised of various types of movement, practice or training.

Physical fitness: optimum health and sufficient energy for the performance of daily tasks.

RDA: The recommended dietary allowances for nutrients as specified by the Food and Nutrition Board to provide standards for professionals to use in planning diets and projects for groups of people with normal health.

Wellness: overall health concepts encompassing nutrition and physical exercise.

CHAPTER I

OVERVIEW

Intense interest in health and wellness has promoted awareness of the interaction of nutrition and physical fitness practices as an essential facet of the total wellness concept. Numerous articles published in the popular press and professional journals reflect this relationship (Haskell, 1985; Leonard, 1984; Applegate, 1986). The dissemination of reliable nutrition and physical fitness information is an effective intervention strategy essential to the enhancement of health promotion (White & Selvey, 1982). An intertwining of these concepts was seen in recommendations for improvement of health as being particularly appropriate since nutrition and physical fitness are both sensitive to knowledge, attitude, perception and behavior responses.

The enhancement of knowledge by educational strategies is one way to deliver information aimed at effecting a change in the health related practices of individuals. Knowledge has been proclaimed as a discriminating factor essential for change in attitudes, perception or behaviors (Brov/n, 1965). However, an increase in knowledge is not necessarily reflected by an attitude or behavior change (Carruth, Mangel & Anderson, 1977). Pov;ers (1980) stated that theoretical knowledge is often forgotten unless it is used as a stimulant for changing behavior. Initiation of effective long lasting change is best stimulated on an

individual basis. Advocates of behaviorism suggest that the education process is incomplete unless a behavioral change has occurred (Brown, 1965). Historically, the desired outcome of an increase in nutrition knowledge has been to modify diet related behaviors in a positive direction, but Sims (1981) suggested the ultimate in nutrition education to be the adoption of a healthy lifestyle.

Hochbaum (1981) indicated that attitudinal and behavioral changes required effective implementation of intervention techniques at various levels to accommodate lifestyle alterations. Knowledge of nutrition and physical fitness is a vital component of the ability to make wise choices with respect to diet and exercise related behaviors.

Self perceptions relating to behavior patterns and physical status are influential in stimulating change in those patterns or status. Adequate incentive to excite behavioral changes may depend on personal perception of a need to alter the behavior. Therefore, if a person does not perceive a need to change, the essential incentive for a behavioral alteration is absent. Body size, body weight and physical fitness levels have been reported to be perceived in an unrealistic manner (Eden, Kamath, Kohrs & Olson 19C4; Slade / Russel 1973; Storz & Green, 1983).

Comparison of the nutrition knowledge of physical education majors to a group of college students near completion of a basic nutrition class, indicated that nutrition knowledge v-as stronger in students who took nutrition courses than in physical education majors (Cho & Fryer, 1974). Exposure to an instructional unit in nutrition v.'as foUov/ed by

an improvement in nutrition knowledge, attitudes and diet related behaviors of elementary aged students and a positive correlation between nutrition knowledge, attitudes toward nutrition and diet related behaviors according to Graves, Shannon, Sims, and Johnson (1982). A positive correlation between nutrition knowledge and attitude intensity was noted by Werblow, Fox and Henneman (1978). To facilitate effective learning, one should capitalize on positive and creative avenues utilizing nutrition information aimed at the cognitive and affective domains (Sims, 1981).

Two areas such as diet and exercise addressed simultaneously in the total health care picture could produce more obvious change of greater duration (White, 1986; Lindvall, 1980). According to Lindvall (1980), the coalition of nutrition and physical fitness information to produce an environment conducive to optimal fitness is a paramount need. White (1986) emphasized that diet and exercise have a synergistic relationship. An integrated approach to the instruction of nutrition, physical fitness, diet and exercise related behaviors would expedite the attainment of the goals set by the Surgeons General's Health Promotion and Disease Prevention Strategies (Wilmore, 1982). This educational method could effectively address the complex matrix controlling diet and exercise related behaviors which in turn would alter the overall health of the individual. The complex matrix of factors determining learned behaviors such as food consumption und exercise patterns afford implications for a study of the diet and exercise related behaviors of college

students. Instruction targeted to the integration of nutrition and physical fitness as well as diet and exercise related behaviors should effectively penetrate the matrix to solicit change in the diet and exercise practices (Lindvall, 1980). However, internalizing nutrition and physical fitness knowledge into appropriate diet and exercise related behaviors is essential for overall adjustment and adherence to the desired change.

The major purposes of this study were: (1) to assess the effectiveness of an integrated instructional unit on the knowledge of and attitudes toward nutrition and physical fitness of college students and (2) to determine if a significant difference existed between the perceived and the reported adequacy of nutrient intake by subjects in nutrition and physical fitness classes and those in the control and the treatment groups.

CHAPTER II

EFFECTIVENESS OF AN INTEGRATED INSTRUCTIONAL UNIT ON KNOWLEDGE OF AND ATTITUDES TOWARD NUTRITION AND PHYSICAL FITNESS OF COLLEGE STUDENTS

Introduction

The acquisition of nutrition knowledge and the flexibility of attitudes toward nutrition were reported as interrelated since an increase in knowledge was enhanced by more flexible attitudes (Boren, Dixon & Reed, 1983). Other researchers (Graves, Shannon, Sims & Johnson, 1982; Perron & Endres, 1985; Schwartz, 1975; O'Connell, Shannon & Sims, 1981) have reported students with greater nutrition knowledge to have more positive attitudes toward nutrition. A positive correlation betv;een nutrition knowledge and the intensity of attitudes toward nutrition was reported by Uerblow, Fox and Henneman (1978). Similar results, reported by Graves, et al. (1982), noted an improvement in nutrition knowledge and diet related behaviors of elementary school students following instruction in basic nutrition concepts. Knowledge was credited as a discriminating factor necessary for change in attitude, perception or behavior patterns. As a vital component for wise choice, appropriate knowledge must be available for the selection of appropriate diet ciid exercise practices for an optimum healthy

lifestyle. Internalizing nutrition and physical fitness knowledge is essential before appropriate diet and exercise related behaviors are adopted. The complexity of the interaction between cognitive facts and attitudes is influential in any improvement.

Sims (1981) stressed the importance of capitalizing on positive and creative avenues to disseminate nutrition information. A change in the instructional procedure to involve both cognitive and affective domains would enhance the ultimate aim of nutrition education to increase knowledge, alter attitudes and reflect an improvement in diet related behaviors leading to the adoption of a healthy lifestyle. Graef and Pettingell (1981) reported a cooperative study of nutrition in the public school as beneficial for the subjects' retention of cognitive knowledge.

Attitudes toward health have been described as a complexity of belief systems interacting with social, economic and environmental factors concurrent with knowledge. Hochbaum (1981) and Foley, Hertzler and Anderson (1979) cited attitudes regarding health beliefs and behaviors to impact these constructs. Brown (1965) suggested that an enrichment of knowledge via education could be expected to create cognitive inconsistencies which would accommodate attitude changes. Hochbaum (1981) reported that initial changes in diet and exercise related behaviors were accomplished with relative ease, but adherence to revised behavior was increasingly difficult. Two components of the total health concept presented concurrently should result in a more effective learning experience reflected by an improved retention of

facts and their application. Integrating instruction in nutrition and physical fitness was an appropriate teaching strategy.

The overall interest in nutrition and fitness expressed by college students and the general population in the United States indicated that merging nutrition and physical fitness instruction was a logical avenue to challenge both the cognitive and the affective learning domains. Integration of the health related aspects of nutrition and physical fitness enhance the cognitive gain relevant to each component and should create inconsistencies conducive to fostering attitude changes. The purpose of this study was to assess the effectiveness of an integrated instructional unit of nutrition and physical fitness concepts on the nutrition and physical fitness knowledge scores and the attitudes towards nutrition and physical fitness scores of college students enrolled in nutrition or physical fitness classes.

Methods and Materials

This investigation was conducted during the 1985-86 academic year at Stephen F. Austin State University, Nacogdoches, Texas. The sample was composed of 159 undergraduate student enrolled either in nutrition or physical fitness classes. The subjects (131 female and 22 male) had a mean age of 21 years (Table 2.1) and were predominately (87%) Anglo with normal health and no therapeutic diet regimens. Since no significant difference existed between the pretest scores of students enrolled in the fall versus the spring nutrition classes, the students from the spring semester were included to enlarge the sample size (Appendix A). Subjects in one lecture section of each of the academic areas were

Table 2.1. Mean age, height and weight of subjects by group and sex for knowledge and attitude scores.

Variable	Nutrition		Physical Fitness	
	Control	Treatment	Control	Treatment
Gender	n	n	n	n
females	51	38	27	21
males	11	10	0	1
total	62	48	27	22
Age, years	21.5	23.4	18.0	19.0
Height, inches				
females	63.5	64.7	64.8	64.7
males	69.2	71.6	n.a.	72.0
Weight, pounds				
females	121.6	125.8	126.3	125.9
males	172.3	189.5	n.a.	165.0

designated as the control group. The treatment groups received the integrated instructional unit midway in the sem.ester. Participation in the study was voluntary; the study was approved by the University's Committee for the Protection of Human Subjects.

A pretest-posttest nonequivalent control group design was used to measure the effectiveness of the integrated instructional unit in nutrition and physical fitness. Knowledge and attitude scores of college students enrolled in nutrition and physical fitness classes were determined. According to Borg and Gall (1971) the quasi-experimental design is legitimate and is considered appropriate v/hen random assignment of subjects to treatment or control groups is impossible.

Data Collection Instrument

A four part, self-report data collection instrument was developed, tested and administered for the study (Appendix B). The entire questionnaire was reviewed by a panel of experts and pilottested by students enrolled in 1985 summer nutrition classes at Texas Tech University and Stephen F. Austin State University. The first part of the instrument was a closed response format tc identify the reported physical activity of each subject, perceived adequacy of fitness parameters, perceived adequacy of nutrient intake, exercise related behaviors and other health related characteristics. In the secona part of the instrument a six point Likert scale (Dixon, Bobo & Stevick, 1984) was used to assess unidimensional attitudes toward nutrition and physical fitness. The flexibility of attitudes was measured. This study used the Attitudes Toward Nutrition Scale previously reported by Boren, et al. (1983).

The Attitudes Toward Physical Fitness scale used the same statement format and the items were similar to those reported by Corbin, Dowell, Lindsey and Tolson (1983). Twenty five statements addressed attitudes toward nutrition, 26 pertained to attitudes toward physical fitness and 3 items were related to general health. Examples of the items are shown in Table 2.2. Negatively worded items, included to reduce response set, were reversed for scoring. Therefore, a higher total score indicated a more flexible (positive) attitude toward nutrition and physical fitness. Cumulative scoring was done to produce three scores for each subject. These included scores for the combined attitudes toward nutrition and physical fitness, attitudes toward nutrition and attitudes toward physical fitness.

The third part of the questionnaire was designed to assess knowledge in the content areas of nutrition and physical fitness. The nutrition related items were adapted from a test previously developed, tested and administered by Harden and Dixon (1983). Discriminating questions appropriate to test specifications for this study were included. The physical fitness related items were developed by following the methodology presented by Tinkelman (1971). The items were constructed using guidelines for multiple choice items with 4 responses (Chamberlain & Kelly, 1981). Content validity was addressed by following a table of specifications and writing items to measure identified objectives. University faculty reviewed the items for apparent content-related validity. The test was pilottested and then submitted for review to a panel of experts. Thirty-five of the 55 items pertained to

Table 2.2. Sample items for attitudes toward nutrition and physical fitness.

*I usually will not taste a food if its appearance is similar to something I dislike.
I think that food habits should be flexible enough to vary with a new situation.
Unfamiliar foods often interest me.
*lf I am satisfied with foods I eat, I see no reason for me to change.
I could learn to eat fruit for dessert rather than a pastry.
*In actual practice, my physical fitness knowledge has little influence on how much I exercise.
I would be willing to exercise regularly if it would be beneficial to my health.
I think physical exercise is a good way to release tension.
*I would rather watch a sport event than to play one.
^Getting 'hot and sweaty' is for the athlete, MOT for me.

Scoring for attitude statements:

6 = I agree very much	3 = 1 disagree a little
5 = I agree on the whole	2 = I disagree on the whole
4 = I agree a little	1 = I disagree very much

•Indicates the items were reversed for scoring.

**The attitude segment consisted of 51 questions. A maximum score = 306 and the minimum score = 51 for the attitudes toward nutrition and physical fitness; if the sections were treated independently, the range for the attitudes toward nutrition score was = 130 - 25 and for the attitudes toward physical fitness = 136 - 26.

nutrition concepts and 20 items to physical fitness concepts. Examples of items are included in Table 2.3. The knowledge score was determined by assigning one point for the correct answer and zero points for an incorrect answer or no answer. Scoring involved summation of the total points and calculation of a percentage score for each subject. Three scores were derived for each subject reflecting a combination of nutrition and physical fitness knowledge, nutrition knowledge and physical fitness knowledge. The fourth part of the questionnaire collected demographic and descriptive data using a multiple choice, closed response fonnat to allow for Scantron summation of data.

Integrated Instructional Unit

The integrated instructional unit for nutrition and physical fitness was designed to enhance the learning experiences of the students enrolled in nutrition and/or physical fitness classes. Objectives, strategies, visuals and other learning experiences were defined. The unit was reviev/ed by a panel of nutrition education experts (Appendix C). The unit was presented mid semester by the same instructor during 3-4 class periods of 50-110 minutes duration. The instructional methods consisted of mini-lectures and discussions using multiple visuals and class activities. Student participation included determination of individual energy needs, body composition, cardiovascular fitness, movement for effective stretching and detection of muscle fatigue. Enrichment activities included the use of blood pressure cuffs, skinfold calipers and 'sit-n-reach' apparatus which were available for students

Table 2.3. Sample items from the knowledge test with a discriminating index value of +.50 or more.

Basal metabolism rate represents:

A. the number of calories required for active voluntary function of muscles
B. about 1/3 of the total daily calorie needs for a moderately active individual
C. the number of calories needed for the involuntary functions of the body
D. energy needed to digest meals

Overconsumption of the water soluble vitamins will usually result in the following condition:

A. accumulation aiding in the prevention of colds and infections
B. no observable condition as they are stored in the adipose tissue
C. a nonobservable condition because they are excreted
D. toxic accumulation in the liver

Fluid and electrolyte imbalance in the body may occur because of:

A. vomiting and diarrhea
B. excessive water consumption
C. excessive beverage consumption
D. constipation due to lack of peristalsis

Eating a wide variety of foods:

A. is not necessary if you take vitamin and mineral supplements
B*. may be harmful due to additives and preservatives
C. will help one meet the nutritional requirements
D'. is more expensive than a low carbohydrate diet

Vitamin A is supplied by which two food groups?

A. Dairy: Fruit and Vegetable
B. Dairy: Meat
C. Bread and Cereal: Fruit and Vegetable
D. Meat: Bread and Cereal

Physical exercise on a 'weekend basis' is:

A. recommended for the busy executive
B. sufficient to maintain an adequate level of fitness
c! insufficient to maintain an adequate level of fitness
D! a good way to stay physically fit

The estimated maximum heart rate of a fifty year old man is:

A. 150
B. 170
C. 200
D. 220

Table 2.3. Continued

Coronary heart disease, high blood pressure, obesity, constipation, and low back pain are examples of diseases characterized as hypokinetic. This suggests they are common to people who are:

A. very physically active
B. moderately physically active
C. somewhat physically active
D. physically inactive

Physical activity patterns should be based on:

A. current fads
B. individual needs and interests
C. current knowledge of effective patterns
D. personal desires

The maximum point score on the test for knowledge was 55 and the minimum = 0; when each subject matter was considered separately, the maximum point value for the nutrition knowledge was 35 and the maximum for the physical fitness was 20; percentages were based on 100% as maximum.

outside the scheduled class time. Objectives for the integrated instructional unit are shown in Table 2.4.

Statistical Analysis

For the purpose of this study, the following assumptions were made:

(1) randomization allowing for the use of parametric statistics,

(2) limited or minimal variability among the samples,

(3) random distribution of the constructs in the population.

Analysis of variance holding the pretest scores constant was performed using the knowledge of nutrition and physical fitness scores and the attitudes toward nutrition and physical fitness scores for subjects in the groups. Duncan's New Multiple Range Test was used to identify significant differences between the means. Pearson's product moment correlation was performed to determine relationships between knowledge scores and attitude scores. The level of significance was set at alpha = $<.05$.

Results and Discussion

Reliability

The values for internal consistency of the knowledge test as measured by the Spearman-Brown formula for split halves were acceptable for use in this study as were the Alpha values of reliability (Table 2.5). The partitioning of the test into segments resulted in a decrease in the split-half value and the alpha value as would be expected since a decrease in the number of questions in effect limited the sample size.

Table 2.4. Objectives included in the integrated instructional unit.

I. Evaluate food as the source of nutrients needed for physical fitness and good health.
   A. Identify the relationships among nutrition, physical fitness and good health.
   B. List the nutrients essential for the physically active individual.
   C. Identify food supplying specific nutrients.
   D. Plan a well balanced diet for one day for a physically active individual.

II. Assess the impact of nutrition and physical fitness on health related fitness parameters.
   A. Cite industrial life styles contributing to hypokinetic disorders.
   B. Identify fitness parameters associated with good health.

III. Analyze the relationship between body composition and physical fitness.
   A. Describe methods of assessing body composition.
   B. Determine effective techniques to a^iter body composition.

IV. Evaluate the function of cardiovascular fitness in total physical fitness.
   A. Specify health benefits associated with improved cardiovascular fitness.
   B. Describe the essential components of exercise necessary tc alter cardiovascular fitness.
   C. Compare methods of evaluating cardiovascular fitness.

V. Evaluate the role of flexibility in physical fitness.
   A. List health benefits associated with improved muscle/joint flexibility.
   B. Describe methods used to evaluate flexibility of specific muscles/joints.

VI. Analyze the role of muscle strength and endurance in physical fitness.
   A. Enumerate the health benefits associated with improved muscular strength and endurance.
   B. Describe techniques for assessing muscular strength and endurance.

VII. Distinguish the nutritional considerations necessary for unique environmental conditions and events.
   A. Cite nutritional implications for success in marathon events.
   B. Describe health related considerations in hot and humid environments.
   C. Describe ergogenic aids used by physically active individuals.

Table 2.5. Reliability estimates of knowledge test.

Pilot Test Results:	Reliability Estimate n = 31	
	Alpha	Split-half
Knowledge		
Combined	.,91	.89
Nutrition	.,87	.83
Fitness	.,76	.66

Study Results:	Reliability Estimate n = 187	
	ATpha	Split-half
Knowledge		
Combined	..89	.,83
Nutrition	.,85	.83
Fitness	.,76	.,78
Attitudes		
Combined	.72	.58
Nutrition	.57	.56
Fitness	.66	.53

Values were determined by SPSSx computer program for alpha and for Spearman Brown Split Half formula.

Knowledge

Combined Knowledge Scores

A significant difference was found in the posttest scores for knowledge of nutrition and physical fitness ($F[3,153] = 24.04$, $p<.01$). The integrated instructional approach was most beneficial tc the cognitive enhancement of subjects in the fitness treatment group (Table 2.6). Lack of a significant different in the scores of subjects in the nutrition classes (control and treatment) indicated that current instructional strategies in nutrition were effective. Results indicating improved knowledge following educational instruction concur with those of Graves, et al. (1982) and Werblow, et al. (1978). A study of subjects' scores by instructional method (control and treatment) showed no significant difference.

Nutrition Knowledge Scores

A partitioning of the knowledge test into scores ^or the nutrition related portion resulted in a significant difference in the nutrition knowledge scores ($F[3,161] = 28.53$, $p <.01$, Table 2.7). Both the traditional and the integrated instructional approach were effective ways to present nutrition concepts to these subjects. The integrated instructional unit was most advantageous to the enhancement of the nutrition knowledge of subjects in the fitness treatment group.

Fitness Knowledge Scores

A significant difference ($F[3,153] = 14.18$, $p<.01$) \Yfas found in the physical fitness knowledge scores. Scores of the subjects in the fitness control group were significantly lower than those in all other

groups (Table 2.7). This indicated that the integrated instructional unit had a powerful influence on the fitness knowledge scores of these subjects.

Attitudes

Combined Attitude Scores

No significant differences in scores were found in the attitudes toward nutrition and physical fitness (Table 2.8). The integrated instructional unit apparently had a modifying effect on the reported attitudes toward nutrition and physical fitness of the subjects as measured by this instrument. A positive change in attitude scores following nutrition instruction was reported by Graves, et al. (1982). However, attitudes are difficult to chanç and the exposure to this unit was of limited duration.

Nutrition Attitude Scores

A partitioning of the scores for attitudes toward nutrition resulted in no significant difference in the scores on attitudes toward nutrition among the groups. The flexibility of attitudes toward nutrition was not stimulated to change by the intervention strategy during this period of time.

Physical Fitness Attitude Scores

A significant difference ($F[3,163] = 3.07$, p .05) was found in the attitudes toward physical fitness scores (Table 2.8). Attitudes toward physical fitness may be more receptive to change than those toward nutrition and more responsive to stimuli over a shorter period of time.

Table 2.6. Adjusted mean scores (N = number correct, % = percentage correct) for knowledge and attitudes toward nutrition and physical fitness by subjects in control group or treatment group.

Groups	Knowledge Scores						Attitude Scores Toward		
	Nutrition		Fitness		Combined		Nutrition	Fitness	Combined
	Nutrition Classes								
	N	%	N	%	N	%			
Control	23	67	12	62	36	66	66.1	72.8	138.9
Trmnt.	22	67	12	62	36	66	62.9	64.2	127.0
	Physical Fitness Classes								
	r;	%	N	%	N	%			
Control	12	35	8	40	20	38	70.2	77.4	147.6
Trm.nt.	18	51	12	60	30	54	67.6	69.1	136.7
	Combined Classes								
	N	01 /o	N	CI 10	N	%			
Control	19	54	11	54	30	54	67.8	74.6	142.5
Trmnt.	20	58	12	61	32	59	65.2	66.5	131.7

Table 2.7. Adjusted mean scores on knowledge for subjects in nutrition (N) classes and fitness (F) classes.

Group	Adjusted Mean Knowledge Score		
	Combined	Nutrition	Fitness
N Control	65.81b	67.16b	62.62bc
N Treatment	66.33b	67.14b	64.90c
F Control	37.75a	35.34a	40.40a
F Treatment	53.88c	51.43c	60.45b

Means not sharing common subscripts in each column are significantly different at the .05 level using the Duncan's New Multiple Range Test.

Table 2.8. Adjusted mean scores for attitudes of subjects in nutrition (N) classes and fitness (F) classes.

Group	Adjusted Mean Attitude Score		
	Combined	Nutrition	Fitness
N Control	137.71a	65.69a	72.02b
N Treatment	133.48a	65.36a	68.12c
F Control	147.63a	70.22a	77.41a
F Treatment	135.73a	67.65a	69.08bc

Means not sharing common subscripts in each column are significantly different at the .05 level using the Duncan's New Multiple Range Test.

These findings were supported when the data were merged and treated as two groups (control and treatment, regardless of academic area). Subjects in the treatment group recorded more moderate scores (less flexibility) in attitudes toward physical fitness. Therefore, a modifying impact from the integrated instructional unit was observed.

Relationship of Knowledge and Attitude Scores

No significant relationship was observed between the subjects' scores for knowledge of nutrition and physical fitness and the attitude toward nutrition and physical fitness (Table 2.9). This differs from reports of other researchers who have found a positive correlation between nutrition knowledge and attitudes (Perron & Endres, 1985; Schwartz, 1975; Werblow, et al., 1978; O'Connell, et al., 1981). The nutrition treatment group, had a significant positive correlation ($r = .31$, $p < .01$) between the attitudes toward physical fitness score and the physical fitness knowledge score. Results (Table 2.9) reflect a tendency toward an inverse relationship between knowledge scores and attitude scores for nutrition. The inverse relationship between the scores for knowledge and attitudes toward physical fitness by subjects in fitness control group implied that flexibility (more positive) in fitness attitudes was not accompanied by an increase in knowledge scores.

Summary and Conclusions

An instructional unit integrating nutrition and physical fitness curricula presented to students enrolled in either nutrition or physical

Table 2.9. Correlation of subjects' scores on knowledge of and attitudes toward nutrition and physical fitness by group, (nutrition control = NC, nutrition treatment = NT, fitness control = FC, fitness treatment = FT).

Variable	Group	Mean	Std. Dev.	£	Significance
Nutr. Know.	NC	23.5077	± 4.7008	-.1864	.069
Nutr. Attit	NC	65.6923	±11.3921		
Fit. Know.	NC	12.5538	± 2.8670	.0583	.335
Fit. Attit	NC	72.0154	±14.1327		
Nutr. Know.	NT	23.5000	± 5.4930	-.0659	.325
Nutr. Attit.	NT	65.3600	±12.5206		
Fit. Know.	NT	12.9800	± 3.4315	.3118	.014*
Fit. Attit.	NT	68.120	±13.2228		
Nutr. Know.	FC	12.3704	± 3.9628	-.1881	.176
Nutr. Attit.	FC	70.2222	i 9.3493		
Fit Know.	FC	7.9615	± 3.3998	-.1112	.296
Fit. Attit.	FC	77.4074	±12.6712		
Nutr. Know.	FT	17.7308	± 5.9904	-.1214	.279
Nutr. Attit	FT	67.6538	±12.6742		
Fit. Know.	FT	12.3077	± 3.3319	.1710	.204
Fit. Attit.	FT	69.0767	°13.9969		

•Indicates significance at .05 level

fitness classes resulted in a significant difference in the knowledge scores of subjects. The scores of subjects in the fitness control group were significantly lower than all other groups. The attitude scores of subjects receiving the integrated instructional unit approach were less flexible than those in the control groups.

The enhancement of knowledge relating to nutrition and physical fitness reflected a strong treatment effect for the students in the fitness class indicating that integration of nutrition and physical fitness concepts was of cognitive benefit. The lack of a significant difference in the attitude toward nutrition and physical fitness score of subjects implied that duration and intensity of the treatment were insufficient to alter attitudes. The significant difference in the attitude toward just the physical fitness score indicated a more responsive construct. Students enrolled in physical fitness classes benefited most from the integrated instructional unit approach. This affords a strong implication for combining nutrition and fitness concepts in the instructional approach, especially in the physical fitness classes.

CHAPTER III

PERCEIVED AND REPORTED DIET AND EXERCISE RELATED BEHAVIORS OF COLLEGE STUDENTS

Introduction

Self perception, one of the multifaceted components of an individual, has an impact on the alteration of a situation or behavior. Reports in the literature concerning self perception have been somewhat limited to those of body image and overall health and fitness levels of the adolescent and adult female (often those who have eating disorders) (Slade & Russell, 1973; Storz & Greene, 1983; Young, 1985; Searles, Terry & Amos, 1986; Melby, Femea & Sciacca, 1986). In a study of adolescent girls where satisfaction of body weight was examined, Storz and Greene (1983) reported that most subjects were dissatisfied with their personal physique and tended to underestimate the desirable weights. Adolescent girls who expressed a desire to lose weight perceived themselves as larger than their actual measurements indicated. Slade and Russell (1973) reported anorexic adult patients initially to overestimate personal girth (width), but to approach a more realistic estimation as the anorexic condition improved. Young (1985) reported a positive self perception related to the athletic performance level of adolescent females. Evidence of possible distortion in self perception of body size and fitness level was addressed by several researchers (Leon, 1980; Shows, 1984; Storz & Greene, 1983). Leon (1980) and Storz

and Greene (1983) noted that a disproportionate number of females perceived 'healthy' with reference to body size as meaning 'extremely thin." College age males perceived themselves as maintaining the same level of fitness attained in high school (Shows 1984). The tendency for a distorted perception was purported to continue into adulthood. Young adult women perceived themselves to have 'better' cardiovascular fitness and more muscular strength than objective testing revealed (Shows & Weems, 1984). These same women perceived their diet to supply a greater amount of fruits and vegetables and less dairy products, breads and cereals than was shown on the dietary records. These findings support the supposition that self perception often reflected what a person thought should be and not necessarily what was observable or measurable. Data about the perceived level of nutrient intake and fitness parameters of college students could be beneficial since behavioral change requires a realistic assessment of the current condition.

Diet and exercise related behaviors were reported as essential components for maintenance of good health. White and Selvey (1982) advocated adjustments in lifestyle and assigned priority to good nutrition and physical fitness through health promoting modifications of diet and exercise related behaviors. The cumulative effect between diet and exercise behaviors was emphasized as a component of a healthy lifestyle by White (1986).

Historically, nutrition education researchers have conducted surveys for information relating to nutrition knowledge and practices, but the behavioral adaptations have been difficult to assess.

Generally, diet related behaviors were more influenced by psychological, cultural and situational factors than by physiological factors (Hochbaum, 1981; Anderson & Hrboticky, 1986). Hochbaum (1981) suggested that diet related behaviors are deep culturally imbedded practices resistant to all except moderate modification. When people are ready to change behavior patterns, knowledge functions as a tool to expedite the change but in itself will not instigate a change. Knowledge serves to justify and rationalize a changed behavior. In the absence of the readiness to change, facts are often disregarded or altered to rationalize present behaviors. Therefore, a realistic (accurate) perception of the situation or condition must exist before there is readiness to change. Knowledge via education could be effective at this point to provide a more accurate self perception. Nutrition education, no matter how effective, has little impact on behavior change, but may prepare individuals to adopt more positive practices (Hochbaum, 1981; Schwartz, 1975; Perron & Endres, 1985). A change in behavior may be stimulated by an accurate perception and a sincere desire for improvement. Research reports (Perron & Endres, 1985) suggested that an expressed desire for weight control functioned as the main factor in determining diet related behavior.

The diet related behaviors of college students have traditionally received much attention but information concerning perceived nutrient intake has been limited. Studies reporting nutrient intake of college students have reflected a reasonably adequate (as compared to the RDA) intake of protein, thiamin, riboflavin, niacin, ascorbic acid and

calcium but a low intake of iron, especially for female students (Driskell, Keith & Tangney, 1979; Jakobovitz, Halstead, Kelley, Roe & Young, 1977; Ostrom & Labuza, 1977; Gottschalk, Macauley, Sawyer & Miles, 1977; Hernon, Skinner, Andrews & Penfield, 1986). However, the kilocalorie intake was reported by these investigators as being somewhat below the recommended level. Barr (1986) reported the nutritional practices of the female recreational athlete, but did not include the adequacy of nutrient intake of these subjects. However, it was noted that the participation in physical activity was positively associated with the nutrition knowledge of the subjects.

The purposes of this study were to investigate (1) the perceived and reported adequacy of nutrient intake of college students, grouped according to subject matter (nutrition or physical fitness) or according to method of teaching (control or treatment groups) and (2) the perceived and recorded fitness level of selected college students.

Methods and Materials

This study was conducted during the 1985 fall semester at Stephen F. Austin State University. Subjects were enrolled either in nutrition or physical fitness classes. Forty-two participants from the nutrition classes (22 in the control group and 20 in the treatment group) and forty-one participants from the physical fitness classes (22 in the control group and 19 in the treatment group) completed the study. The mean age, height and weight are listed in Table 3.1. A pretest-posttest format using nonequivalent groups was used for the study. Student

Table 3.1. Mean age, height and weight by group and sex of subjects completing the study.

Variable	Nutrition		Physical Fitness	
	Control	Treatment	Control	Treatment
Gender	n	n	n	n
Females	20	20	22	19
Males	2	0	0	0
Total	22	20	22	19
Age, Years	21.7	20.9	18.1	19
Height, inches				
Females	63.9	65.6	65.2	64.1
Males	69.0	n.a.	n.a.	n.a.
Weight, pounds				
Females	120.8	126.4	120.3	125.0
Males	140.0	n.a.	n.a.	n.a.

participation was voluntary. The protocol for the study was approved by the University's Corrmiittee for the Protection of Human Subjects.

Data Collection

Data concerning the perceived adequacy of nutrient intake, fitness parameters and reported exercise related behavior were collected by questionnaire with a closed response format using a pretest-posttest schedule (Appendix B). The perceived adequacy of nutrient intake and the perceived level of fitness parameters were assessed by subject identification of a number of an 'end point' defined continuum to indicate the appropriate level of adequacy (example questions are listed in Table 3.2). The reported exercise related behaviors were determined by summing the responses to appropriate cuescions (exaii^ple questions in Table 3.3) and the cumulative score was used for statistical analysis.

Diet related behavior data were collected using a 24 hour diet record at the beginning and again at the end of the semester. Acceptable levels of accuracy and dependability have been reported for individuals reporting diet and exercise related behaviors (Stunkard & Waxman, 1981; Baecke, van Staveren & Burema, 1983) even though recording diet related behavior (food consumption) is a tedious task. The 24 hour dietary record has been reported to be an acceptable method for recording and calculating individual food consumption by college students since they are a literate, extremely cooperative and stable population (Trulson & McCann, 1959; Sorenson, Calkins, Connolly *L* Diamond, 1985). Prior to the recording period, subjects were thoroughly instructed in

Table 3.2. Examples of questions concerning perceived levels of physical fitness and adequacy of nutrient intake.

The following scale was used to indicate the perceived levels of fitness.
Unacceptable = 1 - 2 - 3 - 4 - 5 - 6 = Excellent
1. My cardiovascular fitness level is...
2. My muscualr strength level is...
3. My muscular endurance level is...
4. My personal exercise habits are...
The following scale was used to indicate the perceived adequacy of nutrient intake.
Inadequate = 1 - 2 - 3 - 4 - 5 - 6 = Excessive
5. The level of fat in my body is...
6. My average daily calorie intake is...
7. My daily intake of vitamins is...
8. My daily intake of minerals is...
9. My daily intake of fat is...
10. My daily intake of protein is...

Table 3.3. Examples of questions pertaining to exercise related behaviors of subjects.

1. Run, jog, bicycle or walk briskly for at least thirty minutes.
2. Swim laps for at least thirty minutes.
3. Participate in aerobic dance or exercise for at least thirty minutes.
4. Bowl for leisure or sport for at least one hour.
The answers were coded to indicate how many times each week one participated in the activities.

the technique for recording kind, form and quantity of food consumed. Food models, as well as standard measuring pieces were used in the instructional session to familiarize the subjects with conventional serving sizes of food (Gersovitz, Madden & Smicklas-Wright, 1978; Stunkard & Waxman, 1981; Young, Hagan, Tucker & Foster, 1952). The foods recorded by the subjects were coded by the same registered dietitian for computer analysis. This method was used to eliminate error associated with multiple coders. Quantitative values and percent Recommended Dietary Allowances (RDA) for selected nutrients (protein, vitamin A, vitamin C, riboflavin, niacin, thiamin, iron and calcium) were obtained.

Subjects in the physical fitness classes were measured for the fitness parameters of body composition (percent body fat), cardiovascular fitness, flexibility, muscular endurance and muscular strength at the beginning and end of the semester by the investigator and a graduate assistant in the Health and Physical Education Department. Body composition was estimated using Lange calipers according to the protocol described by Corbin, et al. (1983) and DiNucci and Fleming (1985). Cardiovascular fitness was assessed using the protocol described by Barrow and McGee (1979) and DiNucci and Fleming (1985). The protocol for assessing flexibility of the lov/er back and hamstring was described by Corbin, et al. (1983). Muscular endurance and strength were evaluated using the protocol described by DiNucci and Fleming (1985).

Data collected from subjects in nutrition and physical fitness classes were used to determine the perceived and reported nutrient

intake, perceived fitness level and overall exercise patterns. The data collected about the subjects enrolled in the physical fitness classes were used to assess the reported physical fitness levels.

Statistical Analysis

Assumptions were made allowing the use of parametric statistics for data analysis using the SPSS-X program. Frequencies were determined for the perceived adequacy and the reported quantity of nutrient intake as well as selected fitness related parameters. An analysis of variance (ANOVA) holding the pretest values constant was computed for the reported adequacy of nutrient intake (percentage of the RDA) for all four subject groups and for the fitness parameters for those students enrolled in the physical fitness classes. Duncan's New Multiple Range Test was used to identify significant differences between the group means. Repeated measures analysis was employed for differences in the perceived and reported adequacy of nutrient intake by subjects in the nutrition and fitness classes. The repeated measures analysis employs a simultaneous test for all possible combinations for interaction of the perceived and actual values for the pretest-posttest scores for the subjects.

Student's t-tests were used to identify differences between the posttest reported nutrient intake (adequacy) for subjects grouped according to class enrollment (nutrition or physical fitness) or group assignment (control or treatment). The tests of significance were conducted at the .05 level of significance.

Results and Discussion

Diet Related Behaviors

Perceived

The perception of adequacy of kilocalorie and nutrient intake was based on a continuum of 1 = inadequate to 6 = excessive. Mean responses of the subjects showed their perception of kilocalorie and nutrient intake to be generally adequate (Table 3.4). No significant difference was observed in the perceived adequacy of nutrient intake among the subjects in the four groups. Kilocalorie consumption was perceived to be 3.8 (approaching excessive) by subjects in the fitness control group. This reflected a common public concern that excess kilocalories are consumed. Students in the other three groups were more conservative in their perception of kilocalorie intake. Protein intake was perceived as adequate by all groups. However, subjects in the fitness treatment group perceived their protein intake to be the least adequate (Table 3.4). The range of perceived adequacy for vitamin and mineral intake was 1.91 to 3.07 for vitamins and 1.82 to 3.09 for minerals which indicated a perception of less adequate intake than that for kilocalories and protein. The general public is exposed to information suggesting that diets of the American populace are low in vitamins and minerals and high in energy intake. The perceptions of this student population reflected this concept.

The perceived adequacy of intake for kilocalories, protein, fat and carbohydrate are shown in Table 3.5. The perceived assessment of energy nutrient intake was clustered in the middle of the scale.

Table 3.4. Perceived and reported mean percent of the RDA[1] for nutrients by subjects in nutrition control (NC), nutrition treatment (NT), fitness control (FC) and fitness treatment (FT) groups.

	Perceived Adequacy ±1 SD			
	1 = inadequate ——— 6 = excessive			
Nutrient	NC	NT	FC	FT
kcal	3.61±.99	3.50±.82	3.82± .79	3.63±1.01
protein	3.45±.87	3.27±.68	3.18±1.C0	2.84± .96
vitamins	3.07±1.0	3.05±.98	1.91± .87	2.47±1.20
minerals	3.09±.91	3.00±.90	1.82± .73	2.32±1.20

	rean % of RDA ±1 SD			
Nutrient	NC	ïlT	FC	FT
kcal	96±27	901:47	70±31*	91±46
protein	167±82	157=66	111=59	204=98
vitamin A	127±li:	:22±75	74±11G	99±i32
vitamin C	107±80	170±162	84=70	67±63*
Calcium	99±64	117=91	å5±29*	9e=ci
Iron	76±36	75±45	55±27	64±29

[1] percentage of the 1980 RDA's calculated for each individual by appropraite age, gender, and activity category.

* indicates significance at the .05 level. The value was significantly different from all other groups for this nutrient.

Table 3.5. Perceived adequacy[1] of energy nutrient intake and percent of total reported kilocalories supplied by the energy nutrients in the diets of college students by group, (nutrition control = NC, nutrition treatment = NT, fitness control = FC, fitness treatment = FT).

Nutrient	NC	NT	FC	FT
			MearIS ±1 SD	
Carbohydrate				
Perceived	3.8±0.7	3.6±0.8	3.2±0.7	3.6±0.9
Actual (%)	48±11	47±13	55±14	45±12
Protein				
Perceived	3.7±0.9	3.7±0.9	2.9±0.8	3.6±1.3
Actual (%)	25±5	17±6	14±5	21±7
Fat				
Perceived	3.7±0.8	3.6±0.9	3.3±0.8	3.8±2.2
Actual (%)	37±11	36±11	31±11	34±9

[1] perceived adequacy based on the following scale:
1 = inadequate.....6 = excessive

A significant difference was observed between the subjects in the nutrition classes and those in the physical fitness classes in the posttest perceived adequacy of vitamins and minerals (Table 3.6). The subjects in the fitness classes perceived their intake as less adequate than those in the nutrition classes. Impact of a semester of instruction in nutrition is reflected in this observation since the instructional time afforded more knowledge base for the perception. No significant difference was found in the perceived adequacy of kilocalorie or other nutrient intake when subjects were studied according to group (treatment or control) (Table 3.7).

Repeated measures analysis using the pre/post, perceived/reported values for nutrient adequacy by groups showed a significant difference between the subjects in the nutrition groups and those in the fitness groups on perceived/reported adequacy of kilcalories ($F[l,81] = 4.64$, $p < .05$). Perceived mineral intake and the reported intake of calcium ($F[l,81] = 8.20$, $p<.05$) and iron ($F[l,81] = 4.85$, $p<.C5$) were significantly different among the students.

In this study, perceptions of kilocalorie consumption and the adequacy of nutrient intake apparently were more influenced by subject's academic enrollment than by the method of instruction. Subjects were more conservative in their perceptions of vitamin and mineral intake than in their protein and kilocalorie intake which was reflected in the reported intake of these nutrients. The popular belief that diets are high in kilocalorie intake, low in protein intake and low in vitamin and mineral intake was reflected in these perceptions.

Table 3.6. Summary t-test for significant differences with subjects grouped according to academic class (nutrition or fitness).

Nutrient	Perceived Adequacy (sealie 1 = inadequate.....6 = excessive) Nutrition CIass	Fitness Class	t-value
	Mean ±1 SD		
kcal	3.76±1.08	3.6U0.95	.01
protein	3.52±0.83	3.22±0.88	1.13
vitamin	3.71±0.92	3.5U0.98	1.56*
minerals	3.19±0.89	2.46±1.14	.88*

Nutrient	Reported Adequacy (seal!e 1 = inadequate.....6 = excessive) Nutrition CIass	Fitness Class	t-value
	Mean *1.* RDA ±1 SD		
kcal	99-48	77±41	-1.27*
protein	178±123	143±75	-2.32*
vitamin A	136±114	81±106	- .57*
vitamin C	152±155	85±125	-2.05*
calcium	117±100	67±65	-2.36*
iron	87±81	55±24	-1.20*

* indicates significance at .05 level.

Table 3.7. Summary t-test for significant differences with subjects grouped according to method of instruction (control or treatment).

Nutrient	Perceived Adequacy (scale 1 = inadequate ... 6 = excessive) Controls	Treatment	t-value
	Means ±1 SD		
kcal	3.61±1.C0	3.6U0.85	.97
protein	3.27±0.95	3.49±0.76	1.62
vitamin	2.66±1.20	3.03±0.96	3.24*
minerals	2.68±0.98	2.G:'±C.98	4.36*

Nutrient	Reported Adequacy (scale 1 = inadequate ... P = excessive) Controls	Treatment	t-value
	Mean % RDA ±1 SD		
kcal	82±32	95±58	2.16*
protein	137±78	188±122	1.60
vitamin A	102±114	i:6±il3	2.23*
vitamin C	88±69	151±194	2.25*
calcium	72±56	116±109	2.57*
iron	63±32	80±83	**2.45***

*** indicates significance at .05 level.**

Reported

The reported mean percentages of RDA for energy and selected nutrient intake ranged from 45% RDA for calcium by subjects in the fitness control group to a high of 204% RDA for protein by subjects in the fitness treatment group (Table 3.8). Subjects in the fitness control group reported the lowest percentage of RDA for kilocalories and selected nutrient intake. The subjects in the fitness control group reported a kilocalorie intake of 70% RDA. Subjects in the fitness control group and both nutrition groups reported protein intake above 100% RDA and the subjects in the fitness treatment group reported an intake in excess of 200% RDA. This may have been an attempt by subjects to assure consumption of a 'good' diet since many people equate a good diet with large quantities of protein intake. However, it did reflect an unrealistic assessment of the adequacy of protein intake by subjects in the fitness treatment group.

A significant difference was found in the mean percentage of the RDA consumption of protein, vitamin C and niacin for subjects enrolled in the four classes (Table 3.9). The difference in protein and niacin interrelate since niacin equivalents reflect dietary tryptophan content. The vitamin C difference reflects a lack of fruits and vegetables, which were possibly eliminated due to the high intake of protein rich foods.

The percentage of reported kilocalories supplied by each of *the* energy nutrients reflects an intake pattern similar to the 'average American diet' (carbohydrate = 46%, fat = 37% and protein = 17'^). The high intake of kilocalories from carbohydrate reported by subjects in

Table 3.3. Kilocalorie and nutrient intake and mean percentages of RDA for subjects in nutrition control (NC), nutrition treatment (NT), fitness control (FC), and fitness treatment (FT) groups.

Nutrient	Mean intake ± SD				Mean ± 1 SD Percentage of RDA			
	NC	NT	FC	FT	NC	NT	FC	FT
Energy kilocalories	[illegible]46±641	[illegible]6±10[illegible]	[illegible]45[illegible]	[illegible] ± 1000	[illegible]6±[illegible]7	[illegible]±47	7[illegible]1	9[illegible]6
Protein (g)	76±3[illegible]	[illegible]	[illegible]±24	[illegible]7±35	[illegible]7±[illegible]	[illegible]57±66	[illegible]11±[illegible]	[illegible]4±[illegible]
Vitamin A IU	[illegible]27[illegible]	[illegible]6[illegible]3[illegible]	29[illegible]4[illegible]	[illegible]315[illegible]6[illegible]	[illegible]	[illegible]±73	[illegible]	[illegible]13[illegible]
Vitamin C (mg)	64±4[illegible]	[illegible]	[illegible]±42	4[illegible]±4[illegible]	[illegible]7±[illegible]	[illegible]70±[illegible]6[illegible]	[illegible]4±7[illegible]	67±[illegible]3
Thiamin (mg)	[illegible].[illegible]2±.6[illegible]	1.[illegible]	[illegible].9[illegible].47	[illegible].[illegible]6 .4[illegible]	[illegible]	[illegible]	[illegible]±44	[illegible]
Riboflavin [redacted]	1.[illegible]6±.7[illegible]	1.74±.95	1.1[illegible]	1.67 .[illegible]	[illegible]3	[illegible]6±6[illegible]	[illegible]1±44	[illegible]3[illegible]7[illegible]
Niacin (mg)	[illegible].9[illegible]	[illegible]±11.[illegible]	[illegible]4.[illegible]7. [illegible]	[illegible].4±7 [illegible]	[illegible]6[illegible]	[illegible]7[illegible]	[illegible]4±[illegible]	[illegible]1±[illegible]7
Calcium (mg)	8[illegible]2±[illegible]	[illegible]7±/33	4[illegible]±277	[illegible] ±[illegible]	[illegible]±6[illegible]	[illegible]7±[illegible]	[illegible]	[illegible]6±[illegible]
Iron (mg)	[illegible].[illegible]±4.[illegible]	[illegible].9±6.[illegible]	[illegible].[illegible]±3.[illegible]	[illegible].1±5.[illegible]	76±[illegible]6	7[illegible]±4[illegible]	[illegible]	64±[illegible]

[illegible] extreme [illegible] the vitamin A [illegible] of these [illegible] of [illegible] vitamin A rich [illegible] including spinach, [illegible] on the same day. [illegible] vitamin A range for [illegible] [illegible]51U [illegible]; [illegible] range in [illegible] 0[illegible]4[illegible]U.

Table 3.9. Adjusted mean percentage of the RDA for nutrients significantly different between subjects enrolled in nutrition control (NC), nutrition treatment (NT), fitness control (FC) and fitness treatment (FT) classes.

	Protein	Vitamin C	Niacin
NC	166.91b	106.59b	135.6Sb
NT	156.85b	169.75a	157.40c
FC	111.08a	84.21c	103.58a
FT	204.64c	66.86c	140.68b

Means not sharing commong subscripts in the same column are significantly different at the .05 level using Duncan's New Multiple Range Test.

the fitness control group was due to the large quantity of recorded beer consumption. Data in Table 3.10 indicate that the majority of the subjects had energy intakes in excess of 1200 kilocalories and a mean intake of about 1700 kilocalories. These data indicate that with increased kilocalorie consumption, the likelihood of consuming adequate amounts of other nutrients was enhanced. Hernon, Skinner, Andrews and Penfield, (1986) reported similar observations based on data collected concerning the diets of college students.

A significant difference was found for the mean reported percentage of RDA for kilocalories, vitamin A, vitamin C, calcium and iron between subjects enrolled in nutrition classes and physical fitness classes when analysis of variance was applied. The reported nutrient intake was higher for subjects v/ho had completed a semester of instruction in nutrition or had received the integrated instructional unit than for those in the fitness control group. The .lower values ^or the nutrients reported by subjects in the fitness classes concurred with their perceived adequacy. These data are in agreement with other research reports which have indicated more positive diet related beliavior in nutrition students than students with other majors (SchwartL, 1975).

A significant difference was found in the mean percentage of RDA for protein, vitamin C and calcium for subjects when studied by group (treatment or control). Subjects receiving the integratea instructional unit reported higher intake of kilocalories, protein and niacin than subjects in the fitness control group. Subjects in the nutrition groups

Table 3.10. Frequencies of the reported kilocalorie consumption by group: nutrition control (NC), nutrition treatment (NT), fitness control (FC) and fitness treatment (FT).

NC Group:	<1200kcal = 2;	>1200kcal = 20;	range = 1145-3382kcal
NT Group:	<1200kcal = 10;	>1200kcal = 16;	range = 733-4953kcal
FC Group:	<1200kcal = 10;	>1200kcal = 14;	range = 548-2634kcal
FT Group:	<1200kcal = 6;	>1200kcal = 16;	range = 604-4239kcal

were chronologically more mature which could impact on the perception of adequacy of nutrient intake.

Fitness Related Behaviors

Perceived

The mean responses for the fitness related behaviors and parameters ranged from 2.59 for muscular strength by subjects in the fitness control group to 3.95 for body composition by subjects in the fitness treatment group (Table 3.11). No significant difference was found in the perceived scores for fitness between the groups. Students' scores indicated a general awareness of the importance of aerobic activity and its relationship to overall fitness. Young (1985) reported that the actual performance of adolescent athletes was a^^ected by their perceived performance ability.

No significant difference v.-as found in the perceiveo levels of fitness by subjects. Subjects in the treatment group reported a mean perceived percentage of body fat of 3.95 (the range was based on the continuum valued with 1 = inadequate to 6 = excessive) which was higher than actual measurement indicated. Others (Storz *cx* Greer, 1983; Searles, et al., 1986; Young, 1985) have reported that adolescent females perceived their body size to be larger than it measured. Subjects in the fitness control groups perceived their percent body fat to be slightly less than the measurements indicated. These findings agree with those reported by Slade and Russell (1973) but contradict reports of other researchers (Storz & Green, 1983; Searles, et al., 1986; Young, 1985).

Table 3.11. Posttest perceived adequacy of fitness parameters for subjects in fitness control (FC) group and in fitness treatment (FT) group.

Parameter	Perceived (Scale Used Is: 1 = unacceptable to 6 = excellent)		Reported (Scale Used Is: 1 = unacceptable to 6 = excellent)	
	FC	FT	FC	FT
body comp. %body fat	3.55± .9	3.95±1.0	13.5±3.0	21.5±3.7
CV fitness	3.09±1.4	2.79±1.1	13.5±3.0	12.0±1.3
Flexibility	--	--	38.7±7.7	39.1±8 *
Strength	2.59±1.4	3.00±1.0	11.5±11	15.2±11*
Endurance	2.82±1.4	2.84±1.0	49.0± .9*	38.C±9

•indicates significance at the .05 level

Reported

A significant difference was found between the fitness control and treatment group in the measured levels of flexibility, muscular endurance and muscular strength (Table 3.11). These parameters were muscle or joint specific and reflect classroom or individual training for these particular groups. Subjects in the fitness control group had a higher value for muscle endurance but subjects in the fitness treatment had significantly higher levels of fitness in flexibility and muscle strength (Table 3.12). No significant difference was found in the body composition or cardivascular fitness between the two groups.

Summary and Conclusions

The subjects in this study seemed to more consistently perceive fitness levels than adequacy of nutrient intake. Perception of nutrient intakes is less tangible than exercise since one is more likely.to accurately identify exercise of thirty minutes duration four times a week than ingestion of sixty milligrams of vitamin C daily. Dietary intake based on servings from the food groups right be a more appropriate reporting media for perceived diet practices. Neither duration nor intensity of the integrated instructional unit seemed adequate to produce observable changes in the perception of nutrient adequacy by subjects in this study.

Subjects enrolled in the nutrition classes and those in the fitness class receiving the treatment reported more positive perceptions of the adequacy of nutrient intake.

Table 3.12. Mean values for fitness parameters for fitness students.

Parameter	Physical Fitness			
	Control		Treatment	
	Pretest	Posttest	Pretest	Posttest
Flexibility (in.)	38.9	38.0	36.3	39.0*
Strength (sec.) (flexed arm hang)	11.2	11.5	11.5	15.2*
Endurance (number sit-ups)	35.6	49.4*	33.9	38.0
Body Composition (% body fat)	22.1	22.8	22.5	21.5
Cardiovascular (minutes to run 1.5 miles)	15.0	13.5	14.5	12.0

•indicates significance at the .05 level.

The lack of a significant difference in diet or exercise related behaviors suggest that one semester of instruction offered insufficient time for a measurable change to occur. Subjects were 'accurate' in perceptions of mineral intake with reference to iron, but were less realistic in the perceptions of adequacy of protein intake. Subjects in the fitness treatment group perceived their intake of protein to be adequate but reported excessive protein intake of 204% RDA. The subjects in the fitness control group perceived the intake of kilocalories to be excessive, but reported adequacy at 70% RDA. Repeated measures analysis showed a significant difference between subjects in the nutrition and fitness classes in the intake of kilocalories and minerals.

Subjects in this study tended to underestimate the adequacy of protein, vitamin C and calcium in their daily diet. Perception of a lower intake than was reported reflected mass media's increased coverage concerning consumption of protein, vitamin C and calcium. Overestimation of the adequacy of kilocalorie intake reflected current popular concepts.

Additional studies of perceived nutrient intake and fitness levels are needed to identify factors necessary for the initiation and maintenance of positive diet and exercise related behaviors. The results of this study indicated that students enrolled in nutrition classes were likely to perceive kilocalorie, protein, vitamin and mineral intakes as 'adequate.' Students enrolled in fitness classes perceived vitamin and mineral intake to be 'less than adequate.' The reported perception of physical activity and exercise related activities were similar for all

groups. The integrated instructional unit was most beneficial with respect to reported behaviors for the subjects in the fitness treatment group.

CHAPTER IV

GENERAL SUMMARY

Increased interest in physical activity has the potential to influence dietary behavior in a positive manner (Barr, 1986). The instruction of nutrition and physical fitness using an integrated instructional unit format challenges both the cognitive and the affective learning domains to produce effective learning thus facilitating positive behavior modification. The control of the nutrition related behaviors is multi-dimensional (Eden et al., 1984). Past researchers have reported that knowledge has little or no effect on diet related behaviors and showed no significant relationship to food choices (Carruth, et al., 1977; Perron & Endres, 1985; Schwartz, 1975; Stasch, Johnson & Spangler, 1970). Behavior changes occur when the 'time is right' and are not exclusively induced by an increase in knowledge (Hochbaum, 1981). Situational and/or motivational factors impact diet related behaviors with greater magnitude than nutrition knowledge (Perron & Endres, 1985; Werblow, et al., 1978). Attitudes toward nutrition were not found to be good predictors of diet related behaviors (Perron ^ Endres, 1985). However, Barr (1986) reported that greater participation in physical activity was positively associated with increased nutrition knowledge. The increased interest in nutrition and physical fitness suggests that, incorporation of these two academic areas would positively impact the knowledge, attitudes, perceptions and reported behaviors relating to nutrition and physical fitness.

The purposes of this study were to assess the effectiveness of instruction using an integrated nutrition and physical fitness curriculum (integrated instructional unit) on the nutrition and physical fitness knowledge and attitudes, and to determine the perceived and reported nutrient adequacy and fitness levels of college students. The study acknowledged the inherent limitations associated with the use of a self-report instrument, a sample of convenience and the bias associated with subject participation in activities that were physically exhausting. Additional limitations were acknowledged because self perception may vary from day to day, time to time and situation to situation. Generalizations of the results from this study were limited to this college population and would not be appropriate to the greater population.

The integrated instructional unit was presented to subjects enrolled either in a nutrition or in a physical fitness class during the fall semester. Subjects completed a pretest and a posttest to assess knowledge of nutrition and physical fitness, attitudes toward nutrition and physical fitness, perceived adequacy of nutrient intake, reported adequacy of nutrient intake, and perceived and measured fitness parameters.

Subjects exposed to the integrated instructional unit on nutrition and physical fitness reflected a positive impact on the cognitive performance. The unit of instruction v/as most beneficial to subjects enrolled in the physical fitness class. Subjects in the nutrition classes were chronologically more mature and it is feasible that the increased age impacted the receptiveness to the integrated instructional

strategy. Carruth, et al. (1977) reported that subjects with higher chronological age were not as responsive to behavioral change as those of a lower age.

After completion of the semester of instruction in nutrition, subjects in both nutrition groups reflected an increase in nutrition knowledge. Scores of the subjects in the fitness treatment group were significantly different from the scores of subjects in the other groups on the knowledge of nutrition and physical fitness. In the traditionally taught nutrition classes, all aspects of health, including fitness, are presented. This contributed to an increase in physical fitness knowledge. Graves, et al. (1982) have reported that an increase in knowledge follows exposure to cognitive concepts.

Scores on attitudes toward nutrition were not significantly different for subjects receiving the integrated instructional unit. Other researchers, (Graves, et al., 1982) have reported an improvement in attitudes toward nutrition after an instructional period. A significant difference was found in the scores for attitudes toward physical fitness by the subjects in this study. Attitudes toward physical fitness may be more receptive to change than attitudes toward nutrition. The attitudes toward nutrition and physical fitness scores of students receiving the integrated instructional unit indicated less flexibility than those of the control groups.

The perceived adequacy of nutrient intake and fitness behaviors was not significantly different between subjects in the control and treatment groups. Adequacy of nutrient intake as determined by reported diet behaviors was significantly different between the subjects grouped by

academic area (nutrition and fitness) but not between subjects grouped according to method of instruction (control and treatment). Therefore, nutritional adequacy of the subjects was more dependent on academic area enrollment than the teaching technique used. A lack of significant change in diet behaviors following instruction has been found by others (Carruth, et al., 1977; Harden & Dixon, 1983).

Students who received adequate (90+ % RDA) of kilocalories were more likely to receive adequate amounts of other nutrients, except iron. Increasing the kilocalorie needs for students by encouraging additional exercise activity should be accompanied by an increase in consumption of nutrient dense food.

In conclusion, the results from this study indicated that the integrated nutrition and physical fitness curriculum was highly beneficial to the cognitive enhancement of subjects enrolled in the physical fitness class. Alteration of attitudes likely required a longer period of time and exposure than was feasible in this study. Neither perceptions nor behaviors were noticeably altered over the semester. The diets of subjects enrolled in nutrition classes were significantly different from those of subjects enrolled in the physical fitness classes in the reported adequacy of kilocalories, protein, niacin and vitamiii C.

The challenge to determine the factors most influential in stimulating effective change in diet related behaviors as well as exercise related behaviors could be met by further investigation into self perceptions and the mechanisms essential for stimulating permanent positive productive changes. Suggestions for possible future

investigation include an indepth study of subjects' perceptions of the adequacy of nutrient intake, food intake, fitness levels, exercise practices, body size and general health. The impact of ethnicity, age or gender in relation to perception and reported values for these parameters would be beneficial.

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APPENDIX A

ADDITIONAL DATA

Table A.l. Demographic information of subjects discussed in Chapter II.

	Nutrition Classes		Physical Fitness Classes	
	Control	Treatment	Control	Treatment
Variable Classification				
Freshman	0	0	21	12
Sophomore	23	18	3	6
Junior	30	18	2	3
Senior	9	12	1	2
Other	0	0	0	0
Total n	62	48	27	22
Majors				
Home Ec.	26	16	2	2
H.P.E.	10	10	3	1
Education	1	1	5	3
Medical i^	25	20	1	1
ether	0	1	16	15
Total n	62	48	27	22
Ethnicity				
Anglo	54	40	25	20
Black	4	5	1	2
Hispanic	2		1 1	0
Other	2	2	0	0
Total n	62	48	27	22

Includes pre-med, nursing, and biology majors

Table A.2. Results from t-test used for combining fall and spring Nutrition Control (C) and Nutrition Treatment (T) classes.

Variable	Mean	Std.Dev.	t-value	df	*2-tail probability
Knowledge Nutrition:					
C Fall	17.50	4.397	-1.30	63	.197
C Spring	18.85	3.697			
Fitness:					
C Fall	11.80	2.361	.71	59	.479
C Spring	11.35	2.591			
Combined:					
C Fall	29.87	5.186	-.52	59	.603
C Spring	30.54	4.819			
Attitudes Nutrition:					
C Fall	64.68	12.08	-I.IC	63	.276
C Spring	67.81	10.15			
Fitness:					
C Fall	69.50	14.83	-1.24	62	.219
C Spring	74.04	14.09			
Combined:					
C Fall	134.18	22.43	-1.39	63	.171
C Spring	141.85	21.35			
Knowledge Nutrition:					
T. Fall	19.96	4.66	- .08	48	.936
T. Spring	20.09	6.42			
Fitness:					
T. Fall	11.86	2.8	- .25	48	.807
T. Spring	12.09	3.85			

Table A.2. Continued

Variable	Mean	Std.Dev.	t-value	DF	*2-tail probability
Combined:					
T. Fall	31.82	7.06	- .15	48	.881
T. Spring	32.18	9.81			
Attitudes					
T. Fall	65.68	11.52	- .42	48	.678
T. Spring	67.14	13.09			
Fitness:					
T. Fall	70.64	12.21	-1.42	48	.161
T. Spring	75.27	10.30			
Combined:					
T. Fall	136.32	20.34	-1.09	48	.281
T. Spring	142.41	18.63			

*pooled variance estimates

Table A.3. Analysis of covariance summary table for posttest nutrition knowledge scores by group with the pretest score as covariant.

Source of Variation	Sum of Squares	df	Mean Square	F	Significance of F
Covariates	6836.190	1	6836.190	32.882	<.01
prenutkno	6836.190	1	6836.190	32.882	<.01
Main Effects	17792.268	3	5930.756	26.527	<.01
group	17792.268	3	5930.756	28.527	<.0i
Explained	24628.458	4	6157.115	29.616	<.01
Residual	33471.615	161	207.898		
Total	58100.074	165	352.122		

168 cases were processed.
2 cases (1.2%) were missing.

Duncan's New Multiple Range

	A	B	C	D	Range
	35.34	51.43	67.14	67.16	
A 35.34	—	16.09*	31.80*	31.82*	3.15
B 51.43	. . . .-		15.71*	15.73*	3.32
C 67.14	. . . . . .--			00.02	3.43
D 67.16	. . . . .			--	

* indicates significance at the .05 level.

A = Physical Fitness Control Group Mean Scores

B = Physical Fitness Treatment Group

C = Nutrition Treatment Group

D = Nutrition Control Group

Table A.4. Analysis of covariance summary table for posttest fitness knowledge scores by group with pretest fitness score as covariant.

Source of Variation	Sum of Squares	df	Mean Square	F	Significance of F
Covariates	4365.141	1	4365.141	18.568	<.01
prefitkno	4365.141	1	4365.141	18.568	<.01
Main Effects	10006.361	3	3335.454	14.188	<.C1
group	10006.361	o	3335.454	14.188	<.01
Explained	14371.503	4	3592.876	15.283	<.01
Residual	35967.896	153	235.084		
Total	50339.399	157	520.633		

168 cases were processed,
10 cases (6^:) were missing.

Duncan's New Multi pie Range

	A 40.40	B 60.45	C 62.62	D 64.90	Rat^.ge
A 40.40	--	20.05*	22.22*	24.50*	o J .436
B 60.45	.....	--	2.17	4.45*	3.617
C 62.62	.....	.....	--	2.28	3.739
D 64.90	.....	.....	.....	--	

* indicates significance at the .05 levei.

A = Physical Fitness Control Group

B = Physical Fitness Treatment Group

C = Nutrition Control Group

D = Nutrition Treatment Group

Table A.5. Analysis of covariance summary table for knowledge of nutrition and fitness scores by group with the pretest score as covariant.

Source of Variation	Sum of Squares	d7	Mian Square	F	Significance of F
Covariates	6128.978	1	6128.978	34.928	<.01
prekno	6128.978	1	6128.978	34.928	<.01
Main Effects	12657.050	3	4219.017	24.043	<.01
group	12657.050	3	4219.017	24.043	<'.01
Explained	18786.028	4	4696.507	26.764	<.01
Residual	26847.804	153	175.476		
Total	45633.832	157	290.661		

168 cases were processed.
10 cases (6.0%) were missing.

Duncan's New Multiple Range

	A	B	C	C	Cerae
	37.75	53.88	65.81	66.33	
A 37.75	--	16.13*	28.06*	28.58"^	2.969
B 53.88	. . .	.--	11.30*	12.45*	3.125
C 65.81	. . . . .	.--	0.52	3.321	
D 66.33	. . . . .	--			

*indicates significance at the .05 level.

A = Physical Fitness Control Group

B = Physical Fitness Treatment Group

C = Nutrition Control Group

D = Nutrition Treatment Grcup

Table A.6. Analysis of covariance summary table for posttest scores for attitudes toward nutrition by group with pretest score as covariant.

Source of Variation	Sum of Squares	df	Mean Square	F	Significance of F
Covariates	590.116	1	590.116	4.400	.037
pnutatt	590.116	1	590.116	4.400	.037
Main Effects	338.358	3	112.786	.841	.A73
group	338.358	8	112.786	.841	.473
Explained	928.475	4	232.119	1.731	.146
Residual	21860.900	163	134.116		
Total	22789.375	167	136.463		

168 cases were processed.
10 cases (6.0%) were missing.

Table A.7. Analysis of covariance summary table for posttest scores on attitudes toward physical fitness by group with the pretest score as covariant

Source of Variation	Sum of Squares	dT	MiiTi Square	F	Significance of F
Covariates	144.251	1	144.251	.777	.379
prefitatt	144.251	1	144.251	.777	.379
Main Effects	1707.321	3	569.107	3.067	.030
group	1707.321	3	569.107	3.067	.030
Explained	1851.572	4	462.893	2.495	.045
Residual	30245.375	163	185.554		
Total	32096.946	167	192.197		

168 cases were processed.
0 cases (.0%) were missing.

Duncan's New Multiple Range

	A	B	C	D	Range
	68.12	69.08	72.02	77.41	
A 68.12	—	0.96	3.90*	9.29*	2.96
B 69.08		—	2.94	8.33*	3.11
C 72.02			—	9.39*	3.22
D 66.33				--	

•indicates significance at the .05 level.

A = Nutrition Treatment Group

B = Physical Fitness Treatment Group

C = Nutrition Control Group

D = Nutrition Treatment Group

Table A.8. Analysis of covariance summary table for posttest scores of attitudes toward nutrition and physical fitness by group with the pretest score as covariant.

Source of Variation	Sum of Squares	df	Mean Square	F	Significance of F
Covariates	1206.047	1	1206.047	2.784	.097
preattitt	1206.047	1	1206.047	2.704	.097
Main Effects	3355.420	0	1118.473	2.581	.055
group	3355.420	3	1118.473	2.581	.055
Explained	4561.467	4	1140.367	2.632	.036
Residual	70624.604	163	433.280		
Total	75186.071	167	45C.216		

168 cases were processed.
0 cases (.0%) were missing.

Table A.9. Demographic information of subjects discussed in Chapter III.

V^y'T^ble	Nutrition Classes Control	Nutrition Classes Treatment	Physical Fitness Classes Control	Physical Fitness Classes Treatment
Classification				
Freshman	0	0	18	10
Sophomore	8	10	2	5
Junior	12	8	2	3
Senior	2	2	0	1
Total n	22	20	22	19
Majors				
Home Ec.	10	9	2	2
H.P.E.	4	4	3	1
Education	1	1	5	3
Medical #	7	6	1	1
Other	0	0	11	12
Total n	22	20	22	19
Ethnicity				
Anglo	20	18	21	19
Black	1	1	1	0
Hispanic	0	0	0	0
Other	1	1	0	0
Total n	22	20	22	19

Includes declared pre-med, nursing, and biology majors

Table A.10. Perceived kilocalories eaten in a day by group and pretest (p) and posttest (q) values.

Choice:	Nutrition				Physical Fitness			
	Control		Treatment		Control		Treatment	
	P	q	P	q	P	q	p	q
1000	4	4	2	0	0	0	2	1
1000-1500	16	14	9	6	6	12	12	7
1501-2000	8	10	7	12	7	10	2	9
2001-2500	2	7	7	7	4	3	0	5
2501-3000	3	3	1	1	1	0	0	2
3001-3500	1	0	4	1	2	0	0	0
3500	1	1	1	1	1	0	2	0
No Idea	11	3	2	3	10	4	14	8

Table A.11. Perceived assessment of energy nutrient intake by group with pretest (p) and posttest (q) values.

Choice:	Nutrition				Physical Fitness			
	Control		Treatment		Control		Treatment	
	P	q	P	q	P	q	P	q
CARBOHYDRATES								
Inadequate								
1	0	0	0	0	0	0	0	1
2	0	1	1	2	4	3	5	1
3	22	13	15	12	12	18	15	13
4	16	22	11	11	12	7	11	13
5	5	6	6	5	3	1	0	3
6	0	0	0	0	1	0	1	1
Excessive								
PROTEIN								
Inadequate								
1	0	0	0	0	0	1	3	0
2	6	2	2	1	9	6	4	2
3	23	17	19	12	13	15	16	12
4	14	16	8	12	6	7	7	13
5	2	6	3	4	3	0	2	0
6	0	1	1	1	1	0	1	1
Excessive								
FAT								
Inadequate								
1	0	0	0	0	1	0	1	0
2	4	3	5	4	5	2	5	4
3	17	14	13	9	13	12	17	12
4	20	18	14	12	11	12	6	13
5	5	5	1	5	2	1	3	2
6	0	0	0	0	0	0	1	1
Excessive								

Table A.12. Frequency of perceived adequacy of weight by group with pretest (p) and posttest (q) values.

Choice:	Nutrition				Physical Fitness			
	Control		Treatment		Contro^		Treatment	
	P	q	P	q	P	q	P	q
underweight	2	2	0	0	2	2	0	1
normal	28	23	19	19	12	12	14	12
overweight	16	17	13	11	18	15	16	17
no idea	0	0	1	0	1	0	3	1

Table A.13. Analysis of covariance summary table of the dietary intake of the four groups with the pretest values as covariant.

Nutrient Dependent Variable	Source	SS	df	MS	F	p
kilocalories	Co/pkcal	2956155	1	2956155	4.366	.040
	Main Eff/Grp	4472386	3	1490795	2.202	.094
	Explained	7428542	4	1857135	2.743	.034
	Residual	56202917	83	677143		
	Total	63631459	87	731396		
%RDA kcal	Co/p%kcal	728.517	1	728.517	.493	.485
	Main Eff/Grp	9171.032	3	3057.011	2.068	.111
	Explained	9899.032	4	2474.887	1.674	.164
	Residual	122698.531	83	1478.296		
	Total	132598.080	87	1524.116		
gms Protein	Co/pProt	8743.292	1	8743.292	7.718	.,007
	Main Eff/Grp	15141.180	3	5047.060	4.455	.,006*
	Explained	23884.472	4	5971.118	5.271	.,001
	Residual	94023.517	83	1132.813		
	Total	117901.989	87	1355.264		
%RDA Prot	Co/p%Prot	73619.684	1	73619.684	14.176	.,000
	Main Ef/Grp	105668.262	3	35222.754	6.783	.,000*
	Explained	179287.946	4	44821.987	8.631	.,000
	Residual	431028.497	83	5193.114		
	Total	610316.443	87	7015.132		
lU VitA	Co/pvitA	217367103	1	217267103	5.493	.021
	Main Eff/Grp	45834943	3	15278314	.386	.763
	Explained	263202047	4	65800511	1.663	.166
	Residual	3284627301	83	39573822		
	Total	3547829349	87	40779647		
%RDA vitA	Co/p%vitA	143208.317	1	143208.317	13.559	.000
	Main Ef/Grp	29024.004	3	9674.668	.916	.437
	Explained	172232.321	4	43058.080	4.077	.000
	Residual	876612.043	83	10561.591		
	Total	1048844.364	87	12055.682		
mg VitC	Co/pvitC	13124.519	1	13124.519	3.698	.058
	Main Ef/Grp	40656.809	3	13552.270	3.819	.013*
	Explained	53781.328	4	13445.332	3.789	.007
	Residual	294558.661	83	3548.900		
	Total	348339.989	87	4003.908		

Table A.13. Continued.

Nutrient Dependent Variable	Source	SS	df	MS	F	£
%RDA vitC	Co/p%vitC	37303.713	1	37303.713	3.856	.053
	Main Eff/Grp	1119513.418	3	39837.806	4.118	.009*
	Explained	156817.131	4	39204.283	4.053	.005
	Residual	802876.142	83	9673.207		
	Total	959693.273	87	11030.957		
mg Thiamin	Co/pT	1.183	1	1.183	3.114	.081
	Main Eff/Grp	2.931	3	.977	2.572	.060
	Explained	4.114	4	1.028	2.708	.036
	Residual	31.524	83	.380		
	Total	35.638	87	.410		
%RDA Thiamin	Co/p%T	8284.800	1	8284.880	2.641	.108
	Main Eff/Grp	23592.526	3	7984.175	2.546	.062
	Explained	32237.406	4	8059.352	2.570	.044
	Residual	260238.219	83	3136.485		
	Total	292565.625	87	3362.823		
mg Ribo	Co/pribo	3.396	1	3.396	5.516	.021
	Main Eff/Grp	4.122	8	1.374	2.232	.091
	Explained	7.518	4	1.879	3.053	.021
	Residual	51.093	83	.616		
	Total	58.611	87	.674		
%RDA ribo	Co/p%ribo	23062.350	1	23062.350	6.711	.011
	Main Eff/Grp	23970.678	3	7990.226	2.325	.081
	Explained	47033.027	4	11758.257	3.422	.012
	Residual	285235.291	83	3436.570		
	Total	332268.318	87	3819.176		
mg niacin	Co/pN	484.279	1	484.279	6.448	.015
	Main Eff/Grp	785.114	?	261.705	3.485	.019*
	Explained	1269.393	4	317.34S	4.225	.004
	Residual	6233.586	83	75.103		
	Total	7502.979	87	86.241		
% RDA niacin	Co/p%N	20039.278	1	20039.278	5.565	.021
	Main Eff/Grp	38233.330	3	12744.443	3.539	.018*
	Explained	58272.608	4	14568.152	4.045	.005
	Residual	298904.255	83	3601.256		
	Total	357176.864	87	4105.481		

Table A.13. Continued.

Nutrient Dependent Variable	Source	SS	df	MS	F	£
mg Calcium	Co/pCa	3879462.008	1	3879462.008	12.700	.001
	Main Eff/Grp	2317214.837	3	772404.946	2.528	.063
	Explained	6196676.845	4	1549169.221	5.071	.001
	Residual	25354940.610	83	305481.212		
	Total	31551617.455	87	362662.270		
%RDA Calcium	Co/p%Ca	73759.431	1	73759.431	16.982	.000
	Main Eff/Grp	34264.014	3	11421.338	2.630	.056
	Explained	108023.445	4	27005.861	6.218	.000
	Residual	360499.998	83	4343.373		
	Total	468523.443	87	5385.327		
mg Iron	Co/plron	81.096	1	81.096	3.295	.073
	Main Eff/Grp	115.615	3	38.538	1.566	.204
	Explained	196.711	4	49.178	1.998	.102
	Residual	2042.562	83	24.609		
	Total	2239.273	87	25.739		
%RDA Iron	Co/p%Iron	8621.129	1	8621.129	7.635	.007
	Main Eff/Grp	5851.6c5	3	1950.555	1.727	.168
	Explained	14472.795	4	3618.199	3.204	.017
	Residual	93720.478	83	1129.162		
	Total	108193.273	87	1243.601		

•indicates significant at the .05 level

Table A.14. Analysis of covariance summary table for the posttest percent of kilocalories supplied by the energy nutrients in the four groups with the pretest values as covariant.

Nutrient	Source	SS	df	MS	F	£
%kcal/Protein	Co/p%kcal	82.193	1	82.193	2.578	.112
	Main Eff/Grp	575.743	3	191.914	6.020	.001*
	Explained	657.936	4	164.485	5.159	.001
	Residual	2646.144	83	31.881		
	Total	3304.080	87	37.978		
%kcal/Carbo	Co/pkcal	642.738	1	642.738	4.192	.044
	Main Eff/Grp	1210.593	3	403.531	2.632	.055
	Explained	1853.331	4	463.333	3.022	.022
	Residual	12724.749	83	153.310		
	Total	14578.080	87	167.564		
%kcal/Fat	Co/pkcal	285.055	1	285.055	2.844	.095
	Main Eff/Grp	450.514	3	150.171	1.499	.221
	Explained	735.569	4	183.892	1.835	.130
	Residual	8317.704	83	100.213		
	Total	9053.273	87	104.061		

•indicates significant difference at .05 level

Table A.15. Analysis of covariance summary tables with Duncan's New Multiple Range Tables for determining significant differences for reported nutrient intake among groups.

Nutrient	Source	SS	df	MS	F	£
gms Protein	Co/pProt	8743.292	1	8743.292	7.718	.007
	Main Eff/Grp	15141.180	3	5047.060	4.455	.006*
	Explained	23884.472	4	5971.118	5.271	.001
	Residual	94023.517	83	1132.813		
	Total	117901.989	87	1355.264		

Duncan's New Multiple Range

	A	B	C	D	Range
	50.83	75.64	77.90	87.05	
A 50.83	—	14.81*	27.07*	36.22*	10.42
B 75.64	...	--	2.26	11.41*	10.78
C 77.90	...	...	--	9.15	11.14
D 87.05	...	...	...	--	

•indicates significance at the .05 level
A= Fitness control
B= Nutrition control
C= Nutrition Treatment
D= Fitness Treatment

Nutrient	Source	3^	df	MS	F	p
gms Protein	Co/pProt	8743.292	T	8743.292	7.718	.007
%RDA Prot	Co/p%prot	73619.684	1	73619.684	14.176	.000
	Main Eff/Grp	105668.262	3	35222.754	6.783	.000*
	Explained	179287.946	4	44821.987	8.631	.000
	Residual	431028.497	83	5193.114		
	Total	610316.443	87	7015.132		

Table A.15. Continued

	A 11.08	B 156.85	C 166.91	D 204.64	Range
A 111.08	—	45.77*	55.83*	93.56*	21.92
B 156.85	...	—	10.06	47.79*	23.08
C 166.91	...	...	—	37.73*	23.86
D 204.64	...	...	...	--	

indicates significance at the .05 level
A= Fitness control group
B= Nutrition treatment group
C= Nutrition control group
D= Fitness Treatment group

Nutrient	Source	SS	df	MS	F	£
mg VitC	Co/pvitC	13124.519	1	13124.519	3.698	.058
	Main Eff/Grp	40656.809	3	13552.270	3.819	.013*
	Explained	53781.328	4	13445.332	3.789	.007
	Residual	294558.661	83	3548.900		
	Total	348339.989	87	4003.908		

Duncan's New ^ultiple Range

	A 42.59	B 50.42	C 63.86	D 101.85	Range
A 42.59	—	7.83	21.27*	59.26*	18.13
B 50.42	...	—	13.44	51.43*	19.08
C 63.86	...	...	—	37.99*	19.73
ÛlŭJL.oᴧ,;	...	...	...	~–	

*indicates significance at the .05 level
A= Fitness treatment group
B= Fitness control group
C= Nutrition control group
D= Nutrition treatment group

Table A.15. Continued

Nutrient	Source	SS	df	MS	F	£
%RDA VitC	Co/p%vitC	37303.713	1	37303.713	3.856	.053
	Main Ef/Grp	1119513.418	3	39837.806	4.118	.009*
	Explained	156817.131	4	39204.283	4.053	.005
	Residual	802876.142	83	9673.207		
	Total	959693.273	87	11030.957		

Duncan's New Multiple Range

	A	B	C	D	Range
	66.86	84.21	106.59	169.75	
A 66.86	--	17.35	39.73*	102.89*	29.93
B 84.21	...	--	22.38	85.54*	31.50
C 106.59	...	...	--	63.16*	32.57
D 169.75	...	...	...	--	

*indicates significance at the .05 level
A= Fitness treatment group
B= Fitness control group
C= Nutrition control group
D= nutrition treatment group

Nutrient	Source	3^	df	MS	F	p
mg niacin	CopN	484.279	1	484.279	6.448	.013
	Main Ef/Grp	785.114	∂	261.705	3.485	.019*
	Explained	1269.393	4	317.348	4.225	.004
	Residual	6233.586	83	75.103		
	Total	7502.979	87	86.241		

Table A.15. Continued

Duncan's New Multiple Range

	A	B	C	D	Range
	14.55	18.90	19.35	22.58	
A	14.55	– 4.35*	4.8 *	8.03*	2.64
B	18.90	... --	.45	3.68*	2.78
C	19.35	... ...	––	3.23*	2.87
D	22.58	... ...	...	--	

indicates significance at the .05 level
A= Fitness control group
B= Nutrition control group
C= Fitness treatment group
D= Nutrition treatment group

Nutrient	Source	SS	df	MS	F	£
%RDA niacin	Co/p%/N	20039.278	1	20039.278	5.565	**.021**
	Main Ef/Grp	38233.330	3	12744.443	3.539	**.018***
	Explained	58272.608	4	14568.152	4.045	**.005**
	Residual	298904.255	83	3601.256		
	Total	357176.864	£7	4105.481		

Duncan's New Multiple Range

	A	B	C	D	Range
	103.58	135.68	140.68	]L57.40	
A	103.58	– 32.1*	37.1*	53.82*	18.26
B	135.68	... –	5.0	21.72*	19.22
C	140.68	... •••	--	16.72*	19.87
D	157.40	... •••	•••	--	

***indicates significance at the .05 level**
A= Fitness control group
B= Nutrition control group
C= Fitness treatment group
D= Nutrition treatm.ent group

Table A.15. Continued

Nutrient	Source	SS	df	MS	F	£
%kcal/Protein	Co/p%kcal	82.193	1	82.193	2.578	.112
	Main Ef/Grp	575.743	3	191.914	6.020	.001*
	Explained	657.936	4	164.485	5.159	.001
	Residual	2646.144	83	31.881		
	Total	3304.080	87	37.978		

Duncan's New Multiple Range

	A	B	C	D	Range
	14.25	14.91	16.85	20.82	
A 14.25	—	.66	2.6*	6.57*	1.72
B 14.91	...	--	1.94*	5.91*	1.81
C 16.85	...	...	--	3.97*	1.87
D 20.82	...	..•	•••	""	

*indicates significance at the .05 level

A= Fitness control group
B= Nutrition control group
C= Nutrition treatment group
D= Fitness treatment group

Table A.16. Multiple analysis of variance table (MANOVA) using repeated measures to compare values from students in the nutrition end the physical fitness classes.

Source of Variation	Sum of Squares	df	Mean Square	F	p
Perceived/Actual Adequacy of Calorie Intake					
Within Cells	111055.21966	81	1371.05209		
Constant	705643.48193	1	705643.48193	514.67299	0.0
Grp	1126.798^1	1	1126.79841	.82185	.367
Within Cells	69604.24405	81	859.31165		
Time	4.81928	1	4.81929	.00561	.940
Grp/Time	4269.43668	1	4269.43668	4.96844	.029*
Within Cells	110856.14997	81	1368.59444		
PerAct	600015.04819	1	600015.04819	438.41698	0.0
Grp/PerAct	1165.301o4	1	1165.30184	.85146	.359
Within Cells	69182.22082	81	854.10149		
Time/PerAct	6.93976	1	6.93976	.00813	.928
Grp/time/PerAct	3960.33942	1	3960.33942	4.63685	.034^*
Perceived/Actual Adequacy of Vitamin intake...Vit A					
Within Cells	741287.38037	81	9151.69605		
Constant	841640.53012	1	841640.530122	91.C6552	0.0
Grp	20030.58951	i	20030.58951	2.18873	.143
Within Cells	323544.76481	81	3994.37981		
Time	10308.73494	1	10308.73494	2.58081	.112
Grp/Time	11664.00025	1	11664.00025	2.92010	.091
Within Cells	735139.50523	81	9075.79636		
PerAct	754023.14458	1	754023.14458	83.08066	0.0
Grp/PerAct	18161.85020	1	18161.85020	2.00113	.161
Within Cells	323332.74100	81	3991.76223		
Time/PerAct	9802.45783	1	9802.45783	2.45567	.121
Grp/time/PerAct	11694.30117	1	11694.30117	2.92961	.091

Table A.16. Continued

Source of Variation	Sum of Squares	df	Mean Square	F	p
Perceived/Actual Adequacy of Vitamin Intake...Vit C					
Within Cells	1097322.73165	81	13547.19422		
Constant	1305138.12048	1	1305138.12048	96.34011	0.0
Grp	26809.64767	1	26809.64767	1.97898	.163
Within Cells	690978.72488	81	8539.60154		
Time	1776.57831	1	1776.57831	.20826	.649
Grp/Time	24559.19680	1	24559.19680	2.87895	.094*
Within Cells	1098796.97692	81	13565.39478		
PerAct	1195440.01205	1	1195440.01205	88.12434	0.0
Grp/PerAct	24640.51104	1	24640.51104	1.81642	.181
Within Cells	690630.57274	81	8526.30337		
Time/PerAct	1995.77108	1	1995.77108	.23407	.630
Grp/time/PerAct	24603.15618	1	24603.15618	2.88556	.093*
Perceived/Actual Adequacy of Mineral intake...Calcium					
Within Cells	234010.91696	81	2889.02367		
Constant	643544.24398	1	643544.243982	222.75492	0.0
Grp	26019.08907	1	26019.08907	9.00619	.004*
Within Cells	139278.62021	81	1719.48914		
Time	4461.11145	1	4461.11145	2.59444	.111
Grp/Time	4634.51835	1	4634.51835	2.69529	.105
Within Cells	232802.96574	81	2874.11069		
PerAct	569051.28012	1	569051.28012	197.99212	0.0
Grp/PerAct	23574.00414	1	23574.00414	8.20219	.005*
Within Cells	139607.26132	81	1723.54644		
Time/PerAct	4116.14759	1	4116.14759	2.38818	.126
Grp/time/PerAct	4638.84109	1	4638.84109	2.69145	.105

Table A.16. Continued

Source of Variation	Sum of Squares	df	Mean Square	F	p
Perceived/Actual Adequacy of Mineral Intake...Iron					
Within Cells	105826.078545	81	1306.49480		
Constant	429264.490368	1	429264.59036	328.56204	0.0
Grp	7598.33110	1	7598.33110	5.81581	.018*
Within Cells	91317.98795	81	1127.38257		
Time	390.36145	1	390.36145	.34625	.558
Grp/Time	4149.65060	1	4149.65060	3.68078	.059
Within Cells	105310.82070	81	13C0.13359		
PerAct	368844.44578	1	368844.44578	283.69734	0.0
Grp/PerAct	6304.73351	1	6304.73351	4.84930	.031*
Within Cells	91606.05415	81	1130.93894		
Time/PerAct	293.20482	1	293.20482	.25926	.612
Grp/time/PerAct	4153.74103	1	4153.74103	3.67283	.059
Perceived/Actual Adequacy of Protein intake					
Within Cells	365198.95354	81	4508.62906		
Constant	2033326.27711	1	2033326.27711	450.98549	0.0
Grp	4912.26935	1	4912.26935	1.08953	.300
Within Cells	258574.63124	81	3192.27940		
Time	5216.43373	1	5216.43373	1.63408	.205
Grp/Time	9038.43502	1	9038.43502	2.83134	.096
Within Cells	364269.64866	81	4497.15616		
PerAct	1868100.04819	1	1868100.04819	415.39586	0.0
Grp/PerAct	4601.80314	1	4601.20314	1.02327	.315
Within Cells	258289.09059	81	3108.75420		
Time/PerAct	4888.78313	1	4888.78315	1.53313	.219
Grp/time/PerAct	8939.62628	1	8939.62628	2.80349	.098

•indicates significance at the .05 level

Table A.17. Summary table of repeated measures analysis.

Source of Variation	Sum of Square	df	Mean Square	F	p
Perceived/Actual Adequacy of Calorie Intake					
Within Cells	69604.24405	81	859.31165		
Time	4.81928	1	4.81929	.00561	.940
Grp/Time	4269.43668	1	4269.43668	4.96844	.029^
Within Cells	69182.22082	81	854.10149		
Time/PerAct	6.93976	1	6.93976	.00813	.928
Grp/time/PerAct	3960.33942	1	3960.33942	4.63685	.034^
Perceived/Actual Adequacy of Mineral initake...Calcium					
Within Cells	234010.91696	81	2889.02367		
Constant	643544.24398	1	643544.02367	222.75492	0.0
Grp	26019.08907	1	26019.08907	9.00619	.004^
Within Cells	232802.96574	81	2874.11069		
PerAct	569051.28012	1	569051.28012	197.99212	0.0
Grp/PerAct	23574.00414	1	23574.00414	8.20219	.005^
Perceived/Actual Adequacy of Mineral initake...Iron					
Within Cells	105826.07854	81	1306.49480		
Constant	429264.5903G	1	429264.59036	328.56204.	0.0
Grp	7598.33110	1	7598.33110	5.81581	.018^
Within Cells	105310.82070	81	1300.13359		
PerAct	368844.44578	1	368844.44578	283.69734	0.0
Grp/PerAct	6304.73351	1	6304.73351	4.84930	.031^

•indicates significance at the .05 level

Table A.18. Analysis of covariance summary table for posttest flexibility fitness pararfieter values witih prete;st Values as covariant.

Source of Variation	Sums of Squares	df	MS	F	£
Covariates (pflex)	2504,.900	1	2504.,900	566.106	.000
Main Effects (group)	128,.503	1	128.,503	29.042	.OOO^^^
Explained	2633,.403	2	1316.,702	297.574	.000
Residual	185,.841	42	4.,425		
Total	2819,.244	44	64.,074		

•, ••, *** indicates significance at the .05, .01, .001 levels, respectively
46 cases processed.
1 case (2.2%) was missing.

Table A.19. Analysis of covariance summary table for posttest muscle strength scores with the pretest values as covariant.

Source of Variation	Sums of Squares	df	M5	T_	2~
Covariates (pretest)	4412.582	1	4412.582	222.993	.000
Main Effects (group)	167.525	1	167.525	8.466	.006**
Explained	4580.106	2	2290.053	115.730	.000
Residual	831.094	42	19.788		
Total	5411.200	44	122.982		

*, ••, *** indicates significance at the .05, .01, .001 levels, respectively
46 cases processed.
1 case (2.2%) was missing.

Table A.20. Analysis of covariance summary table for posttest muscular endurance values with the pretest values as covariant.

Source of Variation	Sums of Squares	df	MS	f	p
Covariates (p#situps)	2720,.124	1	2720..124	105,.509	.000
Main Effects (group)	1111,.524	1	nil..524	43,.114	.000***
Explained	3831,.648	2	1915.,824	74,.312	.000
Residual	1082,.796	42	25..781		
Total	4914,.444	44	111..692		

•, ••, ••• indicates significance at the .05, .01, .001 levels, respectively
46 cases processed.
1 case (2.2%) was missing.

Table A.21. Analysis of covariance summary table of posttest body composition values with the pretest values as covariant.

Source of Variation	Sums of Squares	df	MS	F	p
Covariates (pvalues)	768.206	1	768.206	92.451	.000
Main Effects (group)	32.993	1	32.993	3.971	.053
Explained	801.200	2	400.600	48.211	.000
Residual	348.992	42	8.309		
Total	1150.192	44	26.141		

46 cases processed.
1 case (2.2%) was missing.

APPENDIX B

INSTRUMENTS

CONSENT FORI

^*_____^_____, the undersigned, willingly consent to participate in the research project which Is a part of a nutrition education project conducted through the Department of Food and Nutrition at Texas Tech University. I understand that the results of this study will be used in Improving the quality of education available at the college level.

I am aware that I am under no obligation to stay in the study. I have been assured that my personal identity and the Information about me will remain CONFIDENTIAL. With the above understanding, I agree that the information which I provide will be available for the Investigator to use in a manuscript, I may also request a summary of the study.

_____
Participant

_____
Date

Code / ____

24 Hour Recall

Please list the foods and beverages. ..ABSOLUTELY EVERYTHING. ..that you cons^imed yeste-'cij/. Also, please indicate the amount of the food you ate and the way in which it was prepared. It 1$ NOT necessary to include water; BUT do not forget all those other beverages. THANKS!!

	FOOD (list the foods by name)	AMOUNT (Indicate the number of pieces, ounces, cups, etc. that you ate)	PREPARATION (Indicate If the food was fried, baked, broiled, boiled, steamed, creamed, or uncooked, etc.)
MORNING HEAL Where did you **eat** this meal?			
MIOOAY MEAL Where did you eat this meal?			
EVENING MEAL Where did you eat this meal!			
SNACKS Where did you eat your snacks?			

Was this a t/pical day witi regard to your food consumption? Yes ___ Ho ___

Please list any dietary suopleTpnts thet you take. _____

What is your aie? ____yrs.

You **are** being asked to fill out this questionnaire in an effort to collect data on the characteristics of today's college students. From such information, it is hoped that helpful Insights will be gained which will eventually result in Improved educational practices.

The information collected is STRICTLY CONFIDENTIAL and will be used solely for research purposes. It will NOT AFFECT YOUR GRADE IN THIS COURSE. You are being asked to identify yourself only that future data and reports can be matched. As soon as all the information is collected, individual names will be removed and be replaced with a numerical code.

PLEASE BE CAREFUL NOT TO SKIP OR OMIT any questions. Record all the answers on the accompanying answer sheet. THE ONLY RIGHT ANSWER TO QUESTIONS SUCH AS THESE is your HONEST OPINION ANO TRUE FEELINGS. Please return the packet and the answer sheet to the person giving the questionnaire when you have finished.

You may give your name and mailing address to your professor if you want to receive feedback as the the specific results of this research when it is completed.

THANK YOU FOR YOUR COOPERATION

Special Instructions for Completing the Answer Sheet

On side two (2) of the answer sheet, olease enter vour name in the aoDropriate spaces.

- **enter your social security number in the area marked "Identification number"**
- **identify your sex In the appropriate soace**
- **enter your AGE in years under 'birth dGte...yr'**
- **in the SPECIAL CODES spaces:**

enter vour height (without shoes) in inches in the first 3 soaces

eg. if your height is S ^'eet 7 inches, enter as 057 and blacken corresponding spaces

enter your weight in pounds in the next 3 soaces

eg. if your weight is 150 pounds, enter as 150 and blacken the correspo'ndi ng spaces

PLEASE BE CERTAIN TO BLACKEN THE CORRESPONDING SPACES ! ! !

THANK YOU! ! !

PLEASc GO ON TO THE NEXT PAGE

QUESTIONNAIRE

Part A

PLEASE DO NOT WRITE YOUR NAME ANYWHERE CN THIS FORM

This portion of the questionnaire Is concerned with the number of times In a 'normal' week you participate in the activities mentioned. Please, record the number which is most accurate regarding your personal life and habits. The information obtained Is STRICTLY CONFIDENTIAL and will be used only in accumulating data and will not be traced to you personally.

Please Indicate on the answer sheet how many times each week you perform the following activities by blackening the appropriate space or spaces to indicate YOUR MOST ACCURATE ESTIMATE:

A » 0	0 • 3	AC » 6
B • 1	E • 4	AO = 7
C = 2	AB « 5	AE * more than 7

1. Run. Jog, bicycle, or walk briskly for at least thirty minutes.
2. Swim laps for at least thirty minutes.
3. Participate In aerobic dance or exercise for at least thirty minutes.
4. Play tennis or racquetball for at least one hour.
5. Play a competitive sport such as basketball or soccer for at least thirty minutes.
6. Play a competitive sport such as football for at least thirty minutes.
7. Play a sport such as Softball, baseball or golf for a game or a round.
8. Bowl for leisure or sport for at least one hour.
9. Participate in social dance for at least thirty minutes.

Please indicate approximately how many hours you spend each day in the following activities by marking the appropriate space or spaces to indicate your MOST ACCURATE ESTIMATE:

A = 0	D ' 2	AC = 5	BC = 8
B = 0 . 5	E = 3	A D » 6	8 0 = 9
C = 1.0	AB • 4	AE » 7	BE - 10 or more

10. Sitting in class listening and/or taking notes
11. Walking to and from classes
12. Studying
13. Watching television, VCRs, or movies
14. Driving or riding in a notor vehicle
15. Sleeping
16. Working at sedentary tasks (sitting, typing, answering phones, etc.)
17. Working at manual labor tasks (construction, etc.)

Please answer the following questions by r-arking the answer sheet to indicate the BEST response relative to »OUR habits:

18. How many calories do you use in an 'average' day?

A. less than 1000	E- 2501 - 3000
B. 1000 - 1500	AB. 3C31 - 3500
C. 1501 - 2000	*C. *-nre* t*^an 3500
0. 2001 - 2500	^0- ^a^e "O 'c)^«

PLEASE GO ON TO THE NEXT PAGE

19. How often do you go on an exercise program to lose weight?

A. never
B. once or twice a year
C. three or four times a year
D. once a r-onth
E, every other week
AB. always on one

20. How many calories do you consume oo an 'average' day?

A. less than 1000
B. 1001 - 1500
C. 1501 - 2000
D. 2001 - 2500
E. 2501 - 3000
AB. 3001 - 3500
AC. more than 3500
AD. have no idea

21. How often do you go on a diet to lose weight?

A. never
B. once or twice a year
C. three or four times a year
0. once a month
E. every other week
AB. always on one

22. Has your weight changed by five pounds or more in the last 6 months?

A. no
If yes, B.gained weight
C.lost weight

23. How many soft drinks do you drink In the 'average' day?

A. none
B. one
C. two
0. three
E. four
AB. five
AC. six
AO. seven
AE. more than seven

24. How many cups of coffee do you drink in the 'average' day?

A. none
B. one
C. two
0. three
E. four
AB. five
AC. six
AD. seven
AE. more than seven

25. How many cups or glasses of tea do you drink in the 'average' day?

A. none
B. one
C. two
D. three
E. four
AB. five
AC. six
AO. seven
AE. more than seven

26. Do you smoke?

A. fjo
If yes, 8. occassitjnal ly
C. 'i pack or less each day
D. between S Pact and 1 pack daily
E. more than 1 pack each day

27. Do you consume alcoholic beverages?

f^ fjo
If yes, B. less than 2 drinks each week
C. between 2 and -J drinks each day
D. 1 drink each day
E. more than one drink each day

28. Oo you consider yourself to be:

A. underweight
B. nonnal weight
C. overweight
0- ^^we no idea

29. Generally, when you get up In the morning, are you

A. alert
8. Sleepy
C. tired
0. cheery
E- g-'-J^Y
*B. bright

PLEASE GO ON TO THE NEXT PAGE

30. When do you feel the MOST alert and awake?

A. early morning	0. mid afternoon
B. mid morning	E. early evening
C. early afternoon	AB. mid evening

The purpose of this portion of the questionnaire Is tO measure the response of various people to statements concerning their fitness level, exercise practices, nutritional level, and diet practices. In completing this portion, please make your judgment on the basis of what BEST DESCRIBES YOU. The scales are from 1 - 6 with T indicating the value at the left end of the scale and 'S' indicating the value at the right end of the scale. PLEASE MARK THE SPACE/SPACES CORRESPONDING TO THE NUMBER WHICH BEST DESCRIBES YOUR EVALUATION OF THE SITUATION.

For example: If you think the temperature in this room is a bit-warm, but NOT hot, you would mark the space corresponding to the '5'.

cold » l - 2 - 3 - 4 - 5 - 6 » h o t

A » I 0 ➲ 4
B = 2 E » 5
C • 3 AB • 6

Please use the following scale for the statements which follow:

A • 1 0 « 4
B » 2 E • 5 Unacceptable • 1 - 2 - 3 - 4 - 5 - 6 ' Excellent
C » 3 AB » 6

REMEffiER. ..the best answer is your honest opinion!

31. My personal exercise habits are...

32. My cardiovascular fitness level is...

33. My muscular endurance level is...

34. My muscular strength is...

35. My overall personal physical fitness level is...

For the following statements, please use the scale below in the same manner as the previous one.

A = 1 0 = 4
8 ' 2 E = 5 Inadequate = 1 - 2 - 3 - 4 - 5 - 6 = Excessive
C = 3 AB = 6

36. My body weight is...

37. The level of fat in my body is...

33. '-'y average daily calorie intake is...

39. My daily intake of vitamins is...

40. My daily intake of miperals is...

41. My daily intake of fat is...

42. My daily intake of protein is...

43. My daily intake of carbohydrate is...

44. My overall nutritional status is...

45.. My overall intake of food and beverage on an average day is...

PLEASE GO CN TO ^E 'lEXT PAGE

QUESTIONNAIRE

Part B

PLEASE DO NOT WRITE YOUR NAME ANYWHERE ON THIS FORM

Attitudes Questionnaire

{?'^T^Ł.ę!- ""CT TO EACH STATEMENT according to how much vou AGREE or DISAGREE wi th tt. Mark the appropriate space on the answer sheet using the following scale:

A • 6 ' I agree very much
B " 5 • ' agree on the whole
C • 4 • I agree a little
D • 3 =• I disagree a little
E • 2 » I disagree on the whole
AB • 1 = I disagree very much

*^' I usua dlsiu'^^ "''' "°' *"*^ ' ^°'*** ^^ ^** e. aopearance is similar to something I

47. Exploring several methods of food preparation Is desirable.

48. Food sel«ct1on is a personal decision; people shouldn't try to persuade me to change.

49. I think that food habits should be flexible enough to vary with a new situation.

50. I like for my family to stick to the old favorite meals, rather than mess them up with new and different kinds of foods.

51. Learning the basic ideas in nutrition will probably alter my personal eating habits very little.

52. Unfamiliar foods often interest me.

53. If I am satisfied with foods I eat, I see no reason for me to change.

54. I would try a food at least twice before forming a positive or negative opinion about it.

55. I enjoy my family's cooking the most, but I would be happy to eat someone else's cooking.

56. If my diet were poor, I would probably take vitamin pills rather than vary tfie foods I choose.

57. I think traditional ways of preoaring food are the best.

58. I could learn to eat fruit for dessert rather than a pastry.

59. I believe that the person who gets the most satisfaction out of eating is the one who sticks to the foods that are familiar.

60. In actual oractice, my nutrition knowledge has little influence on what I select to eat.

'61. Trying new and different foods appeals to me.

62. I would be willing to spend time in makinq nutritious foods available for myself and / or my family instead of eating convenient food of low nutritional quality.

63. I would be willing to try *an* unfamiliar food at least cnce.

64. Teaching calorie control and food selection to a fat person is a waste of time.

65. I would fix more nutritious meals if I knew what to prepare.

66. For better health, I would be willing to try a food I hadn't eaten before or several foods over a period of time.

PLEASE GO ON TO THE 'lEXT PAGE

A » 6 » I agree very much
8 • 5 = I agree on the whole
C • 4 « I agree a little
D • 3 = I disagree a litt'e
E ' 2 = I disagree on the whole
AB " 1 » I disagree very much

67. I win not eat rather than be served sanething I don't like.

68. Foods that taste good are not good for me.

69. If I didn't like a food prepared in a certain way, I would not try It prepared a different way.

70. I feel that the way I eat has little influence on my health.

71. I think that exercising would make me feel worse than not exercising.

72. If I an satisfied with my weight, I have no reason to exercise.

73. I would exercise regularly to be healthy.

74. In actual oractice, my physical fitness knowledge has little Influence on how Twch I exercise.

75. Teaching exercise activities to a fat person is a waste of time.

76. I think physical exercise is as dangerous to health as it Is valuable.

77. For better health, I would be willing to try a new exercise program over a period of time.

78. Physical exercise is okay for some people, but it is NOT for me.

79. I would be willing to exercise regularly if it would be beneficial to my health.

80. Physical exercise is of no interest to me unless it is a team sport.

81. The tine that I soend in physical exercise activities would be better spent doing something else.

82. I think physical exercise is a good way to release tension.

83. When I get regular exercise, 1 feel good about myself.

84. Learning the basic concepts in physical fitness will probably alter my exercise habits very little.

95. I would rather watch a sport event than to play one.

86. Physical activity is necessary for good health.

87. I think physical exercise is a good way to deal with emotional stress.

88. I could learn to walk up / down stairs instead of riding an elevator each time.

89. If I am satisfied with my exercise practices, I see no reason for me to change.

90. I would oarticipate in more aerobic exercise if I knew how to judge the level of exercise.

91. I feel better when I exercise regularly.

92. If I exercise, I think that I can eat anything I want to.

93. Getting 'hot and sweaty" is for the athlete. NOT for -e.

g4. In my leisure time. I would rather be physically active than to be sedentary.

95. Social dancing is a waste of time and enerqy.

96. I believe that the oerson who gets the most benefit f'^m physical exercise is the one who-IS renularlv involved.

PLEASE GO ON TO THE '^XT PAGE

A » 6 = I agree very much
B • 5 » I agree on the whole
C * 4 • i agree a little
D " 3 'I disagree a little
E • 2 • I disagree on t^e whole
AB » 1 = I disagree very much

97. When I feel 111. it Is because I have not been 'eating right'. •

98. When I feel 111, it is because I have not been getting enough exercise.

99. When I feel ill, it is because I have not been getting enough sleep.

PLEASE GO ON TO THE NEXT PAGE

QUESTIONNAIRE

Part C

PLEASE 00 NOT WRITE YOUR NAME ANYWHERE ON THIS FORM

Knowledge Questionnaire

Instructions: Please select the BEST answer and mark the appropriate space on the answer shee. This will in NO way be identified with you or your grade for this course. Please answer each question with what YOU feel is the BEST answer.

100. Calorlmetry Is the:

A. total amount of heat needed by the average adult
B. measurement of the amount of heat produced from a food
C. amount of heat needed to raise the temperature of one kilogram of food one degree centigrade
0. nutritionists' term for kilocalories

101. Calculate the approximate energy content of the following sandwich and select the correct answer.

	Protein (grams)	Lipid (grams)	Carbohydrates (grams)
1 slice of bread	2	1	13
2 oz lean meat	14	6	0
1 tsp mayonnaise	0	3	0
	VS	11 TT	13

A. 148 kcal
B. 206 kcal
C. 221 kcal
D. 236 kcal

102. In an 'ideally' planned menu, the distribution of protein, lipid, and carbohydrate, respectively, should EQUAL approximately to:

A. 3U. 44?, 25?
B. 61%, 171. 22',
C. 29t. IS*.. 531
0. lot, 35%, 55%

103. Basal metabolism rate represents:

A. the number of calories required for acti <'• voluntary function of muscles
8. about 1/3 of the total daily calorie needs for a moderately active individual
C. the number of calories needed for the involuntary functions of the body
0. energy needed to digest meals

104. To lose 2 pounds of fat per week, calorie intake must be reduced by 2 kildcalones per day less than the energy expended.

A. 500
8. 1000
• C. 2000
0. 3000

REFER TO THE FOLLOWING MENU FOR QUESTION 105;

Breakfast	Lunch	Dinner
8 02. orange juice	Hamourqer	3 oz. broiled steak
1 sweet roll	French Fries	Baked Potato
8 oz. "hole mi Ik	Malted Milk	ij cup broccoli with cheese sauce
		Tossed salad with dressing
		2 hot rolls
		'< CUP ice cream
		Coffee

105 One suggestion for aeneral n^jtritional improvement and reduction of the total • caloric intake in the breakfast menu ^or an 18 year old sedentary college student could be:'

A. r»duce orange juice by 50% and drink 8 oz. sklm milk
B. add one fried egg to breakfast
C. add one ounce of cheese to the sweet roll
0. eliminate whole milk and drink coffee

106. Lipids differ in their degree of saturation or unsaturation due to their:

A. saccharide units
B. peptide linkages
C. amino acids
D. number of double bonds

107. The end products of METABOLISM of the energy nutrients are:

A. energy, carbon dioxide, and water
8. monosaccharides, fatty acids, and amino acids
C. nitrogen, urea, and energy
D. water, cellulose, and energy

108. Carbohydrates are tenned 'protein sparers' because the presence of an adequate amount of this nutrient

A. reduces the use of protein for energy
B. conserves essential fatty acids
C. reduces the protein being converted to fat
0. reduces protein from being consumed in too large quantities

109. Insufficient intake of lipids affects the body in several ways. From the following statements, select the one which is NOT true.

A. lipids serve as major storage areas of energy
B. lipids provide lysine for tissue synthesis
C. body fat protects organs agains heat, cold, and mechanical shock
D. fat soluble vitamin supply will be reduced

110. A food containing all of the essential amino acids can be Identified as one which:

A. contributes one - third of the needed dally kilocalories
B. does not require refrigeration
C. is any animal produced product with the exception of gelatin
0. contains cholesterol and saturated fat

REFER TO THE FOLLOWING MENU FOR QUESTION 111.

Fried Steak
Fresh Frui t Salad
Mashed Potatoes Buttered Broccoli
Suttered Rolls
Ice Cream Whole Mi Ik

111. A change to Lemon Broccoli from the Buttered Broccoli will:

A. decrease the amount of saturated fat
B. increase the number of calories
C. increase the satiety value of t*^e -ea)
0. decrease the amount of unsaturated fat

112. Kwashiorkor, a major nutritional deficiency disease in the world, is caused by a lack of:

A. essential fatty acids
B. energy food sources
C. enough good quality protein
0. vitamins and minerals in the diet

113. The day's adult requirement for protein can best be met by:

A. 2.2 grams of orotein per kiloaram of bcay wenht
8. 58 grams of meat as listed in the -CA
C. 0.8 grams of protem per kilogram or body -eight
D. 30 - 40 calories from protein

PLEASE GO CN TO THE NEXT PAGE

114. Select the foods in tl-e following list which you would recommend as the most reliable sources of vitamin C.

A. beef and chicken
B. whole wheat toast and oatmeal
C. dried beans and nuts
0. strawberries and melons

lis. Overconsumption of the water soluble vitamins will usually result In the following condition:

A. accumulation aiding in the prevention of colds and infections
8. no observable condition as they are stored in the adipose tissue
C. a nonobservable condition because they are excreted
D. toxic accumulation in the liver

116. An Inadequate Intake of calcium for several years can lead to such physiological problems as:

A. osteoporosis
B. impaired energy nutri'ent metabolism
C. pernicious anemia
0. bleeding guns and ease in bruising

117. The major physiological function of vitamin C Is:

A. collagen synthesis
B. bone development
C. epithelial tissue synthesis
0. antibody formation

118. The most Important physiological function of vitamin 0, a fat soluble vitamin, is:

A. synthesis of red blood cells
B. promotion of calcium and phosphorous utilization
C. increased resistance to disease
0. prevention of night blindness

119. Fluid and electrolyte imbalance in the body may occur because of:

A. vomiting and diarrhea
B. excessive water consumption
C. excessive beverage consumption
0. constipation due to lack of peristalisis

REFER TO THE FOLLOWING MENUS FOR QUESTION 120.

Meal A	Meal B	Meal C
Cheddar Soup	Tomato Juice	Orange Ju.^e
Sliced Tomatoes	Roast Seef	Grilled Sacon
Chicken Sandwich	Raw Spinach Salad	Cinnamon Toast
Milk	Glazed Carrots	Mi Ik
Sherbet	Fruit Pie	
	Milk	

120. Meal B contributes significantly nOre J_ than the other meals.

A. calcium
8. iron
C. fluorine
0. iodine

121. Valid research can be identified by the:

A. use of good statistical procedures
B. use of diets established by the National Research Council
C. fact that it can be reoroouced with the same results
D. use of an orderly, clean laboratory with controlled temperature

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122. The first ingredient listed on a label means that It:

A. is an ingredient required by law to be added to the product
B. provides trore calories than the other Inqrealents
C. Is the predominant Ingredient in the product
0. reflects the additive(s) used in the product

123. The Last Chance Diet, Grapefruit Diet, and Dr. Atkins Diet have all the following characteristics EXCEPT:

A. are monotonous and uninteresting
8. can be harmful and sometimes fatal
C. stress eating a wide variety of foods
0. bring tremendous profits to their authors

124. Eating a wide variety of foods:

A. Is not necessary If you take vitamin and mineral supplements
B. may be harmful due to additives and preservatives
C. will help one meet the nutritional requirements
0. is more expensive than a low carbohydrate diet

REFER TO THE FOLLOWING MENUS FOR QUESTION 125. CONSIDER ALL FOODS AS STANDARD SIZED PORTIONS UNLESS OTHERWISE NOTED.

Breakfast	Lunch	Supoer
4 oz. graoefruit juice	3 oz. baked chicken	tuna salad sandvvich composed of:
2 tablespoons peanut butter	S cup brown rice	2 oz. tuna
2 slices whole wheat toast	S cup green beans	1 tablespoon salad dressing
1 cup milk	1 cup mixed fruit salad	2 slices whole wheat toast
•	iced tea	1 tablespoon pickle relish
		2 slices tomato
		1 medium banana
		1 cup mi Ik

125. A LACTO-OVO VEGETARIAN could substitute / for the chicken and tuna to meet the protem needs of the diet.

A. beef and pork
8. dairy products and e^gs
C. breads and cereals
0. fruits and vegetables

REFER TO THE FOLLOWING MENUS TO ANSWER QUESTION 126. CONSIDER iLL FOODS AS STANDARD SIZED PORTIONS UNLESS OTHERWISE NOTED.

Breakfast	Lunch	Dinner	Snack
2 glazed donuts	Ham Sandwich*	Gri lied Steak"-	Beer
2 scrambled eggs	French Fries	Buttered Green Beans	Pretzels
2 slices toast	Chocolate Cf.lp cookies	Enriched Rice	
16 oz. homo mi Ik	Soft Drink	Tossed Green Salad	1. 2 sandwiches totaling 3 o:. ham, *i* slices enriched bread. -J tsp. -ayonna' '.;
		Aople Pie	2. 6 oz. stean
		Iced Tea	

126. This individual's daily intake is 1ow in:

A. fat
8. vitamin C
C. protein
D. calc-ium

127. Vitamin A Is supplied by which two Food Groups?

A. Dairy : Fruit and vegetable
B. Dairy : Meat
C. Bread and Cereal : Fruit and Vegetable
0. Meat : Bread and Cereal

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128. A non-specific chemical substance sometirr^s labeled as a vitamin is:

A. pyridoxine
B. biotin
C. laetrlle
0. folacin

129. The individual who is seriously concerned with excelling in athletics should:

A. eat high calorie, high protein foods before each event to assure endurance
B. eat a nutritious, normal diet with increased calories to maintain weight
C. take vitamin/mineral supplements to assure top performance and oxygen uti 11 zation
0. increase the consumption of protein to foster muscle development

130. Physical exercise on a 'weekend basis' is:

A. reconmended for the busy executive
B. sufficient to maintain an adequate level of fitness
C. insufficient to maintain an adeouate level of fitness
0. a good way to stay physically fit

131. To replenish the body with fluid following heavy exercise, it Is BEST to drink an adequate amount of:

A. water
B. beer
C. glucose/electrolyte drink such as Gatorade
0. coffee

132. The type of exercise most beneficial to long-term fitness is:

A. aerobic
8. anaerobic
C. intermittent
D. static

133. The monitoring of the heart rate during exercise sessions is necessary to assess the _?. of the activity.

A. duration
B. helpfulness
C. intensity
D. result

134. For a conditioning effect reflecting imoroved fitness status, the heart rate should be maintained between:

A. 10 - 20% max
B. Z5 - 40% max
C. 45 - 60". max
0. 65 - 90% max

135. The estimated maximum heart rate of a fifty year old man is:

A. 150
8. 170
C. 2]0
0. 220

135. There apcrears to be 3 true 'sex dif'-'-once' in f-e fat content in fe body which has been identified by some authors as:

A. adipose
B. essential
C. hormonal
0. storage

137. The major physiologic defense against o.erheatma by the body is:

A. conduction
8. convection
C. evaporation
0. radiation

PLE:E GO CN Th T-T NEXT PAGE

na. The most serious of the heat stress condltion(s) observed in man is (are):

A. muscle cramps
B. excessive thirst, gro^giness
C. heat exhaustion
0. heat stroke

139. Thresholds of training for fitness targets are determined by an interaction of:

A. intensity, duration
B. Intensity, frequency
C. duration, frequency
0. duration, frequency. Intensity

140. An evaluation of cardiovascular fitness, muscular strength, muscular endurance, flexibility, and body composition will be necessary to identify the appropriate level of:

A. general well-being
B. physical exercise
C. physical fitness
0. total health

141. The most Important physiological aspect of a pre-event meal for the athlete is:

A., the amount of carbohydrate consumed
B. the timing of the meal
C. the psychological attachment to the meal
0. the amount of protein consumed

142. The nutritional needs of the physically active person are comparable to those of the physically inactive person with the MAJOR EXCEPTION being that:

A. the physically active person has a decreased need for protein, carbohydrate, and fat
B. the physically active person has an increased need for energy from carbohydrates and fats
C. the physically active person has an increased need for protein
D. the physically active person has a decreased need for vitamin supplementation

143. The prevention and/or treatment of major health problems such as obesity, hypertension, and diabetes may be BEST done using:

A. proper exercise independent of proper nptrition
B. proper nutrition independent of proper exercise
C. proper exercise adjunct to proper nutrition
0. adequate vitamin intake irregardless of nutrition or exercise

144. Th6 physiological effect of caffeine in the body which may indicate its use for enhancing endurance activities is:

A. caffeine elevates the free fatty acid level in the blood
8. caffeine is a stimulant for the central nervous system
C. caffeine stimulates the heart
D. caffeine elevatey^drenalin production

145. An effective exerj-cse protocol consists of phases for:

A. warm up, exercise, cool down
B. exercise, cool down
C. warm UP, exercise, rest
0. exercise, warm up, exercise, cool down

146. Gaining weight through diet and exercise Is BEST accomplished with a diet:

A. supplemented with liquid protein
B. augmented with vitamin, mineral, and protein suoplements
C. well balanced with a variety of foods
0. composed of high levels of hormones and protein

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147. Activities which increase energy expenditure *are* those which use:

A. large muscle groups In a continuous manner
B. large muscle groups in an intermittent manner
C. muscle groups in an Isometric manner
D. muscle groups irt an isokinetic manner

148. An Increase in the V02'iiax following the implementation of *an* endurance type exercise program reflects an Increase in the ability to:

A. breathe deeply and consume more oxygen
B. store oxygen in the exercising muscle
C. perform anaerobic exercise
0. deliver more oxygen to the muscle tissue

149. The highest intensity of exercise as measured by kilocalories burned per minute of activity Is obtained by:

A. bicycling
i. jogging
C. swiiming
D. walking

150. The proposed critical frequency for effective conditioning with exercise is:

A. less than two times a week
B. 3 or 4 times a week
C. 5 or 6 times a week
D. 7 times a week

151. The 'life time sport' which contributes the LEAST to cardiovascular fitness Is:

A. basketball
B. bowling
C. golf (walking)
0. tennis

152. Coronary heart disease, high blood pressure, obesity, constipation, and low back pain *are* examples of diseases characterized as hypokinetic. This Suggests they are comnxjn to people who are:

A. very active, physically
B. moderately active, physically
C. somewhat physically active
0. physically inactive

153. Physical activity patterns should be based on:

A. current fads
B. individual needs and interests
C. current knowledge of effective patterns
D. personal desires

154. There are numerous positive physical health benefits attributed to improved physical fitness. A oossible reduction in blood oressure is a related benefit to an improvement in:

A. cardiovascular fitness
B. flexibility
C. strength and endurance of the muscles
D. proportion of lean body mass

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QUESTIOTMIRE

Part 0

PLEASE DO NOT WRITE YOUR NAME ANYWHERE ON THIS FORM

Instructions: Please answer each of the following questions by blackening the appropriate space/spaces on the answer sheet to BEST reflect you response. THIS INFORMATION WILL BE KEPT CONFIDENTIAL.

155. Please indicate which of the following conditions you have been diagnosed as having.

A. Diabetes
B. Heart Disease
C. Hypertension
D. High Blood Pressure
E. Back Trouble (or injury)
AB. Neck Injury
AC. Rheumatic Fever
AD. None of these

156. Please indicate if you are currently under medical treatment for:

A. Obesity
B. Diabetes
C. Heart Disease
0. Hypertension/High Blood Pressure
E. Back or Heck Injury (problem)
AB. Asthma
AC. Nose of these

157. Ethnicity:

A. Anglo
B. Black
C. Hispanic
D. Other

158. Classification in College:

A. Freshman
8. Sophmore
C; Junior
D. Senior
E. Graduate
AB. Other

159. Major field of study:

A. Home Economics
8. Physical Education
C. Elementary Education
0. Health
E. Biology
AB. Chemistry
AC. Pre-med
AO. Nursing
AE. Secondary Education
BC. Other

160. The approximate income of your parents or legal guardian:

A. below SlO.OOO
B. SlO.OOl - 20.000
C. S20.001 - 40.000
0. $40,001 - 560,000
E. over $60,000

161. The highest level of education attained by your mother:

A. 6th grade or less
B. 7th - nth grade
C. High School Graduate
0. 1-3 years of college
E. Colleoe Deoree
AB. Advanced College Degree

162. The highest level of education attained by your father:

A. 6th grade or less
B. 7th - 11th Qrade
C. High School Graduate
0. 1-3 years of college
E- College Degree
AB. Advanced College Degree

163. Your current college GPA:

A 1. 99 or below
g. 2.00 - 2.49
C. 2.50 - 2.99
0- 3--0 " 3.-'9
£• 3.50 - 4.00

THANK YOU VERY MUCH FOR YOUR TIME ANO YOUR COOPERATION'!!

APPENDIX C

INSTRUCTIONAL UNIT

Outline of Objectives for Instructional Unit

I. Evaluate food as the source of nutrients needed for physical fitness and good health.

   A. Identify the relationships among nutrition, physical fitness, and good health.

   B. List the nutrients essential for the physically active individual

   C. Identify food supplying specific nutrients.

   D. Plan a well balanced diet for one day for a physically active individual.

II. Assess the impact of nutrition and physical fitness on health related fitness parameters.

   A. Cite industrial life styles contributing to hypokinetic disorders.

   B. Identify fitness parameters associated with good health.

III. Analyze the relationship between body composition and physical fitness.

   A. Describe methods of assessing body composition.

   B. Determine effective techniques to alter body composition.

IV. Evaluate the function of cardiovascular fitness in total physical fitness.

   A. Specify health benefits associated with improved cardiovascular fitness.

   B. Describe the essential components of exercise necessary to alter cardiovascular fitness.

   C. Compare methods of evaluating cardiovascular fitness.

V. Evaluate the role of flexibility in physical fitness.

   A. List health benefits associated with improved muscle/joint flexibility.

   B. Describe methods used to evaluate flexibility of specific muscles/joints.

VI. Analyze the role of muscle strength and endurance in physical fitness.

A. Enumerate the health benefits associated with improved muscular strength and endurance.

B. Describe techniques for assessing muscular strength and endurance.

VII. Distinguish the nutritional considerations necessary for unique environmental conditions and events.

A. Cite nutritional implications for success in marathon events.

B. Describe health related considerations in hot and humid environments.

C. Describe ergogenic aids used by physically active individuals.

INTEGRATED INSTRUCTIONAL UNIT

The purpose of the integrated instructional unit in nutrition and physical fitness is to enhance the learning experiences of the students in nutrition and/or physical fitness classes. When two components of a total concept such as health and wellness can be addressed in a concurrent manner, the learning must be more effective and result in an improved retention of the concepts. With an overall interest in nutrition and fitness being expressed by the general population in the United States and with increased interest in the subject at the college level, integration of these academic areas seems logical. The unit, initially developed using input from professionals in the areas of nutrition and physical fitness, was reviev^ed by a panel of experts in nutrition education before preparation for presentation.

The unit was designed to be presented over 3-4 class periods of 50 minutes each. Adaptation was made for class periods of 110 minutes when necessary. The unit objectives were:

I. Evaluate food as the source of nutrients needed for physical fitness and good health.

   A. Identify the relationships among nutrition, physical fitness, and good health.

   B. List the nutrients essential for the physically active individual.

   C. Identify food supplying specific nutrients.

   D. Plan a well balanced diet for one day for a physically active individual.

   INTRODUCTION: Do physically active people need a special diet? Can the physically active person eat 'any and everything' they want?

LEARNING EXPERIENCES:

- Attend a mini lecture on basic nutrition.
- Utilize charts and handouts to review nutrients.
- View transparencies related to specific concepts.
- Review 'serving sizes' with food models and service items.
- Plan 'balanced meals' using food models.
- Evaluate personal diet according to percentage of kilocalories supplied by each energy nutrient.
- Plan a 'diet' for a physically active individual based on the recommended percentage of kilocalories from each of the energy nutrients.

II. Assess the impact of nutrition and physical fitness on health related fitness parameters.

A. Cite industrial life styles contributing to hypokinetic disorders.

B. Identify fitness parameters associated with good health.

INTRODUCTION: Good health implies a balance between good dietary habits and good exercise habits.
Define: hypokinetic disorders and Industrialized Society's Syndrome.

LEARNiriG EXPERIENCES:

- Participate in the activity produced cn the tape.
- Contribute tc a discussion of the changes in society relating to hypokinetic diseases.
- View transparencies relating to the hypokinetic disease and current exercise and diet practices.
- Listen to a summary of the identified disorders.
- View transparencies defining the parameters useful in assessing physical fitness.

III. Analyze the relationship between body composition and physical fitness.

A. Describe methods of assessing body composition.

B. Determine effective techniques to alter body composition.

INTRODUCTION: Define body composition and the functions of body fat and lean body tissue.

LEARNING EXPERIENCES:

- Take measurements of height and weight.

- Compare to charts for ideal/average sizes.

- Calculate ideal body weight by formula.

- Estimate body composition using a simple test such as 'pinch* or 'jiggle'.
  (available after class will be the Lange calipers to determine skinfold estimation of body composition)

- View transparencies concerning the percentages of body fat interpreted as adequate/average.

- Participate in a discussion concerning body weight and body composition.

IV. Evaluate the function of cardiovascular fitness in total physical fitness.

A. Specify health benefits associated with improved cardiovascular fitness.

B. Describe the essential components of exercise necessary to alter cardiovascular fitness.

C. Compare methods of evaluating cardiovascular fitness.

INTRODUCTION: Complete the activity "let's take a pulse".

LEARNING EXPERIENCES:

- Attend a lecture on cardiovascular fitness.

- Determine personal fieart rate by measuring the pulse at two locations.

- Calculate an approximate personal maximal heart rate.

- Calculate a personal heart rate target range.

- Participate in class activity to assess pulse rate change, (available outside class time will be a blcod pressure cuff to assess blood pressure if this activity is selected by the student.)

- View transparencies related to the importance of this fitness parameter.

V. Evaluate the role of flexibility in physical fitness.

A. List health benefits associated with improved muscle/joint flexibility.

B. Describe methods used to evaluate flexibility of specific muscles/joints.

INTRODUCTION: Identify the role of flexibility in physical fitness and the health benefits.

LEARNING EXPERIENCES:

- Attend a mini lecture on flexibility.
- Participate in a discussion concerning the health benefits of improved flexibility.
- Complete an active stretch activity.
- Complete a passive stretch activity.
- View transparencies on the muscle and the importance of flexibility.
- Compare flexibility of a 'cold' muscle and a 'warmed' muscle.

VI. Analyze the role of muscle strength and endurance in physical fitness.

A. Enumerate the health benefits associate with improved muscular strength and endurance.

B. Describe techniques for assessing muscular strength and endurance.

INTRODUCTION: Importance of these parameters to physical fitness.

LEARNING EXPERIENCES:

- Participate in a discussion of the importance of muscles in physical fitness.
- Attend a lecture concerning muscles.
- Participate in muscle improvement exercise of isotonic and isometric nature.

VII. Distinguish the nutritional considerations necessary for unique environmental conditions and events.

A. Cite nutritional implications for success in marathon events.

B. Describe health related considerations in hot and humid environments.

C. Describe ergogenic aids used by physically active individuals.

INTRODUCTION: How does the temperature and humidity alter performance and health?

LEARNING EXPERIENCES:

- Listen to a mini lecture concerning heat and the body functions.
- View transparencies explaining heat loss methods.
- Plan a rehydration procedure for a runner in a hot humid environment.

INTRODUCTION: DIET RELATED ERGOGENIC AIDS

Define ergogenic aids.

Discuss the most commonly used.

LEARNING EXPERIENCES:

- Attend a lecture on ergogenic aids.
- Participate in a discussion of the current fads concerning the role of diet in sport success.
- View transparencies shewing the functions and the side effects of caffeine ingestion.
- Prepare a special report on a current exercise/diet related 'hot topic', (present if time allows).

Table C.l. Scoring Table for 1.5 Mile Run for College Women*.

	Category	Time in Minutes 13-19 years	20-29 years
1.	Very Poor	18:31+	19:01+
2.	Poor	18:30 - 16:55	19:00 - 18:31
3.	Marginal	15:54 - 14:31	18:30 - 15:55
4.	Good	14:30 - 12:30	15:54 - 13:31
5.	Excellent	12:29 - 11:50	13:30 - 12:30
6.	Superior	11:50	12:30

*These data were adapted from DiNucci & Fleming (1985) A Practical Approach to Health Fitness p. 66

Table C.2. Scoring Table for 1.5 Mile Run for College Men*.

	Category	Time in Minutes 13-19 years	20-29 years
1.	Very Poor	15:31+	16:01+
2.	Poor	12:11 - 15:30	14:00 - 16:00
3.	Marginal	10:49 - 12:10	12:01 - 14:00
4.	Good	9:41 - 10:48	10:46 - 12:00
5.	Excellent	8:37 - 9:40	9:45 - 10:45
6.	Superior	8:37	9:45

*These data were adapted from DiNucci & Fleming (1985) A Practical Approach to Health Fitness p. 66

TEXT DEVELOPMENT

The methodology outlines by Tinkelman, (1971) for test construction includes the following procedures:

1. Developing the test specifications
2. Writing the test items
3. Pretesting the items and analyzing the item statistics
4. Compiling preliminary test forms
5. Trying out the preliminary test forms to verify difficulty, time limits, reliability
6. Compiling final test forms
7. Administering the final test forms

The procedure for the particular test items were:

1. Nutrition items were taken from previously developed items and reliability and discrimination values determined. Fitness items addressed the specific concepts and objectives of the integrated instructional unit.
2. Test items were written according to guidelines set by Chamberlain and Kelly (1981) for multiple choice v/ith four responses.
3. The items v/ere pilottested on subjects in summer nutrition classes and statistically analyzed for reliability and split-half correlations.
4. The test items were compiled and then preliminary test was given to ascertain the ease of reading instructions, time required for administering the instrument, and other necessary data.
5. The final instrument was compiled and administered in the fall and in the spring semesters.

Tinkelman, S.M., Planning the objective test.In Educational measurement. R. L. Thorndike ed. Washington, D.C: American Council on Education, 1971, pp. 46-80.

Likert Scale Development

The likert technique (1932) is based on the development of statements to which subjects respond along a 5-6 point scale of "strongly agree" to "strongly disagree". The score for each person is summed with the negatively stated items reversed for the scoring. Item analysis using a correlation between each item mean and total scale mean will indicate which items to remove from the scale. Items with low correlation to the total should be omitted since they do not show differentiation among individuals, therefore contributing nothing to the scale. Likert used a split halves (odd/even) reliability estimate, corrected with the Spearman-Brown formula to determine reliability of the entire scale. Coefficient alpha is a better reliability estimate since it is the average of all possible split-halves (Crcnbach, 1951). It was developed after Likert reported his method of scale construction. The Likert method has an advantage of being relatively easy to construct and score. It has received criticism as producing only ordinal level scores, but many researchers do treat the scores as interval level determining deans and using interval level tests of significance. This is the method of scoring using in this study of attitudes.