

Running Head: NUTRITION KNOWLEDGE AND APPLICATION

The Relationship Between Nutritional Knowledge and Application

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Abstract

The FDA has proposed a number of actions to address the problem of unhealthy eating behaviors. Among these recommendations is educating the consumer. Education, however, could only be effective if the people did indeed alter their dietary behavior.

This thesis studied the effect that educating a consumer can make on the consumer's diet.

Twenty college students were selected randomly for the study. The subjects were ten females and ten males. The subjects were given a nutritional assessment to test their nutritional knowledge. The subjects were then placed in one of three groups depending on their test scores. The subjects were also asked to record their daily food intake for one day. The list of food was then entered into a nutritional analysis calculator on an approved website. Then, depending on the age and gender of the subject, the analysis gave the recommended daily intake for the subject. The analysis also gave the percentage of the recommended daily intake that the subject did consume on that particular day. Every subject's daily food intake was entered into the data base, and the average for each nutrient for each group was taken. The results were then analyzed, and the relationship between the nutritionally knowledgeable subjects and their application was identified.

The Relationship between Nutritional Knowledge and Application

The World Health Organization has stated that nutrition is an input to and foundation for health and development. Proper nutrition makes people stronger and more productive. Healthy eating habits lead to a stronger immune system, less illness, and better health. Proper and healthy nutrition is a fundamental key to a better quality of life (World Health Organization, 2007). Four of the ten leading causes of death in the United States are directly linked to nutrition. These diseases are coronary heart disease, cancer, stroke, and diabetes mellitus (Abood, Black, & Feral, 2003). The prevalence of unbalanced dietary and lifestyle practices has led to obesity and other dangerous diseases (World Health Organization, 2007). Since the late 1980s, the number of obese people has increased in the United States. Thirty percent of Americans are obese, and 64% are overweight. Unhealthy eating behaviors and dietary habits are the reason that obesity is so common in the United States (U.S. Food and Drug Administration, 2004). Obesity has been proven to increase the risk of developing other diseases such as high blood pressure, type 2 diabetes, heart disease, stroke, gallbladder disease and cancer of the breast, prostate and colon (National Institute of Diabetes and Digestive and Kidney Diseases, 2004). According to the World Health Organization, all forms of malnutrition are directly linked with growing numbers of deaths, mortality, and economic costs (WHO, 2007). The FDA has also proposed a number of actions to address the problem of unhealthy eating behaviors. Among these recommendations is educating the consumer (FDA, 2004). The U.S. government has started prevention programs to attempt to improve dietary lifestyles. These programs suggest dietary changes as a means of disease prevention by educating people about Dietary Guidelines. These guidelines, however,

could only be effective if the people did indeed alter their dietary behavior (Abood, Black, & Feral, 2003).

Statement of Problem

The purpose of this study was to determine the relationship between nutritional knowledge and application.

Importance of This Study

The diet of a typical American does not correspond with the recommendations of the health professionals. Typical diets are very high in sugar and fat intakes and very low in fruit and vegetable consumption. Consumption of fats and sugars are constantly increasing. The prevalence of such unhealthy eating behaviors and rising numbers of obese people in the country has led many health professionals to become more concerned about ways by which these trends may be altered. Many strategies and ideas have been suggested to reverse such unhealthy eating habits. One of these strategies involves increasing nutrition knowledge (Frazao & Allshouse, 2003).

The eating habits of most people could improve significantly. How much of this improvement, however, is directly linked to nutritional knowledge? Can nutritional knowledge and nutritional education really improve the quality of eating behaviors for people? Public health professionals have still not found a clear answer to these questions. Is nutritional knowledge necessary, sufficient, or both in changing food habits? What are some other factors that influence one's eating behaviors?

Health promoters are constantly searching for ways to improve health and well-being. The World Health Organization has written up a report that describes the reasons why improvements in health have been slow and suggests what must be done to change

this. Several key recommendations were given: To strengthen health systems and ensure they are equitable, to ensure that health is prioritized within overall development and economic policies, to develop health strategies that respond to the diverse and evolving needs of countries, to mobilize needed resources for health in poor countries, and to improve the quality of health data (WHO, 2007). The last of these key recommendations is extremely important. Health promoters are responsible to educate the public. How much changes can this education effect?

Malnutrition is defined as poor nutrition because of an insufficient or poorly balanced diet or faulty digestion or utilization of foods. It is caused by a dietary deficiency, excess or imbalance. There are forty different food substances that must be acquired from the diet in proper amounts to support human life. Malnutrition can develop from chronic intakes at levels both above and below the acceptable ranges. There are about one billion people throughout the world who suffer from nutritional deficiencies as a result of inadequate dietary intake. These people who suffer from malnourished usually live in third world countries all across the globe. Their income and housing are insufficient to purchase, store, and prepare food adequately. Their malnutrition is directly related to poverty and not to lack of education (*Encyclopedia of Medicine*, 2007).

Why is malnutrition such an important issue? Studies have shown that malnutrition during the first two years of life causes a child's brain to shrink or atrophy, impairing physical and mental development. It also reduces IQ, slows motor skills, and increases learning disabilities. An improper diet can stunt growth, blocking the body to grow. Insufficient vitamin consumption can cause vision problems and blindness. It can

cause infections which, in turn, reduce appetite and decrease the absorption of nitrogen. The hormones of the body are also affected and the thyroid levels are altered (Bread for the World, 2007).

Not all malnourished people live in developing countries. Other malnourished people come from industrialized countries. Most of the victims are those people who diet or fast to lose weight. Many pregnant women, infants, and children are also victims because their nutritional needs are relatively high. Sicknesses, injuries, alcohol abuse, and drug abuse could also frustrate the digestion and metabolism of food. When there is not enough energy intake, the body loses weight and muscle mass. There are also many significant changes in behavior. The starving person becomes weak and unable to work productively. Also, the immune system suffers tragically throughout the starvation period (*Encyclopedia of Medicine*, 2007). How effective can nutritional knowledge be in these cases?

Many deficiencies of a single vitamin or mineral also occur. Many people in industrialized nations abuse the use of alcohol and drugs. There are many deficiencies which include the deficiency of niacin (pellagra), thiamine (beriberi), vitamin C (scurvy), and vitamin D (rickets). Iron-deficiency anemia is also another mineral which is common among poor families. Vitamin A deficiency is the principal cause of blindness and a major contributor to illness and death among children in developing nations. In third-world countries, deficiencies are so common because people rely on staple foods as the major source of their calories. They do not get the opportunity to diversify their diets to properly nourish their bodies (*Encyclopedia of Medicine*, 2007). Nutritional knowledge may not be as effective in situations such as these.

A study of the correlation between nutritional education, knowledge and behavior is, therefore, crucial. The health departments are searching for ways by which the attitudes and behaviors of the public could improve. Researching this topic could help determine whether education has a significant impact on the behavior of the consumer.

Review of Related Literature

There is much information in the medical literature regarding the science of nutrition and the effects of nutritional knowledge on a person's behavior. In this review, nutritional knowledge is defined. The different types of knowledge are also presented. Consumers are often misled and misguided by inaccurate information. Determining accurate knowledge from fallacies is discussed. The public is influenced by many different motivators that affect the consumer's eating choices. These motivators are mentioned. Questions about the effects that knowledge can have on a person's eating behavior are also investigated. In this review different studies are analyzed. The results of the studies do not all agree with each other. Some studies revealed that nutritional knowledge did indeed positively impact and alter the subjects' choices. In other studies, however, nutritional knowledge was not sufficient to affect the subjects' choices.

Knowing a certain guideline or principle does not automatically mean direct application. Perception and awareness of the relationship between diet and disease, the nutritional contents of certain foods, and healthy eating habits should result in healthier food choices. The U.S. Department of Agriculture did, in fact, show that nutrition knowledge has a significant impact on the food behavior of consumers and their households (Frazao & Allshouse, 2003). In spite of the plethora of healthy eating

guidelines and recommendations, many people still do not follow these guidelines.

Having knowledge about a certain thing does not always mean direct application.

Psychologists have described two different types of knowledge: declarative and procedural. Declarative knowledge is knowledge of what is knowledge of things and processes (Worsley, 2002). One can know that vitamins are essential in one's diet; that too much fat is not good in one's diet. Procedural knowledge is knowledge involving how to do something. This type of knowledge involves application of declarative knowledge. Knowing how to cook well is an example of procedural knowledge. One takes the declarative knowledge and converts it to procedural knowledge. Choosing the healthier snack is another example of procedural knowledge. Many people may realize that they need to reduce their energy intakes, but how do they go about doing so?

Nutrition behavior obviously involves both types of knowledge.

Nutrition knowledge is defined as knowledge of nutrients. This knowledge is applicable when a consumer learns how to benefit from the knowledge of nutrients. The question is how much of this knowledge does each person need to know in order to apply the knowledge to his or her daily life? The answer to this question depends on the person. The nutritionist obviously has certain scientific needs and interests that require a larger amount of knowledge. A nursing mother will have different nutritional knowledge needs. A college student will be more concerned about what nutritional requirements are needed for people his age and gender. An athlete will need other types of nutritional knowledge. There are so many nutritional facts that are known to nutritionist and dieticians. How much does an average consumer need to know about nutrition in order to apply it to his or her every day eating habits? Some areas in which consumers seem to be

interested in include: the energy content of food, the roles of fat, the sources of vitamins and minerals, the sources of phytochemicals, and the links between food production and ecology and sustainability (Worsley, 2002). Other interests certainly depend on the person and his or her specific needs.

Another question is, how much of this knowledge is accurate? Many consumers have “knowledge” about certain foods, yet this “knowledge” is merely misconceptions about nutritional values of foods. Many average people have difficulty assessing the quality of their eating behaviors. In a survey, nearly half of participants with high cholesterol intakes incorrectly believed that their cholesterol intakes were “about right.” For people who have misconceptions about their eating habits, nutrition education would probably be a lot more effective. Interventions involving nutrition knowledge would most effectively influence consumers positively who don’t have this specific knowledge (Frazao & Allshouse, 2003).

Applying this knowledge to eating habits is the next step. What is an eating habit and what does it involve? Eating habits combines a variety of choices involving food. It can range from choosing certain foods because of their nutritional values to cooking a certain food in a certain way. What influences these eating habits, and how much impact does the person’s knowledge about nutrition affect the eating habits? Research has shown that nutritional knowledge is only one among many influential factors that influence eating habits. These factors include the perceived consequences of a certain behavior, beliefs about a certain behavior, skills that are required, the social and physical environments of consumer, and most importantly, motivators. Motivators can contribute a very significant amount of influence on food behaviors. These motivators include

cultural values, social influences, or different environmental rewards (Worsley, 2002). Many consumers value taste, convenience, and price much more than nutrition. Many people, despite knowing that a certain food is not very healthy, may still consume the food because it provides immediate gratification. Other consumers are reluctant to change their present eating habits merely to prevent future problems (Frazao & Allshouse, 2003).

How much influence does nutritional knowledge have on these eating behaviors? Many studies showed that knowledge had insignificant, if any, influence on the quality of eating behaviors. Other studies, however, showed that knowledge does, in fact, influence eating habits. A study was performed by Wardle *et al.* on a group of 1040 subjects who were 18-75 years of age. The study assessed and surveyed the participants and determined accordingly the link between knowledge and application. After careful analysis, the authors were able to see the correlation between knowledge and healthy eating habits. The participants with more nutrition knowledge were twenty-five percent more likely to consume sufficient amounts of fruits and vegetables daily. Another study conducted by the USDA's economic Research Service revealed that the mothers' knowledge about food and nutrition directly affected their children's diets. Still another study conducted on an adult population in the US revealed a direct correlation between cancer-prevention knowledge and adequate consumption of healthy foods. The more knowledgeable adults consumed vegetables, fruits, fiber, and fat in amounts closer to the recommended daily values than the less knowledgeable participants (Worsley, 2002).

Another question is what factors influence a person's nutrition knowledge? A study conducted by Chew and Palmer found that one of the main reasons there are

differences in nutrition knowledge is because there are differences in nutrition interests among people (Worsley, 2002). For example, elderly people generally consume more fruits and vegetables than do younger people. As people age, they tend to care more about eating healthy since benefits of healthy eating will be more apparent and noticeable (Frazao & Allshouse, 2003). A study conducted on ninety-seven middle aged women revealed that there was a positive association between knowledge of fats and consumption of low fat diets. In another survey of 475 elderly participants, it was found that there was a direct link between nutrition knowledge and reading of nutrition information panels. A study performed on elders found that the sample's nutrition knowledge about dairy products influenced the type of milk they consumed. Reviews have shown that children who are educated regarding nutrition have shown a healthier change in their dietary behavior that lasted for about two years (Worsley, 2002). All these studies reveal that nutrition interest, which leads to nutrition knowledge does, in fact, influence in some way eating behaviors and habits.

Research shows that age and gender also influence nutritional knowledge and eating behavior. A study that focused on sixth, seventh, and eighth grade adolescents in a middle school was conducted to determine nutritional knowledge based on gender, eating behavior based on gender, and the correlation of nutritional knowledge and eating behavior based on gender. The results showed that there was no significant difference in eating behavior among the sixth graders based on gender. Differences in eating behaviors, however, among the seventh and eighth graders were highly significant. Girls tended to be more knowledgeable and health-conscious than the boys. A possible explanation to this difference may be that girls tend to become more occupied with their

physical appearance at an earlier stage than do boys of the same age. This, in turn, results in higher nutritional knowledge and application (Pirouznia, 2001).

Another study was conducted on college female athletes to determine the effectiveness of a nutrition education intervention on improving dietary intakes. Dependent and experimental groups were selected. Nutritional knowledge was assessed based on a questionnaire and a three-day diet analysis was recorded. There was not a significant difference between results from the experimental and results from the control group. The experimental group was treated with an eight-week nutrition education program. The athletes in the experimental group experienced a significant increase in nutrition knowledge and they reported a significant increase in confidence regarding choosing healthier foods. This study supported the significance and efficacy of a nutrition education. The female athletes did in fact, positively change their eating behaviors (Abood ,Black, & Birnbaum, 2004).

Another study was conducted in a colorectal cancer clinic on fifty subjects to determine the effect of a nutrition education leaflet. The subjects were assessed about their nutritional knowledge before and after exposure to the leaflet. After the subjects were exposed to the leaflet, there was not only an increase in facts about fruits and vegetables, but there was also an increase in the consumption of fruits and vegetables. Twenty-three percent of the subjects self-reported to have improved their eating habits. This study showed that education could improve eating behaviors, yet the behavior is not necessarily guaranteed (Dyer, Fearon, Buckner, & Richardson, 2004).

A study was conducted on a physically active, highly-educated, wealthy population in Boston, Massachusetts. The objective was to determine if trans fat

knowledge was related to education level and nutrition label use in a population of health-conscious adults. A twenty-two question survey reviewed by dietitians was given to 320 people. The survey included questions that assessed the participants' knowledge about trans fats and saturated fats. The participants' nutritional attitudes and behaviors were also analyzed. Results showed that participants with high trans and saturated fat knowledge considered the Nutrition Facts label when purchasing packaged foods. About 86% percent of the participants who got high scores on the assessment considered the nutrition label before purchasing a specific food. Seventy- five percent took into consideration the calorie content of a food, and eighty-percent considered the total fat content of a food. The participants who did consider nutrition fact labels had significantly higher trans and saturated fat knowledge scores than participants who do not take the food label into consideration (Hess, Yanes, Jourdan, & Edelstein, 2005).

Not all studies, however, show that nutritional knowledge affects dietary behavior. A study was conducted in a supermarket to establish the relationship between increasing awareness about nutritional value about selected foods and changes in customers' purchasing choices. The National Cancer Institute launched this study in the Giant food stores in an effort to alter food purchasing behavior. The institute intervened by posting food-guide labels which included calorie, fat, cholesterol, sodium, and fiber for all items on the shelves. Nutritional information and recipes were also posted monthly on a bulletin board. One of the purposes of this study was to determine the amount of change in the consumer's purchasing of "recommended" and "unrecommended" items. The institute hoped that self-reported buying and consumption of food high in fiber and low in fat would increase. They also hoped that purchasing of

items that were high in fat would decrease. After analyzing the data, however, no significant changes were reported concerning high-fiber food purchasing. One other goal of the study was to alter food preparation method as a result of increased awareness. The statistics, however, did not show any significant improvement (Rodgers, Kessler, Portnoy, Potosky, Patterson, Tenney, Thompson, Krebs-Smith, Breen, Matews, & Kahle, 1994).

Other studies tended to focus on a different approach other than increasing knowledge to encourage consumers to eat healthier. The study focused on lowering prices of low-fat, healthy snacks in vending machines. The results showed that the overall sales volume did not increase, but the sales of low-fat snacks did increase significantly when the prices were lowered. The study showed the interventions that include lowering of healthy food costs may actually be more effective than a nutrition education intervention. Nutrition education interventions tend to increase nutritional knowledge but have low, short-lived effects on actual healthy eating behavior changes (French, Jeffery, Story, Hannan, & Snyder, 1997).

Different results have been reported by different studies. This study was conducted at Liberty University to determine the relationship between nutritional knowledge and application for college students.

Research Procedures

Twenty subjects were selected randomly for the study. The subjects were ten females and ten males. All of the subjects were college students, and their ages ranged from 19 to 22 years old. They all consented to participate in the study, and they all agreed to do as was asked of them.

The subjects were each given a nutritional assessment to test their nutritional knowledge. This test was compiled by the author of the research project using a nutrition book (Sizer & Whitney, 2003). The test consisted of 25 questions. The first question asked the participants how many calories they thought they consumed every day, and the second question asked how many calories the participants thought they needed every day. These two questions would later be used to get a general idea of whether the subjects did really try to consume as many calories as they thought they needed. The rest of the questions were nutritional questions that asked about fats, proteins, carbohydrates, sugars, cholesterol, vitamins, minerals, and fiber. All of the questions were multiple choice questions or true and false questions. The scores were then determined depending on the number of correct answers. Depending on the number of correct answers, all the subjects were classified into one of three groups. Group 1 included all the subjects that scored above average. Group 2 included the subjects who scored around the average, and Group 3 included all the subjects that scored lower than the average.

The subjects were also asked to record their daily food intake for one day. The subjects wrote down everything they ate and drank on a certain day. The list of food was then entered into a nutritional analysis calculator on an approved website (Nutrition Analysis Tools and Systems, 2005). The nutritional analysis gave a numeric value for the

number of calories, protein, fat, carbohydrates, sodium, vitamin A, vitamin C, saturated fat, and cholesterol the subject consumed on that particular day. Then, depending on the age and gender of the subject, the analysis gave the recommended daily intake for the subject. The analysis also gave the percentage of the recommended daily intake that the subject did consume on that particular day. Every subject's daily food intake was entered into the data base, and the average for each nutrient for each group was taken. The averages were then compared, and results were taken.

Although this review did not give an absolute answer to all the questions regarding nutritional knowledge, it gave examples of studies that were conducted. Results did not all match, but this displays the need for further study.

Analysis of Data

The scores on the nutritional knowledge test ranged from three correct answers to twenty-two correct answers. The average of the scores was a 13.55. Subjects that scored over a 13 were placed into Group 1. Group 1 was labeled the group with the more than average nutritional knowledge. The average score for Group 1 was 16.33. Subjects who scored a 12 or 13 were placed into Group 2. Group 2 was labeled as the group with the average amount of nutritional knowledge. The average score for Group 2 was 12.4. Subjects who scored less than 12 were placed into group 3. Group 3 was labeled the group with the less than average nutritional knowledge. The average score for Group 3 was 7.17.

The average of the recommended daily intake for each group was then taken. For Group 1 the average for the recommended daily caloric intake was 111%. Percents ranged from 50% to 173%. The average percentage of recommended daily intake for protein was 226%. It ranged from 70 to 329%. For fat it was 113%. It ranged from 45 to 231%. For sodium the average percentage was 212% of daily recommendation. For vitamin A it was 217%. For vitamin C it was 203%. For saturated fats it was 112%. For cholesterol it was 87%.

The analysis for group one was good in general. People consumed calories very close to the recommended daily intake. Protein intake, however, was 226% of the recommended intake. That is more than double what is recommended. Fat intake was also good. Sodium intakes were also more than the recommended daily intake; it was more than double. Both vitamin A and vitamin C were taken in large amounts. It seems that even people with more than average nutritional knowledge think they need more

vitamins than they actually do. The cholesterol intake for Group 1 was also excellent, and the average did not exceed the daily recommended value.

The average caloric amount consumed by Group 2 was 97% of the recommended caloric intake. The percentages ranged from 59 to 139%. The percentage of protein intake was 153% of the recommended. For fats it was 96%. For sodium it was 161%. For vitamin A it was 397%, and for vitamin C it was 382%. Saturated fat was 95% of the daily recommended value. Cholesterol percentage was 104% of the recommended daily value.

Group 2 results were also good in general. The caloric intake was excellent. The protein consumption was also exceeded, but not as much as Group 1. Fats were consumed in a moderate amount. Sodium was also taken in by more than the recommended daily value. The vitamins were taken in very large amounts. The average person takes in too much of vitamins, thinking that the more vitamins in, the better. Saturated fats intake was not exceeded. The cholesterol level was not bad either.

The average caloric amount consumed by Group 3 was 128% of the recommended daily intake. Protein was consumed by an average of 194% of the recommended intake. Fats were taken in 110% of the recommended. Sodium intake was 168% of the recommended daily intake. Vitamin A was 121%, and vitamin C was 201%. Saturated fats were 121% of the recommended, and cholesterol intakes were 131% of the recommended.

Group 3 did not do so badly either. Group C exceeded the recommended daily caloric intake by the highest percentage. The percentage differences, however, were not very significant. Group 3 only exceeded the recommended daily value by 17% more than

Group 1 exceeded the recommended value. Protein consumption was exceeded by all three groups, but ironically, the most knowledgeable group exceeded the recommended intake by the most amount. Fat intake for group 3 was not bad. Sodium intake was exceeded, but, again not as much as Group 1. The two vitamin intakes were more than the recommended. Group 1 and 2, however, exceeded the recommended amount by much more than Group 3 did. Group 3 did the worst at saturated fats and cholesterol consumption. Group 3 exceeded the daily recommended intake by the most amount.

Column 1 in Table 2 lists the amount of calories reported from each subject in each group that the subject thought was consumed daily. The second column represents the amount the subject thought was needed. The third column represents the amount of calories actually consumed. This information was used to determine whether the subjects abided by the knowledge they thought they possessed, whether it was true or not. Only 22% of subjects in Group 1 thought they consumed more than they needed. Sixty-percent of subjects in Group 2, however, thought they consumed more than they needed. Fifty-percent of subjects in Group 3 thought they consumed more than they needed. These results show that knowledgeable subjects in Group 1 were more likely to abide by their recommended daily caloric intake, given the right amount. The percentages of people who were willing to abide by the assumed number of recommended caloric intake in Group 2 and Group 3 were a lot less.

Table 1

	Group 1	Group2	Group3
Calories	111%	97%	128%
Protein	226%	153%	194%
Fat	113%	96%	110%
Sodium	212%	161%	168%
Vitamin A	217%	397%	121%
Vitamin C	203%	382%	201%
Saturated Fats	112%	95%	121%
Cholesterol	87%	104%	131%

*Percentages represent the percentages of the recommended daily intake consumed by each group.

Table 2

	Calories Thought Consumed	Calories Thought Needed	Calories Actually Consumed
Group 1 Subject1	2700-3000	2500	3827
Group 1 Subject 2	3000	2800	3526
Group 1 Subject 3	4500-6000	4500-6000	3958
Group 1 Subject 4	3500-4000	3500-4000	3714
Group 1 Subject 5	2000	2000	1096
Group 1 Subject 6	2500-3000	2500-3000	2359
Group 1 Subject 7	2000 or less	2000	2298
Group 1 Subject 8	1300	1300	1157
Group 1 Subject 9	8000	5000	4373
Group 2 Subject 1	2000	1500	1703
Group 2 Subject 2	2500	2200	2090
Group 2 Subject 3	3500	3000	4026
Group 2 Subject 4	1800	2000	2706
Group 2 Subject 5	2000	2000	2148
Group 3 Subject 1	3000	3000	3754
Group 3 Subject 2	1000-2000	1000	2122
Group 3 Subject 3	2000	At least 1300	2363
Group 3 Subject 4	2000	2000	3775
Group 3 Subject 5	2100	1800	1603
Group 3 Subject 6	1500	1000	3345

Summary, Findings, and Conclusions

The study did not show any significant relationship between nutritional knowledge and application. The subjects who scored the highest on the nutritional assessment did not have a significantly healthier diet than the subjects who scored lower. The subjects that scored higher, however, did show that they thought they were consuming as many calories as they thought they should be consuming. This might indicate that the more knowledgeable subjects were probably more likely to abide by the recommended intakes had they known what was expected.

Although the study did not show much difference between subjects with high nutritional knowledge and low nutritional knowledge regarding application, this does not mean that nutritional knowledge is not important. It may not be sufficient for a person to eat healthy; it definitely is a necessary factor.

The study may have had its limitations. The subjects' diets were not observed, and there might have been error in the recording. Participants may not have recorded everything they had eaten, or they might have mistakenly recorded amounts that were not exact. The diet analysis was also taken for one day. This day may not have represented a typical day for the subjects. Also, there were only twenty randomly selected subjects. Twenty subjects is a very small number compared to the population of college students. Their diets and nutritional knowledge more than likely do not represent every college student's diet and nutritional knowledge. There could have been limitations in the nutritional analysis as well. The age and gender of the participants were entered into the system which decided what the daily recommended value was for the certain subject depending only on gender and age. Energy intakes vary from person to person, and many

other factors should be taken into consideration. Although all the females were in the same age range, all the females who participated in the study did not weigh the same, and they did not all expend the same amount of energy. The males also were all in the same age range, but they all did not weigh the same and their activity levels were not the same either. The system did not take any other factors into account other than gender and age.

Recommendations for Future Studies

Unhealthy eating behavior is definitely a problem that is very common not only in the United States, but worldwide. Many diseases could possibly be avoided and risks of getting diseases may be reduced if people ate healthier diets.

There are many factors that affect a person's eating choices. Age and gender affect a person's eating habits. Income levels could also affect a person's food. Many families cannot afford to eat properly and adequately. These families very often suffer from malnutrition and vitamin deficiencies. The media can also affect a person's dietary choices. Many commercials and advertisements commend certain foods. Different celebrities claim to eat a certain food, influencing others to do so as well. Different cultures have different cuisines and eating habits. All these factors affect a person's food choices. This, however, does not undermine the fact that everyone should be educated and taught about how and what to eat.

Nutritional education is a very essential step in reaching a goal of a healthy lifestyle. Although there are other factors that influence a person's eating habits, education programs should still be implemented. The first step in doing something right is knowing what is right.

Further studies should study different effective ways to implement education programs and raise awareness to all people of all ages about healthy eating behaviors and their consequences. Many organizations target different types of people to promote nutritional awareness within that specific group. The EFNEP, for example, is an organization that targets low-income families. The organization educates the families and teaches them how to apply their education (The University of Tennessee, 2003). Organizations such as these are probably more effective because they target certain specific types of people. People are of different ages, genders, and cultures. People can come from low-income and high-income families. Organizations should focus on one group at a time to make a difference.

Further studies should also study different effective ways to promote healthy eating habits and propose different ways that the consumer can apply nutritional knowledge to direct behavior. The goal is for a healthier lifestyle, and one cannot attain that without the proper nutritional application.

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Appendix

Name _____ Gender _____ Age _____

1. How many calories do you think you consume on a typical day?
2. How many calories do you think your body needs on a typical day?
3. When you eat more than your body needs, what happens to the extra nutrients?
 - a. Well, if it's protein, my body will use it to build muscle mass.
 - b. Only if the extra food is from fat or carbohydrates, then my body will gain fat.
 - c. If you eat more than your body needs, your body will gain fat.
4. Complex carbohydrates should be...
 - a. Avoided as much as possible
 - b. Should be exchanged with protein whenever a person can
 - c. Be the major source of food consumed.
5. When looking at bread
 - a. It's better not to eat bread
 - b. the one with a darker color always has more nutritional value than the lighter color
 - c. whole grains are the healthiest; the brown color does not always mean that it's healthiest
6. Most of the calories in peanut butter come from...
 - a. fat
 - b. protein
 - c. carbohydrates
7. Honey should always be used instead of sugar because it has less calories.
 - a. True
 - b. False
8. Which of these statements about fats are true?
 - a. There are three types of fats.
 - b. Olive oil is very healthy, and taking in extra will not make me gain fat.
 - c. I should eliminate fats from my diet.
 - d. All these statements are true.
9. Which is true about cholesterol?
 - a. Exercise causes a rise in HDL cholesterol levels.
 - b. All types of cholesterol clog your arteries.
 - c. None of these answers are right.
10. Circle the right answer among these.
 - a. You can't get protein from plants; you have to get them from meat or dairy.
 - b. The more protein you consume, the better.
 - c. Proteins help athletes build more muscle.
 - d. None of the answers are correct.
11. If you consume too much Vitamin C what happens to the vitamin?
 - a. My body uses however much I give it.

- b. My body gets rid of it in the urine.
 - c. My body stores it in the liver for later use.
12. How many vitamins can you get from the sun?
- a. None, you have to eat your vitamins
 - b. 1, Vitamin D
 - c. 2, Vitamin D and K
 - d. all the vitamins
13. Which of the following vitamin(s) is (are) present only in foods of animal origin?
- a. the active form of vitamin A
 - b. vitamin B12
 - c. riboflavin
 - d. all the vitamins
14. What happens if someone consumes too much iron?
- a. iron is toxic, and once absorbed, it's difficult to excrete
 - b. it can cause tissue damage, especially the liver
 - c. infections can occur
 - d. only a and c are correct
 - e. all are correct
 - f. none are correct
15. Is consuming too much calcium bad for you?
- a. yes, it could cause stones in the urinary tract
 - b. no, nutritionists say that the more milk you drink the better
16. What happens if you do not include sodium (salt) in your diet?
- a. one doesn't really NEED salt to function properly; it just adds flavor to most foods
 - b. you might get hypertension
 - c. you get muscle cramps
 - d. I don't really know
17. Which of the following diets are recommended?
- a. muscle stimulators
 - b. stomach stapling
 - c. herbs containing ephedrine
 - d. none of the above
18. Which of the following provides most of the energy the muscles use in the early minutes of activity?
- a. fat
 - b. protein
 - c. carbohydrates
 - d. b and c
19. Which of the following stimulates formation of muscle cell protein?
- a. physical activity
 - b. a high-carbohydrate diet
 - c. a high-protein diet
 - d. amino acid supplementation
 - e. protein shakes

20. Research does not support the idea that athletes need supplements of vitamins to perform their best.
- a. True
 - b. False
21. The best way to plan a diet to support the immune system is to exceed the recommended dietary allowances for each nutrient.
- a. True
 - c. False
22. Which of the following have been shown to improve acne?
- a. avoiding chocolate and fatty foods
 - b. retinoic acid or Retin A
 - c. vitamin A supplements
 - d. all of the above
23. To digest food efficiently, people should not combine foods, such as meat and fruit, at the same meal.
- a. True
 - b. False
24. Which food (s) from the bread, cereals, rice, and pasta group generally contain fat?
- a. biscuits
 - b. muffins
 - c. pasta
 - d. (a) and (b)
25. Which nutrient passes through the intestines unabsorbed?
- a. starch
 - b. vitamins
 - c. minerals
 - d. fiber