EFFECTIVENESS OF A MULTICOMPONENT INTERVENTION FOR MODIFYING THE NUTRITIONAL PRACTICES OF COLLEGE STUDENTS

by

Carolee Miller

Dissertation submitted to the Faculty of the
Virginia Polytechnic Institute and State University
in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

in

Psychology

APPROVED:

R. A. Winett, Chairman

Thomas H. Ollendick

Russell T. Jones

Debra F. Neff

Kerry J. Redican

May, 1987

Blacksburg, Virginia

LD-2-87
4684

The Effectiveness of a Multicomponent Intervention for Modifying the Nutritional Practices of College Students

by

Carolee Miller

Richard A. Winett, Chairperson

Psychology

(ABSTRACT)

Appropriate nutrition is linked to the prevention of several major diseases, yet over 50% of Americans do not eat diets sufficient in the necessary proportions of protein, vitamins, and minerals. Increased interest in health prevention has led to the development of a variety of programs designed to change dietary habits. Most have been only marginally successful. One explanation for their failure is the lack of consideration given to the characteristics of the targetted population in the development of the programs. In this study, a five week multicomponent intervention was designed using marketing and psychological principles to increase the selection of dinner entrees low in fat, calories, and sugar and to improve participants' knowledge of and attitude toward appropriate nutrition. Subjects were 8600 students who ate in the dining halls of a large southeastern university. The study investigated the additive effectiveness of three intervention components in three dining halls. One dining hall received availability; the second, availability plus point of choice information; the third, availability plus

point of choice information plus an incentive program. The results were derived from three separate sources: cafeteria data, survey data, and individual data. Cafeteria results were not significant. Inspection of daily selection data revealed wide fluctuation in selection across entrees, indicating dramatic changes in student preferences. Inspection of weekly selection means revealed that the incentive program combined with increased availability and point of choice information was initially effective in increasing the selection of the Perfect Balance entree. Prompting was the most effective intervention, yielding an average increase of 31.5% in selection of the Perfect Balance entree. Survey data indicated a minor increase in knowledge in the information condition. Across all conditions there was a decrease in self-efficacy. Forty-four individuals were involved in a tracking project designed to assess whether the aggregate impact of the interventions reflected consistent change within specific individuals or intermittent change across all individuals. Analyses indicated a significant increase in selection behavior across time ($p < .05$). The condition by phase interaction approached significance ($p = .07$). The greatest change occurred in the incentive condition with a 16% increase, compared to a .3% increase in the information condition, and a 2.5% increase in the availability condition. The social marketing analysis of the study reveals several important barriers to change: resistance from staff and administration, poor quality entrees, student distrust of the dining hall administration, and limited availability of certain entrees.

ACKNOWLEDGEMENTS

I would like to express my appreciation to my committee chairman and advisor, Richard A. Winett for his support, insight and guidance. I would also like to thank my committee members, Debra Neff, Russell Jones, Kerry Redican and Thomas Ollendick for their time and effort and Cynthia Baum for her comments and assistance during the development of this study.

Appreciation and thanks go to and for their hard work and time. Particular thanks go to my research assistants for their time and effort.

Special thanks go to for her caring and support throughout the years, for his willingness to help out during the numerous crises, and and for their commonsense perspectives and good humor.

I would also like to thank my parents for their love, support, and ability to help me get my priorities in order throughout my graduate school career. To my sister, I owe so much more to you than I can express; you will always be my rock and guiding light.

To , you are a little piece of sunshine. Your arrival helped me realise what is important in life.

Finally, this dissertation is dedicated with love to , for his love, support, and invaluable assistance. I couldn't have done it without you, .

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

INTRODUCTION

Nutrition has recently become a topic of great interest to individuals working in the health promotion/disease prevention area. The Surgeon General indicates that lifestyle is responsible for approximately 50% of all deaths (Robinson, 1984). One of the major factors contributing to this statistic is the typical American diet. Even though Americans eat a sufficient number of calories, over fifty percent of them eat diets deficient in the necessary proportions of protein, vitamins and minerals and, thus, are malnourished (Jeffrey, McLellan & Fox, 1982). Therefore, in industrialized countries, we find a malnourishment of excess rather than deficiency. The typical American diet derives fifteen percent of its calories from sucrose and forty percent of its calories from fat (Jeffrey et al., 1982). There is also some indication that the American diet includes a high intake of sodium (Abraham & Carrol, 1981) and a less than adequate amount of fiber (Bender & Bender, 1982).

Long term consumption of a diet rich in cholesterol, saturated fats, calories, sugar and salt, and low in fiber has been associated with coronary heart disease, hyperlipidaemia, atherosclerosis, diverticular disease, various types of cancer, obesity and dental decay (Bender & Bender, 1982; Hamburg, Elliot & Parron, 1982).

DIET RELATED DISEASES

Coronary Heart Disease

Ischaemic heart disease (IHD) is the most common cause of death in middle aged men in all western countries. IHD accounts for fifty percent of all male deaths in the 45 - 64 age group and is becoming a leading cause of death in the 35 - 44 age group (Bender & Bender, 1982). In the United States, heart attacks claimed 642,719 lives in 1975 (Meyer, Anash, McAlister, Maccoby, Farquhar, 1980). Risk factors associated with heart disease are cigarette smoking, hypertension, and elevated plasma cholesterol (Meyer et al., 1980). Both blood pressure and cholesterol level are strongly influenced by relative body weight (Blackburn, 1974) and are responsive to changes in diet (Keys, Anderson & Grande, 1965). Dietary modifications to aid in the prevention of IHD include decreasing saturated fat, sucrose and salt intake and increasing the amount of fiber in the diet (Bender & Bender, 1982).

Hyperlipidaemia

Hyperlipidaemia refers to the elevation of one or more of the plasma lipids leading to an increase in plasma cholesterol. This disorder may result in long term complication affecting the renal and cardiovascular systems such as atherosclerosis, IHD, and peripheral vascular disease (Bender & Bender, 1982). The dietary prescription for prevention of this disorder is to restrict fat and cholesterol intake.

Atherosclerosis

Atherosclerosis is an arteriosclerosis characterized by the deposition of fatty substances in and fibrosis of the inner layer of the arteries. A strong body of evidence exists supporting the association between an elevated concentration of cholesterol in the blood and the progression of this disease (National Heart, Lung & Blood Institute, 1981).

Diverticular Disease

Diverticular disease and other diseases of the bowel are due, in part, to a low intake of dietary fiber. Studies indicate that up to twenty percent of people over forty and seventy percent over seventy in both the U.S. and the U.K. have some evidence of diverticular disease (Bender & Bender, 1982).

Cancer

In the 1970's, cancer caused an estimated 3.5 million deaths. approximately thirty percent of the American population now living will eventually have cancer (Iammarino & Wienberg, 1985). Researchers in the area have identified diet and nutrition as one of the, if not the most, important areas in cancer prevention (Doll & Peto, 1980; Newell & Boutwell, 1980). Although these findings are not definitive, diets low in fiber and high in fat appear to be most related to increased cancer risk.

Obesity

Obesity is associated with a variety of health problems including diabetes (Rabkin, Mathewson, & Hsu, 1977; Van Itallie, 1979), heart disease, gallstones, and gout. (Hamburg et al., 1982). Data from the Metropolitan Life Insurance Company indicates that the mortality rate from diabetes for obese individuals was 400% of the expected. Mortality from cirrhosis of the liver, appendicitis, and gallstones was 200% of the expected and from cardiovascular and renal diseases was 150% of the expected (Bender & Bender, 1982). In the United States, fifteen percent of men and twenty five percent of women are overweight (Abraham & Johnson, 1980). The Framingham study - a longitudinal study of risk factors for heart disease - concluded that apart from not smoking, weight reduction is probably the most important factor in the prevention of cardiovascular disease (Kannel & Gordon, 1979).

Dental Decay

In affluent societies, nearly every individual has some tooth decay and a number do not have any natural teeth by the time they reach adulthood (Bender & Bender, 1982). The frequency of ingesting sucrose leads to tooth decay (Bender & Bender, 1982). The dietary prescription for tooth decay prevention is to limit the intake of sweets and to refrain from eating between meals.

Summary

Knowledge of these diseases and the particular dietary practices associated with them has lead to specific dietary guidelines. The recommended diet for adults to aid in the prevention of all of the above diseases is high in fiber, complex carbohydrates, and low in sugar, fat, and salt (Gussow & Contento, 1983).

PREVIOUS INTERVENTIONS

The preceding section demonstrates the importance of appropriate dietary habits and the failure of the typical American diet to meet adequate standards. Programs designed to address this problem can be differentiated in a variety of ways including the type of intervention used, the level of the intervention, and the mode (waiting or seeking) of health care delivery adopted (Rappaport, 1977). The different types of interventions include educational programs, dietary counseling, behavior modification, mass media campaigns, and changes in availability of certain foods. The goals of these programs range from knowledge to behavior change. Different programs have targeted different levels of intervention including individual, small group, organization, and community. The more traditional programs adopt a waiting mode of health care delivery. Recently, some of the projects working with organizations or communities have adopted a seeking mode.

Individual/Small Group

The traditional approach to nutrition education and programs attempting to produce eating behavior change is the individual or small group approach. The role of the Health Education Officer is to provide information about nutrition to various individuals in the community (Angove, 1984; Burman, 1982). This is achieved through mailings, handouts, and lectures/demonstrations given to interested community groups, provision of educational materials to the schools and health education classes available to community members (Angove, 1984; Burman, 1982; Connor, Gustafson, & Vaughan, 1985). Little evaluation has been conducted to assess the impact of these programs.

The USDA Cooperative Extension Service conducts outreach programs that provide nutrition education to individual families or small groups (Cross, 1980). Some 5,673 para-professional aides provide information and education on food buying and preparation to low income families. The service also conducts food and nutrition education projects for youths through the national 4-H program. Again, formal evaluation of these services is often lacking or when it is conducted suffers from serious methodological problems (Karvetti, 1981).

The small group format has proven marginally successful in changing food consumption patterns in individuals at high risk for heart disease (Karvetti, 1981; Mojonnier et al., 1980; Stern, Farquhar, Maccoby & Russell, 1976). The interventions in these studies generally consisted

of basic nutrition education, food preparation demonstrations, lectures on risk factors and skills training. The program conducted in association with the Stanford Heart Disease Prevention Program (Stern et al., 1976) also included behavior modification techniques. The Health Belief Model (Rosenstock, 1974) would suggest that the success of these programs could be attributed to the perception of vulnerability to heart disease on the part of the participants. This model proposes that compliance with any health behavior depends on this perceived vulnerability. This would suggest that this type of intervention may not work with people who have not been identified as being at high risk.

An important advantage of two of the studies (Mojonnier et al., 1980; Stern et al., 1976) is their adoption of the seeking mode. The researchers invited individuals identified through screening procedures to participate in their programs. Another positive aspect of these programs concerns the methods used to assess the impact of their programs. Two of the studies (Mojonnier et al., 1980; Stern et al., 1976) measured serum cholesterol levels and all three assessed changes in food consumption and knowledge of nutrition. Unlike other small group programs (Perkins, 1983; Robinson, 1984), these demonstrated both knowledge and behavior changes.

The Multiple Risk Factor Intervention Trial (MRFIT) is a study supported by the National Heart, Lung and Blood Institute and involves 22 clinical centers (National Heart, Lung and Blood Institute, 1976). The goal of this project is to decrease high risk factors in high risk males. The intervention consisted of small group sessions directed at modifying be-

haviors associated with risk factors. Behavior modification techniques were employed to affect these changes. The results of this program have indicated some reduction in risk factors for the intervention groups.

A final type of individual/small group intervention is the therapeutic treatment of obesity. Behavioral treatment approaches to obesity have been somewhat more effective than other methods in producing immediate weight loss (Hagen, 1974; Harris, 1969; Mahoney, 1974; Stuart, 1971). However, maintenance of the weight loss over a long period of time has yet to be demonstrated (Stunkard & Perick, 1978; Wing & Jeffrey, 1979). Nearly 30 years ago, Stunkard (1958) observed that "most obese persons will not stay in treatment for obesity. Of those who stay in treatment, most will not lose weight, and of those who do lose weight, most will regain it" (p. 27). The same statement is true today. Techniques used in the behavioral treatment of obesity include covert sensitization, stimulus control, reinforcement and changing the environment (Stuart, 1967, 1971). Evaluations of the efficacy of these techniques have generally focused exclusively on weight loss and have not investigated the nutritional composition of the participants' diets.

Two difficulties exist with the individual/small group level interventions. The first is that the programs require a great deal of work and time on the part of the program personnel. This type of strategy may not be cost effective if the purpose is primary prevention. Secondly, these programs seem to require a certain level of existing interest on the part of the subject. They do not include strategies to create

awareness or interest in the general population, but instead focus on high risk individuals or those who already have some type of disorder. These programs are aimed at secondary and tertiary prevention rather than primary prevention.

Organization/Large Group

A variety of programs could be considered in this section, including company and hospital wellness programs. However, the two types of large group level interventions most applicable to this discussion are the school-based programs and those designed to intervene in places where food is directly available (e.g. cafeterias). Interventions designed for these two settings will be covered in this section.

School-based Programs

Stone (1985) identified fifteen ongoing school-based health research studies currently being funded by the National Heart, Lung, and Blood Institute. These studies are researching the effectiveness of risk reduction strategies in school settings. The programs are addressing a variety of health behaviors including not only nutrition but also smoking, stress management, and exercise using a variety of strategies. Most of the studies involve elementary age students. Only three of the studies target high school age students. For the most part, the studies are evaluating changes in knowledge, attitudes, behavior and physical measures. One of the studies (School Promotion of Student Diet and Exercise

Behavior, conducted by Guy Purcel at the University of Texas Medical Branch) is evaluating changes in school policy and procedures. Many of these programs have conducted some type of formative research (surveys, focus groups, pilot tests) in the development of their interventions. At this point, only two of the fifteen studies have any results to report. The first is the Coronary Risk Factor Intervention in Childhood program conducted by Walter in conjunction with the American Health Foundation. After three years of intervention, she has found small but significant differences between the intervention group and the control group in blood pressure and plasma cholesterol levels. Second is the Chicago Heart Health Curriculum Program. The principal investigator of this Chicago Heart Association project is James Schoeneberger. Preliminary results indicate knowledge and attitude changes but little or no measurable behavior changes in the intervention groups. One difficulty with these studies may be problems associated with setting generalization. As Stokes and Baer (1977) indicate, setting generalization is difficult to achieve. The expectation that knowledge and skills learned in the classroom will transfer to the cafeteria or, in some studies, to home may be unrealistic. Another difficulty with these studies is the inability of the present research to identify which procedures in the extensive programs are effective and which are ineffective.

Other studies have investigated the effects of school-based educational approaches (Iammarino & Weinberg, 1985; Terhune, 1984). Neither of these studies attempted to evaluate the behavioral effects of the programs. Both studies found significant changes in knowledge and attitude.

Point of Choice Interventions

The studies reported in this section investigated the effectiveness of nutrition information at the point of choice. Davis and Rogers (1982) and Martilotta and Guthrie (1980) studied the modification of milk selection in school cafeterias. Davis and Rogers (1982) found that providing information at the point of choice significantly influenced milk choice in college students. Their results show a significant shift in consumption from whole to nonfat milk after the introduction of point of choice information. Martilotta and Guthrie (1980) looked at the effect of both availability and point of choice information on the consumption of whole versus low or nonfat milk. The results of this study are somewhat unclear because of the overall decrease in milk consumption during the intervention phases. There is some indication that both availability and point of choice information resulted in a shift from whole to low or nonfat milk. There was a seven percent increase in students choosing skim or lowfat milk between the availability phase of the study and the point of choice information phase. This supports the conclusions reached by Davis and Rogers regarding the effectiveness of point of choice information on milk selection.

Wilbur, Zifferblatt, Pinsky and Zifferblatt (1981) investigated the impact of caloric content information on the sale of regular versus low calorie items in vending machines. The results from this study indicate that the sale of lower calorie items was influenced more by availability than point of choice information. The point of choice information did

enhance the sales of the lower calorie items, though not to a significant degree (from 40% to 45%).

Dubbert, Johnson, Schlundt and Montague (1984) evaluated the effect of posting caloric information on food items in a cafeteria. The results indicated that the information increased the probability of selecting low calorie vegetables and salads but did not affect entree choice. The intervention did not result in an overall decrease in total meal calories. Decreases in calories resulting from a low calorie vegetable or salad were compensated for by the selection of higher calorie entrees. The authors of this study conclude that manipulating environmental cues appears to be a promising method for changing food selection, but suggest that techniques other than calorie labelling of specific items may be more effective.

Zifferblatt, Wilbur and Pinsky (1980) studied the effect of a media-based nutrition intervention program called "Food for Thought" on food selection in a cafeteria setting. This intervention provided incentives for cafeteria customers to pick up cards containing nutrition information. The cards contained information about low calorie nutritious meals. The incentives for accepting and saving the cards were posters available for certain combinations of the cards. The effect of the "Food for Thought" game on food selection and average caloric consumption was a decrease in bread and dessert consumption, an increase in the selection of skim milk as a beverage, a reduction in overall calorie consumption and an increase in the number of customers. One difficulty in inter-

preting the results of the study is the lack of information on customer characteristics. Because of the increase in number of customers, it is not possible to determine if the changes observed represent a shift in food selection or an increase in customers who were calorie and nutrition conscious.

A similar intervention has been tried in a supermarket setting (National Heart, Lung and Blood Institute, 1983). The previously cited study served as a pilot for this project sponsored jointly by Giant Foods, Inc. and the National Heart, Lung, and Blood Institute. The program provided nutritional information primarily through lengthy brochures and supermarket shelf tags placed directly at the point of choice. The evaluation showed some change in knowledge but no change in purchasing behavior. Critiques of the study (Winett, 1986) point to a variety of difficulties with the program that could account for the failure to change purchasing behavior. Among these are the lack of adequate formative research to identify relative consumer characteristics and the complex, vague, general nature of the messages. More recent supermarket interventions have moved to much more limited and specific interventions (Winett, 1986).

A highly specific intervention introduced in a cafeteria setting (Mayer, Heins, Vogel, Morrison, Lankester & Jacobs, 1986) resulted in an increase in purchase of low-fat as compared to nonlow-fat entrees. The intervention consisted of point of choice information announcing the benefits of a low-fat diet and listing the daily low-fat entrees. The intervention resulted in a 15% increase in low-fat entrees.

These studies have several characteristics in common. They are all representative of the seeking mode. The primary goal of each of them was to change food choice behavior. All of the studies provided information within the relevant setting. One of the primary difficulties with these studies is their failure to take into account the influence of individual variables such as weight, sex, current knowledge of nutrition, attitude toward nutrition and level of motivation on food choice behavior change. For example, studies have found that men tend to purchase higher calorie meals than women (Coll, Meyer & Stunkard, 1977; Stunkard & Kaplan, 1977). Some researchers (Dubbert et al., 1984) have suggested, based on these results, that calorie content information may have a greater influence on the food choice behavior of women than men. The implication is that the success of an intervention may, in part, depend on matching the specifics of the intervention with various characteristics of the population it is directed toward.

Community Interventions

Community multifactorial interventions

A recent emphasis on community level interventions directed at reducing cardiovascular disease morbidity and mortality has resulted in several large scale multifactorial intervention programs. The first of these took place in North Karelia, Finland. One of the primary objectives of the project was to change dietary habits. The program included extensive education programs, increasing availability of certain foods and mass

media campaigns. The result of this extensive program was a decrease in serum cholesterol, a decrease in fat consumption, and an increase in the consumption of fruits and vegetables (Pietenin et al., 1984). Overall, however, these changes were not significantly different from those in the nearby control community (Puska, 1973).

The Stanford Heart Disease Prevention Project involved three California communities. One of these served as a control. The other two received an intensive, extensive mass media campaign. In one of these communities, the media campaign was supplemented with educational programs for identified high risk individuals. The program resulted in a decrease in reported cholesterol intake and an overall risk reduction of 16% for the media only community and 20% for the media plus intensive program community as compared to the control community (Farquhar, 1978; Stern et al., 1976). These statistics are primarily due to a reduction in smoking and represent only minimal change in nutritional practices (Farquhar, 1978).

Government Programs

There are several government programs that promote better nutrition. The Food Stamp program for low income populations enables families to buy a greater variety of foods. The stamps are accompanied by educational materials promoting appropriate dietary habits. The Special Supplemental Feeding Program for Women, Infants and Children (WIC) provides food vouchers for pregnant, postpartum and breast feeding women. Individual and group counseling about nutrition is an integral part of this program.

Finally, the Nutrition Education and Training Program (NET) provides lunch and breakfast to millions of children in the school and day care settings. The foundation of these programs is the increase in availability of nutritious foods.

Conclusions

Several conclusions can be reached from this brief review of intervention approaches directed toward promoting nutritional eating behaviors. The first is that an increase in knowledge does not necessarily lead to an accompanying change in nutritional behavior. For this reason, it is important to directly target and measure behavior change if that is the goal of the program. Another conclusion is that it is necessary to adopt a seeking mode in the delivery of nutrition education in order to reach a substantial proportion of the population. A third conclusion is that community or large group level interventions may be better suited to the primary prevention of disorders associated with poor dietary habits. A fourth conclusion is that large group level interventions require less resources than the community level interventions and thus may be more feasible to conduct on a widespread basis. The research on large group interventions indicates that the results of these programs may be improved by designing programs for specific population segments. This is accomplished through the adoption of social marketing techniques such as market segmentation and attention to the four P's (price, promotion, place and product). The following section will discuss the theoretical foundation for the proposed large group intervention.

THEORETICAL FOUNDATIONS

One basis for the research in this project was "a behavioral systems framework" (Winett, 1986). As described by Winett "this framework is an amalgamation of social learning, communication, and behavior analysis principles overlayed by social marketing concepts and variables" (p. 2). The emphasis in this framework is on the bidirectional reciprocal relationship between behavior, person variables and environment. Each of the components of the behavioral systems framework - social learning theory, behavior analysis, communications theory, and systems theory - as it applies to this proposal, will be discussed below.

Social Learning Theory

Two of the primary concepts in social learning theory are reciprocal determinism and cognitive control (Bandura, 1969, 1977). Reciprocal determinism may be defined as the bidirectional reciprocal relationship between behavior, person variables and environment. In this view, not only does environment shape an individuals behavior but individuals play a definitive role in the creation of their environment. SLT emphasizes the role played by cognitive processes. The concept of vicarious learning is derived from this theory. Vicarious learning occurs through observation. The process associated with this type of learning is generally referred to as modeling. According to Bandura, observers form symbolic representations of modeled behavior and these serve as guides for appropriate performance of the behavior. Reinforcement facilitates

observational learning through its effects on the subjects attention to the modeled behavior, memory of the modeled behavior (retention) and motivation to perform the behavior. Bandura differentiates between learning and performance. He asserts that behavior that is learned vicariously will only be performed if the reinforcement contingencies are appropriate. More recently, to better emphasize the cognitive and environmental aspects of this paradigm, Bandura (1986) has renamed his approach social cognitive theory.

Social cognitive theory relates to the proposed intervention in several ways. First, the final form of the intervention is based on the behavior, person, and environment variables identified during the formative research stage in the development of the intervention. Surveys, focus groups and key person interviews helped to identify these factors. For example, environmental constraints and their influence on individual behavior is demonstrated in awareness of the issue of availability. A nutritional analysis was conducted on the dining hall menu in order to determine if nutritional food was available. The impact of individual behavior on the environment is demonstrated by the fact that certain types of food were made available to the students when the requests for them were frequent and persistent. The proposed intervention is based, in part, on the principles of vicarious learning. One expectation of the study is that as individuals become involved in selecting appropriate foods because of the point of choice information or the incentives offered to do so, they will serve as models to other students who will then be more likely to make similar food choices.

Behavior Analysis

Behavior analysis involves the definition of target behaviors and their antecedents and consequences. This is also referred to as the ABC model. It is based on the operant conditioning paradigm. The focus is on manipulating the environment in order to maximize the occurrence of desirable behaviors and minimize the occurrence of undesirable behaviors. Two common techniques for achieving this are stimulus control and contingency management (Geller & Nimmer, 1985). Stimulus control techniques involve manipulation of environmental variables that elicit the behavior. Stuart (1967, 1971) demonstrated the effectiveness of this strategy in producing short term weight reduction. One component of his program was to change the environmental cues that signalled inappropriate eating behavior. Nutritional information at the point of purchase is another stimulus control method commonly referred to as prompting. Contingency management simply refers to reinforcement of appropriate behaviors and punishment of inappropriate behaviors. Immediate reinforcement is far more effective in producing behavior change than delayed reinforcement. One of the primary difficulties in changing eating behavior is that foods low in nutritional value frequently offer immediate reinforcement. The effects of eating either appropriately or inappropriately are generally not readily discernible so that the contingencies may not be clear.

In the proposed intervention, the antecedent strategies are 1) the promotional material designed to heighten the awareness of the importance of nutrition and the upcoming program and 2) the point of choice nutrition

information. The consequent strategy is the incentive system for appropriate meal selection.

Communication Theory: McGuire's Information Processing Paradigm

McGuire's information-processing paradigm suggests that the impact of persuasive messages can be understood in terms of twelve steps: 1) tuning in to the message producing exposure 2) attending to it, 3) liking and taking an interest in it, 4) comprehending its content, 5) generating related cognitions, 6)relevant skills, 7) agreeing with the communication position, 8) storing the change in memory, 9) retrieving the relevant material from memory, 10) decision making on basis of the retrieved material, 11) acting in accord with the decision that is made, and 12) post-action consolidating of the new pattern. These steps generally occur in sequence - the occurrence of each step depends on the occurrence of the previous one(s), although it is recognized that the process is not always a linear one. For example, it must be recognized that changes in attitude do not necessarily mean subsequent changes in behavior. However, this model may be a particularly useful heuristic in this case for explaining some of the mechanisms responsible for maintenance of behavior change. The proposed intervention offers incentives for immediate behavior change and provides persuasive information on nutrition. The maintenance of the behavior change may depend on the formulation of a commitment to appropriate diet through a decision-making process in which the costs and benefits of the behavior are carefully analyzed (Gussow & Contento, 1983).

Systems Theory

Behavioral systems theory emphasizes three systems notions: context, interdependency, and multilevel analysis. Context refers to the setting of the study and includes consideration of barriers to and facilitators of behavior change. The setting for this study was three large cafeterias which furnished meal plans for university students residing in residence halls. Students were provided with three different entree selections, a full salad bar, and several vegetable and dessert choices at each evening meal. Meal service was maintained for two and one half hours each evening. Students choose the time they attended meals within this period. According to a sample of students surveyed, meal time was also regarded as a time to socialize with friends.

The setting yielded a number of barriers to changing student selection behavior. Unlike most commercial enterprises, the dining halls provided only a limited selection of food items and these were not necessarily designed to match student preferences. The quality of the food in the dining hall was affected by the need to cook large quantities within budget constraints. Foods high in fat and calories and low in nutritional value were generally available at each meal. Another barrier concerned the reinforcing value of high fat and/or sugar foods. Many individuals preferred the taste of these entrees which affected their selection of these items.

Facilitative factors related to the setting included the relatively captive nature of the target population. That is, the majority of students ate most of their meals in the cafeteria. This allowed an intervention to reach most of the people most of the time. Another facilitative factor was the interest of the dining hall administration in the program and their willingness to modify food items to meet the Dietary Guidelines.

Interdependence is defined as the recognition that behaviors are interrelated and that a change in one may affect a change in another. In this case, changes in eating behavior may affect changes in social activities, energy level, academic performance, appearance and health. A multilevel analysis requires awareness of the possible influences of the project on a variety of levels - individual, group, and community. The project targetted individual behavior change, both the providers and consumers of cafeteria selection.

Social Marketing

In the past 10 years, marketing has expanded to include marketing of social causes. Social marketing is defined as the design, implementation and control of programs calculated to influence the acceptability of social ideas and involving considerations of product, planning, pricing, communication and marketing research (Fox & Kotler, 1980). A social marketing analysis involves several steps. The first step in the analysis is to identify the target market and its segments. In this case, the target markets have been established as all students who eat in the dining

halls and the dining hall administrators. Segmentation of the student market was directed by survey results during the formative research phase of the project. The market was segmented according to motivational factors, intention to change, and variables important in food selection. The second stage in the analysis is the identification and development of the four P's (the key variables in marketing's conceptual framework): product, promotion, place and price.

Product

Kotler & Zaltman (1971) differentiate between the core product and tangible products. The core product in this case is improving dietary habits in college students. The first step in product development is assessment of the current dietary habits of the target population, the knowledge and awareness of nutritional concerns and the attitudes and beliefs of the students and dining hall administrators regarding nutrition. The assessment was conducted through surveys, interviews and focus groups. The information from the assessment was used to guide the development of the tangible products. The tangible products included low fat, calorie, and sugar entrees and information material related to dietary change.

Promotion

Kotler and Zaltman (1971) describe four types of promotional activities: advertising (paid, nonpersonal promotion), personal selling (paid personal promotion), publicity (unpaid nonprofessional promotion) and sales

promotion (paid forms of promotion designed to stimulate audience interest and acceptance). Factors that need to be considered in the development of a successful promotional campaign, including selecting the appropriate forms of promotion, are the size of the advertising budget, the expertise and skills possessed by the project staff in this area, the accessibility of various forms of media and, of course, the target market. In the case of this proposal: the budget is limited, the investigator has knowledge of nutrition and psychological principles of behavior change; the accessibility to various media forms is limited. The promotional activities associated with this proposal are guided by these strengths and limitations. They included: 1) establishing awareness of the program through the surveys conducted during the programs formative research stage, 2) early contacts with dining hall administrators aimed at promoting the importance and need for a nutrition program, and 3) the incentive system established to promote selection of appropriate meals.

Place

Considerations in selecting the appropriate place include providing adequate and compatible distribution and response channels. In this case, several settings were considered for the program - a fast food restaurant, high school cafeterias and college dining halls. Investigation into the first two settings revealed a number of methodological and programming constraints. At the time of the study the fast food restaurant had limited availability of low fat, high complex carbohydrate foods and the continuously changing customer population would have represented a con-

siderable challenge in the formative research phase of the study. The high school administration required a substantial amount of time before they could agree to such a program. The college dining hall administration were immediately receptive and interested in the program and the setting offered a stable continuous population. These issues highlight the need to consider and attend to various environmental constraints.

Price

Price represents the cost to the buyer (in this case, students using the dining hall and dining hall administrators) for purchasing or obtaining the product. Price includes money costs, energy costs, opportunity costs and psychological costs. The cost to the students in this case include the loss of the opportunity to eat something else, the energy to read the information provided and participate in the incentive program and the psychological cost of becoming aware of the nutritional value of their diet and possible guilt associated with choosing to eat foods without nutritional value. The cost to the administration includes the energy required to work on the program in an advisory capacity, the loss of the opportunity to use this time for another activity and the psychological cost associated with allowing outside personnel to conduct a program without knowledge or assurance of the outcome. To balance these costs, incentives were offered to the students and participation in all phases of development and implementation was invited but not required from the administration.

Positioning

An additional consideration in the marketing analysis is the position of the product or how it compares to similar products offered to the target population. At the time of the study, there were three other primary sources of nutritional information available to students. Dietary counseling was available through the student health services for individuals or small groups, a nutrition course was offered through the food science department, and information was available through television commercials, magazine articles, and books. The present program differed from the dietary counseling and nutrition course by adopting a seeking mode and working at the large group level. Unlike the nutrition course, the program was designed to change behavior as well as knowledge. In contrast to many television commercials, magazine articles, and books, whose aim is to sell a particular product or approach to weight loss, this program was designed on the basis of widely accepted nutritional principles to promote an overall change in dietary habits. A final difference between this program and the others mentioned above involved the setting of the program. This program occurred at the point of selection unlike the others which were quite removed from the occurrence of actual behavior.

FORMATIVE RESEARCH

Formative research is research conducted to guide the development of a project or program (Palmer, 1981). One model for formative research is the social marketing model discussed above. Social marketing provided

the framework for the formative research used to develop this intervention. The techniques used were surveys, focus groups, and menu analysis.

Surveys

Two short surveys were given to 320 students during the dinner hour at one of the dining halls (see Appendix A). The first survey asked questions about general eating behaviors. The second survey was designed to assess attitudes, intentions and beliefs about food, eating and nutrition. The form of the surveys is based on the hierarchy of effects framework employed by the Stanford Heart Disease Prevention Program (Solomon, 1984). The model is derived from the diffusion of innovation literature (Rogers & Shoemaker, 1971) which details the process by which an individual becomes committed to the continued use of a practice, object or idea. Zaltman and Walendorf have described this adoption process in terms of nine stages: (1) perception (the innovation and the need for it are recognized by the individual) (2) motivation (influenced by the needs of the individual and the ability of the product to meet these needs), (3) attitude (liking or disliking the product), (4) legitimization (achieved through reinforcement and modeling effects), (5) trial (trying out the product). (6) evaluation (evaluation of specific aspects of the product), (7) adoption (commitment to continued use), (8) resolution (adjusting other cognitions and behaviors to the adoption of the innovation). The hierarchy of effects model outlines steps derived from the above: awareness, knowledge, motivation, skills learning and maintenance

and self management. The framework views these steps as sequential. The surveys were designed to evaluate each of these steps, to aid in the development of informational materials and to determine effective incentives.

The surveys were handed out at the entrance to the dining hall along with a pencil. The subjects were asked to return the surveys once they were completed. A research assistant circulated through the dining hall to answer questions and to prompt individuals to complete the surveys. The return rate of the questionnaires was approximately 80 percent.

The surveys were analyzed using simple frequency counts and percentages. The results of the behavior survey are shown in Table 1. The results of the attitude/ knowledge survey are depicted in Table 2.

The survey sample was comprised of 69% males and 31% females. In the sample, 38% of the subjects were freshman, 31% sophomores, 20% juniors , 9% seniors and 2% graduate students. Compared to the overall subject population eating in the cafeteria, the sample contained a disproportionate number of upper classmen. Analysis of the data from the eating behavior survey revealed the following:

1. About half of the participants reported exercising regularly (3 times per week for 30 minutes or more),
2. The majority of the participants reported eating between 2 and 3 meals per day.

3. Twenty six percent never eat breakfast. Only 14% eat breakfast on a daily basis. The majority (55 - 70%) eat lunch and dinner on a daily basis.
4. Most of the participants (84%) eat out between 1 and 3 times per week. The meal they are most likely to eat out is dinner (85%) at a fast food restaurant (67%).
5. Seventy percent of the participants reported snacking at least one time per day. The most popular snack foods are salty foods (37%), followed by sweets (20%).
6. Sixty five of the participants in the survey reported eating dessert at least one time per day. Of desserts selected, 51% are ice cream, 36% are other types of sweets, and 8% are fruit.

Relevant conclusions drawn from this survey include the following: meals (primarily breakfast) are frequently skipped, the intake of foods high in fat or sugar is high, due to snacking and eating desserts, most meals are eaten in the dining halls and roughly half of the students participate in any regular exercise program.

The knowledge and attitude survey revealed the following:

1. The participants did not show an adequate knowledge of nutrition. Only two of the eight knowledge questions were answered correctly by 50% or greater of the participants. In particular, participants seemed to lack knowledge about the relative importance of protein and complex carbohydrates.

2. Participants in the survey expressed a minimal interest in improving their nutritional practices.
3. Health and appearance concerns were chosen as the factors most likely to motivate a change in eating habits.
4. Participants expressed a moderate degree of confidence in their ability to change their eating habits for a long time.

The results of the survey suggest that for a program to be successful in changing the eating behaviors of this population interventions directed at increasing both knowledge and motivation will be necessary.

Focus Groups

The purpose of the focus groups was to obtain detailed reactions from dining hall customers to possible formats and contents of informational materials and to refine the intervention processes.

The two focus groups consisted of 12 and 10 freshman and sophomore introductory psychology students residing in the dormitories. The members volunteered to participate in the focus group in exchange for one extra credit point in their introductory psychology course. The groups were comprised of a disproportionately large number of females (64%) compared to the overall population of students eating in the cafeteria. The two groups met for one hour and were asked to respond to a semi-structured interview led by the investigator (see Appendix B). The information from these groups was used to guide the content and format of the informational materials as well as to guide the selection of appropriate incentives.

The information resulting from the focus groups suggested that the following characteristics are important in the development of promotional materials: color, simplicity and the use of an attractive model. The motivational message chosen by the focus group members as most appealing is that eating appropriately results in improved appearance and athletic ability. Sixty five percent of the members stated that the change they most desired in their eating habits is to eat less junk food (50%). The most commonly cited difficulties involved in changing eating behavior are lack of availability of different types of food (33%), lack of time to eat appropriately (23%), and habit (18%). A majority of the members (60%) indicated that they would try a new way of eating if their friends would be willing to eat in a similar way. The benefit from eating appropriately the students indicated the most interest in was an increase in energy (50%), followed by improved sports performance (36%), and improved health (36%). Forty percent of the focus group members listed money as the incentive most likely to get them to try a new way of eating. Other suggestions were tickets to concerts and sports activities, health club privileges and dinner for two out at a restaurant. Eighty five percent of the group members indicated that they would be interested in alternative meal selection if it were available.

Menu Analysis

The purpose of the menu analysis was to to assess the current protein, carbohydrate and fat composition, and calorie content of the entrees available during a sample week (Table 1). The analysis was conducted

using the Nutritionist II computer program (N Squared Computing, 1983). Based on this information, the entrees were placed into one of four categories: (1) low carbohydrate, high fat, (2) high carbohydrate, high fat, (3) low carbohydrate, low fat and (4) high carbohydrate, low fat. An entree was defined as low fat if the fat content provided less than 31% of its total calories. If the complex carbohydrate content of the entree was greater than 50% of its total caloric value, then the entree was classified as high carbohydrate. These categories reflect the goals of the intervention program which are to reduce fat and increase complex carbohydrate intake. Eighteen entrees were analyzed. Fourteen of them were categorized as high fat, low carbohydrate; three as low fat, low carbohydrate; and one as low fat, high carbohydrate. The fourth category was not represented (Table 2). These results indicate that overall the entrees currently available do not meet dietary guideline standards.

Insert Table 1 and Table 2 about here

RATIONALE AND HYPOTHESES

The need for programs promoting nutritional eating behavior has been well established in a preceding section as has the rationale for choosing a large group level intervention (i.e. economic and feasibility issues). The rationale for the specific type of large scale intervention chosen requires a comparison between the proposed program and similar previous ones. The proposed program combines two methods that have been effective in other studies - point of choice information and incentives. The proposed intervention differs from previous programs in three ways. First, the intervention combines two strategies that have been previously successful. Second, the program content and process is based on formative research findings. This research was conducted following a social marketing framework. Researchers in the area of health promotion/disease prevention indicate that formative assessment is essential to the success of their programs (June Flora, personal communication, November 4, 1985; Kerry Redican, personal communication, November 5, 1985). The third difference between this program and others is that the proposed program uses a direct incentive approach to promote immediate eating behavior change. This technique has not been used before in a large scale intervention targetting eating behavior. Zifferblatt et. al. (1980) reinforced attention to nutrition information but did not provide incentives for actual behavior change. Reinforcement theory would suggest that an incentive strategy would prove effective in prompting individuals to try the new behavior. As suggested by the diffusion of innovation literature,

the trial stage is an important step in long term adoption of a behavior. The maintenance of this behavior change may depend on other factors - reinforcement from the short term benefits of appropriate diet and commitment to the new behavior resulting from the processing of new information.

RESEARCH HYPOTHESES

1. Availability of low fat, low salt, high complex carbohydrate food (the 'Perfect Balance') will lead to an overall decrease in fat consumption and an increase in complex carbohydrate consumption.
2. Point of choice information on nutrition will promote changes in eating behavior to a low fat, high complex carbohydrate diet.
3. The incentive strategy will lead to eating behavior change in the desired direction.
4. The combination of the three strategies will be more effective in changing selection behavior than either availability alone or availability plus point of choice information. The combination of availability and point of choice information will be more effective in changing selection behavior than availability alone.
5. The social marketing framework used to provide formative information used in the design and implementation of the intervention will lead to an increase in effectiveness over other similar programs.
6. The program will result in changes in knowledge, attitudes and self-reported behavior regarding nutrition.

METHOD

DESIGN

The study used the multiple time-series design (Campbell & Stanley, 1963) diagrammed below:

0 0 0 X1X2X3 0 0 0

0 0 0 X1X2 0 0 0

0 0 0 X1 0 0 0

The baseline, intervention and post intervention phases each lasted one month. Three intervention strategies were included in the study: availability (X1), point of choice information (X2), and incentive (X3). The design provided the following comparisons: a) availability to availability and point of choice information b) availability to availability, point of choice information and incentives and c)availability and point of choice information to availability, point of choice information, and incentives. The dining halls were assigned at random to the three intervention programs.

Assessment of eating behavior change was continuous across baseline, intervention, and post intervention phases. Assessment of knowledge and attitude change (process evaluation) occurred at pre-intervention and post- intervention.

SETTING AND SUBJECTS

The research was conducted with the cooperation of the Virginia Tech dining hall administration in three dining halls on campus (Dietrick, Owens, and Schultz). The dining halls provided three meals per day for dormitory residents and lunch tickets for off campus residents. The meals were served cafeteria style (see Appendix C for a typical menu).

The subjects were the approximately 8600 students who resided in the dormitories and ate dinner at the dining halls. The demographics for the subject population are presented in Table 3.

Insert Table 3 about here

The students paid for their meals one time per quarter. No money was exchanged in the dining halls. A cashier checked the student's IDs electronically for the appropriate code indicating they had paid for dining hall privileges.

PROCEDURE

Dependent measures

Cafeteria Data

Aggregate measures of entree selection were gathered from the dining hall administration's existing daily data collection system for the dinner meal. This system provided the following information: a) the number of portions selected of each entree item, b) the number of portions prepared of each entree item, c) the number of customers served during each evening meal, and d) comparisons of the number of portions selected between any two similar entrees across time. The entree recipes were analyzed for fat, carbohydrate, and calorie composition using the Nutritionist II program (N-Squared Computing, 1983). Entree items that met the following criteria - fat content less than 30% of total caloric value, simple carbohydrate content less than 15% of total caloric value, and total caloric value under 400 calories - were designated as 'Perfect Balance' (PB) entrees. The name 'Perfect Balance' was selected as the promotional name for the low fat, low calorie, and low sugar entrees. For the most part, PB entrees were modifications of existing recipes. For example, to meet the Perfect Balance criteria, lean cuts of beef were substituted for higher fat cuts of beef in beef recipes. The remaining entrees did not meet the aforementioned guidelines (i.e. were higher in fat, simple carbohydrates, and/or calories). The interventions were directed at ob-

taining shifts from the selection of entrees failing to meet the above criteria to the Perfect Balance (PB) entrees. The data were collected across baseline, intervention, and post- intervention periods.

Survey Data

A survey designed to assess knowledge, attitudes, and self reported behavior on the topic of nutrition was given to dining hall customers during dinner on two occasions: pre-intervention and post-intervention. The survey took approximately 20 minutes to complete and was given to the students as they entered the dining hall along with an informed consent form. Students were requested to sign the informed consent and return the completed forms as they left the dining hall. Following distribution of the surveys, each dining hall table was checked every ten minutes. At this time, questions about the survey were solicited and answered. Attempts were made to match surveys across collection periods by subjects social security number to determine individual changes in knowledge, attitudes, and self-reported behavior. Few surveys were able to be matched because of the large number of students who refused to identify themselves on the survey form, despite assurances regarding anonymity and confidentiality.

Individual Data

A tracking project was designed to follow a small sample of individuals in each dining hall (n=44). The sample was roughly representative of the cafeteria population in terms of sex but included only 5% upper classman as compared to 18% in the overall population. The purpose of the project was to assess whether changes in aggregate selection behavior reflected consistent change in particular individuals or intermittent change across individuals. The subjects were introductory psychology students who volunteered to participate in an experiment on eating behavior for extra credit. They were required to sign an informed consent form prior to participation in the study. Due to time limitations imposed by the introductory psychology course (10 weeks), the subjects only participated in the study during the baseline and intervention phases. The subjects were instructed to fill out opscans detailing their meal selection for each evening meal. They were unaware of the connection between this study and the interventions in the dining halls. They were given one opscan for each week. At the end of each week during the baseline and intervention periods, they turned in the opscans to a research assistant. With their permission, a research assistant contacted a designated significant other (e.g. roommate, close friend) at random intervals to verify the information on their opscans regarding entree selection. Subjects were contacted if they failed to return their opscans each week and every effort was made to ensure their continued participation in the study. At the end

of the study, the subjects were given a full explanation of its purpose and encouraged to provide feedback to the researcher.

Intervention Strategies

Availability

This intervention coincided with a decision on the part of the dining hall administration to introduce low fat, low calorie, and low simple carbohydrate entree choices at the dinner meal. The introduction of this line of entree selections, labelled the 'Perfect Balance', increased the availability of nutritional foods. An example of a PB entree was fish baked in lemon rather than fried fish. The PB entrees were introduced in each of the dining halls at the same time.

Point of choice information

This intervention included the following materials: a) large posters promoting the PB entrees, b) tent cards placed on each table and on the serving line to designate the PB entree, and c) pamphlets providing information on the dietary guidelines and how to modify eating habits to meet these guidelines. These materials were constructed with the help of an advertising agency to reflect the results of the pre-intervention survey data and the focus groups. The information gathered from these sources suggested that promoting the PB entrees in terms of improved health and appearance would be the most effective

marketing strategy. Therefore, the point of choice information materials framed the nutrition knowledge in these terms. The PB entrees were labelled as low in fat and calories and high in complex carbohydrate content. The pamphlet was written with the assistance of a nutritionist on staff at the dining hall services.

Incentive strategy

On the serving line, each student selecting the PB entree received a numbered raffle ticket from the server. Students were instructed to write their student ID number, name, and phone number on the space provided on the back of the ticket and place it in a container located at the exit of the dining hall. Pencils were provided to complete this information. At the end of each week of the incentive program, a random drawing of two raffle ticket stubs was held in the dining hall. The two winners of the drawing each received $20. Money was selected as the incentive because results from the pre-survey indicateed student preference for a monetary reward. results. The winners were contacted by telephone and their names were posted on signs positioned immediately after the entrance to the dining hall. Flyers promoting the incentive campaign provided information on how to collect the incentives. The flyers were posted in strategic areas in the dining hall and were available at at the entrance.

marketing strategy. Therefore, the point of choice information materials framed the nutrition knowledge in these terms. The PB entrees were labelled as low in fat and calories and high in complex carbohydrate content. The pamphlet was written with the assistance of a nutritionist on staff at the dining hall services.

Incentive strategy

On the serving line, each student selecting the PB entree received a numbered raffle ticket from the server. Students were instructed to write their student ID number, name, and phone number on the space provided on the back of one half of the ticket and place it in a container located at the exit of the dining hall. Pencils were provided to complete this information. They were instructed to keep the other half of the ticket for verification. At the end of each week of the incentive program, a random drawing of two raffle ticket stubs was held in the dining hall. The drawing occurred at the same time each week and was performed by one of the dining hall staff. The two winners of the drawing each received $20. Money was selected as the incentive because results from the pre-survey indicateed student preference for a monetary reward. results. The winners were contacted by telephone and their names were posted on signs positioned immediately after the entrance to the dining hall. Winners were allowed to pick up their money anytime within a one week period by showing proper identification. If no one appeared to collect the incentive another drawing was performed. Flyers promoting the incentive campaign provided informa-

RESULTS

The results present findings from three separate sources: cafeteria data reflecting changes in population selection behavior; survey data reflecting changes in sample attitudes, intentions, knowledge and self- reported behavior; and individual data, reflecting changes in individual behavior. The individual data was the basis of the tracking project; a project designed to determine whether the aggregate change reflected consistent change within individuals or intermittent change across all individuals.

Manipulation Check

The manipulation check consisted of brief face to face interviews with a sample of students (n=408) from the incentive and information conditions. The interviews were conducted by research assistants during the second week of the intervention phase. Students were approached in the dining hall during or after the evening meal. They were asked questions designed to assess (a) their awareness of the Perfect Balance program, (b) their selection behavior, and (c) their attitude toward the program.

The interview data showed that by the second week of the program substantial differences in program awareness existed between conditions. Seventy five percent of the individuals in the incentive condition (n

= 138) were aware of the program and only 22% of the people in the information condition (n = 270) were aware of it. Thus, the incentive strategy was more successful in creating awareness of the program.

Seventy five percent of the respondents in the information and 79% of those in the incentive condition had selected the PB entree on one or more occasions. Taste and appearance of an entree were the factors most frequently considered prior to the selection of an entree (96%, n = 408). Health concerns (e.g. nutrition, caloric content) were mentioned by only 9% of the respondents.

In the incentive condition, 86% of the respondents had a favorable attitude toward the program while 76% of the respondents in the information condition had a positive response to the program.

Concern for the small percentage of individuals indicating awareness of the program in the information condition led to two changes in the interventions. First, the availability of promotional materials was boosted by increasing the number of locations where the materials were posted. Second, on two days during the third week of intervention, research assistants handed out information leaflets and encouraged customers to select the PB entree as they entered the dining hall. The two days of personal prompting resulted in an increase in the selection of the number of PB entrees by 20% and 52% in the incentive condition and 30% and 24% in the information condition as compared to their pre-intervention counterparts. This was substantially greater

than the mean increase of selection of PB entrees during the intervention phase in both conditions.

Cafeteria Results

The cafeteria results were calculated using a point by point comparison. This approach involved comparing the selection of the same Perfect Balance entree (or its pre- intervention counterpart) across phase and across experimental conditions. For example, selection of fish baked in butter in the pre-phase was compared to fish baked in lemon in the intervention and post phases within and across experimental conditions.

Figures 1, 2, and 3 illustrate point by point comparisons for the information, incentive and availability conditions respectively. The figures demonstrate the extreme daily fluctuation in the number of PB entrees chosen.

Insert Figures 1, 2, and 3 about here

To reduce these daily fluctuations and still maintain the integrity of the data, weekly means were calculated. Examination of weekly means reveals a marked increase in the selection of PB entrees for the incentive condition during the first week of the intervention phase followed by a decrease. This effect was not found for the other conditions (Table 4).

Insert Table 4 about here

Examination of the selection of the same entrees across time reveals the marked difference in popularity between different Perfect Balance entrees (Tables, 5, 6, and 7).

Insert Tables 5, 6, and 7 about here

Number of Entrees Selected

Three methods of estimating treatment effects were used to analyze the cafeteria data. Each method attempts to assess change at the population level. All the methods provide information on both within cafeteria change across phases and between cafeteria change. The first method assessed the difference in the raw number of PB entrees selected across phases and between cafeterias. Difference scores were calculated by obtaining the difference in the number of each Perfect Balance entree selected between pre and intervention, intervention and post, and pre and post phases. For example, if 100 portions of fish baked in butter were selected in the pre phase, 200 portions of fish baked in lemon (Perfect Balance entree) were selected in the intervention phase, and 150 portions of fish were selected in the post phase, then the difference scores would be +100 pre to intervention, -50 intervention to post, and +50 pre to post. These differences can also be

compared across cafeterias to assess differential treatment effectiveness.

The data were analysed using Analysis of Variance. The procedure revealed a significant main effect for condition, $F(2,203) = 4.42$, $p < .01$ (Table 8).

Insert Table 8 about here

Tukey t-test revealed a significant difference between the incentive and information conditions $t(203) = 3.34$, $p < .05$. Inspection of group means showed the incentive condition increased the mean number of Perfect Balance entrees selected compared to the other conditions. For example, in the incentive condition there was a mean increase of 86 entree portions selected per day from pre to post intervention, whereas in the information and availability conditions there were mean decreases of 126 and 15 portions respectively. In assessing the change these numbers represent, it must be noted that the mean number of Perfect Balance entrees portions prepared across phases and cafeterias was 452.

A potential confound the above analysis failed to control for was the total number of all entrees served. For example, if only 500 entrees are served on one day and 1000 on another, then an increase of 50 Perfect Balance entrees selected may not reflect a change in selection

behavior but rather an increase in the number of individuals eating in the dining hall.

Percentage of Perfect Balance Entrees to Total Entrees Selected

To control for fluctuations in the total number of entrees served, the data were analyzed in a second manner. The number of Perfect Balance entrees served was divided by the total number of entrees served on each day and expressed as a percentage. The ANOVA procedure revealed no significant differences across phases or between groups (Table 9).

Insert Table 9 about here

The above methods of transforming data do not control for a third important confound: the variability in the number of Perfect Balance entrees prepared. On some days, relatively few Perfect Balance entrees were prepared resulting in their "selling out". This had the effect of reducing the number of Perfect Balance entrees available for selection. For example, assume 500 entrees were prepared on a given pre-intervention day of which 200 were the Perfect Balance entree and of the 200 fish entrees 100 were selected or 50%. Now consider the comparable intervention day when only 50 of the 500 entrees available were Perfect Balance entrees and all were selected. In this situation, both previous methods would suggest a decrease in selection of Perfect Balance entrees from the pre to the intervention phase. The first

method would show a decrease of 50 less PB entrees selected during the intervention. The second method would reveal a decrease from 25% PB entree selection during the pre phase to 14% PB entree selection during the intervention phase.

Percentage of PB Entrees Served to PB Entrees Prepared

To control for this confound, a third method of data analysis was performed. The number of Perfect Balance entrees served was divided by the number of Perfect Balance entrees prepared and expressed as a percentage. For the above example, this procedure reveals an increase in Perfect Balance selection from 50% to 100%. The ANOVA procedure revealed no significant differences across phases or between groups (Table 10).

Insert Table 10 about here

Survey Results

Students were randomly selected from the cafeteria populations and asked to complete a survey. The survey contained four a priori identified factors: attitude, knowledge, self efficacy, and behavior. Within cafeteria across phase results are presented first, followed by between cafeteria comparisons.

Information Condition

In the information condition, there was a significant change in three of 27 items and three more items approached statistical significance. The survey revealed a significant decrease in the desire to socialize during meals $t(116) = 2.57$, $p < .01$. Individuals in this condition improved somewhat in their knowledge of nutrition as indicated by the significant gains in 2 of 8 items, (1) = 3.66, 4.08, respectively, $p < .05$ and a gain approaching significance for another item (1) = 3.14, $p = .08$. These three items required knowledge about the fat and calorie content of common food items. The correct response for two knowledge items was chosen by the majority of respondents on the pre survey providing little opportunity for change. The majority of respondents were aware of the association between heart disease and diet and the low fat and calorie content of fruit prior to receiving any information. Two of the four self efficacy items approached significance, $t(116) = 1.91$ and 1.89 respectively, $p = .06$. The change was in the negative direction. This suggested individuals were less sure of their ability to change their eating habits to improve their appearance and increase their energy in the post phase than in the pre phase.

Incentive Condition

In the incentive condition, two items showed significant change. The survey revealed a significant decrease in frequency of snacking,

$t(216) = 225$, $p < .05$ and a significant decrease in self efficacy specific to improved energy, $t(216) = 3.73$, $p < .01$.

Availability Condition

In the availability condition, four items showed significant change. The survey showed a significant decrease in overall self efficacy, $t(176) = 1.92$, $p < .05$, self efficacy specific to improved health, $t(176) = 3.29$, $p < .01$ and energy, $t(176) = 3.98$, $p < .01$. Respondents indicated a significant decrease in the belief that nutritious food was available to them, (1) = 5.37, $p < .05$.

Between Cafeteria Data

Inspection of between cafeteria data revealed that in the pre-phase respondents in the three conditions differed on two behavioral items (X = 14.20, 17.88 respectively, $p < .01$) and one knowledge item (X = 8.42, $p < .01$). The behavioral items concerned the meal most frequently eaten out and the type of dessert most frequently chosen. In both cases the most frequently chosen response did not differ across cafeterias. Students indicated a preference for eating dinner out and for sweets as their favorite type of snack. However, there were differences in the frequency of the responses chosen second most often. In the information condition, respondents expressed a preference for eating breakfast out more often than respondents in the other conditions. At both pre-testing, respondents in the incentive condition

demonstrated more knowledge regarding the link between heart disease and diet than respondents in the information or availability conditions. Following the intervention phase, these differences were no longer significant.

At post-testing, individuals in the separate cafeterias differed in their belief in the availability of nutritious foods, ($X = 13.32$, $p < .01$). Forty six percent of the individuals in the availability condition indicated adequate availability of nutritious foods as compared to 79% in the information condition and 70% in the incentive condition. At pre-testing, 65% of the respondents in the availability condition, 70% of the individuals in the information condition, and 62% of the individuals in the incentive condition indicated there was adequate availability of nutritious foods. Therefore, the information provided in the information and incentive conditions may have effected students perceptions of the availability of nutritious foods in the dining halls.

Individual Data

The ANOVA procedure was used to analyze pre and intervention differences in the percentage of Perfect Balance entrees selected for the 44 individuals involved in the tracking project. The analyses revealed a significant main effect for phase $F(1,87) = 3.92$, $p < .05$. Significantly more individuals chose the Perfect Balance entree in the

intervention than in the pre phase. The group by phase interaction approached significance $F(2,87) = 2.72$, $p < .07$ (Table 11).

Insert Table 11 about here

Inspection of group means revealed the greatest change occurred in the incentive condition with a 16% increase. The information condition showed a slight (.3%) decrease and the availability condition a 2.5% increase. These changes reflect a mean daily decrease in number of Perfect Balance entrees of .5 in the information condition, of 2.0 in the availability condition, and of 4.0 in the incentive condition.

DISCUSSION

This study involved the development, implementation and evaluation of a large scale, multicomponent program designed to increase the selection of nutritious foods by college students. Several differences exist between this program and others designed to change dietary practices. One difference was the program involved the evaluation of behavior change. Many previous programs have only evaluated changes in knowledge and/or attitudes. Another difference was the program adopted a seeking mode - targetting a large number of diverse individuals rather than focusing only on those requesting help with their diet or those identified as at high risk for diet-related health problems. Individuals in the latter categories are more likely to have greater motivation to change their eating behavior, though the success in these programs has also been somewhat limited. A third difference was the program was implemented in a relevant setting, a cafeteria, rather than, for example, a classroom. A fourth difference was the descrepancy between individual and aggregate data. The program also differed from others in that it provided direct incentives for selection of a nutritious entree. This intervention has been used infrequently in other large-scale eating behavior change programs. Finally, in contrast to other programs, the intervention attempted to influence selection of entree. With one exception (Mayer et al., 1986), previous studies (Davis & Rogers, 1982; Dubbert et al., 1984; Martilotta & Guthrie, 1980; Zifferblatt et. al., 1980) have either

failed to show any change in selection of main entree or have failed to target entrees in preference to side dishes or beverages.

Conclusions

The study provided limited support for the following four of the study's six hypotheses: (1) availability of nutritious foods would improve student diets, (2) incentives would lead to an increase in the selection of the Perfect Balance entrees, (3) the combination of the three strategies would be most effective in changing selection behavior, and (4) the information program would result in changes in nutritional knowledge, attitudes, and self reported behavior. The following two hypotheses were not supported: (1) point of choice information would lead to changes in selection behavior, and (2) the social marketing framework used to design the program would result in an increase in effectiveness over other similar programs.

The study does not lead to any definitive conclusions regarding the effectiveness of the interventions because of the failure of the study to test the power of these interventions. For example, the fact that the incentives were unable to sustain change beyond the first week may be due to the low probability of winning one of the twenty dollar bills (4,200 to 1). Similarly, the results of the study do not necessarily indicate that point of choice information is an ineffective method of increasing selection behavior of nutritious foods. Instead, it may be that the particular materials used in this study were not salient

enough to produce change. Furthermore, the social marketing research conducted may have yielded inaccurate information due to the reliance on self report. Social marketing techniques involving behavioral observation and assessment may have yielded more useful information. For example, pilot testing the promotional and informational materials to determine their salience and conducting taste tests of some of the new entrees may have identified some of the barriers to the success of the program prior to its implementation. The development and evaluation of a hierarchy of effects model (i.e. the number of students (1) perceiving the material, (2) reading the material, (3) understanding the material, and (4) making decisions based on the information included in the material) would have been helpful in assessing the effectiveness of the materials used. Without this information, it is difficult to determine if the intervention was not successful because of the students failure to attend to the material or because the intervention itself was not successful.

Contributions

While overall the study provides limited support for the effectiveness of a multicomponent intervention for modifying eating behavior in college students, the study does make a number of contributions to the nutrition and large-scale behavior change literatures. Probably the most significant contribution is the highlighting of obstacles and pitfalls to the success of large-scale behavior change programs, in general, and to nutritional eating behavior in particular. By viewing

the study from a social marketing perspective, several suggestions may be made to enhance the potential effectiveness of large-scale behavior change efforts. Prior to addressing the study from a social marketing perspective, the study's contributions as an intervention study are addressed.

Availability

The first contribution relates to the availability of nutritious foods. While overall availability was not successful in changing selection behavior, the study provides some support for the idea that an increase in availability of nutritious entrees results in a decrease in fat, calorie, and simple sugar consumption. Prior to the introduction of the Perfect Balance entree line, cafeteria customers had little choice but to eat entrees that were high in fat and/or calories. In the most successful case, after the introduction of the entree line, when 89% of the entrees selected were Perfect Balance entrees there was a marked decrease in consumption of fat and calories. Of course, for this decrease to be significant both clinically and statistically, this type of change in selection behavior would have to be maintained over time. When people chose the Perfect Balance entree, they were consuming less fat and more complex carbohydrates as a result of the availability of the entree. It is also important to note, that the majority of respondents to the survey (n=508, 56%) and those interviewed (n=408, 81%) indicated that the availability of nutritious

foods was important to them even if they did not always choose to select these foods.

The most significant impact the program had was on the administration, not on individual selection behavior. Following the termination of the program, the administration decided to continue offering the PB entrees on a daily basis. Further, they were receptive to feedback from the study which suggested more attention needed to be paid to student preferences and to the taste and appearance of the entrees in order to change selection behavior. The administration indicated interest in working on the development of entrees that would meet the dietary requirements and be successful with the student population. Follow-up indicated that although the administration continues to be interested in such a program they currently lack the personnel to carry it out.

Focusing on alteration of meals and their availability is more congruent with a public health approach to nutrition change (Hanlon & Picket, 1984). This approach emphasizes changes in settings and other community and organizational structures as a vehicle for individual change.

Incentives

A second area of contribution is to the reinforcement literature. Two instructive results occurred. First, the study provides partial support for the notion that direct incentives affect eating behavior.

Reinforcement theory suggests an incentive strategy would be effective in prompting individuals to try a new behavior. The incentive condition was initially successful in increasing selection of PB entrees.

Second, an unexpected finding was the large difference in awareness of the program between the incentive and information conditions. Whereas three- fourths of the people in the incentive condition knew of the program after the second week, only about one-fifth of the people in the information condition were aware of it. Thus, incentive approaches appear to be effective as promotional strategies as well (potentially) as behavior change strategies.

Information

A third area of contribution involves the outcome of the information intervention. As hypothesized, the information condition showed some increase in knowledge following the intervention. However, it must be noted that due to the large number of questions, any significant results could be simply due to chance. The presentation of the information at the point of choice did not influence behavior as it had in previous studies (Dubbert et. al., 1984; Mayer et. al., 1986; Zifferblatt et. al., 1980). There are two potential reasons for the lack of positive results. One, as discussed above, was that the material was not salient enough. Another difficulty related to this is that the information provided was too lengthy and involved to have an impact on behavior. Marketing research indicates that information

presented in a brief simple easy to follow manner is more likely to be attended to and understood (Winett, 1986). The administration was very resistant to the use of simple, direct, nontechnical information. The dining hall staff and administration were concerned that simplification of the information would result in a distortion in nutritional facts and criticism from other nutritionists. Thus, the information provided and its format was a compromise between the most effective informational strategy and the demands of the dining hall administration.

A second explanation relates to the type of behavior targeted in this program. Most previous studies (Dubbert et al., 1984; Zifferblatt, et al., 1980) failed to show a change in entree selection behavior. It may be that people are willing to change their selection of a beverage or a side dish, but are more resistant to altering their selection of an entree because of the higher cost involved. Cost here refers to the price the consumer pays in terms of decreased pleasure by selecting a less preferred food item. That is, the cost of selecting low fat as opposed to whole milk may be lower compared to the cost of selecting baked fish over pizza.

Another instructive finding related to the information strategy was that knowledge did not increase in the incentive condition even though individuals received the same material as in the information condition. One explanation is the amount of attention paid to the nutritional information differed in the two conditions. Perhaps handing out the information pamphlet in the information condition and the in-

centive flyer in the incentive condition during the prompting intervention resulted in this difference. Another possible explanation is that the two types of material, informational and promotional, had to compete for the students attention in the incentive condition. The incentive material was probably more salient because of its reinforcing value. The result of this may have been increased awareness of the program in the incentive condition without accompanying awareness of the information provided.

Personal Contact

A fourth area of contribution relates to personal contact. Both the prompting intervention and the individual tracking project were successful in increasing the selection of PB entrees. The personal contact involved may have resulted in these changes. As with other interventions involving personal contact (individual and small group approaches), however, these were expensive in terms of person hours. The intervention required that four individuals provide personal prompting for two hours at each cafeteria. The investment of this amount of time may not prove cost effective in terms of long term gains in eating behavior change. One solution to this problem might be to have dining hall staff provide prompting along with their other duties. This was suggested to the administration. They indicated some reluctance to add further duties to their relatively untrained, online staff due to difficulties in providing adequate supervision.

There are, however, other possible interpretations for the success of both the individual tracking project and the prompting intervention. Self monitoring of behavior is known to have a powerful reactive impact (Cormier & Cormier, 1977). The results of the individual tracking project indicate a possible interaction between self monitoring and the availability of the PB entree. Self monitoring increases awareness of the targeted behavior. This awareness coupled with an increase in knowledge of nutrition and diet may have resulted in the changes that occurred with these individuals. This is supported by the result that the largest change occurred in the incentive condition where awareness of the PB program was the greatest.

A second possible interpretation of the results of the prompting intervention relates to committment and its effect on behavior. Research assistants reported receiving some form of verbal committment to select the PB entree from a number of individuals. As Kiesler (1971) and Pardini and Katzev (1983) suggest, committment may have a direct influence on behavior and, in this case, may have led to an increase in selection of the PB entree. Whether committment is able to influence selection or eating behavior over the long term is a question this study cannot answer but one that provides an interesting direction for future research.

Individual versus Aggregate Results

A final area of contribution relates to the difference in results between the individual and cafeteria data. In contrast to the aggregate data, individual results suggested the program was successful in increasing selection of the Perfect Balance entrees. One possible explanation for this difference, personal contact, has been discussed above. A second explanation relates to the fact that the individual data is a "cleaner" set of data, that is it was more reliable and valid than the aggregate data. Collection of the aggregate data resulted in a number of difficulties that will be discussed in a subsequent section. The individual data was collected through daily diet diaries and the reliablility of the self report was checked by contacting, on random days, a significant other to verify the subject's self report. Significant others were contacted two to four times throughout the study for each subject. The reliability according to this source was 100%. An interesting and potentially important observation is that different levels of analyses (e.g. group, individual) may result in differential outcomes. For example, if the individual data was the only data collected in this study the interventions would have been reported as more successful.

Problems Related to the Criterion

It must be noted that difficulties obtaining reliable criterion data (i.e. number of entrees selected) limit the conclusions to be drawn

from the study regarding the effectiveness of the interventions. Smith (1976) defines good criterion as reliable, valid, sensitive, and practical. The criterion used in the study had difficulty in three of these areas. Reliability refers to the stability or consistency of scores. The method used to calculate the number of entrees selected in the dining halls, initially considered reliable by the dining hall administration, was found to be unreliable during the course of the study. This method involved the on line staff using a counter to calculate the number of portions served of each entree. Both the instrument and the operators were found to be unreliable in the first two weeks of data collection. A second method was selected. This method involved subtracting the number of left over portions from the number of portions prepared of each entree item. These records were kept by the cook in each dining hall and were used to forecast the number of portions needed for future preparations of the entree. However, even this method was not entirely reliable. On a few occasions, left over portions were accidentally discarded by on line staff.

Reliability is a necessary condition for validity. Validity is defined as the extent to which the instrument measures what it intends to measure. Therefore, the validity of the measure in the study must also be questioned. The third characteristic, sensitivity, is defined as the ability of the instrument to accurately detect changes should they occur. The measure's lack of reliability and validity prohibits it from being very sensitive to changes in selection behavior. The

measure may be considered practical or easily obtainable as the data were collected on a daily basis by the dining halls.

Other problems with the data, discussed in the results section above, necessitated analysis of the data in several different ways. Each method had its advantages and disadvantages; none was superior to the other. These different methods resulted in different results. Comparison of the number of entrees selected indicated a significant difference across phase and an interaction between condition and phase that approached significance. The other two methods of analysis did not indicate any significant changes. Interpretation of both significant and nonsignificant results is difficult because of the problems with the data. Overall, it appears that the interventions had limited success in changing selection behavior. The combined incentive, information, and availability intervention appeared to be the most successful in producing change. Given the difficulties in this area, the study may contribute more as a social marketing than an intervention study.

Contributions to the Social Marketing Literature

The study identified several constraints to achieving large-scale selection behavior changes. These constraints are best understood within the context of the social marketing framework.

The first step in a social marketing analysis is to identify the target market. The markets identified in this study were the students and

dining hall administration. For the most part, the interventions were designed to produce change in student behavior enlisting the cooperation of the administration. The results of the study indicate it may be more effective to target administration and staff than students. For example, one constraint to achieving the goals of the study was resistance from the dining hall staff. The staff openly stated they did not feel the students should be concerned with their intake of fat, sugar, or calories. Their compliance with the intervention varied and required constant supervision which, at times, was not possible to deliver.

The administration was supportive of the efforts of the study but provided obstacles to the effective implementation of the interventions. For example, as previously mentioned, the administrators were reluctant to provide nutritional information in a simple, direct manner. They also limited the amount of informational and promotional material allowed in the cafeterias. Most importantly, however, the entrees they selected as the PB entrees were often unpopular entrees prior to their alteration (e.g. spinach and cheese souffle, baked scrod, haddock, cod, and orange roughy). An important characteristic of the dining halls to be noted here is that they are a nonprofit organization with a guaranteed number of customers. They are not competing with anyone for the students business. Even if students choose to eat away for the majority of their meals, if they live in the residence halls they are required to pay for the board provided by the dining hall services. For this reason, they may be less interested

in the consumers opinion of their product than commercial institutions.

The second stage in the social marketing analysis is identification and development of the four P's (product, promotion, place, and price).

Product

The primary obstacle to the success of the program was the extreme fluctuation in product (PB entree) appeal. The modification of existing entrees, for the most part, did not produce a desirable product. Several of these PB entrees were judged unappealing in taste and appearance by the students and the research assistants. For example, the sweet and sour shrimp, most baked fish entrees, and stuffed shells were all judged to be unappealing in taste and appearance. In contrast, battered and fried entrees or those with heavy sauces were judged to be appealing in taste and appearance. Many of the unpopular items did not match student preferences (estimated through survey data and past popularity). For example, the majority of students were known by the food service administration to dislike fish entrees, yet 25% of the PB entrees included fish as their main ingredient. The popularity of some of the PB entrees indicated the students willingness to eat nutritious, low calorie foods provided they were appealing in appearance and taste. These results suggest a public health strategy may be more effective to persuade the administration to create a palatable line of healthy entrees than to develop programs to influence

the selection behavior of consumers. As noted, the results of the study support the adoption of an approach to selection/eating behavior change that has frequently been advocated by individuals in the public health field. Individuals working in this area emphasize the importance of "passive" interventions that require less individual choice (Runyan, Devellis, Devillis, & Hochman, 1982). Criticisms of the health psychology field have included the tendency, as in this study, to target individuals and to institute programs designed to change individual health behavior rather than targeting administration or institutional behavior (Runyan et. al, 1982).

Promotion

To successfully promote a product, barriers to adoption of the product must be taken into consideration. The promotional campaign (1) failed to test the effectiveness of the the promotional materials as discussed above and (2) failed to address two important issues that were barriers to the success of the program. The first issue was student distrust of the food service department. This issue was not addressed by the informational or promotional material. A sample of students (n=35) indicated during personal interviews that they felt the PB entrees were not really lower in fat, sugar, and calories but instead were unpopular items that the food service personnel wanted to "push". The similarity between the PB entrees and pre-intervention entrees supported this belief as did the previous unpopularity of many of the entrees prior to modification.

The second issue the program failed to address resulted in the failure of the program to reach a motivated segment of the student population. Personal interviews indicated that individuals with an interest in diet and nutrition may have chosen to substitute the salad bar for the main entree. The informational aspect of the study did not address the misconception that a salad bar always provides a low calorie, nutritious meal. This supposition is true only if the individual avoids the high fat, high calorie items frequently offered on a salad bar (e.g. cheese, mayonnaise based salad dressings, coleslaw, potato salad, bacon bits, nuts, fried croutons). The salad bar in the dining halls offered most of these high fat, high calorie items.

Place

Involved in the consideration of place is the adequacy of channels of distribution. Two important aspects of this are the packaging and availability of the product. A constraint to the success of the program in this area was the unattractive appearance of many of the entrees and the limited availability of some of the entrees on certain days. These barriers suggest, once again, the need to produce change on the administrative level.

Price

The success of a social marketing program relies on its ability to ensure the benefits of adopting the product outweigh the costs. The

results of the study suggest the cost of selecting the PB entree was often greater than the benefits involved. In particular, the cost of selecting a less preferable entree seemed to outweigh the nutritional benefits. The primary difficulty appeared to be the taste and appearance of the entrees supporting the conclusion that development of nutritious but palatable entrees may be the most effective way to change selection behavior. It is also important to recognize that the availability of palatable and attractive nutritional entrees teach individuals that nutritional foods can be appealing. And conversely, that the association of nutrition with unappealing taste and appearance may teach individuals to avoid these foods.

The relative ineffectiveness of the informational strategy also may have resulted from the cost involved in reading material that was somewhat lengthy and complex. Providing simple, brief, directive material may have proven more effective in increasing knowledge and impacting behavior.

Summary

The constraints identified in this study may manifest themselves in other large-scale, primary prevention programs. As Fox and Kotler (1980) propose, change agents should consider the barriers that may occur in the following areas: (a) appropriate selection of a target market - the appropriate market may not be readily apparent and as Fox and Kotler (1980) point out, there may be pressures to select certain

markets, (b) product strategy - careful evaluation of the product is necessary prior to promotion of the product. It may be that the best product cannot be developed (e.g. a safe cigarette). The limitations of the core and tangible products must be recognized and dealt with in the social marketing program, (c) channels of distribution - the limitations of control over this area in the program must be recognized and considered in the development of promotional strategies, (d) pricing - careful consideration of all aspects of pricing must be considered and time taken to develop ways to decrease the cost of appropriate behaviors, and (e) resistance on the part of management - it may be important to invest considerable time in educating administrators and staff on the factors involved in effective marketing. A marketing program may need to be developed to persuade these individuals as to the effectiveness and benefits of strategies that may conflict with their current practices.

Examination of these barriers indicate that future programs in this area may be more effective if they target administration and staff, promote the development of palatable entrees, and ensure appropriate channels of distribution.

Conclusions

Despite the limited effectiveness of the multicomponent intervention on knowledge, attitudes, and behavior, the study provides several important contributions to the large-scale behavior change and social

marketing literatures. The most important of these is the suggestion that the availability of appealing nutritious entrees may be a necessary first step to changing selection and eating behavior prior to the introduction of programs aimed at changing the behavior of the consumer. The study also proposes the use of direct incentives and commitment as effective means to create awareness and to produce short-term change in eating behavior. The second major contribution of study is the identification of potential obstacles and barriers to change in other social marketing programs. Careful examination of these constraints may prove successful in improving other large-scale behavior change programs. A third contribution is the suggestion that selection of different levels of analyses may lead to differential outcomes.

Finally, the study indicates directions for future research. The impact of the development of a palatable nutritious line of entrees on eating behavior in a similar setting may prove effective. In addition, the use of commitment to produce long-term eating behavior change should be addressed as well as other strategies such as providing personal contact, enhancing self-efficacy, and providing brief, directive point of choice information.

The most promising of the latter approaches are committment and direct point of choice information. Geller and Nimmer (1985) repost the effective use of committment in changing seat belt usage. A similar program may prove effective in changing eating behavior.

Simple direct point of choice information in a public cafeteria setting has been effective in changing selection behavior (Mayer et. al., 1986). Replication of this type of program in other settings is needed to establish the efficacy of this type of program.

REFERENCES

Abraham, S. & Carrol, M. D. (1981). Food consumption patterns in the United States and their potential impact on the decline in coronary heart disese mortality. In R. J. Havlik & M. Feinleib (Eds.), Proceedings of the conference on the decline in coronary heart disease mortality (pp. 253 -281). Washington D.C.: U.S. Government Printing Office, DHEW Publ. No. (NIH) 79-1610.

Abraham, S. & Johnson, C. L. (1980). Prevalence of severe obesity in adults in the United States. American Journal of Clinical Nutrition, 33, 364 - 369.

Angove, R. (1984). The role of the community dietitian in a multidisciplinarian approach to nutrition education in an area of multiple deprivation. Human Nutrition: Applied Nutrition, 38A, 5 - 16.

Bandura, A. (1977). Social learning theory. Englewood Cliffs, N.J.: Prentice Hall Inc.

Bender, A. E. & Bender, D. A. (1982). Nutrition for medical students. New York: John Wiley & Sons.

Blackburn, H. (1974). Progress in the epidemiology and prevention of coronary heart disease. In P. Yu & J. Goodwin (Eds.), Progress in cardiology. Philadelphia: Lea & Fiberger.

Burman, G. (1982). Nutriton education and its application in the community. Human Nutrition: Applied Nutrition, 36A, 5 - 10.

Coll, M., Meyer, A. & Stunkard, A. J. (1979). Obesity and food choices in public places. Archives of General Psychiatry, 36, 795 - 797.

Connor, S. L., Gustafson, J. M. & Vaughan, S. K. (1985). Promoting dietary change: Demonstrating reduction of dietary fat. Journal of the American Dietetic Association, 85, 345 - 347.

Cook, T. D. & Campbell, D. T. (1979). Quasi-experimentation: Design and analysis for field settings. Chicago: Rand McNally.

Cross, A. T. (1980). USDA's strategies for the 80's: Nutrition Education Journal of the American Dietetic Association, 76, 333 - 338.

Davis, D.. Z. & Rogers, T. (1982). Point of choice nutrition information for the modification of milk selection, Journal of American College Health, 30, 275 - 278.

Doll, R. & Peto, R. (1980). The causes of cancer: Quantitative estimates of avoidable risks of cancer in the United States. New York: Oxford University Press.

Dubbert, P. M., Johnson, W. G., Schlundt, D. G. & Montague, N. W. (1984). The influence of caloric information on cafeteria food choices. Journal of Applied Behavioral Analysis, 17, 85 - 92.

Farquhar, J. W., Maccoby N., Wood P. D., Beitrose, H., Haskell, W. L., Meyer, A. J., Alexander, J. K., Brown, B. W., McAllister, A. L., Nash, J. O. & Stern, M. P. (1977). Lancet, 1, 1192 - 1195.

Fox, K. & Kotler, P. (1980). The marketing of social causes: The first 10 years. Journal of Marketing, 44, 24 - 33.

Geller, E. S. & Nimmer, J. G. (1985). Social marketing and applied behavioral analysis: An integration for quality of life intervention. In A. C. Samli (Ed.), Quality of life/marketing interface, Westport, CT.: Greenwood Press.

Gussow, J. D. & Contento, I. (1984). Nutrition education in a changing world: A conceptualization and selective review. In G. H. Bourne (Ed.), World Review of Nutrition and Dietetics: Vol. 44 (pp. 1 - 56). New York: Karger.

Hagen, R. L. (1974). Group therapy versus bibliotherapy in weight reduction. Behavior Therapy, 5, 222 - 234.

Hamburg, D. L., Elliott, G. R. & Parron, D. L. (Eds.). (1982). Health and behavior: Frontiers of research in the biobehavioral sciences, Washington, D. C.: National Academy Press.

Hanlon, J. J. & Picket, G. E. (1984). Public Health: Administration and Practice, (8th ed.), St. Louis: Times Mirror/Mosby.

Harris, M. B. (1969). Self-directed program for weight control: A pilot study. Journal of Abnormal Psychology, 74, 264 - 270.

Iammarino, N. K. & Weinberg, A. D. (1985). Cancer prevention in the schools. Journal of School Health, 55, 86 - 95.

Jeffrey, B. D., McLellan, R. W., Fox, D. T. (1982). The development of children's eating habits: the role of television commercials. Health Education Quarterly, 9, 174 - 189.

Kannel, W. B. & Gordon, T. (1970). Framingham study: Section 24. National Institutes of Health, Bethesda, Maryland.

Karvetti, R. L. (1981). Effects of nutrition education. Journal of the American Dietetic Association, 79, 660 - 667.

Keys, A. Anderson, J. T. & Grande, T. (1965). Serum cholesterol responses to changes in the diet. Metabolism, 14, 747 - 787.

Kotler, P. & Zaltman, G. (1977). Social marketing: An approach to planned social change. Journal of Marketing, 35, 3 - 12.

Mahoney, M. J. (1974). Self reward and self monitoring techniques for weight control. Behavior Therapy, 5, 48 - 57.

Martilotta, M. & Gurthrie, H. A. (1980). Impacts of providing milk options and nutrient information in school lunch programs. Journal of the American Dietetic Association, 77, 439 - 443.

Mayer, J.A., Hiens, J.M., Vogel, J.M., Morrison, D.C., Lankester, L.D. & Jacobs, A.L. (1986). Promoting low-fat entree choices in a public cafeteria. Journal of Applied Behavior Analysis, 19, 397-402.

McGuire, W. J. (1972). Personality and attitude change: An information processing theory. In A. G. Greenwald, T. C. Brock & T. M. Olstrum (Eds.) Psychological Foundations of attitudes, New York: Academic Press.

Meyer, A. J., McAlister, A. L., Maccoby, N. & Farquahar, J. W. (1980). Skills training in a cardiovascular helalth education campaign. Journal of Clinical and Counseling Psychology, 48, 129 - 142.

Mojonnier, M.L., Hall, Y., Berkson, D. M. Robinson, E., Wethers, B., Pannbacker, B., Moss, D., Pardo, E., Stamler, J., Shekelle, R. B., & Raynor, kW. (1980). Experience in changing food habits of hyperlipidemic men and women. Journal of the American Dietetic Association, 77, 140 - 148.

National Heart, Lung & Blood Institute (1976). The multiple risk factor intervention trial. Journal of the American Medical Association, 235, 825 - 827.

National Heart, Lung & Blood Institute (1983). Foods for health: Report of the pilot program. U. S. Department of Health and Human Services, NIH Publication NO. 83-2036.

National Heart, Lung & Blood Institute (1981). Arteriosclerosis: Report of the Working Group. U. S. Department of Health and Human Services, NIH publication No. 81-2034.

N-Squared Computing (1983). Nutritionist II.

Newell, G. R. & Boutwell, W. B. (1980). Cancer preveniton: An Editorial, Cancer Bulletin, 32, 127.

Palmer, E. (1981). Shaping persuasive messages with formative research. In R. E. Rice & W. J. Paisley (Eds.), Public communication campaigns. Beverly Hills, CA.: Sage Publications.

Perkins, J. (1983). Evaluating a nutrition education program for pregnant teenagers: Cognitive versus behavioral outcomes. Journal of School Health, 53, 420 - 422.

Pietinen, P., Dougherty, R., Mutanen, M., Leino, U., Moisio, S., Iacono, J. & Puska, P. (1984). Dietary intervention study among 30 free-living families in Finland. Journal of the American Dietetic Association, 84, 313 - 318.

Puska,P. et. al. (1980). The North Karelia Project, Kuopio, Finland: University of Kuopio.

Rabkin, S. W., Mathewson, F. A. L., & Hsu, P. H. (1977). Relation of body weight to development of ischemic heart disease in a cohort of young North American men after a 26-year observation period. The Manitoba Study. American Journal of Cardiology, 39, 452 - 458.

Rappaport, L. (1977). Community psychology: Values, research and action. New York: Holt, Rinehart & Winston.

Robinson, T. C. (1984). Health promotion, disease prevention: An allied health initiative. Journal of Allied Health, November, 243 - 251.

Rogers, E. & Shoemaker, F. (1971). Communication of innovations: A cross-cultural approach. New York: Free Press.

Rosenstock, I. (1974). Historical origins of the health belief model. Education Monographs, 2, 328 - 335.

Runyan, C.W., DeVellis, R.F., Devillis, B.M. & Hochman, G.M. (1982). Health psychology and the pyblic health perspective: In search of the pump handle. Health Psychology, 1, 169-180.

Scammon, D. L. & Christopher, C. L. (1981). Nutrition education with children via television, a review. Journal of Advertising, 10, 26 - 36.

Solomon, D. S. (1981). A social marketing perspective on campaigns. In R. E. Rice & W. J. Paisley, Public communication campaigns (281 - 292). Beverley Hills, CA.: Sage Publications.

Stern, M.P., Farquhar, J. W., Maccoby N. & Russell, S. H. (1976). Results of a two year health education camapign on dietary behavior: The Stanford Three Community Study. Circulation, 54, 826 - 832.

Stokes, T. F. & Baer, D. M. (1977). An implicit technology for generalization. Journal of Applied Behavior Analysis, 10, 349 - 367.

Stone, E. J. (1985). School-based health research funded by the National Heart, Lung & Blood Institute. Journal of School Health, 55, 168 - 174.

Stuart, R. B. (1967). Behavioral control over eating. Behaviour Research and Therapy, 5, 357 - 365.

Stuart, R. B. (1971). A three dimensional program for the treatment of obesity. Behaviour Research and Therapy, 9, 177 - 186.

Stunkard, A. J. (1958). The management of obesity. New York State Journal of Medicine, 58, 79 - 87.

Stunkard, A. J. & Kaplan, D. (1977). Eating in public places: A review of reports of the direct observation of eating behavior. International Journal of Obesity, 1, 89 - 101.

Stunkard, A. J. & Perick, S. B. (1978). Behavior modification in the treatment of obesity: The problem of maintaining weight loss. Unpublished manuscript.

Terhune, J. A. Oregon Title IV-C Curriculum development model of health skills for life: An example. Journal of School Health, 54, 33 - 36.

Van Itallie, T. jB. (1979). Adverse effects on health and longevity. American Journal of Clinical Nutrition, 32, 2723 - 2733.

Wilbur, C. S., Zifferblatt, S. M., Pinsky, J. L. & Zifferblatt, S. (1981) Healthy vending: A cooperative pilot research program to stimulate good health in the marketplace. Preventive Medicine,10, 85 - 93.

Winett, R. A. (1985). Information and behavior: Systems of influence. Hillsdale, N.J.: Erlbaum.

Wing, R. R. & Jeffrey, R. W. (1979). Outpatient treatment of obesity: A comparison of methodology and clinical results. International Journal of Obesity, 3, 261 - 279.

Zaltman, B. & Wallendorf, M. (1983). Consumer behavior: Basic findings and management implications. New York: Wiley.

Zifferblatt, S. M., Wilbur, C. S. & Pinsky, J. L. (1980). Changing cafeteria eating habits. Journal of the American Dietetic Association, 76, 15 - 20.

Table 1

Nutritive Components for Sample Entrees Protein, Fat, Carbohydrate and Kcalories

Entree	Protein (% of total caloric value)	Carbohydrate	Fat	Kcal
Top round steak	45	0	55	330
Liver & onions	47	11	43	275
Trout Almondine	34	13	53	275
Cold cuts	14	0	86	255
Turkey Divan	37	28	35	600
Baked Cod	71	0	29	200
Spaghetti	22	46	32	485
Hamburger Ring	23	39	37	415
Pan Pizza	30	14	56	615
Fried Chicken	68	3	26	320
Almond Cheese Rice	20	25	56	350
Stuffed Peppers	23	40	37	430
Veal	53	0	47	225
Macaroni with cheese & ham	21	24	55	475
Sweet & Sour Shrimp	12	79	9	425
Chicken Salad	35	3	62	320
Beef with vegetables	29	27	44	330
Baked Chicken	73	0	27	240

Table 2

Entrees Categorized by Carbohydrate and Fat Content

		Carbohydrate	
		High	Low
Fat	High	0	14
	Low	1	3

Table 3

Demographics of Dining Hall Customerse Sex and Class Status by Percent

		SEX		
		F	M	
CLASS STATUS	FR	23	30	53
	SO	13	16	29
	JR	4	7	11
	SR	2	5	7
		42	58	100

Table 4

Weekly Means - Difference in Percentage of PB Entrees Served Across Time

	AVAIL/INFO			AVAIL./INFO INCENTIVE			AVAIL		
WEEK	PRE-DUR	DUR-POST	PRE-POST	PRE-DUR	DUR-POST	PRE-POST	PRE-DUR	DUR-POST	PRE-POST
1	28.9	34.1	35.8	30.3	21.4	42.9	25.5	27.0	27.0
2	14.7	14.2	20.8	15.3	16.7	14.4	22.0	16.2	19.8
3	43.2	42.8	38.2	50.2	44.0	51.2	40.5	35.9	32.2
4	46.2	45.6	38.6	40.8	32.8	27.8	31.6	37.3	27.5

Table 5
Number of PB Entrees Prepared and Served Across Time by Condition: Availability plus Information plus Incentive

ENTREES	PRE		DURING		POST	
	PREPARED	SERVED	PREPARED	SERVED	PREPARED	SERVED
Orange Roughe	250	50	300	300	-	-
Sukiyaki	600	330	600	600+	320	200
Chicken Pasta	500	450	730	450	1100	750
Roast Beef	2000	1400	2000	1520	1785	1740
Turkey Divan	500	500+	500	500	1000	980
Trout	100	100	100	100	200	-
Beef Macaroni	300	195	460	430	1000	1000+
SweetNSour Shrimp	700	475	700	235	700	700
Beef W/ Vegetables	500	500	500	350	700	490
Cod	1050	900	1050	910	300	300
Turkey Breast	1000	920	900	840	-	-
Pepper Steak	375	275	300	300+	-	-
Stuffed Shells	400	250	400	220	275	-
Haddock	350	350	300	300	360	360
Roast Beef	1400	1120	1000	960	950	940
Chicken Enchiladas	900	620	1000	640	650	600
Almond/Cheese/Rice	750	750+	500	500	-	-
Chicken Cantonese	850	570	1000	920	800	600
Pizza Deluxe	1800	1800+	3310	3170	2450	2365
Cod	350	200	335	335	365	210
Seafood Salad	225	225	225	225+	325	85
Chicken	1400	1120	1000	700	880	720
Beef Chow Mein	-	-	500	460	400	400+
Turkey Divan	575	575	650	650	900	900
Salmon	275	275	265	155	300	300
Roast Beef	2100	1680	2100	1745	660	500
Souffle	150	150+	240	240	200	80
DeLite Pizza	600	560	1200	395	1045	310
Spaghetti	900	740	600	200	600	-
Chicken Sandwich	1350	1290	1350	1350+	1600	1515
Veal Marsala	375	-	375	255	290	175

+ = Entree Sold Out

Table 6
Number of PB Entrees Prepared and Served Across Time: Availability plus Point of Choice Information

ENTREES	PRE		DURING		POST	
	PREPARED	SERVED	PREPARED	SERVED	PREPARED	SERVED
Sukiyaki	1125	1095	1800	1500	1642	1222
Chicken Pasta	575	475	600	450	590	590+
Roast Beef	2400	2280	2320	2280	2135	1860
Turkey Divan	1500	1500+	1600	1590	850	850
Trout	100	100+	140	125	40	20
Veal Marsala	-	-	400	210	300	60
Beef Macaroni	600	570	800	695	750	615
SweetNSour Shrimp	570	470	520	320	562	362
Beef W/ Vegetables	430	330	400	260	450	450+
Cod	700	300	350	180	420	240
Turkey Breast	1200	1180	1400	1320	1305	1285
Stuffed Shells	1150	855	900	180	400	160
Haddock	200	200	200	165	245	125
Roast Beef	-	-	1500	1100	1425	1185
Almond/Cheese/Rice	500	260	500	500+	415	325
Chicken Cantonese	600	600	600	385	400	360
Cod	500	300	785	725	250	70
Seafood Salad	300	300+	325	325+	350	350
Beef Chow Mein	980	865	1040	840	1360	960
Turkey Divan	925	925+	890	890+	620	560
Souffle	240	235	250	250+	275	250
DeLite Pizza	1105	660	960	610	950	595
Spaghetti	900	750	1250	850	1050	875
Veal Marsala	1350	1350+	1350	1150	1250	1225
Taco Salad	1260	1260+	1550	1550+	1575	1550
Brunswick Stew	900	675	700	450	800	550

+ = Entree Sold Out

Table 7
Number of PB Entrees Prepared and Served Across Time: Availability Condition

ENTREES	PRE		DURING		POST	
	PREPARED	SERVED	PREPARED	SERVED	PREPARED	SERVED
Sukiyaki	450	180	250	250+	200	110
Chicken Pasta	275	155	200	200+	200	190
Roast Beef	1600	900	1500	900	1500	1020
Turkey Divan	600	160	675	675+	700	700+
Trout	110	80	60	30	80	60
Veal Marsala	-	-	125	85	150	110
Beef Macaroni	450	405	375	360	300	235
SweetNSour Shrimp	300	250	300	275	300	225
Beef W/ Vegetables	500	500	600	480	420	270
Cod	250	190	250	210	200	180
Turkey Breast	800	640	460	460+	740	700
Pepper Steak	175	165	200	200	200	180
Stuffed Shells	620	395	250	115	500	260
Haddock	120	120+	130	90	120	100
Roast Beef	1375	375	700	60	900	660
Almond/Cheese/Rice	200	200+	250	160	300	300+
Chicken Cantonese	570	510	325	125	240	120
Cod	80	70	120	120+	150	70
Seafood Salad	120	95	160	80	160	160+
Roast Beef	1400	920	1100	940	1000	720
Souffle	120	120+	120	80	120	60
DeLite Pizza	500	320	625	490	400	#380
Spaghetti	500	300	550	450	-	-
Veal Marsala	500	480	600	440	400	655
Trout	500	480	580	225	250	190
Taco Salad	800	800+	1000	1000+	1000	800
Brunswick Stew	300	240	250	50	-	-

+ = Entree Sold Out

Table 8

Analysis of Variance Summary: Number of Perfect Balance Entrees Served Between Condition Across Phase

Source	SS	df	MS	F	p
Condition	5606.80	2	2303.40	4.42	.01
Phase	632.38	2	316.19	0.50	.61
Cond*Phase	2653.33	4	663.33	1.05	.38
Error	128675.29	203	633.87		

Table 9

Analysis of Variance Summary: Percent of Perfect Balance Entrees Served to Total Served Between Condition Across Phase

Source	SS	df	MS	F	p
Condition	1668.58	2	834.29	1.51	.22
Phase	80.53	2	40.27	0.07	.93
Cond*Phase	74.91	4	18.73	0.03	.99
Error	123338.11	223	553.09		

Table 10

Analysis of Variance Summary: Percent of Perfect Balance Entrees Served to Perfect Balance Entrees Prepared Between Condition Across Phase

Source	SS	df	MS	F	p
Condition	1065.89	2	532.95	1.24	.29
Phase	93.59	2	46.80	0.11	.90
Cond*Phase	513.87	4	128.47	0.30	.88
Error	96738.52	225	429.95		

Table 11

Analysis of Variance Summary: Percent of Perfect Balance Entrees Selected - Individual Data Between Condition Across Phase

Source	SS	df	MS	F	p
Condition	808.62	2	404.31	1.82	.17
Phase	871.92	1	871.92	3.92	.05
Cond*Phase	1210.01	2	605.01	2.72	.07
Error	18218.89	82	222.18		

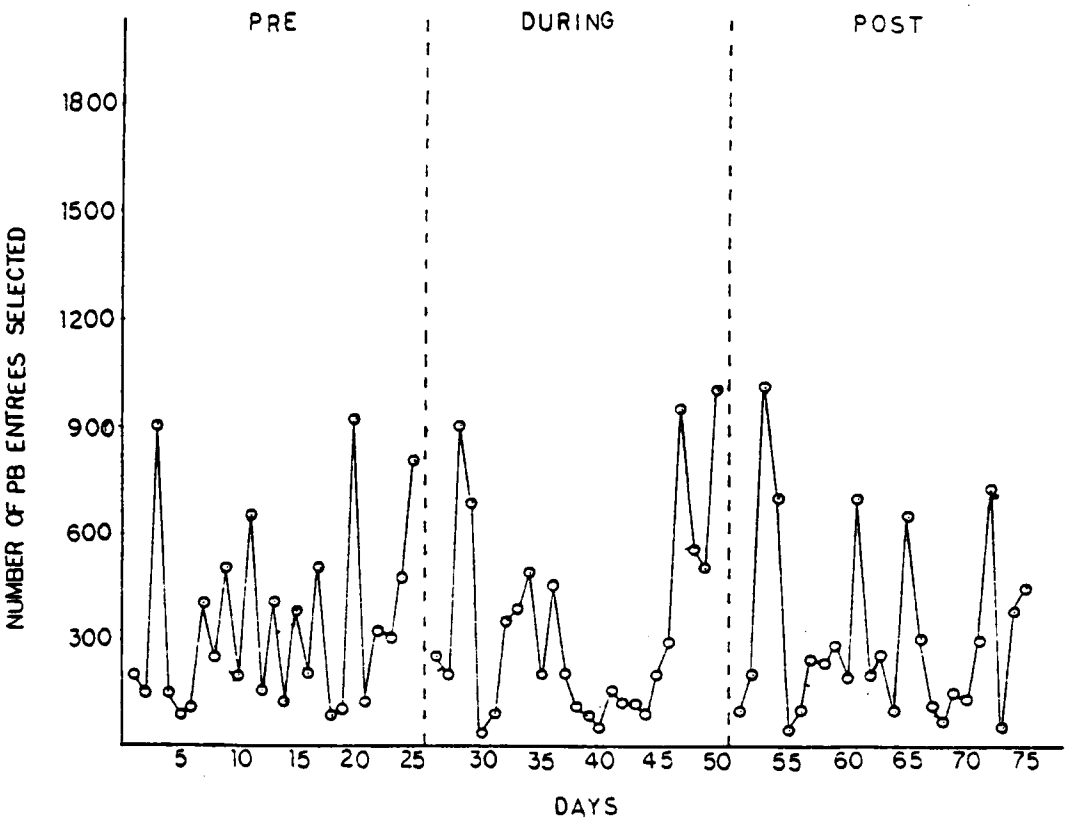

Figure 1. Number of Perfect Balance entrees served across time: Availability condition

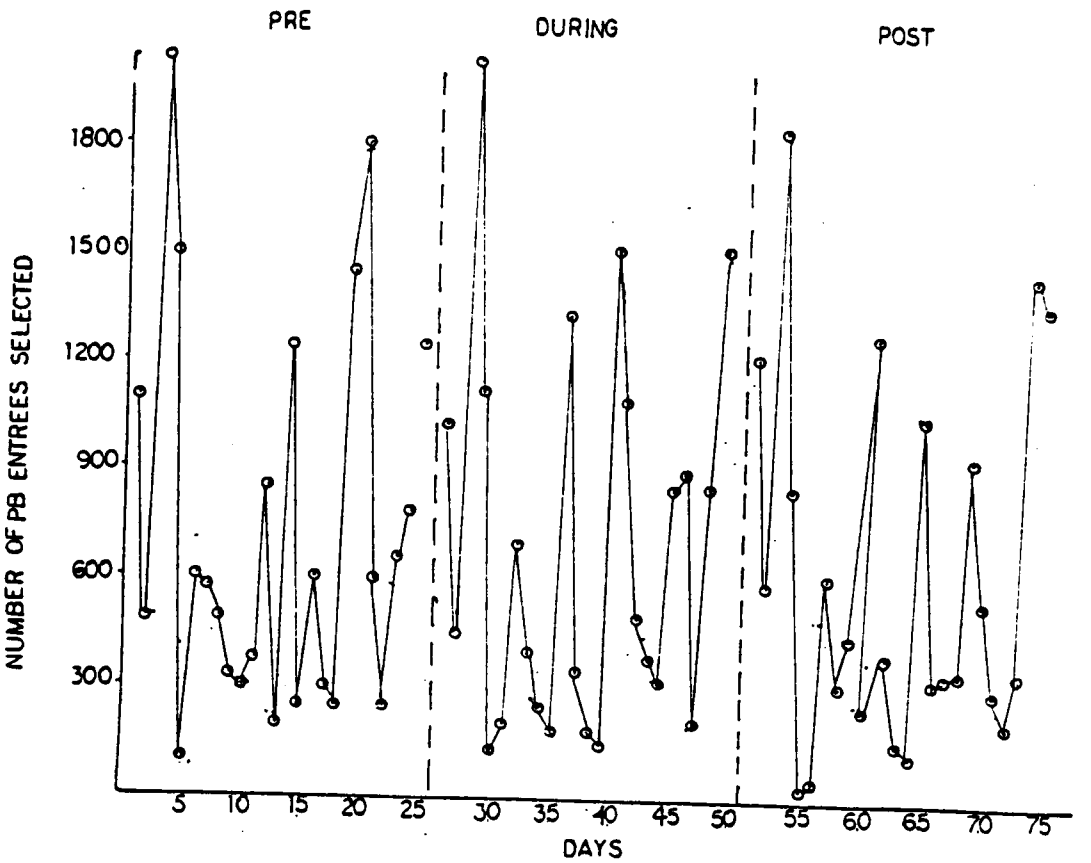

Figure 2. Number of Perfect Balance entrees served across time: Availability plus point of choice information condition

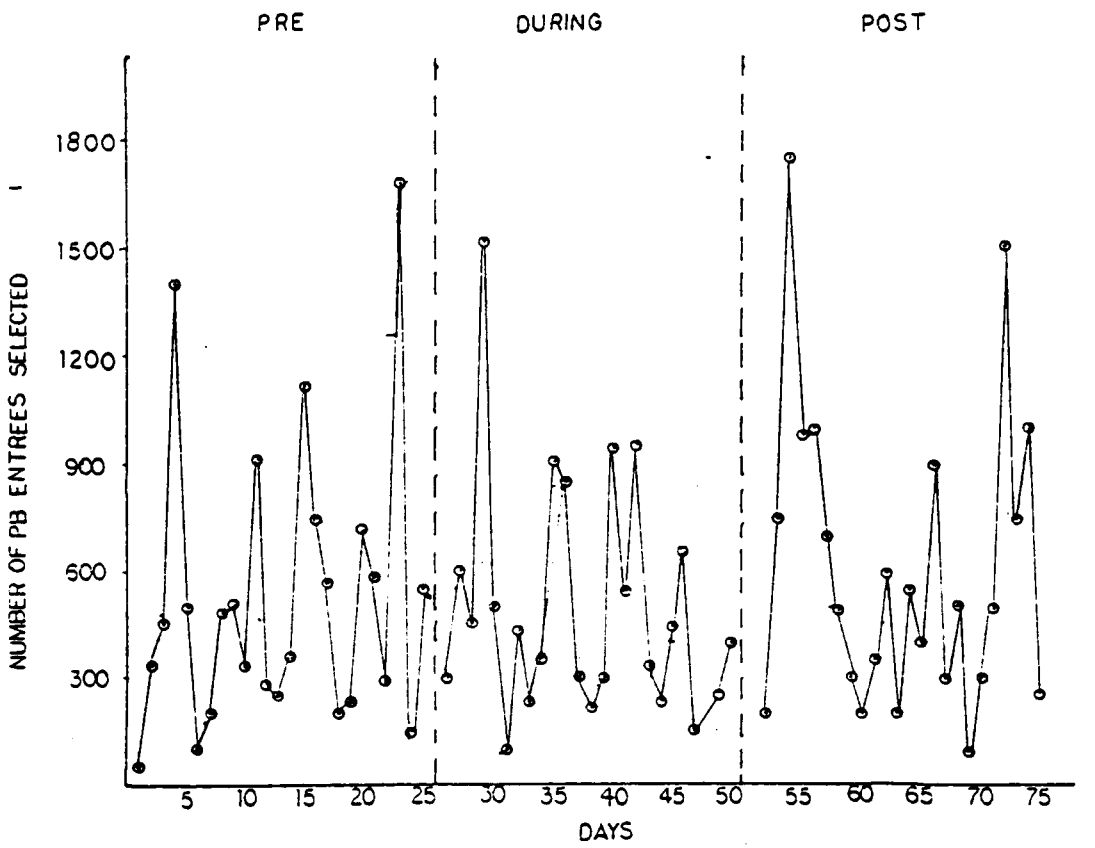

Figure 3. Number of Perfect Balance entrees served across time: Availability plus information plus incentive condition

APPENDIX A.

NUTRITIONAL KNOWLEDGE AND ATTITUDE SURVEY

INCLUDING RESPONSE OPTION FREQUENCIES AND PERCENTAGES

Questions, Response Option Frequencies and Percentages

---

1. Which fast food comes closest to being a good meal because of its ideal proportion of protein, fats, and carbohydrates, and relatively low calories?

   1)Big Mac, fries, shake 2)Kentucky Fried chicken dinner 3)plain pizza 4)pizza with meat

   N = 246

   n = 1) 36 2) 90 3)30 4)96

   % = 1) 15 2) 34 3)12 4)39

2. Which has the most calories?

   1)two pieces of bread 2)three spoons of peanut butter

3)glass of whole milk 4)a 12 oz. Coke

N= 246

n= 1)27 2)112 3)15 4)92

%= 1)11 2)46 3)6 4)37

3. Which of the following has the least calories and contains the lowest fat content?

1)large order of fries 2)Snickers candy bar

3)small (2 oz.) hamburger 4)two large bananas

N= 243

n= 1)7 2)14 3)31 4)191

%= 1)3 2)6 3)13 4)79

4. Which of the following has the most calories and contains the highest fat content?

1)large, baked potato 2)average serving of sirloin

3)2 large pieces of bread 4)3 frankfurters

N= 239

n= 1)23 2)94 3)21 4)101

%= 1)10 2)39 3)9 4)42

5. Suppose you are really tired and decide to eat a candy bar in the hopes of getting some "quick" energy. The most likely result is

1)a short time of increased energy followed by feeling tired again 2)a fairly long time of increased energy followed by feeling tired again 3)quick energy for one hour, just like the ads say

N= 240

n= 1)206 2)13 3)21

%= 1)86 2)5 3)9

6. Which is the most nutritious combination?

1)complex carbohydrate, corn, high fiber 2)simple carbohydrate, milk, high fiber 3)simple carbohydrate, white bread, high fiber 4)complex carbohydrate, orange juice, high fiber

N= 233

n= 1)30 2)96 3)13 4)94

%= 1)13 2)41 3)6 4)40

7. According to the most current nutritional knowledge, which of the meals below would be the best for an adult's dinner?

1)Steak, small piece of fish, salad , no dessert 2) potatoes, small salad, fruit, small dessert 3)steak, potatoes, vegetables, small dessert 4)spaghetti with grated cheese, salad, small dessert

N= 235

n= 1)66 2)44 3)73 4)52

%= 1)28 2)19 3)31 4)22

8. If you were interested in controlling your weight, your diet should most healthfully emphasize

1)protein and water 2)potatoes and bread 3)steak and grapefruit 4)no carbohydrates

N= 233

n= 1)109 2)26 3)43 4)55

%= 1)47 2)11 3)18 4)24

9. How much do you want to change you current nutritional practices?

1)not very much 2)somewhat 3)a lot 4)much 5)very much

N= 239

n= 1)104 2)85 3)22 4)13 5)15

%= 1)44 2)36 3)9 4)5 5)6

10. Eating the most nutritious food for me is

1)not very important 2)somewhat important 3)indifferent 4)important 5)very important

N= 239

n= 1)26 2)101 3)28 4)67 5)17

%= 1)11 2)42 3)12 4)28 5)7

11. Which statement best describes why you would change your nutritional practices?

1)I want to avoid certain diseases 2)I don't want to be overweight 3)I want to improve my health 4)I want to have more energy 5)it seems to be the "in thing to do 6)I'm not interested in changing my nutritional practices

N= 235

n=	1)10	2)79	3)80	4)24	5)4	6)38
%=	1)4	2)34	3)34	4)10	5)2	6)16

12. Which of the below is most likely to motivate you to change your eating habits?

1)simple,correct information 2)a bad health check-up 3)if my friends were changing their eating habits 4)if I knew I'd have more energy 5)none of these

N= 235

n=	1)56	2)80	3)11	4)39	5)47	6)2
%=	1)24	2)34	3)5	4)17	5)20	6)1

13. Please complete the follwoing sentence. My social activities

1)involve many activities, but do not usually include eating

2)involve many activities and often include eating

3)center around eating

N= 233

n= 1)158 2)66 3)9

%= 1)68 2)28 3)4

14. I arrange my meal schedule so that I can eat with my friends

1)never 2)seldom 3)occasionally 4)frequently 5)always

N= 237

n= 1)18 2)20 3)39 4)106 5)54

%= 1)8 2)8 3)16 4)45 5)23

Many people would like to change their eating habits, but find there are certain difficulties in doing so. What difficulties do you have?

15. I'm not really sure what is good and not good nutrition.

1)yes 2)no

N= 233

n= 1)72 2)161

%= 1)31 2)69

16. I can't get myself to eat nutritionally balanced meals, I don't like them.

1)yes 2)no

N= 229

n= 1)53 2)176

%= 1)23 2)77

17. Nutritious foods are not available to me.

1)yes 2)no

N= 231

n= 1)53 2)176

%= 1)30 2)70

18. I don't have enough time to eat nutritious meals.

1)yes 2)no

N= 229

n= 1)28 2)201

%= 1)13 2)87

Nutritionally good eatiang for most people means decreasing fatty foods (eggs, meat, dairy products), increasing complex cazrbohydrates (potatoes, certain cereals, breads, pasta), increasing fresh fruits and vegetables, and decreasing sugary foods (certain snacks, cereals and desserts)

19. How confident are you that you may be able to make these changes in your eating habits for a long time?

1)not very confident 2)somewhat unconfident 3)not sure

4)somewhat confident 5)very confident

N= 231

n=	1)30	2)29	3)46	4)91	5)35
%=	1)13	2)13	3)20	4)39	5)15

20. How confident are you that you may be able to change your eating habits to lose weight?

1)not very confident 2)somewhat unconfident 3)not sure
4)somewhat confident 5)very confident

N= 230

n=	1)26	2)26	3)46	4)85	5)47
%=	1)11	2)11	3)20	4)37	5)21

21. How confident are you that you may be able to change your eating habits to prevent health problems?

1)not very confident 2)somewhat unconfident 3)not sure
4)somewhat confident 5)very confident

N= 228

n=	1)13	2)28	3)10	4)80	5)97
%=	1)6	2)4	3)12	4)35	5)43

22. How confident are you that you may be able to change your eating habits to improve your performance in sports activities?

1)not very confident 2)somewhat unconfident 3)not sure
4)somewhat confident 5)very confident

N= 230

n=	1)19	2)18	3)53	4)77	5)63
%=	1)8	2)8	3)23	4)33	5)27

23. How confident are you that you may be able to change your eating habits to have more energy?
1)not very coanfident 2)somewhat unconfident 3)not sure
4)somewhat confident 5)very confident

N= 230

n=	1)20	2)19	3)60	4)87	5)44
%=	1)9	2)8	3)26	4)38	5)19

24. For which of the following incentives would you try a new eating pattern?
1)dinner for two at a local restaurant 2)movie tickets for two
3)a record album 4)a poster

N= 216

n=	1)116	2)36	3)56	4)8
%=	1)54	2)16	3)26	4)4

APPENDIX B.

FOCUS GROUP INTERVIEW

I am interested in the nutritional attitudes and behaviors of college students. In the next hour, I am going to ask your help in answering a number of questions which will guide the development of an intervention to promote nutritional eating habits in the dining halls.

Response to Messages Promoting Nutrition

I am now going to show you six advertisements. Each one is labeled with a letter - A through F. Please use these letters to indicate the advertisement you are referring to when answering the following questions.

1. Which of these advertisements appeals to you the most?
2. What is it about this particular advertisement that you find appealing?
3. What is the message in advertisement a? b? c? d? e? f?
4. Which message appeals to you the most?
5. What do you like about advertisement a? b? c? d? e? f?
6. What do you dislike about advertisement a? b? c? d? e? f?

Eating Behavior

7. Tell me what a typical dinner is for you.

8. What would you like to change about your current eating habits, if anything?

9. At one time or another, for one reason or another (weight loss, sports), most of us have tried to alter our eating habits. If you were to try to change your eating habits now what difficulties would you face? (e.g. social factors, taste, familiarity, time, emotional eating)

Motivational Factors

10. What would prompt you to try a new way of eating?

11. A high complex carbohydrate, low fat diet offers a number of advantages including weight loss, increased energy, improved sports performance and improved health. Which of these benefits, if any, is most important to you? to your friends?

Incentive Questions

12. What type of incentive would be most likely to persuade you to try a new way of eating for a short period of time? (e.g. movie tickets, free pizza, tanning sessions, etc.).

APPENDIX C

Typical Dinner Menu

Italian Submarine Sandwich

Fried or Baked Chicken

Stuffed Pepper with Creole Sauce

Dutchess Potato Cake

Butternut Squash

Seasoned Cabbage

Salad Bar

Homemade Dinner Rolls

Ice Cream

The 8 page vita has been removed from the scanned document

The 8 page vita has been removed from the scanned document

The 8 page vita has been removed from the scanned document

The 8 page vita has been removed from the scanned document

The 8 page vita has been removed from the scanned document

The 8 page vita has been removed from the scanned document

The 8 page vita has been removed from the scanned document

The 8 page vita has been removed from the scanned document