

EVALUATION OF A COLORED BACKGROUND  
ON PRINTED NUTRITION EDUCATION MATERIAL

by

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## I. Introduction

Law enforcement personnel are highly trained professionals given the mission of enforcing society's laws. These professionals have basic needs common to all humans, one of which is proper nutrition. The law enforcement profession has unique work related demands placed upon it. These unique work related demands have the following nutritional implications: diabetes (1-4), cardiovascular disease (1-7), and obesity (5-7). The individual utilizes various senses in relation to food consumption. The smell, taste, and, especially, sight are several senses used. Various characteristics of food are present: the shape of food, solid or liquid; the texture of the food item, smooth or coarse; and the color of the food item. It is the color of the food item that makes one of the initial impacts upon which the individual bases his or her judgement of that food item. The increased use of convenience and processed foods has focused upon the aesthetics of advertising and packaging. The visual appeal generated has a direct relation regarding an individual's feeling or attitude regarding that food item.

Visual appeal can be applied in nutrition education programs. Present limitations upon training time and training funds have resulted in professional trainers choosing the most cost effective means of realizing

training goals. Visual appeal created through the effective use of color presents an avenue to influence attitudes which enhance learning.

### Implications

Society has a vested interest in safeguarding the effectiveness of law enforcement professionals. Through education and training, effectiveness is maintained. Education transmits knowledge. Knowledge affects attitudes. Attitudes affect performance. It is theorized that through effective use of color in written nutrition education materials, immediate recall will be increased. An improvement in immediate recall represents an increase in knowledge. The increase in nutrition knowledge may possibly generate favorable attitudes regarding nutrition education.

### Objectives of This Study:

1. To determine the knowledge of a selected area of nutrition of the participants prior to the distribution of the nutrition education pamphlet.
2. To determine the attitudes of the participants toward the area of food and nutrition.
3. To measure the immediate recall in relation to the nutrition information provided in a pamphlet of three separate background colors and on a white pamphlet.

4. To determine if the attitude of the participants towards nutrition affects immediate recall when using any or all of the background colors.
5. To determine if the prior nutrition knowledge of the participants affects immediate recall when using any of the background colors.

## II. Review of the Literature

### Law Enforcement as a Population

The general public has grown increasingly dependent upon the services of the law enforcement profession. In the fiscal year of 1979, the general public spent approximately \$822,268,000 for police protection (8). The health status of law enforcement officers should be excellent to be health care cost effective. As has been recommended (2), it would be wise to increase knowledge of the health-diet relationships to the general public. Possibly, educational strategies targeted to specific groups could be more effective in achieving earlier results. Kok and associates (9), in their study involving a stratified random sample of 1,951 adult Dutch men and women between the ages of 18 and 64, evaluated the concept of targeting nutrition information to specific groups versus the general public at large. Information about knowledge, behavior, and attitude relative to coronary heart disease risk factors was acquired. Food recalls were conducted to obtain diet histories of the subjects. A less than desirable food consumption pattern qualified the subject to be in the target population. A questionnaire survey ascertained the method of education most preferred by the target population. The authors attempted to identify from a heterogenous population a subgroup in need of

nutrition education intervention, to profile this subgroup, and to identify the preferred method of nutrition information delivery. The authors identified the selected subgroup as 18-44 year old subjects who had large families, were in the lower socioeconomic strata, and whose nutritional habits did not follow accepted dietary recommendations. The authors concluded that individual or group counseling techniques which utilize a television medium should be used as educational methods.

Law enforcement personnel would possibly qualify as a subgroup in need of nutrition education intervention. The law enforcement officer is particularly prone to the development of heart disease, hypertension, cancer, stroke, diabetes, and arteriosclerosis (10-13). These disorders have resulted in lost manhours, early retirement, light duty status restrictions, earlier mortality than that of most other occupations, and earlier mean age for hospital admissions versus those for most other occupations (2,13). A contributing factor in the development of heart disease, hypertension, cancer, stroke, diabetes, and arteriosclerosis is poor nutrition (1-7). One of the most pressing problems in law enforcement research has been the lack of a sufficient number of controlled studies to allow definitive conclusions to be made.

Richard and Fell (14) surveyed hospital admissions in

the state of Tennessee. Of the 8,728 admission surveyed, 70 were police officers. Police officers were admitted to the hospital at a significantly higher rate than individuals in other occupations evaluated in this study. Circulatory and digestive system complaints were the most often cited ailments for the police officer hospital admissions. These disorders have nutritional implications.

Fell and associates (15) conducted an epidemiological examination of the records of death certificates, community health centers, and mental hospitals to determine the incidence of stress related disorders for occupations with over 1,000 employees as of 1970 in the state of Tennessee. One hundred and seventy four of the diseases listed in the International Classification of Diseases (ICD) were chosen to have been associated with physical and mental health conditions related to psychological stress. The actual data collection period covered the number of incidences during 1972-1974. There were 6,717 death certificates issued covering premature death or suicide associated with stress related diagnoses, 8,450 community mental health center admissions from 22 of the state's 27 such centers, and 8,460 hospital admissions with stress related diagnoses from 3 general hospitals located in different parts of the state. The authors found that law enforcement officers had a significantly higher number of deaths and general

hospital admissions than other occupations reviewed in this study; however, admissions of police officers to mental health facilities were not significantly higher than those in other occupations evaluated. This finding could possibly be related to the unwillingness of law enforcement officers to seek this type of treatment. A comparison of cause of death and hospital admissions for police was not significantly different from the other occupations studied. Circulatory and neoplasms were the leading two causes of death; whereas, digestive disorders and circulatory disorders were the leading two causes for hospital admissions for the police group. Lester (16) evaluated injury and illness data from various states for law enforcement personnel. He determined the incidence of injury and illness of law enforcement officers in comparison to other occupations for the years 1977 and 1978. Law enforcement personnel in Connecticut had an injury/illness rate of 39.7/100 police officers in 1977 while in 1978 the rate increased to 43.9/100 police officers. For 1978, the State of Hawaii reported rates of 35.2/100 for policemen and detectives compared to a rate of 10.2/100 for other workers. In 1977, California reported a rate of 23.9/100 for full time workers for law enforcement officers compared with a rate of 34.2/100 for sanitary

service workers and 22.9/100 for fire fighters. In California for the period of 1971-1975, 209 law enforcement officer fatalities were reported of which 131 were associated with diseases. The most prominently occurring disease was cardiovascular disease. It appeared to be a major debilitator of law enforcement personnel, which is representative of the overall population in the United States.

Price and associates (17) examined police officers (N=213) from the Dallas, Texas, Police Department; Richardson, Texas Police Department; and the Texas State Department of Public Safety. The subjects ranged in age from 20-50 years and were measured for certain physical performance, biochemical, and anthropometric parameters. The authors reported the following: (a) that the younger police officers, below the age of thirty years old, possessed several risk factors for coronary heart disease, specifically percent of body fat and cigarette smoking; (b) the middle aged police officers showed a higher risk than the 20-29 year age group for coronary heart disease; and (c) ninety percent of the officers possessed at least one coronary risk factor.

Occupational psychological stress has been reported to be the major contributor to the early morbidity and mortality in law enforcement occupations (10-15, 18).

Kroes and associates (11) conducted interviews with police officers of Cincinnati, Ohio. The majority of these officers were Caucasian with all the participants involved in police car operations. The interviews were semi-structured covering the officer's background, perceptions of job stress, and health status. The authors concluded that police officers are in a uniquely high stress occupation. Job stresses affect their lives all the time, producing an adverse effect on the total life of the officer. Alkus and Padesky (18) identified major stresses experienced by those in law enforcement. They were:

- (a) performance-related: a lack of well-defined roles outlined and a lack of departmental back-up;
- (b) organizational-related: supervisory discrepancies and structural concepts;
- (c) external, duty-related: a court system too lenient with offenders and a public attitude which ranged from apathy to hostility;
- (d) and lastly, personal-related: marital/family situations where emotional withdrawal takes a toll upon the relationship with the spouse and children.

The author found that law enforcement personnel prematurely incur an above normal number of injuries, illnesses, and deaths. The major contributor of this early morbidity and mortality appears to be cardiovascular and digestive maladies resulting from an abnormally high amount of job

related psychological stress.

Recently, there has been contradictory opinion to this theory. Malloy and Mays (19) suggest that law enforcement may not have the high psychological pressures earlier attributed to it. They state that it would be too simplistic to conclude that law enforcement is too stressful for all police officers. Individual considerations must be taken into account. The authors propose the Stress-Diathesis model theory in which the psychological make-up of an officer dictates how stressful the occupation is perceived to be by that officer. Secondly, law enforcement officers are afforded better health insurance benefits than other occupations. These health insurance benefits allow the officer a greater opportunity for the officer to seek medical attention without the financial burden. It should be noted that this suggestion possibly explains the higher number of hospital admissions; however, the prevailing attitude toward mental health admissions would possibly explain the low admission rate in this area which was reported by Fell (15). Malloy and Mays (19) also concluded that further law enforcement research is needed in this area.

Nutritional consequences would be the effect of poor nutrition knowledge, inappropriate food availability, and poor meal planning. Nutritional health is a contributing

factor to the physical health of an individual. Proper nutrition intervention has made an impact on the risk factors associated with hypertension, heart disease, stroke, cancer, arteriosclerosis and diabetes (1-7). Kelly (20) conducted a nutrition intervention program aimed at weight reduction for members of the Boston, Massachusetts Police Department. This program consisted of volunteers attending twelve lectures covering various topics. Of the original 78 volunteers, 53 completed the program. There was a mean weight loss of 7.5 kg. At twelve months past program completion, 26 of the 53 graduates were reassessed through a questionnaire survey. These 26 respondents had a mean weight loss of 10.9 kg. at the end of the initial program. At the post program reassessment, 25% of these 26 subjects had an additional weight loss of 4.4 kg. One respondent maintained his initial weight loss while 12 respondents had a weight gain of approximately 3.5 kg. None of the respondents returned to their former weight status. Kelly's project illustrates that some law enforcement personnel are receptive to nutrition intervention. Although this study used volunteers and approximately 32% of the original volunteers failed to complete the study, the importance of the research with this profession needs to be emphasized due to the large investment made by the public and the benefit to the

health of the officers who would remain in such a program.

### Attitude

Color is a motivating cue or stimulus. Birth and Veroff (21) classified motivation as an instrumental or goal directed activity. Such an activity increases in intensity as it continues toward its end, that being the achievement of its goal. Consummatory activities are activities which are goal specific. Therefore, instrumental activities tend to be consummatory activities. Motivation is the stimulus which propels an instrumental or goal directed activity toward the achievement of the goal or consummatory activity. There are four determinants to instrumental activities. The first is availability. A particular stimulus initiates a particular action. An analogy which illustrates this point would be the purchase of a food product. Initially, the product must be made available for purchase. The second determinant is expectancy. Expectancy gives action to the path towards a goal. The food product to be purchased must possess something the consumer wants or needs. The consumer expects this product to fulfill a need or want. Determinant number three is incentive. The strength of the instrumental activity is determined by incentive. The importance of weighing the consequences of this purchase are execution versus non-execution. The

strengths of consequences interact with each other and influence whether an action is taken or not. Secondly, once purchased, will the product deliver the expected results? The last determinant is motive. Motives are the modifiers of incentives. Motives may override the incentive in achieving a goal. Motives and incentives interact with each other to determine if the action is taken. For example, the purchaser may wish to purchase a product for a particular reason. The cost of this purchase is exorbitant; however, the desire for the purchase overrides the cost factor. The purchase is the consummatory activity in this instance. Motivation is an indicator of attitude. The definition of attitude is:

"Attitude is a state of mind or feeling with regard to some matter." (22)

Sims (23) expands upon this basic definition in a step like fashion. Attitude is a mental state which uses past experience as a point of direction toward a particular subject or object. Interrelationships of concepts as well as one concept leads to attitude formation. Opinions differ from attitudes in that they are a reflection of our attitudes on a controversial issue. The interrelationship of a concept or concepts and an object is referred to as belief. Assessing attitudes toward nutrition is a critical element in the field of nutrition education. The

perception an individual may have regarding nutrition will be based upon the individual's experience creating a mental state which influences or contributes to the formation of an opinion. The opinion of nutrition is derived from a belief of the role of nutrition in the interrelationships of good health, convenience, and economy.

The opinion of an individual reflects that person's attitude. Sims (23) goes on further to clarify attitude versus belief by stating that a belief is a response which can be judged correct or incorrect. There exists a difference of right from wrong. However, an expression of an attitude, affective, is made by the beliefs, cognitive, of a person. The belief reflects the relationship between an object relative to something else.

Foley and associates (24) stated that there are three components of attitude. They are: (1) information and the individual's evaluation of it; (2) emotion - motivational supports; and (3) resultant tendency toward action. Simply stated, information as knowledge, experience, or other forms of input, give a basis from which an attitude is formulated. The emotion allows for evaluation of the input, and finally a resultant tendency towards action is the output. This output could possibly be a belief based on an attitude which would give rise to an opinion.

There is, however, no conclusive agreement on what

constitutes an attitude. Randall (25) states that there is:

"...no clear elucidation of what an attitude is, or how attitudes interact with other closely associated concepts as opinions, beliefs, motivations, and actions."

Foley (24) further defines the parameters by which an attitude functions as:

"...existing within a set of other attitudes, a readiness to act, existing within the intangible setting of one's mind, being semipermanent in structure, learned by the individual, and assuming an evaluative role for the person."

Werblow and co-workers (26) examined 125 female competitive, college age athletes on the topics of general nutrition for the athlete. Of the 125 volunteers, 94 responded to the questionnaire survey. Thirty-one nutrition and nineteen attitude questions were incorporated into the test instrument. The respondents had a better nutrition knowledge score for nutrition of the athlete versus general nutrition. Positive correlation coefficients were found for nutrition knowledge and training weight control and pre-event weight control. Weight control was of primary importance to the respondents. The authors also observed that those respondents who

received prior nutrition education had significantly higher knowledge and attitude scores as compared to those who did not. The motivational component in this study appeared to be the desire to lose weight. Prior nutrition education in this study had a positive impact upon nutrition knowledge. Secondly, subjects who registered higher in aptitude and nutrition attitude exhibited a higher rate of implementing such nutrition knowledge.

Foley and associates (27) randomly sampled fourth to sixth graders in Kansas (N=3,231). The subjects were administered a 130 item pre-tested questionnaire. The instrument was designed to measure nutrition knowledge, nutritional attitudes, and dietary practices. Relationships between nutritional attitudes and practices were also evaluated. The subjects were composed of the following: 50% male, 50% female, 95% white, 3% black, 2% other ethnic groups, 75% lived in town and 25% on farms. The age range was 9.6 to 13.4 years. The authors concluded that girls possessed a greater amount of nutrition knowledge than boys while both urban and rural students had similar nutrition-related knowledge scores. Students from the farm areas had higher nutrition-related attitude scores than town students. The conclusions of the authors suggest that knowledge does not reflect attitude. What an individual knows about a subject may not always relate to

the feeling that individual has towards that subject.

Nutrition education professionals are faced with a difficult task. Rudell (28) stated that prudent nutrition related consumerism benefits those who need it least. Individuals possessing better education and higher income make a more efficient use of nutrition information, although it is the lower income persons who need nutrition information most. This assumption is contradicted by Spitze (29) who attempted to measure the nutritional knowledge of a group of men and the relationships of nutritional knowledge to certain demographic characteristics and participation in food related activities. Full time university employees (N=97), possessing a minimum of a bachelor's degree, were randomly selected for an interview survey. No significant correlation was demonstrated between nutrition knowledge scores and the variables of age, educational level, or any of the food related activities. The subjects possessed more nutrition knowledge about general nutrition than about specific nutrients. Of interest was the source from which the respondents acquired their nutrition knowledge. Over one-half of the subjects (50%) stated that newspapers and magazines were a preferred source of nutrition information. Only 10% of the respondents stated that nutrition education classes or the cooperative extension service were the

preferred source of nutritional information.

### Color

Pearson (30) in her study of Virginia dietitians, stated that 87% of the new information learned was through sight. We may define sight as a faculty of vision (22). Secondly, we may define color in terms of physical as well as a psychological visual response to wave lengths of visible light (31). Color is an intricate part of our environment. Through visual perception of color the mood of an individual can be affected. Color acts as a cue to evoke responses on the part of an individual (21, 32-35). This cue is the motivating device which can associate a stimulus and response or associate two separate stimuli. The perception or interpretation phase allows for a coherent picture of the stimuli to effect a response. Learning, the culmination of the motivation-perception-learning cycle, is achieved through perception. It is then evident that learning is initiated by and directly related to motivation (36,37). The reader can see a similarity in this cycle and that of attitude formation (24).

The use of color in the area of food and nutrition becomes quite evident as one strolls through the aisles of the local food store or views pages of printed advertisements (38). Food packaging and advertisements

have used the motivating cue of color to draw attention to the product for sale (38). The net result will be an increased profit for the seller. The relationship of color and nutrition education has not been extensively explored (39). (Appendix 1 and 2, Note correspondence)

Recently, the area of health maintenance and disease prevention has been promoted. Part of this prevention effort encompasses the field of nutrition education. Through nutrition education, an attempt is underway to reverse the effects of major health risks some of which are nutrition related (1-7, 13). The question arises as to what are the results of effective nutrition information?

Jason and Frasure (40) evaluated the effect of nutritional information about brown rice at the point of purchase. Nutrition information available at the supermarket contrasted the nutritional benefits between brown and white rice. The incentive projected was to become healthier due to an expectancy generated by the information regarding the improved nutrient content of brown rice. The study was conducted in a suburban supermarket in a geographic location whose inhabitants favored the purchase and use of white rice. The investigators developed English language and Spanish language nutrition information signs. These signs, emphasizing the nutritional benefits of brown rice

consumption over white rice consumption, were placed next to the brown rice section of the supermarket shelf. The investigators failed to mention whether the brown rice and white rice sections were in close proximity, allowing for all potential rice consumers to read the information. The investigators counted the number of brown rice boxes and the number of white rice boxes on two separate occasions, one time representing the baseline or prior to intervention, the other time representing the intervention treatment. The intervention treatment initially increased the use of brown rice; however, from later evaluations conducted in the study a decline in the use of brown rice was identified. The researchers felt that the intervention program was initially successful due to the availability of the information at the purchase site. This allowed for no time lapse to interrupt the motivational effect of the information. The researchers concluded that the treatment was not effective in changing well established dietary patterns in the community.

Hays (41), using a questionnaire survey, evaluated the acceptance by Expanded Nutrition Education Program (ENEP) Aides (N=998) in Pennsylvania, of printed nutrition education materials which utilized large print, were readable, were illustrated, and were printed on colored paper stock. Hayes theorized that color generated a more

positive attitude toward the information transmitted in a printed format. Three different handout formats were developed, two versions per format. Each format dealt with a different variable under study. The handouts were more acceptable when: (a) printed on colored paper, (b) the color contrast of ink to paper was maintained to assist in legibility, and (c) color usage was a motivational cue to read the information. This study reinforced the conclusion of Jason and Frasure (40) that printed nutrition education material can be effective when available at the point of purchase and when used in a format designed to enhance reader acceptance.

Motivating cues have been used to create a variety of responses. One particular response was memory. From a summary of several early studies regarding audiovisual techniques (42) conducted by Long (1946), McLean (1930), Vandermeer (1948, 1949), and May and Lumsdaine (1958), no effect of color upon recall could be identified. Color was not found to enhance learning from audiovisual techniques. Research design flaws, i.e., multiple variables influencing the results, prevented definite conclusions from being drawn. Maruyama and Forester (43) conducted informal evaluations of county home economists and 4-H extension agents regarding the use of a series of computer programs on nutritional topics. The purpose of these computer

programs was to interest passers-by at public places about nutrition. The passers-by were found to be favorable in their evaluations on the use of color, sound, and graphics in this type of display.

Nilsson and Nelson (44) investigated the effect of color on memory of four male subjects, one of whom was a principal investigator of the study. Sixteen monochromatic stimuli were to be matched by the subjects at a rate of one stimuli at a time. The subjects failed to attain exact matches indicating a loss of accuracy in precise match recall. The authors (44) indicated that color assisted the memory to be approximate in recall rather than exact. Due to the small sample size, the study would need to be repeated with a larger sample before definite conclusions could be made. Secondly, the authors failed to cite the visual acuity of the participants. Peck and Unze (45) examined the effect of redundancy upon memory. The subjects (N=200) were assigned to various subgroups (N=50) covering age groups ranging from pre-school through adults. Ten members of each subgroup were assigned to each of five categories ranging from non-redundant to redundant informed. The objective was to identify a collection of letters and colored images. Six trials were given per category. The researchers found that search times decreased with each successive trial and with the greater amount of information

given to the subject, i.e., redundant category versus the non-redundant category. The authors concluded that color can assist in image recall. Peck and Unze (45) repeated their study to assess the reliability of the pattern exhibited in the first study (45). The research design was identical to an earlier study with the following exceptions: (a) N=80, (b) five trials were conducted rather than six, and (c) a new category of more redundant was introduced to all subgroups except the adult group. The research results were similar to the original and established the reliability of this type of research (45). These researchers suggest that redundant information, of which color is one type, aids in visual searches. This principle is applicable to product recognition used in product advertising. Secondly, it creates a positive attitude through consumer appeal of the packaging. A possible motive for the use of color would be to influence consumer attitudes and eventually behavior through the visual medium (23).

Well and Green (46) investigated the effect of color and perception. The authors sampled undergraduate college students (N=10) for their ability to match letter names and forms. Sixty-four trials were conducted by using sixteen letter pairs identical in form and name, sixteen letter pairs identical in name but different in form, and

thirty-two letter pairs different in name. Each letter pair appeared as two colored letters on a colored background. In 75% of the trials, both letters were the same color, in 25% of the trials, both letters appearing were different colors. The letters A, B, C, and E were used in different forms for the trials. The objective of the study was to identify the letters by form and name. The authors concluded that the letter form was easier to identify and match than the name form. Color enhanced the recognition and identification of the letter forms.

Carter (47,48) conducted two experiments examining the effect of color. In his first study (47), seventy-eight volunteers, 17-35 years of age, were selected from an introductory psychology class. Eighteen subjects were assigned to each subject condition and asked to locate a pre-announced target from a number of three digit targets. The critical targets were presented in a circular array identified by the first two digits and by the color of the digits. The author concluded that mean search times increased proportionally with the target class size (TCS) when the TCS was increased from 1 to 10 to 30 with color coding and 30 to 60 on black and white displays. The rate of the search was more rapid for a TCS of 30 than 60. In the second study (48), two colors were presented on each display. The target class was always the lighter color

with the background colors always darker. All other procedures were identical as in the previous experiment (47). Search time was virtually unchanged by 29 background items of a color very different from the target's color. Similar results were noted when a greater color contrast between the color of the target or the absence of a colored background was used. When the background items were similar to the target, search times were longer. The greater the number of background colors, the longer the search time. Carter also found that highly contrasting colors, when used together, provide more effective perception.

One can conclude, therefore, that color acts as a subconscious cue to learning. Primarily, the use of color provides the attention getting device to enhance perception in an effort to learn, such as highlighting to emphasize a point. Secondly, with classical conditioning incorporated by a high degree of color leading to memory retention, color displays as evidenced in food advertisements could bring a conditioned response by the purchase of the advertised food item. The association of the advertisement and purchase represents the culmination of the instructional activities to the consummatory activity (21).

This assumption has been contradicted by authors of other studies. Rudell (28) investigated the role of

nutrition information in food choice selection. The author presented a questionnaire to members of a Parent Teachers Association (N=187), who were 25-55 years old, possessed education levels from high school dropout to graduate school, and had income ranging from \$6,000-\$75,000 per annum. Subjects were required to have at least one child at home and do most of the family's grocery store shopping. The model respondent was a white, 35-39 year old, full time housewife who was a high school graduate with annual family income of \$15,000-\$20,000. The author stated that out of a possible ten information types sampled, brand names and advertising claims finished seven and ten respectively. Broad-based conclusions could not be made due to the design of the study. The effect of advertising information types on populations which were either of lower socio-economic status, of lower educational levels, or of households with two working parents was not measured.

Rusted and Coltheart (49) studied the effect of color upon children's recall. The sample (N=100) was divided between boys (N=53) and girls (N=47) who had a mean age of 9 years 3 months. The participants were shown passages to read. The participants were subdivided into three groups: Group #1 was asked to read passages which had no accompanying pictures, Group #2 was asked to read passages which had accompanying pictures, and Group #3 was given

passages with colored backgrounds. Although the pictured passages helped the poorer readers, the effect of color was concluded to be insignificant. Peck and Unze (45) also observed a slower search time with children when compared with adults. A possible explanation would be greater comprehension skills of adults versus children.

Freimuth and associates (50) surveyed respondents (N=100) in three geographic locations in the United States: the East Coast, the Midwest, and the West Coast. The respondents were asked to screen test 58 television health public service announcements (PSA) for effective message performance. The respondents were shown television programs of 25 minutes in length. The health PSA were embedded in the programming time. The authors concluded that audio-slogan and audio repetition of the subject matter were most significant as attention getting devices. The effect of color in the PSA was not listed as a significant attention getting device.

In evaluating the Foods for Health Nutrition Education Program, a joint consumer nutrition education project of the National Institutes of Health (NIH), National Heart, Lung, and Blood Institute (N.H.L.B.I.) and Giant Foods, Inc., (51), the effect of color was measured by the evaluation of the artwork utilized in the educational material. Five and three-tenths percent of the respondent

cited artwork as the best feature in comparison to 35.5% of the respondents who liked the recipes and cooking tips. Unfortunately, this survey did not take into consideration the motivating influence of color in providing a cue or incentive to pick up and evaluate the contents of the pamphlet.

A third type of response color may elicit, is the physiological effect. Pelligrini and co-workers (52) studied male students' (N=60) quadriceps strength function. The function of muscular strength was correlated to different colors from the psychological color chart (32) shown to the subjects. A rest period was allowed between color showings. The color card was shown to the subject simultaneously as the subject was lifting the weight utilizing the quadriceps muscle group. The blue colored card produced a greater amount of weight lifted versus exhibition of a pink colored card. One drawback of this study was that only male students were used as subjects. Prior exposure to the color and the color preferences of the subjects were two of the uncontrolled variables in the research design. Eason and Smith (53) evaluated the motor performance of college undergraduate men (N=56). The authors used various colored darts and various colored targets to illustrate motor performance interaction of dart throwing. Although the sample size was small, the subjects

reported no color perception deficiency prior to testing and the subjects were randomly sampled to avoid bias. The authors concluded that a proportional relationship existed between the color contrast of the target and the ability to distinguish the targets.

Lastly, color may generate a psychological effect regarding color perception. Rubinoff and Marsh (54) asked college students (N=154) to evaluate their perception of would-be voters to the color of a political poster. Subjects were asked which color pattern related best with the particular personality characteristics being judged. Posters with six color combinations were used, one for each assigned college class. Responses of males (N=87) and females (N=67) were analyzed separately. Males ranked extroversion highest and associated it with a poster color combination of white on blue, the lowest rank for extroversion was orange on blue. The white on blue color combination was highly associated with honesty by females, whereas a black on yellow combination indicated the highest ranking for male competence. Personal color perception appeared to affect the results since one color was perceived differently by various individuals.

Jacobs and Nordan (55) studied the effect of color as a measure of a patient's perception of function of oral medication. The objective of this study was to have the

subjects describe the psychological effect of the capsule (i.e., stimulant or depressant). Two groups were evaluated: Group #1 - a college undergraduate group (N=50) with a mean age of 19.14 years and Group #2 - a group of adults who didn't attend college whose mean age was 42.52 years. The subjects were shown simulated medicine capsules of a variety of colors. The subjects evaluated the blue colored capsules as depressants while red and yellow capsules were classified as stimulants. The findings of the authors parallel those listed in relation to moods identified in the psychological color chart (32) and those implemented by business enterprises (34, 33-40). The sample size was limited, but more importantly, the ages of the subgroups were not matched which might affect the reliability of the results.

The relationship between the use of color in nutrition education materials has not been extensively researched. The research presented in this review illustrates the inconclusive findings regarding the functions and the limitations of the use of color for nutrition education purposes. The present study was designed to determine if color has an effect on immediate recall when used for nutrition education materials.

### III. Experimental Procedures

#### Overview

Questionnaires were developed and administered to students in basic training at the Federal Law Enforcement Training Center (F.L.E.T.C.), Glynco, Georgia, to determine the effect that color had on the immediate recall of nutrition information. Nutrition information was provided in the Eater's Almanac (Vol. I, No. 21) (Appendix 3). The overview of the experimental procedure is given in Table 1. The details will be discussed later.

#### Facilities

The training facility at Glynco, Georgia, is supervised by the U.S. Department of the Treasury to provide various levels of law enforcement training to approximately fifty-one federal law enforcement agencies. The training courses are divided into two general divisions: (a) a basic law enforcement curriculum and (b) an advanced law enforcement curriculum. Only basic curriculum trainees were selected for participation in this project; however, there exists a possibility that trainees enrolled in these basic programs have had prior law enforcement training and work experience.

The classrooms which were utilized for the test were located in Buildings 64, 252, and 262. These facilities were of modern design and construction, were heated and air

TABLE 1: OVERVIEW OF EXPERIMENTAL PROCEDURE

	<u>Step 1</u>	<u>Step 2</u>	<u>Step 3</u>
	<u>Pre-Test</u>	<u>Pilot Test</u>	<u>Experimental Project</u>
Identity of Subjects	U.S. Bureau of Prisons Training Staff	D.E.A. Basic Agent Class No. 32 -Session I N=40 -Session II N=40	F.L.E.T.C. Basic Classes (11)
Number of Subjects	N=24	-Session I N=40 -Session II N=40	Session #1 - N=313 Session #2 - N=286
Procedure	Developed Test Instruments Questionnaires -Nutrition Knowledge (NKQ) -Attitude (AQ) -Immediate Recall (IRQ)	Administered revised - Test Instruments Questionnaires - Nutritional Knowledge (NKQ) - Attitude (AQ)  - Read <u>Eater's Almanac</u> ,  Vol. I, No. 21)  Administered Immediate Recall Questionnaire (IRQ)	Session #1: Administered - Final Questionnaires A - Demographic/ Occupational B - Nutrition Knowledge (NKQ) C - Attitude (AQ)  Session #2: Administered - Read <u>Eater's N.E.P.</u> Almanac  - Final Questionnaire D - Immediate Recall (IRQ)

conditioned, had excellent lighting, and adequate seating to conduct this project.

Format of Project:

Selection of Sample Population

Three separate groups were chosen to participate in this project. Each group was involved in a separate stage of this project. They were: Step 1 Pre-test - personnel from the U.S. Department of Justice, Bureau of Prisons Training Staff; Step 2 Pilot-test - trainees from the U.S. Department of Justice, Drug Enforcement Administration Basic Agent Class No. 32; and Step 3 Experimental Project - trainees from 11 F.L.E.T.C. basic training program classes.

Prior to involvement in this project, permission was obtained from the Director of F.L.E.T.C., the Directors of Training from each participating agency, and the class coordinators of the participating class (Appendix 4). Basic federal law enforcement curriculum trainees (N=400) located at the F.L.E.T.C. were solicited for volunteer participation in the experimental nutrition education project. The volunteers (N=313) were selected from a representation of various basic programs for the following reasons: (a) length of training period which allowed for a time delay required between Sessions I & II of the study, (b) a larger variety of training programs from which to select, and (c) the cooperation required by all responsible

parties allowed for such a project. A list of the classes selected for participation in this project can be located in Appendix 5.

### Procedure

#### Development of the Test Instruments

#### Indices for Analysis

##### Characteristics of Sample Population:

Marital Status of the Subject: What effect marriage and living with a spouse had on the nutrition knowledge of a subject was investigated. Secondly, the sex of the subject and the marital status of the subject was examined to distinguish which group: (a) married female, (b) single female, (c) married male, and (d) single male; possessed the greatest degree of nutrition knowledge.

Ethnic Background: The effect of ethnic background upon the nutrition knowledge and performance of the subjects was also investigated. The author selected representatives from all ethnic backgrounds for participation in this project.

Years of Schooling: Ability of the subject to respond to nutrition education questions focusing on various subject areas of nutrition in relationship to the educational experiences of the individual was assessed.

Amount of Nutrition Education Experience: This variable was chosen to illustrate whether a correlation

existed between nutrition knowledge and the amount of nutrition education experience the subject had completed.

Years of Prior Law Enforcement Experience:

The effect prior law enforcement experience had on a trainee's level of nutrition knowledge was evaluated. The law enforcement profession encompasses health risk factors which may be affected by nutrition education intervention (20).

Attitude Towards Nutrition: The attitude of the subject toward nutrition was measured by using a questionnaire which covered four separate subject matter areas put into the following subscales: weight control, general nutrition concepts, nutrition relevant to law enforcement, and food faddism.

Nutrition Knowledge Questionnaire (NKQ,  
Questionnaire B)

Thirty multiple choice and fifteen true-false questions were developed (56) using various sources of nutrition information (57,58) in addition to those developed by the author. The purpose of these questions was to establish baseline data on nutrition knowledge for each subject and for comparison to measure the effect of the treatment. General nutrition concepts, weight control, specific nutrient use, and food faddism were the subscale topics represented in this questionnaire. The subscales

of general nutrition concepts, weight control, specific nutrient usage, and food faddism were established to evaluate specific topics of nutrition to be investigated (59). Each subscale question was placed in one or more subscales based on the nutrition subject area addressed. Of the original 45 questions tested for validity and reliability, 25 were used in the final questionnaire.

Attitude Questionnaire (AQ, Questionnaire C)

Twenty questions were developed using a Likert scale to measure attitude toward nutrition. The subscales of weight control, nutrition relevant to law enforcement, food faddism, and general nutrition concepts were represented in this instrument. These twenty questions were reviewed for validity and reliability as is later discussed.

Immediate Recall Questionnaire (IRQ, Questionnaire D)

The immediate recall questionnaire consisted of twenty-five items incorporating a twelve question test utilized by Giant Foods/National Heart, Lung, Blood Institute (N.H.L.B.I.) in prior research (51). In the revision, five of these questions were removed. These Giant Foods/N.H.L.B.I. questions were specifically developed to evaluate the nutrition education material presented in Eater's Almanac, Vol. I, No. 21. The format of the questions was changed for this project so that the style for all three project test questionnaires would be

consistent. The test instruments appear in Appendices 6 and 7.

### Reliability and Validity

The validity of these three questionnaires was established by an evaluation of the thesis committee, faculty and graduate students of the Department of Human Nutrition and Foods and by Dr. Robert Frary the Learning Resource Center, Virginia Polytechnic Institute and State University (V.P.I. & S.U.), Blacksburg, Virginia. After the initial evaluation, the questionnaires were changed to conform as closely as possible to the recommendations and by using the computer evaluation of the pre-test and pilot-tests (60). The questionnaires were resubmitted for final approval to the thesis committee. Computer analysis of the correlation coefficients for each questionnaire was used to determine reliability.

### Choice of the "Eater's Almanac"

The Eater's Almanac was a publication developed for use in the Giant Food/N.H.L.B.I. Foods for Health Project (51). The format of this publication consisted of twenty-six issues four pages each in length. The publication was designed for aesthetic appeal and had various forms of artwork, variable print size, and each featured a different color. Several colors were used on several occasions in the course of the twenty-six issues.

The publication featured information in several areas of nutrition which were pertinent to the consumer. For the current study, the Eater's Almanac, (Vol. 1, No. 21) was chosen for the following reasons: (a) it possessed the advantages of written educational materials (31, 61), (b) it was used in a prior research project, and (c) it possessed the aesthetic appearance and nutrition information desired by the author. The Eater's Almanac used in this study was printed on three different colored backgrounds and the control group had black print on white background. Experimental Group #1 had black print on a blue background. Experimental Group #2 had black print on a green background. Experimental Group #3 had black print on a yellow background.

### Test Implementation

#### Pre-Test

Staff members (N=40) of the Federal Bureau of Prisons (B.O.P.), Office of Training, located at F.L.E.T.C., were selected to participate in the pre-test. The questionnaires which were developed to determine nutrition knowledge (NKQ) and attitudes (AQ) were given to this group.

The B.O.P. subjects were given initial written instructions regarding the purpose of the project (Appendix 8), the purpose of the pre-test, and directions

for completing the pre-test. The purpose of the pre-test was to: (a) record the time necessary to complete each phase of testing process, (b) to determine if written instructions needed further clarification, (c) to determine if the test instrument questions were understood by the subjects, and (d) to identify potential problems not anticipated by the author and (e) to determine the reliability of the test questions.

The steps of the pre-test were as follows:

- (a) The subjects were informed that the purpose of the study was to gain further understanding in the application of the nutrition materials with a law enforcement population.
- (b) A packet was distributed to each pre-test participant. The packet included the following: An introductory letter, written instructions in reference to recording answers on the data coding sheet as well as recording the starting and completion time for each test instrument, and a standard data coding sheet (DCS). The pre-test subjects recorded an identification code for data test sheet identification. The pre-test subjects noted any problems which they incurred with the pre-test.
- (c) The pre-test data coding sheets were collected

at a central collection point.

- (d) The pre-test data coding sheets were sent to Virginia Polytechnic Institute and State University, Blacksburg, Virginia, and evaluated.
- (e) Based on the evaluation of the pre-test results, appropriate changes were made to the test instruments.

### Pilot Test

A pilot test was conducted on students of DEA Basic Agent Class #32 (N=40). Participation was mandatory. The procedures were identical to the experimental project described in the next section.

The results of this pilot test were evaluated by Dr. Robert Frary and the committee. Recommendations were implemented for use in the Experimental project. The results are shown in Appendices 9-12.

### Experimental Project

#### Presentation of Project to Subjects

The prospective sample population was addressed by the project director and/or the class coordinator regarding volunteer participation in this study. Each class was addressed separately. A minimum target population of 240 subjects was needed to allow for student variation; therefore, requests for participation was issued to those agencies having basic training program classes being

conducted during the months of November and December, 1984. Secondly, those classes would have to be in training for a sufficient period of time to allow for a minimum 10-day time lag between Sessions #1 and #2.

The introductory session to obtain volunteers was conducted either several days prior or just prior to Session #1. The introductory session was scheduled this way based on the discretion of the class coordinator. The prospective study participants were informed of the interest by F.L.E.T.C. in nutrition education research as it applied to law enforcement and the nutritionally related health consequences of the law enforcement officers. Regarding the design of the study, the prospective study participants were informed that the project was: (a) for volunteers only, and (b) consisted of two parts requiring a time lag of at least 10 calendar days. They were also told that the study attempted to measure: (a) the level of nutrition knowledge of law enforcement trainees, (b) the ability of printed nutrition education material to improve nutrition knowledge, and (c) to determine the attitudes of federal law enforcement trainees toward nutrition. The subjects were not informed during the course of the project that the purpose of this study was to measure the effect of colored backgrounds on retention of information in the written materials.

Project Session #1

The steps of this project were conducted in the following order for Project Session #1:

- A. Data coding sheet (DCS) and a #2 lead pencil were used to record responses of participants. The participants were instructed in the method of recording answers on the DCS. Next, the participants were instructed to complete the DCS identification block. The social security number of participants was used as the identification number. Project session #1 was designated by Form A. An assigned number was used to denote the agency employing the participant. The participants were instructed to answer all questions. Questionnaires and answer sheets were distributed.
- B. The participants recorded answers on the DCS during the forty-five minutes allowed to complete the test questionnaires A-C (Appendix 5). The time limit was based on the results of the pilot study.
- C. At the conclusion of the allotted time, the participants were instructed to recheck their recorded answers for completeness. The DCS and questionnaires were then collected.

- D. Class coordinators informed the trainees as to the arrangements for Project Session #2.

Project Session #2:

- A. A period of 10 calendar days elapsed before Project Session #2 was conducted.
- B. DCS and #2 lead pencils were distributed. Instructions for participant identification were given to the participants. The participant was assigned to one of four possible experimental groups by the project director based on the last four numbers of the participant's ID number. Eater's Almanac, Vol. 1, No. 21, (NEP) was distributed to the volunteers.
- C. At a set command, the participants were given 15 minutes to read and review the contents of the pamphlet.
- D. At the expiration of this time period, the Eater's Almanac, Vol. 1, No. 21, was collected from each volunteer.
- E. The test questionnaire form D (Appendix 6) was then distributed to the participants.
- F. The participants were given 30 minutes to answer the questions and allowed to leave the test area upon completion of the test instruments.
- G. The DCS and questionnaires were then collected.

The DCS from project session #1 and #2 were evaluated by the project director for completeness. Any incomplete DCS were identified. The participant responsible was then contacted by the project director in a follow-up effort to answer all demographic questions. The DCS were then sent to V.P.I. & S.U. for data processing.

### Treatment of Data

#### Data Analysis

Mean scores of the questionnaires B (NKQ) and D (IRQ) were compared among the treatment groups to determine the background color most effective in immediate recall. Printed background color represented the treatment. Correlation coefficients were calculated to study variable interrelationships. Multivariate analysis was also conducted to determine which treatment was most significant in affecting immediate recall.

#### Scoring of the Nutrition Knowledge

The frequency of correct responses was obtained from the total number of possible correct responses. One point was awarded for a correct answer with 0 points awarded for an incorrect answer.

#### Scoring of the Attitude Survey

The subject had four potential answers from which to choose. The possible answers and respective score per answer are as follows: completely agree (4 pts.), partly

agree (3 pts.), partly disagree (2 pts.), completely disagree (1 pt.). A composite subscale score was tabulated by the author. The composite score represented the total number of points accumulated by a subject for each subscale. The composite score was divided by the number of subscale questions. This figure reflected a mean questionnaire item score.

#### Scoring of the Immediate Recall Instrument

The frequency of correct responses was obtained out of a total of twenty possible correct responses. One point was awarded for a correct answer and 0 points given for an incorrect answer. Scores were totaled to determine if background color of the printed material had any affect on immediate recall.

#### IV. Results and Discussion

##### Description of Sample Population - Session #1

The descriptive and occupational data of the NKQ/AQ sample population (N=313) appears in Table 2. The sample population ranged in age from 20-54 years. Male subjects dominate the sample population (80.8%). A majority of the subjects (58.7%) were in the not married and living with spouse classification. Caucasians (63.6%) were most prominent, hispanics were a distant second (25.2%), and blacks were third (6.7%). Almost 69 percent of the subjects possessed some college education. The overall majority (97.8%) possessed a high school education or more. More than one-half of the subjects (56.6%) had no formal nutrition education experience. Nearly 82 percent had formal nutrition education experience ranging from none to less than 3 months. A majority (52.4%) had less than one year of professional law enforcement experience. Candidates with 2-5 years of law enforcement experience composed the next largest segment (20.1%) of this sample. In summary, the majority of this sample population was Caucasian 20-34 years of age, male, not married and living with spouse, no formal nutrition education experience, and had less than one year of professional law enforcement experience.

Correlations analysis was conducted on a number of

TABLE 2: DEMOGRAPHIC and OCCUPATIONAL DATA  
SESSIONS #1 and #2

	SESSION #1 (N=313)		SESSION #2 (N=286)	
	Number	Percent	Number	Percent
Age: 20-24	85	27.2	74	25.9
25-29	127	40.6	118	41.3
30-34	74	23.6	71	24.8
35-39	18	5.8	16	5.6
40 & Over	9	2.8	7	2.6
Sex: Male	253	80.8	231	80.8
Female	60	19.2	55	19.2
Marital Status:				
Married with Spouse	129	41.3	123	43.0
Other	183	58.7	163	57.0
Ethnic Background:				
Negro	21	6.7	16	5.6
Hispanic	79	25.2	75	26.2
Caucasian	199	63.6	181	63.3
Other	14	4.5	14	4.9
Years of Schooling:				
Non HS Grad	7	2.2	6	2.1
HS Grad	91	29.1	76	26.6
Associate	40	12.8	35	12.2
Bachelor	154	49.2	149	52.1
Masters & Above	21	6.7	20	7.0
Amount of Nutrition Education Experience:				
None	177	56.6	156	54.6
<3 Mo.	79	25.2	76	26.6
3-6 Mo.	40	12.8	38	13.3
6-12 Mo.	10	3.2	10	3.5
>12 Mo.	7	2.2	6	2.1
Years of Professional Law Enforcement Experience:				
<1 Yr.	164	52.4	146	51.1
1-2 Yr.	21	6.7	18	6.3
2-5 Yr.	63	20.1	61	21.3
6-9 Yr.	50	16.0	47	16.4
10 or More Yrs.	15	4.8	14	4.9

demographic and occupational variables (62-64) (N=10). The older the law enforcement trainee, the greater the possibility for that trainee to not be married and living with a spouse,  $r=-.349$ ,  $p\leq.0001$ . This finding is consistent with the work reported by Alkus and Padesky (18) regarding personally related stresses. Secondly, the older trainees appeared to have more law enforcement experience,  $r=.341$ ,  $p\leq.0001$ . The higher the education level of the trainee, the better the NKQ score,  $r=.350$ ,  $p\leq.0001$ . Lastly, a positive relationship was found between the NKQ score and the IRQ score of the trainees,  $r=.428$ ,  $p\leq.0001$ .

#### Description of Sample Population - Session #2

The descriptive data of the Session #2 participants (N=286) also appears in Table 2 and was compared with the Session #1 participants (N=313). Session #1 participants were requested to return for participation in Session #2. There was a loss of 27 subjects (9.1%) between Sessions #1 and #2. The sample population ranged in age from 20-54 years. The majority (92.0%) of the subjects were 20-34 years of age. Male subjects (80.8%) dominated this sample. A smaller majority than in Session #1 were not married and living with spouse (57.0%). Caucasians dominated the ethnic origin (63.3%). College educated subjects were in the majority (71.3%) with a similar percentage represented in each category from Session #1 to Session #2. A majority

(97.9%) possessed a high school education or higher. Slightly over half of the subjects (54.6%) possessed no formal nutrition education experience. Around 81 percent possessed none to less than 3 months of formal nutrition education experience. Lastly, 51.1% of the subjects possessed less than one year of law enforcement experience. Similar to the Session #1 sample, officers with 2-5 years of experience composed the next largest block of participants.

In summary, the Session #2 study sample parallels the profile of the Session #1 study sample. Although small shifts in some characteristics of the participants were noted, the Session #2 study sample had a majority who were Caucasian 20-34 years of age, mostly male, not married and living with a spouse, possessed a minimum of 2 years of college education, had no formal nutritional education experience, and possessed less than one year of professional law enforcement experience.

#### Comparison with F.L.E.T.C. Basic Law Enforcement Training Population

A comparative analysis was performed on the F.L.E.T.C. student population (N=2,843) for fiscal year, 1985 (October, 1984-September, 1985) to the present (65). Similar law enforcement candidate descriptive data between the study sample and the F.L.E.T.C. basic law enforcement trainee

TABLE 3: COMPARISON OF SESSION PARTICIPANTS and FLETC STUDENTS (BASIC)

	<u>F.L.E.T.C. (BASIC)</u> <u>STUDENTS</u>	<u>PARTICIPANTS</u> <u>SESSION #1</u>	<u>PARTICIPANTS</u> <u>SESSION #2</u>
Number of Students:	2843	313	286
Age Range:	32*	20-54	20-54
Sex:	Male - 2368 (83.3%) Female - 475 (16.7%)	253 (80.8%) 60 (19.2%)	231 (80.8%) 55 (9.2%)
Marital Status:	Married - 1511 (53.1%) Single - 1332 (46.9%)	M & - 129 (41.2%) O - 183 (58.5%)	123 (43.0%) 163 (57.0%)
Ethnic Background:	Negro : 288 (10.5%) Hispanic : 547 (19.8%) Caucasian: 1856 (67.3%) Other : 65 (2.4%)	21 (6.7%) 79 (25.2%) 199 (63.6%) 14 (4.5%)	16 (5.6%) 75 (26.2%) 181 (63.3%) 14 (4.9%)
Years of Schooling:	GED : 137 (5.0%) H.S. Grad : 963 (35.4%) Asso. Degree: 271 (10.0%) BA/BS : 1204 (44.3%) MA/MS & Above : 145 (5.3%)	Non H.S. Grad: 7 (2.2%) H.S. Grad : 91 (29.1%) Asso. Degree : 40 (12.8%) BA/BS : 154 (49.2%) MA/MS & Above : 21 (6.7%)	6 (2.1%) 76 (26.6%) 35 (12.2%) 149 (52.1%) 20 (7.0%)
Years of Law Enforcement:	Average Length of Service = 53 months (4.42 yrs)	Less than 1 Yr - 164 (52.4%) 1-2 Years - 21 (6.7%) 2-5 Years - 63 (20.1%) 6-9 Years - 50 (16.0%) 10 or More - 15 (4.8%)	146 (51.1%) 18 (6.3%) 61 (21.3%) 47 (16.4%) 14 (4.9%)

\*Mean Age

population is provided in Table 3. The F.L.E.T.C. population had a mean age of 32 years. The majority of this population were Caucasian, married, male, possessed at least two years of college education, and approximately four and one-half years of law enforcement experience. The amount of formal nutrition education experience was a new variable not available on the F.L.E.T.C. general student profile information sheet. Therefore, the variable could not be compared.

#### Results and Discussion by Project Objective

Objective 1: To determine the nutrition knowledge of the subjects prior to the distribution of the pamphlet on food and nutrition.

The mean score of NKQ responses was 10.38 items correct out of 20 with a standard deviation of 2.7. These findings are presented in Table 4. The range of the NKQ scores was 3-17. The reliability estimate (KR-20) was .486 with 11 out of 20 NKQ test questions having a significantly positive correlation ( $r=.30$  or above) with the total pre-test score. With over half of the questions answered correctly, one can assume that the subjects possessed some degree of knowledge in the subject of nutrition; however, guessing by the participants possibly took place as reflected in the reliability estimate (KR-20=.486).

TABLE 4: MEAN SCORES of the NUTRITION KNOWLEDGE QUESTIONNAIRE (NKQ)

<u>Session #1 N=313</u>	
<u>Treatment of Paper Color</u>	
White	
	N=72
Mean	10.74
SD	2.813
Range	5.0-17.0
SE	0.332
Blue	
	N=71
Mean	10.42
SD	2.729
Range	4.0-17.0
SE	0.324
Green	
	N=73
Mean	10.16
SD	2.483
Range	5.0-16.0
SE	0.291
Yellow	
	N=69
Mean	10.48
SD	2.811
Range	5.0-16.0
SE	0.338
<hr/>	
Overall	
Mean	10.38
SD	2.708
Range	3-17
SE	1.942
KR-20	.486
<hr/>	

Key: KR-20 - Kudor-Richardson 20  
SD - Standard Deviation  
SE - Standard Error of Mean

Due to insufficient test identification information, 28 subjects were eliminated from Session #2 before computing the NKQ scores. The mean NKQ score by treatment and control groups varied from 4 to 17 (Table 4). The participants who read the black print on white background, had the highest mean score of 10.736 with the scores for the yellow, blue, and green groups of 10.478, 10.422, and 10.164, respectively. Although the overall difference in the mean scores was only .572, it is interesting to note that the control group who read the traditional black print on white background had the highest mean score; however, the groups were not significantly different in their responses. It could be concluded that the subjects possessed some knowledge of nutrition upon arrival at F.L.E.T.C. This finding parallels the conclusions of Spitze (29) who reported that a group of adults who lacked formal nutrition education experience, but had some knowledge of nutrition.

It cannot be concluded that this mean NKQ score represents the baseline nutrition knowledge level of all new law enforcement subjects or new federal law enforcement students. Prior mention was made regarding new federal law enforcement officers possessing prior professional law enforcement experience with either another federal, state, county, or municipal law enforcement agency. This factor

makes ascertaining the baseline nutritional knowledge level of first time law enforcement officers a difficult task. The importance of acquiring this baseline nutrition knowledge level provides a basis to determine how much nutrition information is acquired by law enforcement personnel once on the force. Establishing this baseline offers the possibility of expanding the nutrition knowledge base of law enforcement personnel through targeting towards the nutrition subject areas most in need. Secondly, it would serve as a guide in planning nutrition education training.

The NKQ from Session #1 was subdivided into four subscales, and these data are displayed in Table 5. The test questions were analyzed according to four subscales: general nutritional concepts, weight control, specific nutrient usage, and food faddism. Several questionnaire items were used in more than one subscale. Of the 24 possible questionnaire items analyzed by subscale, 15 knowledge questions had the highest frequency responses which coincided with the correct answers. General nutrition concepts had the highest number of questions with the correct answer. Food faddism had the lowest number of questionnaire items having the correct answer; however, fewer questions dealt with this subscale.

The numerous diet authorities recommending a variety

TABLE 5: KNOWLEDGE QUESTIONNAIRE (NKQ)  
RESPONSES BY SUBSCALE <sup>1</sup> (N=313)

Subscale	NKQ Item Number	Choice Number				+
		1	2	3	4	
General Nutrition Concepts:						
	4	34	40	106		<u>/188/*</u>
	5	71*	15	84		<u>/140/</u>
	6	42	9	<u>/258/*</u>		4
	7	30	14	<u>/233/*</u>		35
	11	29	21	<u>/132/*</u>		129
	14	30	5	<u>/260/*</u>		18
	15	78	<u>/160/*</u>	46		28
	18	<u>/154/*</u>	66	57		34
Weight Control:						
	1	<u>/200/</u>	2	105*		6
	2	1	0	102*		<u>/209/</u>
	3	7	<u>/259/*</u>	24		23
	4	34	40	106		<u>/133/*</u>
	11	29	21	<u>/132/*</u>		129
Specific Nutrient Usage:						
	8	<u>/139/</u>	126	12		36*
	9	<u>/276/*</u>	8	13		16
	10	127*	21	36		<u>/129/</u>
	12	33	<u>/246/*</u>	13		19
	13	68	43	69		<u>/132/*</u>
	19	76	<u>/109/</u>	33		93*
	20	39	32	99		<u>/140/*</u>
Food Faddism:						
	1	<u>/200/</u>	2	105*		6
	16	7	28	46		<u>/232/*</u>
	17	47	101*	<u>/118/</u>		47
	19	76	<u>/109/</u>	33		93*

---

KR-20=0.486

---

\* The correct answer

<sup>1</sup> Several questionnaire items were used in several subscales

+      / The highest frequency of responses

of diet plans increases the difficulty for law enforcement personnel to make decisions on nutrition matters based upon valid scientific recommendations. The law enforcement community is currently expressing a strong interest in the development of agency wide physical fitness programs as a means of addressing the obesity and weight control problems (17). Food faddism information appears to present a logical starting point to implement nutrition education intervention programs.

Objective 2: To determine the attitudes of the subjects toward the area of food and nutrition.

A twenty question attitude survey was administered to the subjects (N=313) to assess their attitudes toward the areas of food and nutrition. Question numbers 33, 34, 39, and 40 were eliminated from analysis after the initial evaluation. Poor wording of questions probably caused correlations with total score to be low. Answers to the attitude survey were scaled from 1 to 4. The lower the individual item score or the cumulative score, the less favorable the subject's attitude toward food and nutrition. The mean score per individual attitude item ranged from 1.96 to 3.46. The range of the subjects composite attitude scores was 29 to 64 (Table 6). The mean attitude score was 45.08 out of a total of 80 with a mean per item score of

TABLE 6: MEAN SCORES OF ATTITUDE TOWARD FOOD  
AND NUTRITION (N=313)

Treatment of Paper Color

White	
Mean	45.92
SD	7.021
Range	31.0-61.0
SE	0.827
Blue	
Mean	44.79
SD	6.043
Range	30.0-64.0
SE	0.717
Green	
Mean	44.96
SD	5.89
Range	29.0-59.0
SE	0.689
Yellow	
Mean	45.19
SD	7.047
Range	31.0-61.0
SE	0.842

---

Overall	
Mean	45.08
Mean/item	2.83
SD	6.43
Range	29.0-64.0

---

Key: SD=Standard deviation  
SE=Standard Error of the Mean

2.83. A favorable attitude toward nutrition would be indicated by a composite score of greater than 40 or an individual AQ item score of 2.5 or above.

The experimental (colored background) and the control group (white) mean cumulative attitude score (N=313) are given in Table 6. Inaccurate DCS identification resulted in excluding 27 scores from the statistical analysis. Using the mean score of 45.08 as a measure of attitude, the overall attitude was favorable towards nutrition. A frequency response per subscale was tabulated. The participants who read the black print on white background had a mean attitude score of 45.92 and scores for the yellow, green, and blue groups followed with 45.19, 44.96, and 44.79, respectively. A favorable attitude was recorded by all project treatment groups, but not by all individuals in the groups (Range 29.0 - 61.0).

The attitude survey was subdivided into four subscales (Table 7). The subscale with the highest mean item score was in general nutritional concepts with 3.23 per AQ item, while the area with the lowest mean item score was food faddism, 2.64 per AQ item. Although the weight control and food faddism mean subscale scores, 2.80 and 2.64 respectively, were regarded as positive, these scores were weaker compared to the general nutrition knowledge subscale, 3.23. This finding seems to indicate that how an

TABLE 7: ATTITUDE QUESTIONNAIRE (AQ)  
 RESPONSES by SUBSCALE\*  
 N=313

Subscale	Total Score of Subscale	Mean Score/ Subscale Item	Item Number	Choice Number +			
				1	2	3	4
Weight Control	13.99	2.80	28	28	<u>/119/</u>	74	91
			29	17	<u>60</u>	65	<u>/171/</u>
			30	41	50	65	<u>/156/</u>
			31	52	51	65	<u>/145/</u>
			32	<u>/132/</u>	93	55	<u>33</u>
General Nutrition Concepts	9.68	3.23	35	11	49	78	<u>/175/</u>
			36	16	26	68	<u>/203/</u>
			37	16	86	<u>/127/</u>	84
Nutrition Relevant to Law Enf.	8.28	2.76	38	56	<u>/99/</u>	63	94
			41	45	<u>75</u>	63	<u>/129/</u>
			42	46	76	94	<u>/96/</u>
Food Faddism	13.18	2.64	43	12	71	<u>/119/</u>	110
			44	27	98	<u>/100/</u>	87
			45	70	<u>/129/</u>	85	28
			46	80	<u>/117/</u>	67	48
			47	40	82	78	<u>/111/</u>

\* Questions 33, 34, 39, and 40 were removed from analysis

Scale = 1 (Most unfavorable toward nutrition) to 4 (Most favorable toward nutrition)

+      / - Highest frequency of responses

individual views a subject may not be consistent with the quantity of knowledge that a person possesses about that subject. Foley et al (27) reported similar findings. This explanation appears to indicate that a person's interest in weight control and food faddism as viewed by the AQ scores may make this individual subject to jeopardizing his health by following the recommendations of nonreliable sources of nutrition information. Interested individuals must be provided with reliable sources of nutrition information to increase their knowledge to affect favorable practice.

The correlation coefficient comparing attitudes towards nutrition and the demographic or occupational variables were insignificant. Based on the attitudes identified of some of the law enforcement trainees indicate that they would be receptive to nutrition education, and innovative teaching methods would be needed to further motivate this particular occupational group. Receptiveness by the subjects is essential for a successful educational effort (22,23). Food faddism and weight control were indicated as subject areas that should be addressed in the training course.

In comparison, an attitude survey was conducted on the staff and students at the Department of Human Nutrition and Foods, Virginia Polytechnic Institute and State University (V.P.I.) (N=31). This survey was the identical AQ

administered to the F.L.E.T.C. sample population in Session #1 of the project. The mean scores of the individual AQ item varied from 2.63 to 3.86. The mean attitude score was 53.22 with a mean per item score of 3.33 as compared with a mean of 45.08 in the sample group. It is obvious and expected that the V.P.I. staff and students would have very favorable attitudes toward food and nutrition in general. A comparative evaluation of the subjects attitude item scores with the V.P.I. sample shows that the V.P.I. sample scored higher per attitude item than the sample population on 13 out of 16 items.

Objective 3: To measure the immediate recall in relation to the selected pamphlet of three separate background colors as well as a white background color.

The Session #2 sample population, were administered educational material in four separate background colors to review. An IRQ was then administered to measure immediate retention of the nutritional education material presented. The IRQ mean score for the subjects (N=286) was 13.28 out of a possible 20, with a standard deviation of 3.72, see Table 8. The KR-20 reliability estimate was .739. This represents an increase of .253 over the NKQ reliability estimate obtained in the pilot study. This finding is substantiated by an analysis of the correlations of each

TABLE 8: MEAN SCORES OF THE IMMEDIATE  
RECALL QUESTIONNAIRE (IRQ) (N=286)

<u>Session #2</u> <u>(KR-20=.739)</u>	
Overall	
Mean	13.28
SD	3.720
Range	3.0-20.0
SE	1.899
<hr/>	
<u>Treatment of Paper</u> <u>Color</u>	
<hr/>	
White	
	N=72
Mean	13.60
SD	3.491
Range	4.0-20.0
SE	0.411
Blue	
	N=72
Mean	13.22
SD	3.835
Range	3.0-19.0
SE	0.452
Green	
	N=73
Mean	12.92
SD	4.006
Range	4.0-20.0
SE	0.469
Yellow	
	N=71
Mean	13.41
SD	3.588
Range	5.0-20.0
SE	0.426

Key: KR-20 - Kudor-Richardson 20  
SD - Standard Deviation  
SE - Standard Error of Mean

question with total score. Nineteen out of twenty IRQ test items had significantly positive correlations,  $r \geq .30$ , with the post test (Session #2) total score. The subjects appeared to have guessed less in answering the IRQ in the experimental project.

Mean scores by color background of the IRQ are also shown in Table 4. The treatment control group, white background (N=72), had an IRQ mean score of 13.60. Treatment group blue (N=72) had an IRQ mean score of 13.22. Treatment group green (N=73) had an IRQ score of 12.92. Treatment group yellow (N=71) had an IRQ mean score of 13.41.

The mean IRQ scores were nearly identical for all treatment groups ranged from a mean IRQ score of 12.92 to 13.60. This represents only a net difference of .68. It can be concluded that the background color of the nutrition educational material was not a factor which influenced the overall improvement in scores. Similar results were reported in the project pilot test (Appendix 7-10). Therefore, any commonly acceptable color (33-35) could be used as a background color for these nutrition education materials.

The ultimate aim of nutrition education efforts, and nutrition practices, must be based upon reliable nutrition information. Kelly (20) has demonstrated previously that

nutrition education programs can be effective. Secondly, the law enforcement training curriculum provides an excellent opportunity to provide nutrition information to law enforcement subjects. A comparison of AQ scores with IRQ scores had a non-significant correlation coefficient,  $r=0.123$   $p \leq .04$ . Another explanation for the lack of relationship between the AQ and IRQ scores would be that the subjects were in a testing situation not reflecting a true attitude toward nutrition but a favorable attitude toward performing well irregardless of the educational material presented. This conclusion is similar to that made by Foley (27) who concluded that knowledge of nutrition is not related to attitudes towards nutrition.

Objective 4: To determine if the subjects attitude toward nutrition affects immediate recall for any of the background colors.

There exists no significant relationship between the subject's attitude toward nutrition and the immediate recall of the subjects,  $r=.122$ ,  $p \leq .05$  was found (Table 9). A review of the mean scores for the IRQ and AQ for each of the project groups illustrates nearly identical scores (Table 8 and 4, respectively). It can be concluded that no project group displayed a particular advantage due to background color. Similar results were reported in the project pilot test.

TABLE 9: CORRELATION COEFFICIENTS FOR  
SELECTED VARIABLES

	<u>NKQ (N=313)</u>	<u>IRQ (N=286)</u>
Formal Schooling (Education)	r= 0.349 p 0.0001 n= 313	---
Nutrition Knowledge	r= 0.122 p .04 n= 312	---
Prior Nutrition Education Experience	r= --- p n=	0.121 0.04 286
Attitude Towards Nutrition	r= --- p n=	0.12259 0.04 286

Key: NKQ - Nutrition Knowledge Questionnaire  
IRQ - Immediate Recall Questionnaire

Objective 5: To determine if the subjects prior nutrition knowledge affects immediate recall when using any of the background colors.

No significant relationship was found between prior nutritional knowledge and immediate recall for the project sample,  $r=.122$ ,  $p \leq .04$  (Table 8). There was, however, a positive correlation found between the level of education and the NKQ score ( $r=0.349$ ,  $p \leq .0001$ ).

## V. Summary and Conclusions

Law enforcement trainees (N=313) volunteered to participate in a two-session nutrition education study. Session #1 of the study involved the participants completing questionnaires regarding demographic and occupational data, nutrition knowledge, and attitudes toward food and nutrition. Session #2 of the study involved Session #1 participants (N=286) randomly assigned to one of four treatment groups to read printed nutrition education material of one background color followed by completing an immediate recall questionnaire.

Contrary to prior research findings reported by Hays (41), this project illustrated that any acceptable paper background color (33-35) would result in the same degree of immediate recall. Color had been shown by Nilsson and Nelson (44) to be effective in aiding immediate recall.

This study illustrated that law enforcement candidates possessed some knowledge of nutrition but much less than is desirable to form a basis for wise food behavior. A possible explanation would be that law enforcement candidates possibly have access to reliable nutrition information sources which were not qualified as nutrition education experience. Similar results were reported by Spitze (29). Food faddism was found to be the weakest area of knowledge of nutrition according to results from the

current study. Rudell (28) stated that the better educated and higher income individuals were more efficient users of nutrition information. The majority of participants in this study had some college education training. In this study, a higher level of formal education correlated with a higher NKQ score. The question arises as to whether this finding is unique to these occupational trainees or to a limited questionnaire. Should this be the case, the concept of targeting nutrition information for specific groups as proposed by Kok and associates (9) is worth exploring. Secondly, the low food faddism subscale score is consistent with the low reliability estimate ( $KR=0.486$ ) which suggest that law enforcement candidates may not have sufficient nutrition knowledge to distinguish between false nutrition claims or the advice of irresponsible nutrition "experts", and scientifically established nutrition practices.

Law enforcement candidates are receptive to nutrition information as measured by the IRQ and the AQ. The initial step in the educational process is the development of positive attitudes to enhance the educational effort. Although Foley et al (27) concluded that knowledge of nutrition is not related to attitudes toward nutrition, Werblow and associates (26) concluded that motivation was essential to implement such an educational effort. The

majority of the participants in this study possessed a favorable attitude toward nutrition. The food faddism subscale score was the lowest of the four attitude subscales evaluated. Possibly, irresponsible nutritional claims regarding weight control are having an effect upon the opinions of law enforcement candidates towards nutrition and foods. No significant correlation was found between prior nutrition knowledge of the trainees and their attitudes toward food and nutrition,  $r=.183$ ,  $p\leq 0.001$ . Secondly, there was no significant relationship between the NKQ scores and the AQ scores of the trainees,  $r=.220$ ,  $p\leq 0.0001$ . The amount of nutrition knowledge had no effect upon attitudes toward food and nutrition. Therefore, what may be known about nutrition by the participant does not guarantee implementation of this knowledge. Background color was not found to improve the IRQ as evidenced by reviewing the IRQ scores by treatment group. There was only a slight variation observed in these IRQ scores. There was no relationship found between prior nutrition knowledge and the IRQ score,  $r=0.122$ ,  $p\leq .04$ . Secondly, a positive attitude towards food and nutrition was not found to be related to a high IRQ scores,  $r=0.123$ ,  $p\leq .04$ .

Future research efforts are needed using law enforcement officers to evaluate additional relationships between color and the visual medium used in nutrition

education programs, long term nutrition education recall, and the relationship of nutritional knowledge, nutritional attitudes, and their effect upon nutritional practices.

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Appendix 1

(Facsimile)

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The Nutrition Information and  
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865-6323

October 10, 1983

Dear Mr. Gundersen,

While continuing the search for information on use of color vs. black and white in education materials (specifically nutrition education), I wanted to share these preliminary references with you. I am not finding an abundance of information--but onward! You'll be hearing from me again within the week.

Sincerely,

Martha Harvey Webster

-Vandermeer, A.W. Relative effectiveness of color and black and white instructional film. Technical Report No. 269-7-28. SDC. The Instructional Film Research Program, Port Washington, Long Island, New York, Special Devices Center, 1952.

Appendix 2

(Facsimile)

THE PENNSYLVANIA STATE UNIVERSITY  
BENEDICT HOUSE  
UNIVERSITY PARK, PENNSYLVANIA 16802

College of Human Development  
The Nutrition Information and  
Resource Center

Area Code 814  
865-6323

10/13/83

Dear Mr. Gundersen,

After reviewing 10 years of back issues of the Journal of Nutrition Education and the index issues of the Journal of the American Dietetic Association, I find no references investigating the use of color vs. black and white media in nutrition education. Dr Francis M. Dwyer, Professor of Education here at Penn State, reports that he knows of no recent research in this area. Dr. Dwyer is responsible for the instructional systems program and is actively involved in the area of visual literacy. He states that there have been numerous studies on black and white vs. color media in general in the past 20 years. Dr. Dwyer can provide references if you would like to contact him at 310 Rackley Building, PSU, University Park.

Sincerely,

Martha Harvey Webster

## Appendix 3

Four background colors were used as the treatment in this project. The format of the printed nutrition education material was identified to the attached Eater's Almanac, Vol. 1, No. 21. The following were the background colors:

Black print on a blue background.  
Black print on a green background.  
Black print on a white background.  
Black print on a yellow background.

**FOODS FOR HEALTH**  
**BUYERS' ALMANAC**

VOL. I. NO. 21

PRICE: FREE



**"Shelf Talkers" To Help You Shop**

**TEST YOUR SHOPPING I.Q.**

# Which foods should you buy for your family?

Consider what we know and don't know about foods and your heart health.

- People with low levels of cholesterol in their blood have less chance of having heart attacks than people with higher levels.
- Eating foods low in saturated fats and cholesterol is a safe and easy way to lower blood cholesterol levels. Cutting down on fat helps cut calories, too.
- But we don't know whether lowering your blood cholesterol level will help prevent or delay coronary heart disease.

## You Decide!



## Let These "Shelf Talkers" Talk To You!

**FAT FACTS**

USDA CHOICE    USDA PRIME

LOWER FAT    HIGHER HIGHEST FAT

**LEAN TOWARD LEAN YOU DECIDE**

**Tuna Fat Facts!**

Tuna, water packed...1%

Tuna, oil packed...21%

**YOU DECIDE**

**MEAT CUTS**

	FAT
1. Round	15%
2. Choice	14%
3. Sirloin	13%
4. Porterhouse	12%

**PORK**

1. Pork Loin	16%
2. Ham	15%
3. Spareribs	14%

**LEAN TOWARD LEAN YOU DECIDE**

**GROUND BEEF FAT FACTS**

Regular ..... 30%

Lean ..... 25%

**LEAN TOWARD LEAN YOU DECIDE**

**% FAT**

LIGHT TURKEY ROLL ..... 3%

BOILED HAM ..... 17%

BOLOGNA ..... 23%

COOKED SALAMI ..... 26%

DRY SALAMI ..... 38%

**POULTRY FAT FACTS**

(the less fat, the better)

skinless meat ..... 10%

skin on meat ..... 15%

dark meat ..... 20%

skin on dark meat ..... 25%

**YOU DECIDE**

The facts on this pamphlet were originally developed as part of a pilot program conducted by the National Heart Lung and Blood Institute as part of the National Institutes of Health, Bethesda, MD and Food and Drug Administration, Washington, D.C.

Do You Use "Shelf Talkers" When You Shop?

"What are 'Shelf Talkers'?"

They're our way of calling your attention to certain foods. As part of the Foods for Health program, we've placed shelf signs throughout the store. Together with information in the Eaters' Almanacs, these "shelf talkers" can help you decide which foods to buy. In case you've missed some, we've reproduced many of them for you in this Almanac.



"How can I use them?"

If you're trying to decide which foods to put on your shopping list, check the "shelf talker" facts in this Almanac and in the store for:

- quick food comparisons by fat and calorie content, and
- new and easy low-fat, low-calorie recipes.

And when you're at the store and faced with all those products, look for the "shelf talkers" to help you decide.

**71**

**CHEESE** % FAT

1% COTTAGE CHEESE.....	1%
AMERICAN CHEESE (PASTEURIZED PROCESS)...	25%
SWISS.....	33%
CHEDDAR.....	35%
CREAM CHEESE.....	35%

**72**

**COUNT CALORIES**

90 CALORIES	100 CALORIES	150 CALORIES	PER CUP
0.5% FAT (154KCAL)	2.0% FAT (160KCAL)	3.3% FAT (170KCAL)	

**YOU DECIDE**

**73**

All Margarine are not alike!

LOOK FOR AT LEAST TWICE AS MUCH POLYUNSATURATED FAT AS SATURATED FAT

**YOU DECIDE**

**74**

**Cookie fat facts**

WHICH IS THE BEST?

WHICH IS THE WORST?

**YOU DECIDE**

**75**

**NOODLES AND SPAGHETTI**

WHICH IS THE BEST?

WHICH IS THE WORST?

**YOU DECIDE**

**76**

**FOR GOD PROTEIN...**

WHICH IS THE BEST?

WHICH IS THE WORST?

**YOU DECIDE**

**77**

**CHOOSE OILS**

WHICH IS THE BEST?

WHICH IS THE WORST?

**YOU DECIDE**

Appendix 4



DEPARTMENT OF THE TREASURY  
FEDERAL LAW ENFORCEMENT TRAINING CENTER  
GLYNCO, GEORGIA 31524

LET 12-7 (EA)

April 4, 1984

MEMORANDUM TO: CIAC Representatives

FROM: Charles F. Rinkevich  
Director

SUBJECT: Proposed Research

Mr. Steven Gundersen, Assistant Athletic Trainer, assigned to our staff from DEA, has proposed a basic research project involving a stratified random sample of our student population.

Briefly, Steve intends to (1) test some students' present knowledge of good nutritional practices, (2) introduce additional nutritional information using print media of different colors, (3) retest for knowledge gained, and (4) compare results. The results should indicate (a) whether or not additional nutritional information should be introduced into the curriculum (since we know from other authoritative research that diet is a factor in stress management) and (b) whether instructional materials of one color expedite learning vis-a-vis other colors when used with this occupational group.

In order to conduct the experiment, Steve will need to address several classes during orientation and, thereafter, request that class to remain in their classrooms for two one-hour periods after duty hours during the first week. Both basic and AIRS classes will be included and no regularly scheduled instruction will be interrupted. Students may decline to participate on an individual basis and the anonymity of the students will be guaranteed. Pre- and post-test results will be available to individual students on request indicating their levels of nutritional knowledge.

This research is organizationally non-controversial and individually non-threatening. I encourage you to approve participation of your students as they may be selected in the sample. Should you wish to have them categorically excluded, however, please let me hear from you not later than Friday, April 13, 1984. If I do not hear from you to the contrary, the research will commence on Monday, April 16, 1984. Thank you in advance for your anticipated usual high level of cooperation.

CLASS DESIGNATIONS OF PROJECT PARTICIPANTS

Criminal Investigator Program: Drug Enforcement Administration (DEA) - Basic Agent (BA)

Class No. 34/DEA-BA 34

Drug Enforcement Administration (DEA)-Basic Agent (BA)

Class No. 35/DEA-BA 35

Criminal Investigator Class No. 502/CI-502

Police Training Program:

Eight Week Police Training Course No. 501/8PT-501

Thirteen Week Police Training Course No. 404/13PI-404

Fourteen Week Police Training Course No. 404/14PI-404

Fourteen Week Police Training Course No. 405/14PI-405

Seventeen Week Police Training Course No. 407/17PI-407

Seventeen Week Police Training Course No. 502/17PI-502

Seventeen Week Police Training Course No. 503/17PI-503

Seventeen Week Police Training Course Patrol No. 501/17PIP-501



8. The best approach to a healthful weight loss diet plan:
  1. Consult with a good "diet" doctor
  2. Go on a "crash" diet for quick results
  3. Use prudent lifestyles
  4. Begin a one day per week fast
9. A beneficial exercise regimen for weight loss would be:
  1. Reduce physical exercise to offset an increased need for calories
  2. A weekly use of exercise machines and massage
  3. A daily twenty to thirty minute walk and/or jog
  4. A regular weekly exercise program
10. From age 20 to age 65, adipose tissue (fatty tissue):
  1. Decreases
  2. Increases
  3. Remains the same
  4. Fluctuates depending on the sex of person
11. Which of the following provides the highest amount of calories per gram:
  1. Ethyl alcohol
  2. Protein
  3. Carbohydrates
  4. Fat
12. Vitamin K is obtained from the following sources:
  1. Dark-green leafy vegetables
  2. Citrus fruits
  3. Yellow vegetables
  4. None of the above
13. To obtain Vitamin C, a good substitute for a glass of orange juice is:
  1. a glass of milk
  2. a glass of regular beer
  3. A glass of tomato juice
  4. A glass of water
14. A rich source of protein for a meal is:
  1. Bacon
  2. Cornbread
  3. Cheese
  4. Carrots
15. Two vitamins important in proper red blood cell (RBC) formation are:
  1. Vitamin A and Vitamin D
  2. Thiamin and Riboflavin
  3. Biotin and Vitamin K
  4. Folic acid and Vitamin B<sub>12</sub>

16. A mineral and vitamin which are necessary to build and repair the bones and teeth are:
1. Calcium and Vitamin D
  2. Iron and Vitamin E
  3. Iron and Vitamin C
  4. Calcium and Vitamin K
17. Which of the following is not a major function of protein:
1. Provide dietary fiber
  2. Build and repair body tissue
  3. A source of vitamins and minerals
  4. Maintain acid-base balance
18. Foods which help prevent osteoporosis include:
1. breads and cereals
  2. fats and oils
  3. milk and dairy products
  4. fruits and vegetables
19. The main function of carbohydrates is to:
1. Maintain acid-base balance
  2. Provide energy
  3. Develop strong bones and teeth
  4. Produce antibodies
20. Vitamin K is the vitamin associated with:
1. Energy production
  2. Bone formation
  3. Eyesight
  4. Blood clotting
21. Recently, the American diet has been accused of lacking fiber. Fiber can be found in which one of the following foods.
1. Sirloin steak
  2. Scrambled eggs
  3. Celery
  4. Cheddar Cheese
22. Diabetics often have an impaired tolerance for:
1. Fat
  2. Carbohydrate
  3. Protein
  4. Water
23. Food fads often:
1. Make it easy to sort valid information from misinformation
  2. Present both viewpoints of a nutritional question
  3. Encourage people to explore a variety of foods
  4. Cause people to spend money on unnecessary "health" foods

24. Salt tablets are advised under which circumstances:
1. During very hot, humid weather conditions
  2. Are never recommended for healthy individuals
  3. When an individual experiences excessive sweating
  4. An individual who anticipates engaging in exertive physical exercises
25. The following foods additives have been linked to potential health problems except:
1. Pyridoxine hydrochloride
  2. Monosodium glutamate
  3. Sodium nitrate
  4. Saccharin
26. Lecithin has been associated with which of the following functions:
1. A psychological stress reducer
  2. Aids in the production of energy by the body
  3. Protects the lungs from pollutants
  4. A major constituent of cell membranes
27. Vitamin E has been shown to perform what function:
1. Improve athletic performance
  2. Prevent cancer
  3. Enhance sexual performance
  4. Protect polyunsaturated fats in the body from destruction by oxygen

Section C - Attitude, Beliefs, and Opinions

For the following statements, please darken the appropriate space on your accompanying answer sheet which most accurately reflects your feelings

1. If you completely agree with the statement
2. If you partly agree with the statement
3. If you partly disagree with the statement
4. If you completely disagree with the statement

28. Weight gain comes as a natural consequence of advancing age.

1 \_\_\_ 2 \_\_\_ 3 \_\_\_ 4 \_\_\_

29. An exercise program should be painful to be beneficial.

1 \_\_\_ 2 \_\_\_ 3 \_\_\_ 4 \_\_\_

30. I'd rather have a ham sandwich than a turkey sandwich for a meal.

1 \_\_\_ 2 \_\_\_ 3 \_\_\_ 4 \_\_\_

31. Hot dogs and bologna constitute low cost nutritious meats.

1 \_\_\_ 2 \_\_\_ 3 \_\_\_ 4 \_\_\_

32. On a low calorie diet, starchy foods should be avoided.

1 \_\_\_ 2 \_\_\_ 3 \_\_\_ 4 \_\_\_

33. Taste dictates which foods I choose to eat.

1 \_\_\_ 2 \_\_\_ 3 \_\_\_ 4 \_\_\_

34. Food companies expend considerable effort to safeguard the nutritional health of the consumer.

1 \_\_\_ 2 \_\_\_ 3 \_\_\_ 4 \_\_\_

35. Food advertisements are generally reliable ways of gaining nutrition knowledge.

1 \_\_\_ 2 \_\_\_ 3 \_\_\_ 4 \_\_\_

36. A balanced diet is too expensive to maintain.  
1\_\_\_\_ 2\_\_\_\_ 3\_\_\_\_ 4\_\_\_\_
37. Governmental agencies are adequately safeguarding our food supply.  
1\_\_\_\_ 2\_\_\_\_ 3\_\_\_\_ 4\_\_\_\_
38. Law enforcement duties tend to prevent a police officer from maintaining an ideal weight.  
1\_\_\_\_ 2\_\_\_\_ 3\_\_\_\_ 4\_\_\_\_
39. Law enforcement officers require additional information about food and nutrition.  
1\_\_\_\_ 2\_\_\_\_ 3\_\_\_\_ 4\_\_\_\_
40. At certain times during the work day, law enforcement duties interfere with the selection of a nutritious meal.  
1\_\_\_\_ 2\_\_\_\_ 3\_\_\_\_ 4\_\_\_\_
41. After work I'd rather relax by drinking an alcoholic beverage rather than a fruit juice.  
1\_\_\_\_ 2\_\_\_\_ 3\_\_\_\_ 4\_\_\_\_
42. For a meal in the middle of my work day, I would rather eat a hamburger and french fries than a bowl of soup and a salad.  
1\_\_\_\_ 2\_\_\_\_ 3\_\_\_\_ 4\_\_\_\_
43. The use of specially labeled diet foods is a preferred method of weight loss.  
1\_\_\_\_ 2\_\_\_\_ 3\_\_\_\_ 4\_\_\_\_
44. Vegetarian diets are unhealthy.  
1\_\_\_\_ 2\_\_\_\_ 3\_\_\_\_ 4\_\_\_\_
45. Most food additives are unhealthy.  
1\_\_\_\_ 2\_\_\_\_ 3\_\_\_\_ 4\_\_\_\_

46. The use of vitamin and mineral supplements are needed to make the diet more nutritious.

1\_\_\_\_ 2\_\_\_\_ 3\_\_\_\_ 4\_\_\_\_

47. The term "health food" indicates that the food has power to promote health more so than "regular" foods.

1\_\_\_\_ 2\_\_\_\_ 3\_\_\_\_ 4\_\_\_\_

Appendix 7

Immediate Recall Questionnaire

Form B - Section D - Eater's Almanac Questionnaire

Of the possible answers listed below each question, please darken the appropriate space on your accompanying answer sheet.

1. Choice grade beef is lower in fat than:
  1. Giant lean grade beef
  2. USDA Grade A beef
  3. Prime grade beef
  4. None of the above
2. Round steak has how much fat versus sirloin steak.
  1. About one-quarter as much
  2. About one-half as much
  3. About three-quarters as much
  4. About the same amount as
3. Chicken white meat without skin (uncooked) has 2% fat. Chicken white meat with skin (uncooked) has what percentage of fat?
  1. 2%
  2. 4%
  3. 6%
  4. 8%
4. Tuna packed in oil (undrained) has how many times more fat than tuna packed in water?
  1. 5x
  2. 10x
  3. 15x
  4. 20x
5. Switching from whole to skim milk can save you how many calories per cup?
  1. 10
  2. 25
  3. 45
  4. 60
6. Which of the following is the highest in polyunsaturated fats?
  1. Safflower oil
  2. 100% vegetable shortening
  3. Lard
  4. Butter
7. All margarines should have how much polyunsaturated to saturated fats?
  1. an equal amount of polyunsaturated to saturated fat
  2. a lower amount of polyunsaturated to saturated fat
  3. a higher amount of polyunsaturated to saturated fat
  4. a lower amount of monosaturated to saturated fat

8. Of the following, which would add flavor to spaghetti while adding the least amount of calories.
1. 2 pats of butter
  2.  $\frac{1}{4}$  cup of meatless spaghetti sauce
  3. caraway seeds
  4. 1 cup of meatless spaghetti sauce
9. Of the cookies listed below, which contains the lowest percentage of fat?
1. Sandwich cookies
  2. Shortbread
  3. Fig bars
  4. Chocolate chip
10. Of the following cuts of beef, which cut has the lowest percentage of fat?
1. Porterhouse
  2. Round
  3. Sirloin
  4. Chuck
11. Of the following cuts of pork, which cut has the lowest percentage of fat?
1. Ham
  2. Round
  3. Spareribs
  4. Pork loin
12. When comparing the percentage of fat in regular ground beef versus lean ground beef, what is the difference in the percentage?
1. 1%
  2. 5%
  3. 10%
  4. 15%
13. Boiled ham has a lower percent of fat except which one of the following?
1. Bologna
  2. Light Turkey Roll
  3. Cooked salami
  4. Dry salami
14. Uncooked chicken dark meat (with skin) has what percentage of fat?
1. 2%
  2. 4%
  3. 6%
  4. 8%
15. All of the following cookies have under 12% fat except:
1. Sandwich cookies
  2. Graham crackers
  3. Ginger snaps
  4. Fig bars

16. On your morning muffin you are going to have cheese. Which of the following has the lowest amount of fat recommended by your low fat diet?
1. Swiss
  2. Cheddar
  3. Cream cheese
  4. American cheese (pasteurized process)
17. That cup of whole milk you are about to drink has how many calories?
1. 90
  2. 130
  3. 150
  4. 210
18. For a good non-meat protein combination, combine pasta with:
1. Tomato Sauce
  2. Corn
  3. Rice
  4. Beans
19. You are searching your kitchen cabinets for a high polyunsaturate oil. Which of the following would you choose?
1. Peanut oil
  2. Corn oil
  3. Olive oil
  4. None of the above
20. Two pats of butter can add how many calories to your spaghetti dinner?
1. 10
  2. 45
  3. 70
  4. 150

## Appendix 8

April 5, 1984

Dear Bureau of Prisons Staff Member,

I am a staff member of the Drug Enforcement Administration's (DEA) training staff at Glynco, assigned to the Center's Athletic Trainers Office. I am also working on my master's degree in human nutrition from Virginia Tech and I need your help.

I have received permission from the Director, FLETC, to conduct a questionnaire survey of the Center students for my master's degree project. To ensure that the questions are understandable to the students, I would appreciate your taking the time to answer the questionnaire as carefully as possible. In addition to this cover letter, I have included the questionnaire, an answer sheet, a sample of the answer sheet illustrating how the answer sheet is to be completed, and a blank sheet for you to record any problems you incurred answering the questionnaire or to make any suggestions and/or comments you may have. I will use your comments and suggestions to revise the questionnaire before administering it to the students.

To begin answering the questionnaire, please locate at the upper left hand corner of the answer sheet the identification number block and enter in the first four digits of your social security number. At the lower left hand corner of the answer sheet, record your initials. This is for identification purposes. Next, please record the starting and finishing times for each section of the questionnaire you complete as illustrated on the sample answer sheet.

There are a total of seventy-seven questions in the questionnaire, divided into four sections (A-D). The answers should be recorded on the answer sheet as illustrated on the sample using a #2 lead pencil. The question number should correspond to the identical number on the answer sheet. For example, question number 1 will have the answer recorded in line number 1 of the answer sheet.

When you have finished your questionnaire, please bring both the questionnaire and answer sheet to Kathy Hawk for collection. Let me thank you in advance for your cooperation and assistance.

Sincerely,

Steven J. Gundersen

Appendix 9

PILOT NUTRITION KNOWLEDGE QUESTIONNAIRE  
(NKQ) RESPONSES BY ITEM (N=40)

Item No.	Choice Number			
	1	2	3	4
1	16	0	24*	0
2	0	0	18*	22
3	0	36*	2	2
4+	8	12	9	11
5	6	4	14	16*
6	1	38*	0	1
7	19	4	16	1*
8	6*	1	18	15
9	6	2	32*	0
10	5	31*	2	2
11+	3	2	34*	1
12	13	22	0	5*
13	33*	0	2	5
14	17*	3	2	18
15	7	2	13*	18
16	7	28*	2	3
17	6	9	12	13*
18	0	36*	3	0
19	10	20*	4	6
20	3	3	3	31*
21	35*	0	2	3
22	8	13*	10	9
23	21*	10	7	2
24	9	18	3	10*
25	6	1	8	25*

Mean = 13.38

SD = 2.72

KR-20= 0.455

Standard

Error of the mean = 2.00

Range= 9-19

Key: \* - Correct answer  
+ - No appropriate response  
— - Most frequent response

Appendix 10

PILOT ATTITUDE QUESTIONNAIRE (AQ)  
RESPONSES BY ITEM

<u>Item No.</u>	<u>Mean Score Per Item</u>	<u>Choice Number</u> <sup>1</sup>			
		<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>
1	2.47	3	22	8	7
2	3.38	0	10	5	25
3	3.27	2	8	7	23
4	3.32	4	4	7	25
5	2.20	13	12	9	6
6	2.32	4	24	7	5
7	3.47	1	4	10	25
8	3.67	1	2	6	31
9	3.32	2	6	9	23
10	3.17	0	8	17	15
11	2.80	3	15	9	13
12	3.42	23	12	4	1
13	1.65	21	14	3	2
14	2.92	2	14	9	15
15	2.90	3	14	7	16
16	3.27	0	7	15	18
17	2.92	2	11	15	12
18	1.80	16	16	2	0
19	2.52	4	20	7	9
20	3.10	2	10	10	18

Key: <sup>1</sup> - Revised Scoring  
     - Most frequent response

Appendix 11

PILOT IMMEDIATE RECALL QUESTIONNAIRE (IRQ)  
RESPONSES BY ITEM

Item No.	Choice Number			
	1	2	3	4
1	2	5	29*	4
2	17	16*	4	3
3	0	33*	4	3
4	1	2	3	34*
5	0	40*	0	0
6	4	5	8	23*
7	36*	2	0	2
8	3	2	33*	2
9	0	4	36*	0
10	40*	0	0	0
11	0	0	0	40*
12	2	3	34*	1
13	3	35*	1	1
14	2	5	1	31*
15	0	9	22*	9
16	0	28*	9	3
17	0	36*	0	4
18	34*	1	1	4
19	2	7	1	30*
20	2	8	30*	0
21	2	0	2	36*
22	3	24*	2	11
23	2	3	26	9*
24	9	18	3	10*
25	6	1	8	25*

Mean = 17.71

SD = 2.59

KR-20= 0.543

Key: \* - Correct answer  
 - Most frequent response  
SD - Standard deviation  
 KR-20 - Kudor-Richardson 20  
 SE - Standard error of mean

Appendix 12

MEAN SCORES AND STANDARD DEVIATIONS OF  
IMMEDIATE RECALL USING DIFFERENT COLORED  
BACKGROUNDS - PILOT (N=40)

By Treatment

White, Control	
Mean	17.40
SD	2.15
Yellow	
Mean	17.30
SD	2.57
Blue	
Mean	17.60
SD	3.26
Green	
Mean	18.60
SD	1.96

Key: SD - Standard Deviation

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document. Page 2 of 2**

EVALUATION OF A COLORED BACKGROUND  
ON PRINTED NUTRITION EDUCATION MATERIAL

by

Steven J. Gundersen

(ABSTRACT)

A two session nutrition education research project was conducted using basic training candidates at the Federal Law Enforcement Training Center (FLETC), Glynco, Georgia. Prior to the administration of the full scale project, a test questionnaire was developed and evaluated and a project pilot test was conducted. The first part of the project involved the basic training candidates (N=313) responding to questionnaire survey designed to measure demographic and occupational data, knowledge of nutrition (NKQ), and attitudes toward nutrition (AQ). The NKQ and AQ were individually subdivided to measure various subscales. A minimum time period of 10 calendar days was allowed to elapse prior to the administration of the second part of this project. The same participants (N=286) were randomly assigned to one of four color treatment groups. All the groups were exposed to written nutrition education material, Eater's Almanac Vol. 1, No. 21, reprinted on one of four background colors (white, blue, green, and yellow). Following a set time period to review the contents, the candidates were administered an

immediate recall questionnaire (IRQ).

The basic training candidates at FLETC possessed some knowledge of nutrition prior to reading the nutrition education material. Out of a possible maximum score of 20, the mean was 10.38. Food faddism issues appeared to be the weakest area. Improvement of nutrition knowledge was approximately equal among all treatment groups. The overall mean IRQ score was 13.28 with a range of 12.92 to 13.60. The nutrition attitudes of the candidates were favorable with a mean cumulative score of 45.08 out of a possible 80 (2.83/item). Food faddism was the weakest area. Immediate recall scores were unaffected by the candidates attitudes ( $r=.122$   $p .05$ ).

Background color does not appear to be a factor in the improvement of immediate recall scores. Basic training candidates possess favorable attitudes toward nutrition; however, this favorable attitude did not affect immediate recall scores. Further research efforts should be tailored toward the evaluation of additional relationships between color and nutrition education, long term nutrition education recall, the relationship of nutrition knowledge and nutrition attitudes, and their effect of knowledge and attitudes upon nutrition practices for law enforcement personnel.