DISSERTATION

THE EFFECTIVENESS OF AN INTERNET-BASED NUTRITION AND FITNESS EDUCATION PROGRAM FOR SENIOR MILITARY OFFICERS

Submitted by

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WE HEREBY RECOMMEND THAT THE DISSERATION PREPARED UNDER OUR SUPERVISION BY LORI D. SIGRIST ENTITLED THE EFFECTIVENESS OF AN INTERNET-BASED NUTRITION AND FITNESS EDUCATION PROGRAM FOR SENIOR MILITARY OFFICERS BE ACCEPTED AS FULFILLING IN PART REQUIREMENTS FOR THE DEGREE OF DOCTORATE OF PHILOSOPHY.

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ABSTRACT OF DISSERTATION

THE EFFECTIVENESS OF AN INTERNET-BASED NUTRITION AND FITNESS EDUCATION PROGRAM FOR SENIOR MILITARY OFFICERS

A six-month Internet-based nutrition and fitness education program, entitled *Taking Command of Your Health*, to improve diet and fitness behaviors and physiological measures in a group of senior military officers enrolled in the Distance Education course at the U.S. Army War College. The intervention was based on the Transtheoretical Model (TTM) for behavior change and was delivered via the Internet. A needs assessment survey assessed senior military officers' health concerns, educational preferences for nutrition and health topics, eating habits, and motivators and barriers for eating healthfully and exercising regularly. Survey results determined the content of the intervention. Participants were randomly assigned to either a control group that did not have access to the website intervention or to the treatment group that had access to the program. The program was designed in a monthly newsletter format which combined nutrition and fitness information. Staging algorithm surveys determined stage of change for diet and exercise for participants each month. Participants were provided with stage-matched education based on the diet algorithm and all participants received identical fitness information regardless of stage for exercise. To evaluate the program, treatment participants completed exit surveys at the end of the intervention.

Results of the study indicate that an intervention based on the TTM did not result in statistically significant improvement in behavioral and physiological measures between treatment and control groups. The program was effective in significantly progressing treatment participants through the stages for diet behavior, but not for exercise behavior. Unfortunately, dietary behavior change was not maintained as participants regressed to earlier stages after the intervention. In the exit survey, participants reported that they liked receiving health information over the Internet and they would recommend a similar program to others in the military. Future research on the implementation of a theory-based intervention should focus on an individual's cognitive and behavioral processes that determine one's success and failure with behavior change, factors that determine participation and regular usage of a website program, and the impact of program duration and content on other military populations.

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CHAPTER 1

INTRODUCTION

Rationale for Research

"Force Health Protection" and "well-being" are a part of the U.S. military's transformation into the 21st century (1). Force Health Protection (FHP) embodies the following three pillars: 1) a healthy and fit force; 2) casualty prevention; and 3) casualty care and management to protect the nation's soldiers, sailors, airmen, and marines. Well-being encompasses the health and fitness of military personnel and their families as the armed forces move into the 21st century, the era of the advanced war fighter, the digitized battlefield, and innovative advances in fighting technology and telemedicine. Health promotion has been a part of the United States military since the 1986 inception of Department of Defense (DoD) Directive 1010.10 (2). The 2003 update of this directive (3) continues to support the achievement of the Department of Health and Human Services' Healthy People Goals and Objectives (4) throughout the DoD.

Past research on behaviors have reported that military personnel were more likely to be smokers, indulge in alcoholic beverages more regularly, get less sleep, weigh less, exercise more and eat breakfast less frequently than their civilian counterparts (5). A comparison of health behaviors of U.S. Army personnel with the Healthy People 2000 objectives found that objectives were not met for dietary fat and sodium intake, tobacco

use, and seat belt use (6). Although military personnel met the Healthy People 2000 objective for overweight, DoD surveys indicated that there was a significant increase in the percentage of overweight male and females as defined by a body mass index (BMI) greater than or equal to 25 kg/m^2. Additionally, the economic burden of specific health behaviors in the military is significant. Excess body weight and smoking, in particular, have cost the Department of Defense million of dollars through increased health care costs and indirect costs for lost productivity (7-9).

Specific national dietary recommendations include restricting fat to 30 percent or less of total energy intake and consuming a minimum of five servings of fruits and vegetables daily (10, 11). Yet, only 34 percent of U.S. adults report consuming the recommended fat intake and 35 percent report consuming five or more servings of fruits and vegetables a day (12). When Army personnel were asked if they thought their diet was too low, too high, or just about right for fat content, 51 percent reported that they thought their diet was too high in fat (13). Nearly 55 percent of males and 57 percent of females in the $\geq$ 40 years age group reported that they felt their diets were too high in fat. Half of the respondents thought that it was very important to have a diet with plenty of fruits and vegetables. This same survey observed a mean daily fruit and vegetable intake of 2.5 and 2.9 servings, respectively among military personnel. Among the respondents, 55 percent of military officers reported consuming less than two servings of fruits and 87 percent consumed less than three servings of vegetables every day.

Although each military service conducts health promotion programs, there is clearly a need for more effective nutrition and fitness interventions within the U.S. military. Very little is known about the health concerns and educational preferences for

specific groups within the military and little is known about the factors that motivate and impede service members' attempts to lead healthy life styles. As a result, this study targeted the senior officer population by providing them with an Internet-based nutrition and fitness intervention to improve eating and exercise behaviors and physiological measures. Due to the recent advances in Internet technology and access, and because military personnel are located around the world, often with Internet and e-mail access, the Internet was chosen as a practical mode for educational delivery.

Project Hypothesis and Objectives

There were two phases to this investigation. The purpose of the first phase was to assess senior military officers' health concerns, educational preferences for nutrition and health topics, eating habits, and motivators and barriers for eating healthfully and exercising regularly. This phase occurred in April 2002 and was accomplished through a self-administered, e-mail delivered survey that was completed by military officers attending the U.S. Army War College's (USAWC) in-resident course at Carlisle, Pennsylvania. The purpose of the second phase was to evaluate the effectiveness of a nutrition and fitness education based on the Transtheoretical Model (TTM) using the Internet as the delivery medium. The target audience was senior military officers enrolled in the USAWC's distance education course who were stationed throughout the United States and overseas. Results of the needs assessment survey were used to determine the content of the Internet-based program, called *Taking Command of Your Health*. Using a randomized controlled intervention design, the goal of the intervention was to improve diet and fitness behaviors and physiological measures in this group of

military officers. Participants were assigned to either a treatment group that had access to the website intervention or to a control group that did not have access to the program. The second phase was conducted from June 2002 to July 2003.

It is hypothesized that application of stage-matched education via the Internet will result in improved behavioral and physiological changes. Outcomes were collected by physiological measurements and self-report surveys.

Anticipated behavioral outcomes:

- Increase in fruit and vegetable intake
- Decrease in caloric intake
- Decrease in the percentage of fat and saturated fat in the diet
- Increase in fiber intake
- Increase in consumption of breakfast and lunch
- Decrease in the frequency of dining out
- Increase in regular moderate intensity physical activity (increase in caloric expenditure)
- Increase in military physical fitness test scores (push ups, sit sups, and 2-mile run)

Anticipated physiological outcomes:

- Decrease in anthropometric measures: body fat percent, BMI, waist circumference, and waist to hip ratio
- Decrease in blood pressure
- Decrease in total cholesterol, low-density lipoproteins, and triglycerides
- Increase in high-density lipoproteins

Theoretical Basis

Previous research has emphasized that the most effective nutrition programs are those that are behaviorally focused and based on appropriate theory (14). The educational component of this six-month intervention was based on the Transtheoretical Model. The model was originally developed for smoking cessation behavior by Prochaska and colleagues after they observed that smokers who were trying to quit, used

a variety of behavioral coping strategies and cognitive processes at different times during their struggles with cessation (15). Constructs of this model have effectively been applied to other health behaviors such as weight control, high-fat diets, safer sex, condom use, sunscreen use, exercise, quitting cocaine, and mammography screening (16).

The model suggests that individuals move through a series of stages when attempting to change behavior and that relapse is common during the behavior change process. The TTM posits that behavior change is successful when a behavioral criterion has been met and the individual is confident that relapse will not occur. An essential aspect of the theory is the application of appropriate stage-matched education through the use of change processes, which are cognitive and behavioral activities that people use throughout behavior change. Prochaska and colleagues contend that people use different processes of change throughout the various stages of change and that people benefit the most from appropriate stage-matched interventions to move them through the stages (17). For this program, educational newsletters were developed and written for each stage of change for the targeted behavior which was fruit and vegetable intake. The specific change processes were diligently incorporated into the monthly newsletters for each stage in an effort to progress individuals through the stages of behavior change. It was anticipated that education tailored to an individual's stage of change through the appropriate use of the TTM's constructs would motivate individuals to change behavior during the course of the intervention.

Assumptions and Limitations

The target population for this study is senior military officers and therefore the results of this intervention are not generalizable to other demographically different military populations. The target audience is primarily reservists who are extremely busy juggling dual military and civilian careers, family, and extensively time-consuming USAWC coursework. Therefore, recruitment is a potential limitation. Completion of all pre- and post-study measures in addition to monthly logons to the web site program every month for six months (treatment only) are also potential problems, especially in light of current international military conflicts.

Self-selection bias may also occur as the study may appeal to those individuals who are already interested in nutrition and fitness. Individuals who are unaware that they need to change behavior may perceive that there is little benefit of participating in the study. It is expected that there will be few individuals in the early stages for exercise behavior since military personnel are required to meet fitness standards every year.

The possibility of cross contamination between control and treatment groups is minimal since participants could only access the website through the use of approved usernames and passwords. Also, since participants are located throughout the United States and overseas, there is little concern of participants "sharing" information. Limited access to a computer and the Internet is a possible limitation for some participants during the study period since activation from reserve to active duty status, deployment, or a change in duty station has the possibility of impacting Internet access.

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CHAPTER 2

LITERATURE REVIEW

Health Promotion in the United States Military

Health promotion was formally implemented in the military in 1986 when the Department of Defense (DoD) released a health promotion directive to all military services. The directive defined health promotion as a group of educational, organizational, and environmental actions that support and encourage lifestyle decisions that optimize health (1). The directive's main objectives targeted smoking prevention and cessation, physical fitness, nutrition, stress management, alcohol and drug abuse prevention, and early identification of hypertension. The 2003 update of this directive continues to "establish the Department of Defense requirement to implement health promotion and disease and injury prevention programs to improve and sustain military readiness and the health, fitness and quality of life of military personnel, DoD personnel, and other beneficiaries" (2). The edict supports the achievement of the Department of Health and Human Services' Healthy People Goals and Objectives (3) throughout the Department of Defense. Creation of a DoD Health Promotion Directive prompted each military service branch to implement their own health promotion programs.

Army Regulation 600-63, The Army Health Promotion Program, states that the goal of health promotion is to "maximize readiness, combat efficiency and work performance" (4). This regulation created the Army's first comprehensive health

promotion program, *Fit To Win*, which aimed to enhance the quality of life for all solders, Army civilians, family members, and retirees and encouraged lifestyles to improve and protect physical, emotional, and spiritual health (4). Both the Army Regulation and the DoD directive place responsibility for achievement of the health promotion goal on the organization as well as the individual. A goal of the DoD health promotion directive is to "enhance mission readiness, unit performance, and the health and fitness of military personnel, beneficiaries, and civilian employees through the creation of a culture within the Department of Defense that values health and fitness and empowers individuals and organizations to actualize those values and achieve optimal health" (2).

Since inception of the DoD health promotion policy, the armed forces have invested resources and personnel to meet the health promotion standards set forth in the directive. The United States Air Force established Health and Wellness Centers which offer various programs on nutrition, exercise, and stress management. The United States Army created a command called the U.S. Army Center for Health Promotion and Preventive Medicine to provide health promotion and preventive medicine leadership and services; and to identify, assess and counter environmental, occupational, and disease threats to health, fitness, and readiness in support of the National Military Strategy (5). The Navy Environmental Health Center's mission is to ensure Navy and Marine Corps readiness through leadership in prevention of disease and promotion of health (6).

Most recently, the DoD created Force Health Protection (FHP), a military health care strategy designed to meet the needs of a flexible, smaller, and more "computer-digitized force." The FHP goal is casualty prevention, achieved through a physically and mentally fit force trained for modern combat and supported by mobile, technologically

advanced medical teams (7). Success of this plan is dependent on maintaining a fit and healthy force, and service members are encouraged to maintain a healthy lifestyle by exercising and eating right, avoiding tobacco, consuming alcohol in moderation, if at all, and getting regular medical and dental check-ups. Military leaders and commanders are charged with setting the example by adopting healthy lifestyles, encouraging their units to follow good health practices, and providing a supportive environment for service members.

Health Behaviors of the United States Military

As a result of the military's mission and the increased operational tempo of a smaller computerized force, health and stamina are extremely important. The Department of Defense has conducted several worldwide surveys on health behaviors among military personnel to determine if the armed forces are indeed a fit and ready force in regard to health. A 1985 DoD survey of 17,328 military personnel compared military and civilian health habits in the six areas of sleep, breakfast consumption, alcohol consumption, cigarette smoking, physical exercise, and adherence to weight standards (8). As a result of enforced weight standards in all military services, the military was within recommended weight standards; 94 percent of military males met their respective service's military weight standard while 59 percent of civilian males met their desirable weight as defined by the Metropolitan Life Insurance Company standard tables (8). Approximately 65 percent of military males and females were categorized as "moderately active" compared to 16 percent of the civilian population. Age was a significant factor for both civilian and military respondents with older men and women

being less active than younger men and women. Regular consumption of a daily breakfast was reported by 54.4 percent of civilian males and 56.4 percent of civilian females compared to 34.2 percent and 29.4 percent of military personnel, respectively. Thirty-one percent of military males and 40.6 percent of military females never or rarely consumed breakfast. For male civilians, the likelihood of eating breakfast increased with age, but this was not true for military men as the 30 to 44 year-old group of military males were least likely to eat breakfast. Military personnel were more likely to be smokers, indulge in alcoholic beverages more regularly and get less sleep than their civilian counterparts.

A 1997 study comparing health behaviors of Army personnel with the Healthy People 2000 objectives found that the Army exceeded the physical fitness goals by at least 50 percent and also met goals for eating high-fiber foods and using bicycle helmets (9). Army personnel did not meet Healthy People 2000 goals for dietary fat and sodium intake, tobacco, and seat belt use. A 1995 telephone interview of 1931 active duty U.S. Air Force service members observed that Healthy People 2000 objectives were met for overweight, safety belt use, child safety belt use, mammography and clinical breast exams, and Papanicolaou smears but did not meet objectives for current smoking and cholesterol testing (10).

A second DoD follow-up survey of health behaviors in 1998 demonstrated a decline in the use of drugs, alcohol, and cigarettes among military personnel (11). Although military personnel met the Healthy People 2000 objective for overweight, the percentage of overweight personnel increased from 1995 to 1998. Data from the 1995 and 1998 Department of Defense Surveys of Health Related Behaviors among Military

Personnel, which defined overweight as a Body Mass Index (BMI) greater than or equal to 25 kg/m^2, observed a significant increase in the percentage of overweight male military personnel from 54.1% to 58.6% ($p < 0.001$). Percentage of overweight female military personnel increased from 21.6 percent to 26.1 percent ($p < 0.01$).

The economic burden of specific health behaviors is significant. Excess body weight incurs considerable costs to the military in terms of both direct costs for increased health care and indirect costs for lost workdays. Total direct and indirect costs associated with being overweight in the U.S. Air Force was estimated at $22.8 million in 1997 (12) while total annual cost to the U.S. Navy for obesity-related inpatient care was expected to be $5.8 million in 1998 dollars (13). In 1995, direct health care costs attributed to smoking within the Department of Defense (active duty, dependents, and retirees) were estimated at $584 million with lost productivity among active duty personnel valued at $346 million (14).

Diets high in fruits and vegetables have been associated with a reduced risk for several cancers and for cardiovascular disease (15). The National Academy of Sciences recommends consuming five or more servings of fruits and/or vegetables daily (16). Similarly, the U.S. Dietary Guidelines for Americans recommends a minimum of two servings of fruits and three servings of vegetables a day to promote health (17) while the U.S. Department of Agriculture's Food Guide Pyramid recommends a daily consumption of five to nine servings of fruits and vegetables combined (18). Although the benefits of fruit and vegetable consumption are well documented, reported national consumption is below the recommendation of five servings a day. A 1991 National Cancer Institute telephone survey to assess fruit and vegetable intake observed a median U.S. intake of

3.4 servings per day with 23 percent of the respondents consuming five or more daily servings of fruits and vegetables (19). A 1997 telephone survey conducted by the *5 A Day for Better Health Program* observed a mean national intake of 3.9 servings daily with nearly 26 percent of the respondents consuming five or more servings daily (20).

Military studies have demonstrated conflicting results on fruit and vegetable consumption. A study which evaluated fruit and vegetable intake of active duty service members who ate meals in government dining facilities showed that 43 percent of service members met the minimum recommendations of five servings a day (21). In 1996, active-duty Army personnel world-wide completed the Army Food and Nutrition Survey to evaluate nutrition knowledge and attitudes and to assess dietary intake. From the total population surveyed (n = 3,065; 83% male and 16% female), the mean daily fruit intake was 2.5 servings and the mean vegetable intake was 2.9 servings daily (22).

Health Status of Senior Military Officers

Since the inception of a physical training program, which emphasized physical fitness testing for all soldiers aged 17 to 65 years (23), assessment of the health and physical fitness of senior military personnel has been of interest to the military. Shortly thereafter, the Army Medical Department developed a cardiovascular screening process to evaluate one's risk for cardiovascular disease, which is now part of the routine medical assessment administered to all soldiers at the age of 40 and every five years thereafter (24).

Since inception of the cardiovascular screening program, two senior service schools, the National Defense University (NDU) and the U.S. Army War College

(USAWC), have conducted health and physical fitness assessments on senior military officers attending the one-year schools. An assessment of approximately 1300 male military officers (mean age 41.5 years) who attended the NDU from 1981 to 1985 observed a mean body fat of 18 percent (as determined by three-site skinfold thickness measures), mean blood cholesterol level of 201.2 mg/dl, mean systolic blood pressure of 128.2 mm Hg, and diastolic blood pressure of 80.4 mm Hg (25). Although the mean cholesterol level was slightly above the 200 mg/dl for optimal range, 23 percent of the students exceeded 220 mg/dl, an indication of increased risk for cardiovascular disease (CVD). Additionally, 20 percent of the students had total cholesterol to high density lipoprotein (HDL) ratios greater than 4.98, which placed them at a two to three times greater risk for CVD than those with ratios less than 4.98.

A 1994 report of 1,223 male senior military officers who attended the USAWC and participated in a Physical Fitness Assessment during academic years 1986 to 1990 (mean age 43.1 years) revealed a mean body fat of 24.4 percent (as determined by hydrostatic weighing), and a mean BMI of 25.6 kg/m^2 (26). Mean total blood cholesterol level was 205 mg/dl and mean low-density lipoprotein (LDL) level was 134 mg/dl.

Both senior service schools measured aerobic capacity via a graded exercise stress test. Results from both assessments demonstrated that senior military officers exhibit higher aerobic fitness levels as compared to other males of comparable age (25, 26). One report comparing female senior military officers and their civilian counterparts attending the USAWC from 1986 to 991 found that the female officers were more fit and had lower cardiovascular risk factors (27).

The Military Reserve Population

Although much is known about the health and fitness of active-duty military personnel, there is a dearth of research about health and fitness in the Army reserve population. A major emphasis in the military is individual soldier combat readiness through optimal physical fitness and health. Changing trends point toward more rapid mobilization of reservists for peacekeeping and combat missions around the world, but few studies have been conducted to evaluate the health behaviors and physical readiness of the reserve forces (28).

Reserve personnel are a unique group of individuals who maintain full-time civilian careers and work part-time one weekend a month and two weeks per year as soldiers in a military environment. Reservists must balance civilian and military careers, and family, community and personal commitments while preparing mentally, emotionally, and physically for the possibility of military activation. They must also meet height, weight, body fat and fitness standards that are mandatory for all Army personnel regardless of military status (reserve or active duty). For senior military officers in the reserves, leadership positions often require more hours than mandatory reserve hours. Also, many senior leaders enroll in a senior service school via distance education to improve their possibility for promotion. Thus, maintaining civilian and military careers, balancing personal and professional lives, and completing the extensive written requirements necessary to graduate from a senior service school creates an increased amount of stress on an individual who has little time, if any, to focus on maintenance or improvement of fitness and health behaviors.

An extensive review of the literature by Wynd and Ryan-Wenger revealed that only one research article addressed health risk behaviors in reservists, which was alcohol consumption prevalence (29). Further, a 1996 article in the *Army Times* (30) reported that Army Physical Fitness test failure rates were higher in reservists (10%) than in active duty personnel (5.5-6.2%). This result may be a reflection of physical fitness not being a part of most reservists' daily routines (unless self motivated) compared to active duty personnel who are usually provided time during the workday to exercise.

Adherence to established height and weight standards is mandatory in the military and subsequently, failure to meet height/weight and body fat standards could end a military service member's career. The Army Weight Control Program states that soldiers not in compliance with established weight and/or body fat standards may not receive awards, promotion, attend military education programs, reenlist, or receive additional active duty for training (31).

To assess positive and negative health behaviors that might be used to control and maintain one's weight to meet the regulation standard, Sweeney and Bonnabeau administered a survey to all officers and enlisted personnel assigned to a medical reserve unit (32). The reservists reported using many startling and negative health behaviors to comply with established weight and body fat standards. The percentage of survey participants who indicated that they have tried or would try the following methods to lose weight included the following: dieting defined as $\leq$ 1200 calories/day (41.7%); popular diets (26.5%); self-induced vomiting (4.5%); taking laxatives (12.3%); taking diuretics (19.6%); and taking diet pills (26.0%). Fifty-eight percent of the respondents agreed with the question "Do you want to lose weight?" (32). In comparison, the Food and Nutrition

Survey of 1995-1997 reported that 37 percent of active duty male personnel and 60 percent of females were dieting to lose weight (22).

The Use of Theory in Nutrition Education

Since the 1980's, a priority for nutrition education research has been to apply human behavior change theories and models to the study of nutrition-related behaviors (33). The impetus to create nutrition interventions based on behavior theories is driven by the need to answer important questions, such as "is nutrition education effective and if so, how is it effective?" In a 1973 review of seventy years of studies (34), it was observed that nutrition education had been directed more toward the purpose of disseminating nutrition information than toward the purpose of improving dietary habits. However, dissemination of information and teaching of skills, referred to as the knowledge-attitude-behavior model, has not been very effective in bringing about nutrition-related behavior change (35). A meta-analysis of 303 studies by Johnson and Johnson (36) in 1985 revealed that although nutrition education resulted in overall improvements of 33 percent in knowledge, 14 percent in attitude and 19 percent in dietary practices, the interventions were not based on theoretical models. Finally, in a 1995 review of 217 nutrition education intervention studies, Contento and colleagues (35) observed that the most effective nutrition programs were those that were behaviorally focused and were based on appropriate theory and prior research. Consequently, a major objective in nutrition education research in the past 20 years has been to gather information on a variety of potential factors that may affect whether or not a person

changes behavior, such as behavioral intent, health values, self-efficacy, behavioral capabilities and skills, cognitive or coping skills, and environmental support.

In the more recent past, nutrition programs targeting health promotion and disease prevention have been based on theoretical frameworks and have measured various factors expected to contribute to program effectiveness (35). In general, these studies implemented combinations and variations of different behavior change models and theories. Popular theoretical frameworks implemented in nutrition education research are expectancy-value models of motivation such as the Health Belief Model, the Theory of Reasoned Action and the Theory of Planned Behavior. These models posit that people are more likely to change a behavior if the change will lead to outcomes or consequences that they desire or value. The Social Learning Theory, based on the concept that a person affects and is affected by his/her environment, is also widely used in nutrition interventions. The theory also includes constructs of self-efficacy, skills training, modeling of desired behavior, and anticipated outcomes of behavior change. The Transtheoretical Model, which integrates constructs of the above theories and many other behavior change and information processing theories, infers that individuals change behavior through a series of stages by utilizing disparate cognitive processes depending on their motivation to change. Overall, these behavior change theories and models have proven to be applicable and effective in changing nutrition-related behaviors but more research is needed to evaluate the effectiveness of theoretical frameworks and their different constructs on diverse populations.

The Transtheoretical Model

The Transtheoretical Model (TTM), also referred to as the "stages of change" model, was developed by James Prochaska and Carlo DiClemente after they observed that smokers who were trying to quit, in either a treatment program or self-help program, used a variety of behavioral coping strategies and cognitive processes at different times during their struggles with smoking cessation (37). Since establishment of the model's principles and core constructs, the TTM has proven to be effective in smoking cessation programs (38, 39) and has also been effectively applied to other health behaviors, such as weight control, high-fat diets, safer sex, condom use, sunscreen use, exercise, quitting cocaine, and mammography screening (40).

The Transtheoretical Model consists of the following four constructs: 1) stages of change, 2) processes of change, 3) decisional balance, and 4) self-efficacy. The TTM's underlying principle is that behavior change occurs through a series of stages and that change is a process involving progression or relapse through the six stages. The first stage, precontemplation, is the stage in which an individual is not intending to take action or change a behavior within the next six months. A six-month time frame is used because it is assumed that most people, when planning a specific behavior change, do not look ahead more than 6 months into the future (40). A precontemplator may be uninformed or under-informed about the risks associated with a certain behavior, or the individual may be discouraged about a particular behavior change because past attempts to change have failed. In this stage, individuals view the cons of behavior change, or reasons not to change a behavior, much higher than they view the pros, or the benefits of changing the behavior. For example, an individual who is in precontemplation for eating

a low-fat diet most likely views the steps to eat more low-fat foods as time-consuming and costly and therefore perceives that it is much easier and cost-effective to continue eating a high-fat diet. As a result, precontemplators are resistant to or unmotivated to recognize or modify a problem behavior and usually avoid reading, talking, or thinking about their high-risk behaviors.

Contemplation, the second stage of change, is the stage in which an individual is planning to take action in changing a problem behavior within the next six months. Contemplators are aware that they engage in a problem behavior and are seriously thinking about overcoming it but have not yet made a commitment to change. In contemplation, an individual begins to place more value on the pros of changing a behavior and less value on the cons of behavior change. Prochaska asserts that for most problem behaviors, people decide that the pros of changing the behavior outweigh the cons before they take action to modify that behavior (40). Contemplators struggle with the personal motivators associated with a behavior change and the barriers, such as time, energy and cost. If not provided with more information on why and how to change, individuals can remain in this stage for long periods of time.

In preparation, the third stage of change, an individual intends to take action in the immediate future, defined as "within the next month" (37). An individual in preparation has thought about changing a behavior and may have started developing a plan of action to change a behavior. Preparation is a vital stage to the success of behavior change because a short transition through this stage and inadequate time spent on developing an action plan often leads to only a temporary change in behavior (41). The individual in this stage begins experimenting with and practicing the new behavior through trial and

error as he/she determines the most effective way(s) to integrate the new behavior into daily life. In the preparation stage, individuals become more receptive to action-oriented behavior change programs.

In the fourth stage, called action, an individual has made a commitment to change a specific behavior and has implemented the developed plan of action. Individuals in this stage have made overt and noticeable changes in their behavior and have re-structured the environment to support these changes. Although action implies a successful behavior change through observable events and attainment of goals, individuals should not erroneously equate action with long-term change since the behavior has been modified for a time period of only six months or less (38). For successful, long-term behavior change, an individual must progress to the next stage in the TTM, which is the maintenance stage.

In the maintenance stage, individuals work hard to prevent relapse to previous behaviors and to maintain long-term commitment of the new behavior. Initially, maintenance was viewed as a static stage however this stage is a very active part of and continuation of change as the individual continually learns new coping methods and strategies to effectively maintain the new behavior. An individual in the action and maintenance stages views the benefits of behavior change as outweighing the cons of the behavior and are therefore motivated to initiate and maintain the new behavior. The maintenance stage begins six months after action started and ends when the behavior is no longer a problem or when the individual is not tempted to relapse. For smokers who have quit smoking, Prochaska asserts that maintenance may last anywhere from six months to five years (37). Nutrition experts could argue that eating is necessary for life

and the temptation to relapse to previous behavior(s) is always present, and therefore maintenance is the final stage of a nutrition-related behavior change.

The last stage, called termination, is the stage in which an individual does not feel any temptation to return to the risky behavior and is confident, regardless of the situation, that relapse will not occur. In a study of former smokers and alcoholics, Prochaska found that less than 20 percent of each group reached the criteria of zero temptation and total self-efficacy (37). An explanation for the low percentage of people in termination is that the criteria may be too strict and that this stage may not be a realistic goal for some people. For behaviors such as exercise, weight control, and a healthy diet, a practical goal may be continuation of the maintenance stage since there is almost always temptation to eat unhealthy food or obstacles that interfere with a regular exercise routine. Conversely, for addictive behaviors such as smoking and alcohol and drug abuse, the termination stage, defined as complete abstinence and zero temptation for the problem behavior, may be a realistic goal for behavior change. For the purpose of this study, the termination stage will be excluded from further discussion.

Prochaska contends that people use different processes of change throughout the various stages of change and people benefit the most from appropriate stage-matched interventions to move them through the stages (38). The processes of change, or the covert and overt activities that people use when attempting to change a behavior, are an integration of various behavior change theories and their core constructs. Table 2-1 lists the ten change processes that people use when changing a behavior.

Table 2.1. Change Processes of Behavior Change as described by the Transtheoretical Model (38, 42, 43)

COGNITIVE CHANGE PROCESSES
Consciousness raising: increasing one's level of knowledge or awareness about self and problem behavior through the use of statistics and personal anecdotes
Dramatic relief: Experiencing and expressing deep emotions about one's problem behavior; real-life tragedies, dramatic films and stories, and other fear arousal techniques often trigger this process
Self-reevaluation: Assessing how one feels and thinks about continuing with a problem behavior and how one would think and feel if the behavior was changed
Environmental reevaluation: Assessing how one's behavior problem affects the physical environment
Social liberation: Increasing alternatives for non-problem behaviors available in society; increased awareness of social opportunities available for changing the problem behavior
BEHAVIORAL CHANGE PROCESSES
Self-liberation: Committing to change the problem; accepting personal responsibility for the behavior change
Counterconditioning: Substituting positive alternative behaviors for problem behaviors
Stimulus control: Avoiding or countering situations or stimuli that trigger problem behaviors; removing cues in the environment that lead to unhealthy behavior
Reinforcement management: Rewarding self or being rewarded by others for making changes; often includes self-praise or gifts to recognize reaching a certain goal
Helping relationships: Trusting and utilizing support from others to help in the change process; eliciting support, understanding and encouragement from others

Prochaska and colleagues observed that there was a relationship between an individual's stage of change and the change processes that they used (37). The cognitive change processes are used more often during precontemplation, contemplation, and preparation, which are often referred to as the preaction stages. On the other hand, individuals in the action and maintenance stages utilize the behavioral change processes

more often. To help individuals move from precontemplation to contemplation, consciousness raising and dramatic relief are used to increase awareness of a problem and impact one's emotional response to a particular behavior. Use of counterconditioning and stimulus control would not be effective in helping one move from precontemplation to contemplation since the individual does not want to change. However, these change processes would be appropriate for an individual in the action stage. Therefore, according to the TTM, utilization of the appropriate change processes at a particular stage of change is a key element in behavior change interventions.

Decisional balance, another core construct of the TTM, is an individual's evaluation of the pros, the perceived positive aspects and motivators to changing a behavior, against the cons, the perceived negative aspects or barriers to changing a behavior (41). It can be described as the pattern of cognitive and motivational shifts an individual experiences throughout the course of behavior change. Prochaska contends that as an individual progresses through the stages of change for a specific behavior, he/she will place more value on the perceived pros of changing the behavior and will perceive the cons as less important (40). In an investigation of twelve problem behaviors, two of which were related to diet and weight control, Prochaska and colleagues observed that for all twelve behaviors the precontemplators viewed the cons higher than the pros, but as one moved into contemplation the pros increased (40). Likewise, individuals in the action stage viewed the pros of changing the behavior as higher than the cons. Thus, to progress from precontemplation to contemplation, one must place more value on the perceived positive aspects of changing the behavior. To progress from contemplation to

action, an individual must continue to weigh the pros higher and place less emphasis on the perceived negative barriers of the behavior change.

Self-efficacy, or the self-confidence that an individual has about successfully changing a behavior, is the fourth construct of the Transtheoretical Model. It is the situation-specific confidence people have that they can cope with high risk situations without relapsing to an unhealthy habit (37). It is an important predictor of whether someone will successfully change a behavior. An individual is more likely to change when he/she perceives him/herself to have high self-efficacy in being able to change a behavior. In fact, as one progresses through the stages of behavior change, self-efficacy increases (44, 45). In a study of self-reported nutrition intake, Schwarzer and Renner (46) observed that the more self-efficacious individuals reported better nutrition behaviors, and perceived self-efficacy helped predict behavioral intention to change.

The Transtheoretical Model and Nutrition

There is a great challenge in motivating individuals to change behavior and consequently, to maintain that change. At any given moment, only one-quarter of the population is ready to take meaningful action to change a health behavior and half of those with problems are in the precontemplation stage unaware that a problem exists (47). Thus, the use of stage-matched information in the development and implementation of nutrition interventions may result in greater success and improvement of nutrition behaviors. The stage of change construct has been successful in classifying individuals according to their readiness to lower dietary fat (48-50) and to increase dietary fiber (50)

and fruit and vegetable intake (45, 50). Additionally, the use of stage-matched information has reported mixed results in changing dietary behavior (43, 51-53).

Although successful dietary interventions based on the TTM have been documented, some nutrition experts argue that the model may be problematic in the nutrition discipline due to the intrinsic differences between dietary behaviors and addictive behaviors, from which the model was originally derived (54). A challenge in applying the TTM to nutrition is that eating is not a behavior that requires cessation like smoking, but one that requires modification. Caution must be used in defining the goals of nutrition-related changes and one must carefully interpret research using the stages of change model with dietary behavior (42).

The end point or goal of the behavior change is one such difference between dietary behavior and addictive behavior. The goal for an addictive behavior, such as smoking, is complete abstinence while the goal for dietary behavior could be described in more general terms such as lowering fat intake, increasing fiber intake or increasing fruit and vegetable intake. Eating a healthy diet requires modification, not complete abstinence from food. Due to the complex nature of a diet, an individual may be categorized into more than one stage for various components of the diet. For example, an individual may be in maintenance for consuming a low-fat diet, in the preparation stage for consuming five servings of fruits and vegetables daily, and in contemplation for fiber intake. Therefore, the lack of a clear nutrition goal can make the application of the TTM on nutrition behavior less concrete and more difficult than its application to addictive behaviors (54).

Self-reports and self-perceptions of dietary intake is another challenge in using the TTM to stage individuals into appropriate categories. Individual perceptions of diet can have a serious impact on the appropriate application of the stage of change model, especially since previous studies report a large discrepancy between the objective assessment of diet and self-rated subjective intake (55, 56). Povey and colleagues (57) observed that 50 percent of subjects who perceived themselves as eating a healthy diet actually had an objectively unhealthy diet. Likewise, 51 percent who perceived themselves as eating an unhealthy diet consumed an objectively healthy diet.

A comparison of two staging methods (one that used self-reported dietary fat intake and one method that staged according to an objective behavioral criterion of consuming thirty percent or less energy from fat) found that 14 percent of subjects were classified as precontemplators through self-reporting, while 55 percent of the subjects were classified as precontemplators using the behavioral criterion (58). These results indicate that perceived misconceptions or confusion about dietary intake may categorize individuals into inaccurate stages, thus resulting in an educational intervention that is not appropriate for one's actual stage of readiness for change. Therefore, caution must be taken when choosing a staging classification method since results from self-report surveys often disagree with results from surveys based on specific behavioral criteria.

The use of a specific dietary measure to assess diet may result in more accurate stage categorizations. Povey and colleagues (54) found that as definitions for behaviors became more specific such as "eating a healthy diet" to "eating five portions of fruits and vegetables per day," the proportion of people in precontemplation, contemplation, and preparation increased while those in action and maintenance decreased. These results

suggest that people are likely to self-evaluate a specific behavior such as "eating five portions of fruits and vegetables per day" more accurately than a general behavior like "eating a healthy diet." Interpretation of a general term like "healthy eating" allows more misperceptions of diet which can create a mismatch between one's perceived diet and actual diet. Also, an individual may be trying to consume a lower-fat diet or attempting to consume more fiber, but he/she does not meet established dietary intakes for fat or fiber. The individual is subjectively eating healthier, but objectively is not meeting the definition for a "healthy diet".

The Transtheoretical Model uses fixed time frames to categorize individuals into corresponding stages. According to Prochaska's definitions, an individual who is not currently performing the targeted task, but is planning to change in the next 30 days would be categorized as a person in the preparation stage while an individual who has been performing the targeted task for a period of six months or longer would be in the maintenance stage. A criticism in using fixed time frames with nutrition-related behavior to distinguish between stages neglects to recognize the gradual behavior change which may occur over several months or years, or the daily attempts to change and/or substitute unhealthy behaviors with healthy behaviors (54).

In research evaluating qualitative stage differences for three dietary behaviors of healthy eating, eating a low-fat diet, and eating five servings of fruits and vegetables a day, it was observed that individuals who were actively making a change or attempting to maintain a change had done so for a range of different time periods and no six-month cut-off point was significant between the two stages (54). In fact, 25 percent of subjects who were classified in the action stage for "eating five portions of fruits and vegetables per

day" had been doing so for longer than six months. Interestingly, 82 percent of subjects who were in the action stage for "healthy eating" had been doing so for longer than six months. The fact that more than two times as many people remained in action for "healthy eating" as compared to "eating five portions of fruits and vegetables per day" again suggests that individuals may be more likely to change a behavior when given a specific goal such as eating five portions of fruits and vegetables daily as compared to the general goal of "eating a healthy diet." These results also suggest that the established time frames defined in the Transtheoretical Model for addictive behaviors may be less appropriate for complex and varied health behaviors such as nutrition-related behaviors.

Although there are challenges in applying the Transtheoretical Model to nutrition-related behaviors, many studies have validated and supported its use in the area of dietary change. The success of the TTM relies heavily upon the following three factors: 1) development of a staging classification algorithm to appropriately categorize an individual's stage of change for the dietary behavior being examined, 2) an accurate definition of the target behavior, and 3) a criterion for effective action (47). Staging algorithms have been developed for dietary intakes of fat, fruits and vegetables and fiber (43, 49, 50, 59), but controversy exists on whether to use self-reported dietary intake or an objective dietary assessment to classify an individual into the stage of change model. Nutrition research lacks a universal staging algorithm however most algorithms use a combination of the following three factors to stage an individual: 1) self-rated diet, 2) previous attempts to change diet, and 3) intention to change diet. A few algorithms use measures of self-efficacy or an objective dietary assessment to classify individuals. The validity of self-reported surveys in determining stage classification depends upon the

degree to which people are knowledgeable about the targeted task such as eating a low-fat diet, a high-fiber diet, or a low-cholesterol diet. If the algorithms are valid and interpreted correctly, they should be able to predict differences in dietary behavior across the stages of change. In the nutrition research studies that have been conducted, the differences in behavior are often, but not always, fairly modest between the preaction stages of precontemplation, contemplation, and preparation and larger between the preaction stages and the action and maintenance stages (60).

Curry and colleagues were among the first researchers to examine the association between stage of change for dietary fat reduction and fat intake (48). The staging algorithm used in this study staged subjects through a combination of perceived self-ratings of fat intake, intention to change in the future, and perceived self-efficacy for making future dietary changes. Percentage of calories from fat was assessed using a brief, validated food frequency questionnaire designed specifically for fat intake. The investigators observed that as stage of change increased, percent energy from fat was significantly different as male precontemplators consumed an average fat intake of 40.5 percent and males in maintenance averaged 35 percent. Females consumed less fat than males, but the trend was similar. Although the algorithm was useful in staging individuals according to fat intake in which those in higher stages consumed less fat than individuals in lower stages, individuals in action and maintenance continued to consume more than the dietary fat recommendation of 30 percent or fewer calories from fat.

In the previous study, action was defined as "limiting dietary fat intake." Yet, many of the individuals in action and maintenance consumed more than 30 percent of their calories from fat. To minimize the impact of potential misclassification, Greene and

colleagues developed and validated a staging algorithm using a behavioral criterion of 30 percent or less fat for the action stage (49). The study examined the staging differences in a sample of subjects who were assessed using the following four algorithms: 1) a "limit" algorithm that asked "have you limited the fat in your diet?," 2) an "avoid" algorithm that asked "do you consistently avoid eating high fat foods?," 3) a "low-fat diet" algorithm that asked "are you on a low-fat diet?," and 4) an algorithm based on five behavioral markers for low-fat food intake.

Each algorithm included the traditional time periods as defined in the Transtheoretical Model. There were no significant differences in the proportion of people in each stage for the "Avoid" and "Limit" algorithms and were therefore, combined into one sample while subjects completing the "low-fat diet" algorithm were excluded from the study because they did not understand the term "low-fat diet." Sixty-eight percent of subjects who were classified in action or maintenance stages with the "Avoid/Limit" algorithms consumed more than 30 percent fat in the diet however, the results agree with previous studies in that there was a linear decrease in percent energy from fat as stage of change increased.

Use of the behavioral criterion algorithm improved the classification of individuals into the action and maintenance stages since it was more effective in identifying individuals whose dietary fat was 30 percent or less of total energy intake. Although the behavioral criterion algorithm may be more useful in accurately categorizing people for stage of change for fat intake that meets recommended nutrient guidelines, it was more time-consuming and labor-intensive for both subjects and researchers and/or practitioners. Both algorithms were useful in identifying stage of

change for fat intake and thus can be useful in developing interventions to reduce dietary fat intake.

To evaluate the applicability of the stage construct for fruit and vegetable intake, Van Duyn and colleagues developed a staging algorithm that consisted of a series of questions related to dietary practices, behavioral intentions, and self-efficacy regarding fruit and vegetable consumption (59). Data analyzed from the 2056 adults who participated in the 5 A Day for Better Health program show similar results in fruit and vegetable consumption and stage of readiness when compared to previous studies assessing fat intake. In general, as stage of change increased, consumption of fruits and vegetables also increased. Van Duyn and colleagues observed a significant one serving greater intake of total fruits and vegetables per day for those in action as compared to those in preparation while individuals in maintenance consumed an additional one serving more per day than those in the action stage (59). Interestingly, the subjects in the action stage consumed a mean intake of 3.68 servings of fruits and vegetables per day and those in maintenance consumed 5.07 servings per day.

In the Working Well Trial, a health promotion program designed to reduce cancer risk among a large, diverse group of workers, Glanz and colleagues administered an 88-item food frequency questionnaire and self-report surveys to determine stages of change for dietary fat and fiber intakes (50). Based on their analyses of staging algorithms and dietary intakes, dietary fat intake decreased and grams of fiber per 1000 calories and consumption of fruits and vegetables increased as an individual progressed through the stages of change. It was observed that there was little difference in percent energy from fat between the precontemplation (39.6%), contemplation (39.3%) and preparation

(39.7%) stages while there was an approximate two percent decrease in the action stage (37.4%) and another six percent decrease in the maintenance stage (31.7%) (50).

Daily fiber intake increased from 6.29 grams of fiber per 1000 calories in precontemplators to 9.81 grams per 1000 calories in maintainers, with a significant difference in intake between each stage. Precontemplators consumed an average of 1.69 servings of fruits and vegetables daily while maintainers consumed 3.11 servings a day. Similar to previous research, this study shows that individuals who consume higher fat and lower fiber diets are in the preaction stages of precontemplation, contemplation or preparation while those who consume less fat and more fruits, vegetables, and fiber are in the action or maintenance stages. Also similar to research described earlier and results observed by Lechner (58) and Brug (61) is the fact that many individuals in the action and maintenance stages do not meet recommended nutrient intakes for fat, fiber, and fruit and vegetable consumption.

Because dietary behavior is fundamentally different from addictive behaviors like smoking and using drugs, practical interpretation of the stages of change construct is necessary in reference to diet. Preferences for foods with fat, sugar, and salt can be modified, but not eliminated and diets vary over time since the food supply changes and individuals enjoy eating many different foods. Kristal and colleagues offer two perspectives on the stages of change construct to make it more applicable to dietary change (60). First, the stages of change construct is most useful when the target behavior is defined using self-rated diet instead of a behavioral criterion because it reveals more about what people are thinking and less about what people are eating. Although objective measures of dietary intake are useful for developing personalized feedback to

help increase awareness and motivate change, assessments of self-rated diet allows researchers and practitioners to use the construct as a measure of cognitive and behavioral commitment throughout the process of dietary change.

Second, Kristal and colleagues assert that the action and maintenance stages should be interpreted as the time for developing and maintaining cognitive and behavioral awareness about healthful food choices and that recycling between action and maintenance should be viewed positively (60). For example, an intervention or a health event may trigger a person in maintenance to move into action for adopting a group of new healthful behaviors and thus, a practitioner can use a maintainer's motivation as an opportunity to introduce more challenging behavior changes.

Although there is scientific consensus that the risks of cardiovascular diseases, obesity, and some cancers can be reduced by adopting more healthful diets, trials of successful community-based dietary interventions rarely observe an improvement greater than one percentage point in percent energy from fat and half a serving per day of fruits and vegetables (51, 62, 63). Because very little is known about what motivates people to change dietary behavior, recent research has examined psychosocial influences on healthy eating by using constructs from behavior change models such as the TTM, the Social Cognitive Theory, and the PRECEDE-PROCEED model. In general, there are two broad areas of psychosocial factors affecting dietary behavior. They are individual, intrapersonal, or "predisposing" factors such as knowledge, beliefs, and self-efficacy, and external, interpersonal or environmental factors such as social support and norms related to healthy eating. Both internal and external factors are associated with dietary behavior, but most studies find that associations are stronger for the individual's internal factors

(45). The Transtheoretical Model's constructs of decisional balance and self-efficacy are two examples of internal factors that affect dietary change. The following sections present the research evaluating the validity of applying decisional balance and self-efficacy to nutrition-related behavior changes.

To assess the validity of a decisional balance scale, Ling and colleagues (64) developed and tested a scale of perceived benefits and barriers for increasing fruits and vegetables in a group of subjects in Singapore. It was observed that as stages of change for fruit and vegetable consumption increased, the pros, or perceived benefits for eating more fruits and vegetables, became more important than the cons. Subjects in preparation reported significantly higher pros for fruit and vegetable intake than those in precontemplation and contemplation while subjects in action and maintenance reported significantly lower cons scores than individuals in preaction. It was also observed that the cross over point for the pros of consuming more fruits and vegetables to outweigh the cons occurred between the contemplation and preparation stages.

Ounpuu and colleagues (65) demonstrated similar results from a study that examined cognitive profiles of subjects classified to stages of change for dietary fat reduction. It was observed that as individuals progressed through the stages of change for fat reduction, the pros increased and the cons decreased. These research findings, along with similar findings from comparable studies (40, 64, 66) suggest that an individual weighs the pros and cons of a behavior change when attempting to change. Therefore, an effective strategy to motivate individuals to change dietary behavior would target the pros during the preaction stages of precontemplation, contemplation, and

preparation and then target the cons associated with the behavior in the later stages of behavior change.

The impact of self-efficacy, another core construct of the TTM and an internal factor affecting behavior change, on stage of change for nutrition behaviors has been evaluated in numerous studies. In general, as stage of change increases for a particular behavior, self-efficacy also increases. In a Dutch study of 739 adults, Brug and colleagues (61) found that self-efficacy towards increasing fruit and vegetable intake was significantly lower among precontemplators than that among subjects in all other stages. Van Duyn and colleagues (45) observed similar results in an American study of 2605 adults in which self-efficacy for eating fruits and vegetables and taste preferences were the two factors most consistently and strongly associated with both higher consumption and greater likelihood of being in the action or maintenance stages of change. Another study by Brug and colleagues (67) reported that self-efficacy was highest among subjects in maintenance for a low-fat diet and lowest for contemplators. Additionally, Glanz (50) and Herrick (68) observed similar self-efficacy trends in work-site environments in which stage of change for fat and fiber intake were measured. Results from these studies support the validity of the self-efficacy construct of the TTM for nutrition-related behaviors indicating that educational interventions should emphasize specific behaviors that will enhance one's ability and confidence to change a behavior.

The Transtheoretical Model and Nutrition Interventions

The Transtheoretical Model is an appealing model for nutrition education because it helps identify the types of interventions that will be most effective at each stage of

change (60). Although, only one quarter of the population is ready to take action to change a health behavior (47), many interventions are action-oriented and thus have little impact, if any, on the precontemplators who are in denial or are unaware of a problem behavior or the contemplators who are aware of a problem but need more persuasive evidence on why to change behavior. If applied appropriately, interventions that use a valid staging algorithm and that incorporate decisional balance, self-efficacy, and relevant change processes tailored to an individual's stage of change should result in behavior change within a given population. This section will describe the effectiveness of nutrition interventions based on the Transtheoretical Model of behavior change.

The Working Well Trial (52), a work-site cancer control intervention trial to reduce cancer risk, employed a public health approach that reached people at all stages of dietary change rather than providing individually stage-matched interventions. The TTM's change processes were incorporated by first increasing awareness of dietary behaviors, followed by skills training and then focused on maintenance of changes. Algorithms assessed participant's stage of change for dietary fat, fiber, and fruit and vegetable intake at baseline and at three years follow-up. Results from the Working Well Trial showed that individuals who participated in the intervention were in the later stages of change, such as action and maintenance ($p < 0.0001$) and that for both fat and fiber stages, the most common pattern was no change in stage (52). However, when controlled for covariates, the odds ratio for being in a later stage for fat and fiber was significantly greater for those in the intervention than for control subjects. At follow-up, intakes in fiber and fruit and vegetable intake was significantly higher in the intervention group

compared with the control group while fat intake was not significantly different between groups (52).

The nutrition goals of the Next Step Trial (51), a multi-component cancer control program for high-risk auto workers, were to increase fiber, fruits, and vegetables and reduce dietary fat intake. The two-year intervention, based on concepts from the Social Cognitive Theory, social support principles, and the stages of change construct of the TTM, consisted of five classes and mailed self-help materials in the first 12-month period followed by work site posters and personalized feedback from food frequency questionnaires during the second 12-month period. After adjusting for age, education, marital status and employment status, Tilley and colleagues observed that after the first 12-month period, subjects in the intervention reported consuming significantly less fat as a percentage of total energy (35.6% vs. 36.4%; $p = 0.006$) and more dietary fiber (9.3g vs. 8.8 g/1000 calories; $p = 0.001$) and fruit and vegetable (3.56 vs. 3.35 servings/day; $p = 0.001$) intake as compared to control subjects (51). At the end of the less intensive second 12-month period, the only statistically significant effect that remained between the two groups was for fiber intake because subjects in the control group made modest but positive improvements in fruit, vegetable and fat consumption.

In a study comparing the effects of two interventions intended to promote Mediterranean dietary behavior in a population at high risk for cardiovascular disease in the Netherlands, Siero and colleagues (53) reported that tailored, stage-matched education did not significantly improve eating behaviors more than a basic intervention. A control group received "usual care" which was a brochure that listed the Dutch national nutrition guidelines and the intervention group was provided three 2-hour educational

sessions. The sessions followed progression of TTM change processes by first raising awareness and increasing knowledge of a healthy Mediterranean diet; secondly, promoting a positive attitude towards the diet with hands-on demonstrations of label reading, grocery shopping, and recipe taste testing; and lastly, improving skills in preparing a Mediterranean diet. Between the second and third educational sessions, a sub-group of the intervention group was mailed personal information and education that was individually tailored to attitude, self-efficacy, social norm and stage of change measured at baseline. It was observed that both intervention strategies resulted in improvements in both fish and fruit and vegetable consumption and in progression of stage of change however, the addition of individually stage-matched tailored letters did not result in more progress over the basic intervention group. Explanations for this result could be that the main intervention was intensive and that the mix of educational components in the group sessions was sufficient to result in positive outcomes, regardless of participant's stage of change at baseline.

To evaluate the long-term effectiveness of the TTM's change processes in reducing dietary fat consumption, Finckenor and colleagues (43) conducted a study among undergraduate students attending an introductory nutrition science course. Since most people who need to change a problem behavior are in a preaction stage (41) and similar change processes are used for the preaction stages, the investigators implemented an intervention based on preaction change processes. Students were assigned to either an experimental group who were given eleven 15-minute nutrition lessons emphasizing change processes appropriate for those in the preaction stages, a pretest/posttest control, or a posttest-only control group. The first six lessons of the intervention emphasized

change processes most useful to those in precontemplation and contemplation and the last five lessons emphasized processes most useful to those in the contemplation and preparation stages.

At the study's onset, more than 60 percent of subjects in both the experimental and pre/posttest control groups were in a preaction stage. At the end of the study nearly 66 percent of the experimental group were in action or maintenance while 50 percent of the pre/posttest control and 33 percent of the posttest only groups were in action/maintenance (43). An important finding from this study is the fact that subjects in the experimental group who were in a preaction stage significantly reduced mean fat intake, significantly increased mean stage and maintained these changes for one year (43). These results suggest that interventions incorporating the use of change processes for preaction stages in a group setting can help participants change dietary behavior.

Although many nutrition interventions based on the Transtheoretical Model have been effective in improving dietary behavior, more research needs to be conducted to determine an appropriate and standard staging algorithm for each specific dietary behavior and to determine effective and practical change processes for each stage of change. A summary of the change processes and techniques that are most beneficial in promoting change in individuals at various stages of readiness to change is presented in Table 2.2. Secondly, few outcome interventions have been evaluated for long-term success. Two TTM-based interventions failed to show any difference after 18 months (69) and 2 years post-intervention (51), indicating a need for either more intense education and follow-up or more appropriate and continued use of the change processes.

Table 2.2. Individualizing Education Methods for Individuals in Preaction and Action/Maintenance Stages (42).

Stage of Change	Activity	Example of Activity
Precontemplation and Contemplation	Consciousness raising	Explain the necessity of the need to change and hazards of not changing. Individualize the behavior risk, making problems associated with the behavior specific to the client's current lifestyle.
	Self-reevaluation	Have the client examine current behaviors to see how they either agree or disagree with the required changes.
	Social reevaluation	Help to examine the environment in which the client lives and identify those factors that will either enable or discourage the necessary change.
	Dramatic relief	Work with the client to identify those moments when the change occurred and describe the psychological feelings of success.
	Minimize barriers	Identify methods to overcome those obstacles that the client lists as reasons for not changing.
	Increase self-efficacy	Set small, realistic goals that are easy for the client to achieve. Once these goals are met, allow the client to reward his or her efforts and set new goals.
Preparation, Action, and Maintenance	Prevent relapse and problem-solving techniques	Recognize those situations that may cause the client to resume the old behavior and develop a plan to overcome those obstacles.
	Cope with relapse	Explain to the client that a relapse in behavior is common and that it is not considered failure. Encourage the client to continue the good behavior, regardless of the length of the relapse.
	Self liberation	Encourage the client's belief that one can change and maintain change.
	Helping relationships	Encourage the client to establish relationships that will help to support and continue the change.
	Reinforcement	Establish a system for rewarding appropriate behaviors. Rewards should not involve a relapse in the previous behavior.
	Counterconditioning and stimulus control	Help the client to identify unhealthy behaviors and to replace them with healthy behaviors. Removing those cues in the environment that lead to unhealthy behavior.
	Enhance benefits	Continue to recognize the benefits of the change and list any additional benefits the client may not have originally recognized.
	Increase self-efficacy	Encourage an overall feeling of confidence in the client's ability to maintain the change. Continue to set and encourage goals in order for the client to be successful.

The Transtheoretical Model and Physical Activity

Substantial literature indicates that physical activity and regular exercise can lead to improvements in quality of life along a broad range of physical and psychological factors (70). Thus, physical activity is incorporated into most health promotion programs along with goals for healthy eating and weight loss. In fact, health care providers would be remiss if they did not counsel patients on the health benefits of both nutrition and exercise. Despite the fact that media campaigns and health care professionals promote the benefits of physical activity, most Americans do not get enough physical activity. In fact, one-quarter of U.S. adults do not engage in any leisure-time physical activity (71).

Clearly, efforts to begin and maintain an exercise routine remain a challenge for many Americans, especially since approximately 50 percent of adults who begin exercise programs quit within three to six months (72). Also, health promotion programs and media campaigns tend to target those individuals who are motivated or are already participating in regular exercise and not individuals who would benefit the most from an exercise program. Motivation for health behaviors has been examined to understand why people do or do not engage in physical activity despite its benefits. Low self-efficacy has been associated with perceived barriers to physical activity with lack of time as the primary barrier and internal cues such as a desire to look or feel better were the most frequent motivators (73, 74). The utility of the TTM's constructs with regard to exercise has been validated for use among diverse population groups (75-78). Identification of the exercise stage of readiness, perceptions of pros and cons to exercise, and self-efficacy can help predict an individual's level of physical activity. In these studies, self-efficacy also seemed to be extremely important in predicting future exercise behavior without exercise

intervention. Individuals with high self-efficacy viewed physical activity as important even when tired, depressed, or having little time for exercise. However, the effectiveness of TTM-based physical activity interventions have yielded mixed results.

The Jump Start to Health program (72), a prospective controlled trial that compared the efficacy of a self-help intervention tailored to the individual's stage of readiness for exercise with a standard self-help exercise promotion intervention, showed that participants receiving the stage-matched intervention were significantly more likely to increase exercise than were the individuals who received standard education. The interventions were delivered at baseline and at month one while assessments were collected at baseline and month three. Also, regardless of the subject's initial stage, more advancement was observed among those individuals who were given the tailored messages.

A 24-week intensive intervention for obese females reported significant and positive changes in physical activity and fitness for the TTM-based intervention as compared to a usual care intervention (79). A randomized, controlled trial of adult primary care patients comparing the effectiveness of tailored, personalized, and general health messages and usual medical care on physical activity found that the tailored group (based on the TTM) was more likely to increase physical activities of daily living than were patients in the personalized, general, and control groups (80). However, there were no significant differences in leisure time activities between the groups.

Two investigations conducted in primary care settings did not show significant improvements in exercise. The Physically Active for Life (PAL) Project was a randomized, controlled trial of middle-aged and older adults comparing the efficacy of

brief (5 minutes) physician-delivered physical activity counseling based on the TTM to usual care on self-reported activity. At the 6-week follow-up, subjects who had received the TTM-based intervention were more likely to be in more advanced stages of motivational readiness, but the effect was not maintained at the 8-month follow-up (81). A second study involving 128 subjects found that a single stage-based intervention did not result in significant changes in self-efficacy or exercise levels from baseline to six months when compared with other intervention strategies (82).

Computer Tailoring and Internet-based Interventions

Computer tailoring is a popular behavior change technique that has been adopted by nutrition educators and researchers in the past decade (83). Computer tailored interventions mimic, to some extent, the traditional face-to-face counseling interview because the education is based on an individual's risks, needs, and attitudes and is therefore more personally relevant. Individuals complete surveys or personal interviews which are scanned into a data file. The computer system links each individual's results with a feedback and advice source from a message library that contains appropriate feedback and guidance for each survey response. Computer tailored education has the capability to reach many individuals in a relatively inexpensive manner while simultaneously providing personalized information.

Computer tailoring has been used quite successfully in motivating people to stop smoking, change their diet, increase physical activity, and to help patients understand and cope with disease (83). Brug and colleagues observed that patients who received computer tailored nutrition education letters reacted more positively to the information

and reduced their fat intake when compared to patients who received general nutrition information (84).

In a very few reported studies, the Transtheoretical Model has been applied to computer tailored nutrition messages. When Brug and colleagues provided participants with nutrition messages that were tailored to an individual's personal attitudes, perceived social influences, self-efficacy and motivation to change fat and fruit and vegetable intake, subjects in the tailored message group were more satisfied with the information that they received and more often reported increased fruit and vegetable intake and reduced fat intake when compared with subjects receiving general information (85).

Lutz and colleagues (86) found disparate results when evaluating the effectiveness of computer tailored nutrition newsletters designed to increase fruit and vegetable intake. The intervention consisted of three versions of four monthly newsletters: 1) non-tailored traditional newsletters, 2) tailored nutrition newsletters without a goal-setting component, and 3) tailored nutrition newsletters with a goal-setting component. The newsletters contained constructs of self-efficacy from the Social Cognitive Theory, stage of readiness to change from the Transtheoretical Model, and perceived barriers and benefits from the Health Belief Model. Although there was not a significant difference in fruit and vegetable intake among the three groups receiving newsletters, there was a significant difference in intake between the three groups and the control group, which did not receive any intervention.

A second promising mode of delivery for health promotion interventions is the Internet. Nguyen and colleagues reported that 73 to 110 million American adults used the Internet to look for health information in 2002 (87). Advantages to the Internet as a

method of education include 24-hour accessibility to search and gather information, elimination of geographic constraints, allowance for anonymity, "real time" or immediate feedback on surveys, and opportunities to participate in a socially supportive environment through on-line discussion forums or chat sessions. In addition, web-based interventions can incorporate access to vast information sources, offer communication with experts and peers for support, and provide links for additional information.

However, there are challenges in utilizing the Internet for health promotion interventions. A potential barrier to delivering effective education by means of the world wide web is the web itself. The vastness of the web with its virtually unlimited sources for information may encourage individuals to "surf" the Internet instead of focusing their attention on one specific website. One has to question whether people actually read and process information that is perused from various websites. Another potential barrier is the issue of a program's credibility. It is often nearly impossible to confirm the validity of a website's educational content, especially when an individual is not knowledgeable about the topic.

Published studies on the efficacy of Internet-based health interventions are limited. In a 2003 review of seventeen studies using the Internet to deliver health education interventions, Nguyen and colleagues summarized that although more focused and thorough evaluations need to be conducted to determine the effectiveness and usefulness of Internet-based education, some outcomes in certain groups can be moderately improved with the use of the Internet as a medium (87). A six-month weight loss program in which subjects were assigned to either Internet education or Internet behavior therapy (24 weekly behavioral lessons via e-mail, weekly online submission of

self-monitoring diaries, individualized therapist feedback, and online bulletin board) revealed that subjects in the behavior therapy group lost more weight than those in the education group from baseline to three months but neither group lost additional weight from month three to month six (88). For both groups, log-in frequency to the website was significantly correlated with weight change between zero and six months. However, log-ins decreased significantly after the third month for each group.

There are limited published studies incorporating both the Internet as the medium for educational delivery and the Transtheoretical Model as the theoretical basis for the intervention. One study that used the Internet and the TTM compared an 8-week stage-targeted print program with a stage-targeted website program to evaluate change in self-reported physical activity. The authors reported no significant differences in reported physical activity between the two groups (89). Although 53 percent of subjects receiving print material and 59 percent of those receiving the web-based program indicated that they would prefer to receive health-related information via website and e-mail, one-half of the subjects in the web-based education group did not once view the website (89).

A second study evaluated the efficacy of an Internet-based intervention on physical activity levels of adults (90). Subjects were either assigned to the Internet intervention in which they had access to the website for three months and received weekly e-mail tips or to the waiting list control group who were told that they would have to wait three months to participate. Interestingly, more participants in the intervention group dropped out of the study compared to the control group. More participants in the intervention group were more likely than the control group to significantly progress in stage of motivational readiness when compared to baseline, but no differences were

observed from months one to three. Measures of minutes spent on physical activity and minutes spent walking at baseline, month one, and month three, found that only walking minutes at month one was significant with the intervention group walking more minutes than the control group.

Veverka and colleagues evaluated the efficacy of a six-month Internet-based fitness and nutrition program targeted at U.S. Air Force enlisted males using the stage of change model as the theoretical basis for the intervention. Analyses demonstrated that the intervention was not effective in improving the primary goal which was fitness scores (as measured by VO^2 max) but it did improve secondary outcomes such as weight, BMI, and percent body fat (91). Additionally, all of the treatment subjects in this investigation ($n = 20$) strongly agreed or agreed that they enjoyed getting health information over the Internet and would recommend that type of program for others in the Air Force (92).

Veverka's latter findings agree with a similar study conducted by the Oregon Air National Guard that examined the feasibility of implementing a virtual health and wellness center for their personnel. An analysis of 521 surveys revealed that 92.5 % of respondents had contemplated making one or more health behavior changes in the past year which included becoming more physically active, improving eating habits, losing weight, improving stress management and reducing tobacco use (93). Moreover, 91.3 percent of respondents ranked the Internet as a popular source for health information, 82 percent had Internet access, and average computer self-efficacy score was rated as very high. These results demonstrate that the Internet may be a viable and effective medium for providing health information to the Air National Guard population.

In summary, the efficacy of and the possibility of reaching large numbers of people with computer tailoring and the Internet is a promising and innovative technique that requires more research. Future studies should concentrate on the characteristics of tailored interventions that increase its effectiveness, the impact of individualized feedback, and the point at which further education no longer leads to a greater effectiveness or cost-effectiveness (94). The Internet also appears to be a viable medium for health information dissemination for most individuals, including members of the armed forces. An effective health promotion program via the world wide web would be advantageous to military personnel who are stationed and deployed around the world and would benefit from health education.

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CHAPTER 3

NEEDS ASSESSMENT OF SENIOR MILITARY OFFICERS: EDUCATIONAL CONCERNS AND MOTIVATORS AND BARRIERS FOR HEALTHFUL EATING AND REGULAR EXERCISE

INTRODUCTION

Health promotion and military readiness are top priorities in the United States military. The 2003 update of Health Promotion Directive 1010.10 continues to "establish the Department of Defense (DoD) requirement to implement health promotion and disease and injury prevention programs to improve and sustain military readiness and the health, fitness and quality of life of military personnel, DoD personnel, and other beneficiaries" (1). A goal of Health Promotion Directive 1010.10 is to "enhance mission readiness, unit performance, and the health and fitness of military personnel, beneficiaries, and civilian employees through the creation of a culture within the Department of Defense that values health and fitness and empowers individuals and organizations to actualize those values and achieve optimal health" (1).

Physical activity and diet are major factors that influence morbidity and mortality in the United States (2-5). Sixty-four percent of U.S. adults are overweight or obese as defined by a body mass index (BMI) of higher than 25.0 kg/m^2, an increase of more than 25% over the past three decades (6). Additionally, one-quarter of U.S. adults do not engage in any leisure-time physical activity (7). Results from Department of Defense

Surveys of Health Related Behaviors among Military Personnel reported a significant increase in the percent of both overweight male and female military personnel (defined as BMI $\geq$ 25.0 kg/m^2), from 54.1% to 58.6% ($p < 0.001$) and 21.6% to 26.1% ($p < 0.01$), respectively (8). Excess body weight incurs significant costs to the military in terms of both direct costs for increased health care and indirect costs for lost workdays. Total estimated costs, including direct and indirect costs, associated with overweight in the Air Force was $22.8 million in 1997 (9) while total annual cost to the U.S. Navy for obesity-related inpatient care was expected to be $5.8 million in 1998 dollars (10).

Numerous studies have shown a strong association between a healthy diet and a lower risk for cardiovascular disease, obesity, and certain cancers (11-13). Specific national recommendations include restricting total fat to less than 30% of energy intake and consuming a minimum of 5 servings of fruits and vegetables daily (14, 15). Yet, only 34.4% of U.S. adults report consuming the recommended 30% or less of calories from fat and 35.1% report consuming five or more servings of fruits and vegetables a day (2). A review of health habits of U.S. Army personnel revealed that Healthy People 2000 goals were not met for dietary fat and sodium intake, tobacco, and seat belt use (16).

The 1996 Army Food and Nutrition Survey observed a mean daily fruit and vegetable intake of 2.5 and 2.9 servings, respectively among military personnel (17). Approximately 55% of officers reported consuming less than 2 servings a day of fruits and about 87% consumed less than 3 servings a day of vegetables. When soldiers were asked if they thought their diet was too low, too high, or just about right for fat content, 51.2% reported that they thought their diet was too high in fat with those in the $\geq$ 40 years age group reporting higher percentages of 54.6% for males and 57.1% for females

(17). When asked about attitudes on diet, 45.7% of soldiers thought that it was very important to have a diet low in saturated fat and 51.1% thought that it was very important to have a diet with plenty of fruits and vegetables.

Emphasis has been placed on the evaluation and improvement of the health and physical fitness of military personnel since the inception of Department of Defense Directive 1308.1 "Physical Fitness and Weight Control Programs" in 1981 (18). The senior service colleges at the National Defense University in Washington, DC and the U.S. Army War College (USAWC) in Carlisle, Pennsylvania have been conducting health and fitness programs for senior military officers attending these courses. In general, senior male military officers participating in these programs were normotensive, non-obese, and had a high aerobic capacity and at low risk for developing cardiovascular disease (19, 20). Senior female military officers were reported as being more fit and had lower cardiovascular risk factors than their civilian counterparts attending the USAWC (21).

The increasing trend of overweight in the military, the high cost of healthcare associated with overweight, failure to meet key Healthy People 2000 objectives related to diet such as fat and sodium, and service members' beliefs about their diets identify the need for more appropriate nutrition and fitness education for military personnel. In general, educational interventions are more effective when they are tailored to the needs and preferences of the target population (22) however, educational preferences of various segments of the military have not been reported in the literature. This article identifies the health concerns, educational preferences for nutrition and fitness, barriers and motivators for eating healthfully and exercising regularly, and eating habits of senior

military officers enrolled in the residence course at the USAWC. This information can aid in the development of targeted educational programs for this population.

METHODS

A Nutrition and Fitness Educational Needs Assessment Survey (Appendix A) was developed and validated to assess senior military officers' concerns on various health topics, educational preferences for nutrition and health topics, eating habits, and barriers and motivators for eating healthfully and exercising regularly. It was given to resident students enrolled in the Academic Year 2002 USAWC course at Carlisle, Pennsylvania.

Approval to survey the resident students was obtained by the Colorado State University Human Research Committee and the Director, Institutional Assessment, USAWC (Appendix B). The survey and a cover letter describing the purpose and point of contact were sent electronically to 292 active duty U.S. military officers. A consent form was not necessary as the study was given exempt status by the Colorado State University Human Research Committee. Completion of the survey was voluntary, but not completely anonymous as completed surveys were sent electronically to the investigator. However, confidentiality was maintained by not reporting and identifying individual responses.

The survey consisted of 15 questions. The first four questions were related to demographic data and included age, gender, military status, and marital status. Six questions measured respondents' attitudes on a 5-point Likert scale from strongly agree to strongly disagree on their health concerns, educational topics they wanted to know more about, and barriers and motivators for eating healthfully and exercising regularly.

Additionally, respondents were asked to subjectively rate both their eating habits and fitness levels as excellent, good, fair, needs improvement, or poor and were asked specific questions about the number of times they dined out each week and the number of days per week they consumed breakfast and lunch.

Descriptive analysis was performed using Statistical Package for the Social Sciences, Version 11.5 (SPSS, INC, Chicago, IL) by calculating mean scores for the attitude responses as well as computing frequencies and percents for all responses.

RESULTS

Fifty-eight USAWC resident students completed and returned the Nutrition and Fitness Educational Needs Assessment Survey for a return rate of 20%. Of the students completing the survey, 93 percent were male, 88 percent were between the ages of 40 and 50 years, and 90 percent were married. Respondents reported being in the U.S. Army (76%), the U.S. Air Force (9%), Army Reserves (7%), and U.S. Marine Corps (3%). Respondents' survey answers and mean scores are listed in Table 3.1.

Approximately 98% of respondents strongly agreed and agreed that fitness was their primary health concern followed closely by weight (94.8%). Senior military officers were also concerned with their blood cholesterol (86.2%), body fat (89.7%), and blood pressure (79.3%). Cancer (67.3%) and diabetes (43.1%) were less important health concerns.

Table 3.1 Percentage of Responses by Senior Military Officers regarding Health Concerns, Educational Preferences, and Motivators and Barriers to Healthy Eating and Regular Exercise[1]

Question	Strongly Agree % (N)	Agree % (N)	Neither Agree/Disagree % (N)	Disagree % (N)	Strongly Disagree % (N)	Mean Score[3]
HEALTH CONCERNS:						
Blood cholesterol	44.8 (26)	41.4 (24)	10.3 (6)	3.4 (2)	0	4.28
Blood pressure[2]	37.9 (22)	41.4 (24)	8.6 (5)	8.6 (5)	1.7 (1)	4.07
Body fat[2]	43.1 (25)	46.6 (27)	6.9 (4)	1.7 (1)	0	4.33
Cancer[2]	32.8 (19)	34.5 (20)	19.0 (11)	10.3 (6)	1.7 (1)	3.88
Diabetes	22.4 (13)	20.7 (12)	27.6 (16)	22.4 (13)	6.9 (4)	3.29
Fitness[2]	67.2 (39)	31.0 (18)	0	0	0	4.68
Weight[2]	58.6 (34)	36.2 (21)	3.4 (2)	0	0	4.56
WANTS TO KNOW MORE ABOUT:						
Benefits of dietary fiber	12.1 (7)	43.1 (25)	39.7 (23)	5.2 (3)	0	3.62
Dieting/weight loss/fad diets	13.8 (8)	41.4 (24)	25.9 (15)	17.2 (10)	1.7(1)	3.48
Eating healthy on the run	34.5 (20)	44.8 (26)	17.2 (10)	3.4 (2)	0	4.10
How to lower/control blood cholesterol[2]	31.0 (18)	46.6 (27)	12.1 (7)	8.6 (5)	0	4.02
How to lower/control blood pressure	17.2 (10)	48.3 (28)	24.1 (14)	10.3 (6)	0	3.72
Reading food labels	6.9 (4)	32.8 (19)	44.8 (26)	13.8 (8)	1.7 (1)	3.29
Safety and use of dietary supplements	15.5 (9)	36.2 (21)	24.1 (14)	20.7 (12)	3.4 (2)	3.40
BARRIERS TO EATING HEALTHFULLY:						
Too busy	27.6 (16)	44.8 (26)	12.1 (7)	13.8 (8)	1.7 (1)	3.83
Not a personal priority	8.6 (5)	32.8 (19)	8.6 (5)	44.8 (26)	5.2 (3)	2.95
Lack of knowledge—not sure what to eat	8.6 (5)	10.3 (6)	19.0 (11)	56.9 (33)	5.2 (3)	2.60
Healthful food choices not available	3.4 (2)	29.3 (17)	20.7 (12)	37.9 (22)	8.6 (5)	2.81
Confusion from the media/research	1.7 (1)	27.6 (16)	22.4 (13)	39.7 (23)	8.6 (5)	2.74
Do not like to cook	8.6 (5)	22.4 (13)	20.7 (12)	39.7 (23)	8.6 (5)	2.83
MOTIVATORS TO EATING HEALTHFULLY:						
My health	48.3 (28)	46.6 (27)	5.2 (3)	0	0	4.43
My appearance	44.8 (26)	51.7 (30)	3.4 (2)	0	0	4.41
Meeting weight and/or body fat standard	43.1 (25)	41.4 (24)	12.1 (7)	1.7 (1)	1.7 (1)	4.22
My family	34.5 (20)	48.3 (28)	12.1 (7)	3.4 (2)	1.7 (1)	4.10
My personal medical history/advice by health care provider	22.4 (13)	37.9 (22)	27.6 (16)	8.6 (5)	3.4 (2)	3.67
Support from family/friends/co-workers	8.6 (5)	32.8 (19)	36.2 (21)	20.7 (12)	1.7 (1)	3.26
BARRIERS TO EXERCISING REGULARLY:						
Too busy	19.0 (11)	37.9 (22)	8.6 (5)	25.9 (15)	8.6 (5)	3.33
Lack of knowledge	0	5.2 (3)	19.0 (11)	48.3 (28)	27.6 (16)	2.02
Fitness facility is not in close proximity	1.7 (1)	15.5 (9)	19.0 (11)	43.1 (25)	20.7 (12)	2.34
Do not like to exercise	3.4 (2)	17.2 (10)	25.9 (15)	20.7 (12)	32.8 (19)	2.38
MOTIVATORS TO EXERCISING REGULARLY:						
My appearance/weight	41.4 (24)	56.9 (33)	1.7 (1)	0	0	4.40
My military career—passing the fitness test	41.4 (24)	44.8 (26)	10.3 (6)	1.7 (1)	1.7 (1)	4.22
Achievement of personal fitness goals	29.3 (17)	56.9 (33)	12.1 (7)	1.7 (1)	0	4.14
My personal medical history/ advice by health care provider	8.6 (5)	50.0 (29)	19.0 (11)	17.2 (10)	5.2 (3)	3.40
Support from family/ friends/co-workers	8.6 (5)	31.0 (18)	32.8 (19)	25.9 (15)	1.7 (1)	3.19

[1]Total N = 58

[2]Percent and mean score based on N = 57

[3]Mean Score based on range from 5 to 1: 5 = Strongly Agree; 4 = Agree; 3 = Neither Agree or Disagree; 2 = Disagree; and 1 = Strongly Disagree.

Nearly 80% of respondents wanted information on eating healthy on the run and 77.6% wanted to learn more about lowering/controlling their blood cholesterol. Senior military officers also reported that they wanted to learn how to lower/control their blood pressure (65.5%). Almost three-quarters of respondents reported "being too busy" as the number one barrier for eating healthfully. Forty-one percent reported that they did not make healthful eating a personal priority while nearly one-third agreed that the non-availability of healthy food choices, a dislike for cooking, and confusion from the media/research were also barriers for eating healthfully. Appearance (96.5%) and health (94.9%) were the leading motivators for eating healthfully. Meeting military weight and/or body fat standards (84.5%) was also reported frequently as a motivator followed closely by family (82.3%).

Nearly 57% of respondents reported "being too busy" as the primary barrier for maintaining a regular exercise program. A dislike for exercise (20.6%) and the non-availability of a fitness facility within close proximity (17.2%) were also reported. Concern for appearance/weight (98%) was the primary motivator for exercising regularly. Approximately 86% of respondents reported passing required physical fitness tests and achievement of personal fitness goals as motivators also.

Personal ratings of eating habits and fitness levels revealed that 22.4% of senior military officers perceived themselves as having an excellent level of fitness while only 8.6% felt that they had excellent eating habits (Table 3.2). A small proportion of respondents felt that they should improve eating habits and fitness levels and none of them felt that their eating habits or fitness levels were poor. In evaluating senior military officers' eating habits, almost half of the respondents (46.6%) reported eating breakfast

seven days per week while 34.5% reported eating lunch seven days per week (Figure 3.1). Sixty-five percent of respondents reported dining out two or fewer days per week (Figure 3.2).

Table 3.2. Senior Military Officers' Personal Perceptions of Eating Habits and Fitness Levels[1]

	Excellent	Good	Fair	Needs Improvement	Poor
Eating Habits[2]	8.6	60.3	20.7	10.3	0
Fitness Level[2]	22.4	50	19	8.6	0

[1]Total N = 58

[2]Results reported as percentage

Figure 3.1. Percentage of Senior Military Officers Eating Breakfast and Lunch (n = 58)

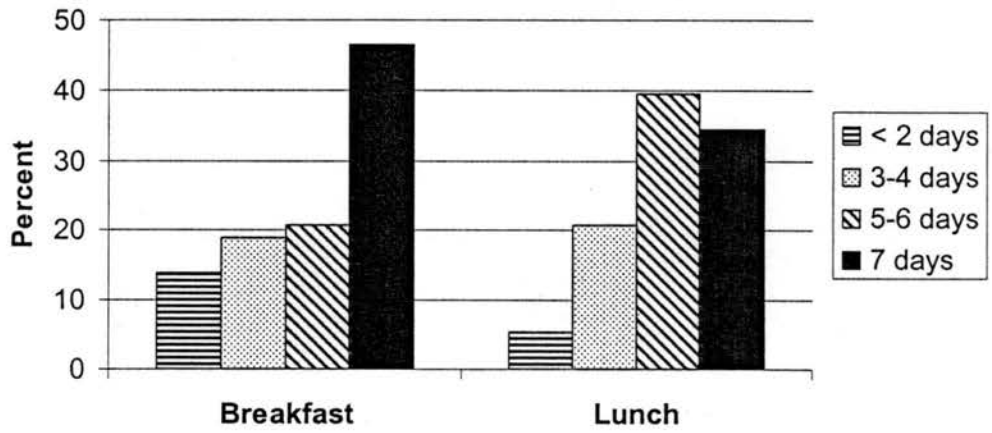
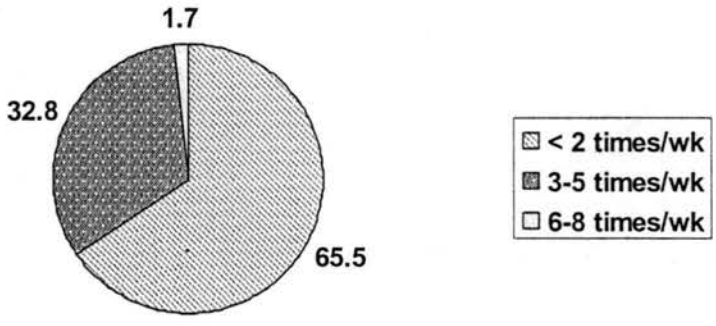


Figure 3.2. Percentage of Senior Miltiary Officers Dining Out Weekly (n = 58)



DISCUSSION

Findings from this study reveal that senior military officers were most concerned with fitness, weight, and body fat. Military regulations governing fitness and weight may be the impetus for these concerns as non-compliance can result in military discharge. The standards were established in Department of Defense Directive 1308.1 "Physical Fitness and Weight Control Programs," a policy created to ensure that military branches implemented physical fitness programs and weight standards to ensure a physically fit combat force (18). Despite the enforcement of weight and body fat standards, overweight prevalence among military service members is on the rise. Body mass index among military personnel has increased over the past several years (23) and therefore it is no surprise that this group of respondents was concerned with weight and body fat, especially when their military careers are at stake.

Cholesterol and blood pressure were also frequently reported health concerns. This may be because cholesterol and blood pressure readings are routine measurements in

mandatory physical exams and therefore service members are more aware of cholesterol and blood pressure values than risk factors for other chronic diseases. Another potential reason for these concerns was that the officers surveyed may be more knowledgeable about cholesterol and blood pressure values than other senior officers because they have participated in the health and fitness program offered by the Army Physical Fitness Research Institute (APFRI) during the USAWC course, which educates officers on cardiovascular disease risk factors and offers classes on controlling cholesterol and blood pressure levels.

The number one topic that respondents wanted to know more about was how to eat healthy on the run. Considering the fact that senior officers lead fast-paced, executive lifestyles, it is not surprising that they perceive there is little time during the day to eat healthfully. How to lower/control blood cholesterol and blood pressure were the second and third topics, respectively, that they wanted to know more about. The desire to know more about these topics may also be the result of participation in APFRI's program because students are made aware of their cholesterol and blood pressure levels, guidelines for normal values, and potential consequences of high cholesterol and blood pressure levels.

Interestingly, respondents reported that learning about cholesterol and blood pressure control was more important than education on dieting, weight loss and fad diets albeit weight was their second health concern. One could argue that a desire for information on weight loss should coincide with the officers' concerns for weight and body fat. One explanation for the disparate results may be that they do not want education on how to diet or lose weight as much as they want education on how to

"control weight" and therefore, changing the educational topic to "weight control" may increase interest. Also, military officers may feel that they are knowledgeable on how to lose and/or control weight.

"Being too busy" was the primary barrier that prevented respondents from eating healthfully. This finding supports a study conducted with the Oregon Air National Guard in which "lack of time" was the most commonly cited barrier to making positive health behavior changes (24). While appearance and health were the major motivators to eat healthfully and they were concerned with their weight, respondents reported that they did not make eating healthfully a personal priority. It appears that their busy schedules and lack of time outweigh any personal perceived benefits that they may have of eating healthfully. Since officers did not report knowledge as a major barrier to eating healthfully, they may know what to eat but view healthy eating as a time-consuming event.

"Being too busy" was also the primary barrier that prevented senior military officers from engaging in regular exercise while appearance/weight and achievement of both military physical fitness standards and personal fitness goals were top motivators for exercise. The perception of time as a barrier for exercising regularly is consistent with previous studies identifying barriers to physical activity (25-27). Although exercise is an essential part of military culture, one-fifth of the respondents reported that they did not like to exercise. Not one respondent felt that lack of knowledge was a barrier to exercise which may be reflective of the presence of military physical fitness policies and programs. Again, military regulations governing fitness and weight may be the driving force that motivates these officers to exercise regularly; surpassing any motivating

influences triggered by one's personal medical history/advice from health care provider or support from family/friends/co-workers. Some officers are motivated to exercise to achieve personal fitness goals which may or may not be related to the physical fitness test requirements such as meeting minimum testing requirements or surpassing the maximum standards.

Although the majority of respondents perceived their eating habits as "good," there is some argument as to whether an individual's perception of diet is an accurate reflection of true dietary intake. A report of perceived healthy eaters compared with an objective assessment of their diet found that 50% of those subjects perceiving themselves as eating a healthy diet had an objectively unhealthy diet while 51% of the perceived unhealthy eaters had an objectively healthy diet (28). These disparate results support the fact that every individual has a different interpretation of what defines a healthy diet and that "healthy diet" is a general term which can include various components such as fat, fruits and vegetables, sodium, and fiber. This survey asked subjects to rate their "eating habits" which could potentially invoke a variety of interpretations in addition to those listed previously such as meal pattern consumption, eating three meals a day, skipping meals, late night snacking, bingeing, and dieting. Therefore, it is difficult to accurately assess senior military officers' dietary intake without an objective dietary evaluation.

Almost half of senior military officers consumed breakfast daily and approximately one-third consumed lunch every day. The Army Food and Nutrition Survey found that 18.6% of male Army personnel $\geq$ 40 years "always/usually" skipped breakfast while one-quarter of females reported skipping this meal (17). Nine percent of males and 11% of females $\geq$ 40 years reported "always/usually" skipping lunch. Meal

skipping continues to be prevalent in this senior officer population even though they were stationed at the USAWC where there was a cafeteria in the academic building that served breakfast and lunch. Additionally, many students lived within a mile from the USAWC and had quick access to meals at home or at the USAWC. It appears that many officers continued to skip meals even when provided with a more flexible school environment and access to food.

More senior officers perceived themselves to have excellent fitness levels than excellent eating habits. This could again be related to military fitness policies that directly influence the physical activity habits of military personnel to include encouragement of physical training time during the work day (when feasible), annual physical fitness testing, and compliance with physical training regulations. Likewise, many military personnel do not attend nutrition classes unless they are directed to or have a personal interest in nutrition.

Limitations

The small sample size and the low survey return rate limits the results of this study. Students who completed the survey may have been more concerned with health than students who did not respond and therefore these results may not be generalizable to the senior military officer population. Also, the survey provided a limited number of specific answers and did not allow respondents to supply additional comments which could have potentially restricted the answers to the survey. The fact that the subjects were enrolled in the resident course at the USAWC also potentially biased the results since they were living in a school environment that was different from the typical military assignment. The survey was administered in March, three-fourths of the way through the

USAWC course, and therefore exposure to APFRI's health education could have biased the students' answers.

CONCLUSIONS

This is the first investigation targeting the senior officer population to identify their health concerns, educational preferences and their perceived motivators and barriers for eating healthfully and exercising regularly. It is imperative that educational strategies consider the audience's characteristics to include their demographics, nutritional needs and preferences, and their perceived motivators and barriers toward the targeted behavior(s). Based on the results of this needs assessment, a nutrition and fitness intervention for this group of senior military officers should emphasize fitness, weight, body fat, control of blood cholesterol and blood pressure, and eating healthy on the run. Effective interventions should address the lack of time that these officers perceive as the major barrier to a healthy diet and regular exercise program and provide them with simple, reality-based, and appropriate education that will encourage adoption of positive eating and exercise behaviors.

Future research should assess the health concerns and perceived motivators and barriers for eating healthfully and exercising regularly of other military populations such as younger enlisted personnel and younger officers, and special groups like Special Forces or Rangers. An objective assessment of the targeted audience's dietary intake and physical activity patterns would also be extremely beneficial in determining the educational goals of an intervention. To increase the effectiveness of a health promotion intervention, it should be tailored to the specific needs and preferences of the targeted group.

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CHAPTER 4

DEVELOPMENT OF AN INTERNET-BASED NUTRITION AND FITNESS PROGRAM FOR SENIOR MILITARY OFFICERS

INTRODUCTION

The need for effective health promotion interventions is paramount for the improvement of American's health behaviors. Sixty-four percent of U.S. adults are overweight or obese as defined by a body mass index (BMI) of equal to or higher than 25.0 kg/m^2, an increase of more than 25 percent over the past three decades (1), and one-quarter of U.S. adults do not engage in any leisure-time physical activity (2). Department of Defense Surveys of Health Related Behaviors among Military Personnel observed a significant increase in the percent of both overweight male and female military personnel (defined as BMI $\geq$ 25), from 54.1 percent to 58.6 percent and 21.6 percent to 26.1 percent, respectively (3). Not only is excess body weight associated with an increased risk for cardiovascular disease, diabetes mellitus, hypertension, stroke, and osteoarthritis (4), it also incurs significant costs to the military in terms of both direct costs for increased health care and indirect costs for lost workdays. Total estimated costs, including direct and indirect costs, associated with overweight in the Air Force was $22.8 million in 1997 (5) while total annual cost to the U.S. Navy for obesity-related inpatient care was expected to be $5.8 million in 1998 (6).

Numerous studies have shown a strong association between a healthy diet and a lower risk for cardiovascular disease, obesity, and certain cancers (7-9). Specific national recommendations include restricting total fat to 30 percent or less of total energy intake and consuming a minimum of five servings of fruits and vegetables daily (10, 11). Yet, only 34.4 percent of U.S. adults report consuming the recommended 30 percent or less of calories from fat and 35.1 percent consume five or more servings of fruits and vegetables a day (12). Additionally, the 1996 Army Food and Nutrition Survey reported a mean daily fruit and vegetable intake of 2.5 and 2.9 servings, respectively among active duty personnel (13). From this survey, approximately 55 percent of officers consumed less than two servings of fruits a day and about 87 percent consumed less than three servings of vegetables a day. Approximately one-half of service members thought their diet was too high in fat. For respondents in the $\geq$ 40 years age group, 54.6 percent of males and 57.1 percent of females thought their diets were too high in fat (13). When asked about attitudes on diet, 45.7 percent of service members thought that it was very important to have a diet low in saturated fat and 51.1 percent thought that it was very important to have a diet with plenty of fruits and vegetables. Finally, a review of health habits among United States Army personnel revealed that Healthy People 2000 goals were not met for dietary fat and sodium intake, tobacco, and seat belt use (14).

The senior military officer population is one group of service members who could benefit from a nutrition education intervention since they are at a time in their lives when personal and/or family health may impact their daily lives. Furthermore, senior officers who learn and maintain positive health habits and attitudes may provide the motivation and influence necessary for organizational change in health care policies and practices.

One particular senior officer group is military officers who attend a senior service school such as the U.S. Army War College (USAWC). Previous research reports that this group of officers are generally normotensive, non-obese, have a high aerobic capacity and are at low risk for developing cardiovascular disease (15, 16). Although this population appears to be relatively healthy and fit, results from a survey administered to a group of students enrolled at the USAWC for the first phase of this investigation, indicated that senior military officers are concerned with fitness, weight, body fat, and control of both blood cholesterol and blood pressure levels. They desire to know more about how to eat healthfully on the run and they perceive time as their primary barrier to eating a healthful diet and exercising regularly.

One specific sub-group of this population are the officers who are enrolled in the Department of Distance Education (DDE) course at the U.S. Army War College. The DDE population is approximately 70 percent reservists. The remainder are active-duty service members and a very small percentage are Department of the Army civilians. Reservists are a unique population because they have the added responsibility of juggling dual military and civilian careers while preparing for possible activation and/or deployment and maintaining personal commitments. They are expected to maintain combat readiness, attend military courses for promotion, and meet weight, body fat, and fitness standards. Thus, maintaining civilian and military careers, balancing personal and professional lives, and completing the extensive written requirements necessary to graduate from a military senior service school may create an increased amount of stress on an individual who has little time, if any, to focus on improvement or maintenance of

fitness and health behaviors. Additionally, reservists do not have routine access to the military health care system for health promotion, nutrition, and fitness information.

Few studies have been conducted to evaluate the health behaviors and physical readiness of the reserve forces (17). Alcohol consumption prevalence among reservists has been reported to be higher than the civilian population, but lower than the active military (18). Results of Army Physical Fitness tests indicate that failure rates are higher in reservists than in active duty personnel (19). To determine the incidence of health practices used by reservists to comply with mandatory weight and body fat standards, Sweeney and Bonnabeau found that reservists use many startling and negative health behaviors such as very low calorie dieting, popular diets, self-induced vomiting, and taking laxatives, diuretics, and diet pills (20). Fifty-eight percent of the reservists surveyed agreed that they wanted to lose weight (20). This is consistent with data from the Food and Nutrition Survey of 1995-1997 in which 37 percent of active duty male personnel and 60 percent of females reported dieting to lose weight (13).

Senior military officers lead fast-paced, high-stress lifestyles and would benefit from an intervention that provides them with concise and pertinent information to improve or maintain healthy eating and exercise habits. This chapter describes the development of an Internet-based nutrition and fitness program designed for senior military officers enrolled in the distance education course at the USAWC.

METHODS

Target Population

A six-month Internet-based nutrition and fitness intervention called *Taking Command of Your Health* was developed for senior military officers enrolled in the Department of Distance Education course at the U.S. Army War College with the goal of improving eating behaviors and military physical fitness measures. A Nutrition and Fitness Needs Assessment Survey (Appendix A) completed by resident students at the USAWC provided the information to develop program content. Refer to Chapter 3 for a description of survey results. Although this intervention was modeled after Veverka's six-month intervention, *Let's Get Moving* (21), the demographics of the target population were very different from Veverka's younger, enlisted male subjects. *Taking Command of Your Health* was developed for officers with the rank of Lieutenant Colonel and Colonel who were approximately ten years older than the aforementioned group (46 vs. 36 years). This study also included males and females who were all college graduates (necessary for officer status) and did not exclude for known disease. Additionally, this intervention combined the fitness and nutrition information into one newsletter while Veverka provided two separate newsletters for nutrition and fitness.

Theoretical Model

Because the most effective nutrition programs are those that are behaviorally focused and based on appropriate theory and prior research (22), recent nutrition programs targeting health promotion and disease prevention have been based on defined theoretical frameworks and have measured various factors expected to contribute to program effectiveness. *Taking Command of Your Health* was based on the

Transtheoretical Model (TTM), developed by Prochaska and colleagues for addictive behaviors (23). It is also called the Stage of Change Theory. The TTM infers that individuals change behavior as they progress through a series of stages (Table 4.1) by using different cognitive and behavioral processes, called processes of change, at each stage (Table 4.2). The TTM views behavior change as a spiral pattern rather than a linear progression as relapse and recycling through the stages is common when attempting to change behavior.

Table 4.1. A Description of the Transtheoretical Model's Five Stages of Change for Behavior Change (23)

STAGE	DESCRIPTION
Precontemplation	An individual is not intending to take action or change a behavior within the next six months. A precontemplator may be unaware of the risks associated with an unhealthy behavior or may be discouraged about the behavior change because he/she has failed to change behavior in the past. The individual is resistant to or unmotivated to recognize or modify a problem behavior and usually avoids reading, talking, or thinking about the high-risk behavior.
Contemplation	An individual intends to take action in changing a problem behavior within the next six months. Contemplators are aware that a problem exists and are seriously thinking about overcoming it but have not yet made a commitment to take action. Individuals can remain in this stage for long periods of time if they are not provided with more information on why and how to change.
Preparation	An individual plans to take action within the next month. The individual has thought about the positive and negative consequences of changing a problem behavior, has developed a plan of action to change, and has taken some steps toward changing the problem behavior. An individual in this stage is most receptive to action-oriented behavior change programs.
Action	An individual has changed a problem behavior, but has done so for a time period less than 6 months. An individual has made a commitment to change a behavior and has made noticeable changes in behavior, experiences, or environment. An individual in this stage must prepare oneself for relapse to an earlier stage by developing strategies to maintain change.
Maintenance	An individual has changed a problem behavior and has done so for a time period greater than 6 months. An individual maintains continued commitment to the behavior change, creates new motivators to maintain the change, and anticipates relapse to earlier stages by using relapse prevention strategies. An individual in this stage must learn to deal with high-risk situations, continue to practice the new behavior change, and experiment with new coping skills.

The success of the TTM relies heavily upon the use of a valid staging algorithm to appropriately assess stage of readiness to change for the dietary behavior being

examined. The primary focus of this intervention was fruit and vegetable intake with exercise as a secondary focus. At initial access to the intervention each month, the participant completed two staging algorithms (Appendix C). The first algorithm was for

Table 4.2. Change Processes of Behavior Change as described by the Transtheoretical Model (24-26)

COGNITIVE CHANGE PROCESSES
Consciousness raising: increasing one's level of knowledge or awareness about self and problem behavior through the use of statistics and personal anecdotes
Dramatic relief: Experiencing and expressing deep emotions about one's problem behavior; real-life tragedies, dramatic films and stories, and other fear arousal techniques often trigger this process
Self-reevaluation: Assessing how one feels and thinks about continuing with a problem behavior and how one would think and feel if the behavior was changed
Environmental reevaluation: Assessing how one's behavior problem affects the physical environment
Social liberation: Increasing alternatives for non-problem behaviors available in society; increased awareness of social opportunities available for changing the problem behavior
BEHAVIORAL CHANGE PROCESSES
Self-liberation: Committing to change the problem; accepting personal responsibility for the behavior change
Counterconditioning: Substituting positive alternative behaviors for problem behaviors
Stimulus control: Avoiding or countering situations or stimuli that trigger problem behaviors; removing cues in the environment that lead to unhealthy behavior
Reinforcement management: Rewarding self or being rewarded by others for making changes; often includes self-praise or gifts to recognize reaching a certain goal
Helping relationships: Trusting and utilizing support from others to help in the change process; eliciting support, understanding and encouragement from others

fruit and vegetable consumption with a behavioral criterion of five or more servings of fruits and/or vegetables daily. The second algorithm was for exercise with a behavioral criterion of 30 minutes or more of moderate intensity physical activity on at least 3 or more days per week. These staging algorithms were the classification tools used to stage participants for diet and exercise and were the same algorithms that Veverka used for his web-based study (21). Since this intervention combined the nutrition and fitness

information into one monthly newsletter, the diet algorithm was used as the classification method for staging participants into the appropriate stage for fruit and vegetable intake and also for providing the appropriate stage-matched newsletter to the participant each month. All participants received identical fitness information regardless of stage for exercise behavior.

In addition to the stages of change and processes of change, decisional balance and self-efficacy are also core constructs of the TTM. Decisional balance is an individual's personal assessment of the pros (the perceived positive aspects and motivators to changing a behavior) against the cons (the perceived negative aspects or barriers to changing a behavior) (27). As an individual progresses through the stages of change for a specific behavior, the perceived pros for changing the behavior increase while the cons decrease (28). Self-efficacy is the confidence that an individual has about successfully changing a behavior and is an important predictor of whether someone will successfully change an undesirable behavior. It is the situation-specific confidence people have that they can cope with high risk situations without relapsing to an unhealthy habit (23). All constructs of the TTM were appropriately applied to this intervention and will be discussed in detail in the following sections.

RESULTS

Website Program Development

Taking Command of Your Health was the title of the six-month educational intervention designed for senior military officers with the goal of improving eating behaviors and military physical fitness measures. The term "*taking command*" was

appropriate for this audience since the participants had experience in leadership positions and were accustomed to taking responsibility for themselves as well as others. *Taking Command of Your Health* was an empowering phrase that challenged senior military officers to accept responsibility for their own health.

The intervention was presented as a newsletter issue each month with different nutrition and fitness topics presented monthly. Participants were allowed access to the current and all previous months' newsletters. Participants did not have access to the current month's newsletter until the first day of the current month. Each participant was given an individually assigned username and password to ensure approved access to the website program and to avoid cross-contamination.

The website was designed with the camouflage colors of the military battle dress uniform which included black, brown, and various shades of khaki green. To complement the graphics, the majority of text was black and khaki green. A muted red-colored text was used to capture the participant's attention on a key point or to make a congratulatory comment. It was concluded that since participants were extremely busy individuals, they may be more receptive to an intervention presented in an easy-to-read format. Therefore, the text was presented in bullet format instead of paragraph style to encourage easy and quick comprehension of the educational material. Also, service members are familiar with this presentation style since most military policies and correspondence are written in bullet format. To capture the participant's attention and break the lines of text, khaki-colored boxes framed some of the written information.

The website welcome page was the first screen viewed each month after participants logged on to the program (Appendix D). All months of the intervention were

displayed, but only current and previous months' information was accessible. Participants had the opportunity to log out of the program at any time by clicking the *Logout* button. Participants were automatically logged out of the program after 20 consecutive minutes of inactivity. The website also provided participants with a point of contact e-mail address if they had any questions or problems regarding the program.

Real-time subject data was recorded and collected using an application with over 1200 lines of code which included subject identification number, date and time that the page was requested, referrer page, stage category, newsletter issue, newsletter quiz answers, and other technical client/server information. All data was collected in a custom designed Microsoft Access database on a Windows 2000 server. Eat table within the database was accessible by the investigator using an ordinary web browser and the appropriate authentication.

Newsletter Content

Results from the needs assessment survey completed by resident students at the U.S. Army War College were used to determine newsletter content. Although the underlying theme was the promotion of fruit and vegetable intake, a different health topic was presented each month that was based on the educational preferences of the USAWC students who completed the survey (Table 4.3). There were seven main sections of each monthly newsletter which are listed below:

- *Food for Thought*
- *Survival Eating*
- *The Sensible Weigh*
- *Combating Disease*

- *Fitness Corner*
- *The Command Post*
- *Links*

Table 4.3. Monthly Topics for *Taking Command of Your Health.*

INTERVENTION TOPICS	CONTENT EMPHASIS
Month 1: Eating to Fuel Your Active Lifestyle	Described the impact of how food enhances both mental and physical performance; provided ideas for healthy snacks to keep at the office
Month 2: Controlling Your Cholesterol	Provided risk factors for cardiovascular disease (CVD) and goals for blood lipid values; discussed fat content of fast foods; provided American Heart Association physical activity recommendations for lowering CVD risk
Month 3: Simple Strategies for Weight Control	Provided overweight/obesity prevalence rates and the impact of obesity on chronic disease risk; discussed portion sizes and fad diets; discussed the benefits of strength training and interval training for weight control
Month 4: Controlling Your Blood Pressure	Provided current recommendations for blood pressure (BP); described the DASH diet for lowering BP; discussed the effect of weight loss on BP
Month 5: Eating for Performance	Provided national inactivity prevalence; discussed timing of meals/snacks for optimizing performance; explained the importance of carbohydrates in fueling mental and physical performance; provided tips on how to effectively train for the mandatory physical fitness test and specific routines for interval training
Month 6: The ABC's of Good Nutrition	Provided tips on how to incorporate the last 5 months of education; described successful strategies for weight control, signs of a fad diet, signs of fraudulent supplement products, and interpretation of research and media reports; provided real-life descriptions from senior citizens who described the importance of physical activity

Although the newsletter topic and information changed monthly, the seven newsletter sections and specific website layout remained consistent throughout the intervention in an effort to maintain continuity and ease of navigation for the participant. There was no forced navigation as participants could view sections in any order. Care was taken to ensure that appropriate change processes, self-efficacy, and decisional balance was incorporated into each section to promote stage-matched learning and behavior change. A description of each newsletter section is listed below:

"Food for Thought." This section introduced the month's specific topic and captured the participant's attention by posing personally relevant questions that pertained to the topic such as eating for performance or controlling cholesterol and blood pressure levels. This section also provided the participant with statistics from credible organizations and concluded with "questions to ponder" regarding personal eating, exercise, and/or other health behaviors. The goal of this section was to introduce the monthly topic and to capture the participant's curiosity of the information through the use of questions that related to personal behaviors. Depending upon the participant's stage, the "questions to ponder" would either motivate the participant to start thinking about his/her behavior (precontemplation), motivate the participant to start thinking about how to change his/her behavior (contemplation/preparation), or encourage the participant to think about how to maintain the desired behavior (action/maintenance).

"Survival Eating." Because USAWC students were most interested in learning about how to eat healthy on the run, this section was provided every month to inform the participant how he/she could eat healthy at work, while dining out, or at home. This section provided ideas on how to pack flavorful nutritious meals and snacks, how to successfully dine out without consuming too much fat, sodium or calories, and how to prepare simple, healthy meals at the end of a hectic day. Scenarios describing other senior military officers, their struggles with diet and exercise, and how they successfully overcame barriers to change behavior were often utilized to provide role models for the participant. The term **Smart Strategy!** was used throughout the newsletter sections to capture the participant's attention on a key strategy that would be helpful in promoting behavior change. Because the target audience was a group of senior military officers

who were familiar with military strategies and tactical plans, the term "strategy" was deliberately applied with the intention of stimulating curiosity and enhancing knowledge. The **Smart Strategy!** either raised awareness of a potential problem behavior (precontemplation stage), provided the pros and cons of behavior change (contemplation and preparation), or provided further information on how to maintain the desired behavior (action and maintenance).

"The Sensible Weigh." This section was included in the intervention each month since weight was the second leading health concern reported by students who completed the needs assessment survey. The purpose of *"The Sensible Weigh"* was to provide information on sensible strategies for weight control in combination with the monthly topic. For example, in the first month's topic, "Eating to Fuel Your Active Lifestyle," this section provided information on the negative effects of skipping meals to lose weight and fuel performance, discussed diet myths, and listed "portable" fruits and vegetables to encourage healthy eating on the run. Scenarios were also used in this section to depict role models and their struggles with weight loss, behavior change, and successful strategies for weight control.

"Combating Disease." The purpose of this section was to provide medical information, and research results and statistics for each monthly topic. Since the target audience's average age was 46 years, it was felt that the average participant may be more interested in research-based disease prevention information than a younger audience. For the monthly topic "Controlling Your Blood Pressure," a scenario provided a concise description of a senior military officer's diet before and after adoption of the DASH (Dietary Approaches to Stop Hypertension) Diet to lower blood pressure. For the topic

"Simple Strategies for Weight Control," research on fad diets was provided as well as the potential side effects of ephedra-containing supplements sold as weight loss aids.

"Fitness Corner." This section provided identical fitness information to the participant regardless of exercise stage and therefore was not stage-matched. It was assumed that the participants would have various levels of fitness, the goal of the *"Fitness Corner"* was to provide tips on how to fit exercise into a busy schedule, how to cross train to prevent over-use injuries, and the benefits of aerobic exercise and strength training. This section was meant to provide additional motivation to exercise regularly as well as provide new information on how to maintain fitness in a fun and enjoyable way without becoming bored and incurring repetitive over-use injuries.

"The Command Post." This section contained five different questions every month to test the participant's learning and application of the information. The questions were either behavior-based to assess the participant's behavior, such as eating breakfast or eating five servings of fruits and vegetables a day, or knowledge-based to assess how well the participant could apply the information learned that month. This section was a self-assessment section in which the participant could confirm what he/she had learned. Immediately after submission of selected answers, participants received the correct answers and feedback comments based on whether or not the answer was correct. Therefore, this section raised awareness of personal habits (self reevaluation) and continued to build confidence (self-efficacy) for those individuals in all stages of change.

"Links." This section contained active links to credible websites where the participant could obtain more information on diet and exercise. For participants in precontemplation and contemplation, the websites provided further information for

participants who were curious to learn more about a particular disease or health condition even though they may not have contemplated changing the behavior. The *Links* section provided a second opportunity for participants to increase their awareness and assess the perceived negative and positive consequences of changing a behavior. For participants in the later stages (preparation, action, and maintenance), the websites provided additional information to reinforce their knowledge of the pros of changing a behavior, reinforce commitment to behavior change, and provide further motivation to maintain positive behaviors in addition to learning new ways to practice the desired behaviors.

Application of the Transtheoretical Model

After development of the individual newsletter sections for the website intervention, a content matrix was developed for each stage of change for fruit and vegetable consumption. As stated previously, the nutrition and fitness messages were combined into one monthly newsletter and participants did not receive stage-matched information related to physical activity. Because individuals benefit the most from interventions that are appropriately stage-matched to help them progress through the stages of behavior change (24), extensive consideration was taken to ensure that each newsletter contained appropriate TTM constructs that would encourage the participant to change behavior. As a result, five different versions of each monthly newsletter were developed to provide tailored information to the five stages defined by the TTM.

Newsletter content for each stage, based on TTM constructs, is presented below as well as content for the *"Fitness Corner."* See Appendix E for a thorough explanation of the newsletter content matrix applied to this intervention and desired outcome(s) for

each stage of change and for the *Fitness Corner* section. Appendix F provides specific examples of newsletter content for *Taking Command of Your Health.*

Precontemplation. Prochaska asserts that to help individuals progress from precontemplation to contemplation, the change processes of consciousness raising, dramatic relief, and environmental reevaluation should be most emphasized to precontemplator (23). The precontemplative newsletter utilized these processes by providing facts and statistics related to a particular behavior or health condition and by describing evocative, persuasive scenarios of similar senior military officers who have changed a problem behavior. The message also applied the processes of social liberation and self reevaluation. Social liberation and decisional balance was integrated into the newsletter through the use of senior officer scenarios in which role models illustrated alternative ways to adopt the desired behavior, overcame obstacles to change behavior, and discussed positive consequences of behavior change. It has been reported that attitudes toward increasing fruit and vegetable intake are least positive among those in precontemplation (29) therefore, decisional balance was introduced to the precontemplator in the form of posed questions, statistics, and scenarios. Self reevaluation and self-efficacy was applied in *"The Command Post"* section by posing questions that encouraged the participant to assess personal eating and/or exercise habits (self reevaluation) while instant feedback on answers increased confidence of learned information (self-efficacy).

Contemplation. Increasing confidence in one's ability to adopt recommended behaviors is a key strategy for moving an individual from contemplation to preparation (30). Schwarzer and Renner observed that the more self-efficacious individuals reported

better nutrition behaviors and perceived self-efficacy helped predict behavioral intention to change (31). The contemplative newsletter utilized the cognitive change processes that are important in precontemplation (consciousness raising, dramatic relief, environmental reevaluation, and social liberation) and also applied the self-efficacy construct. Self-efficacy was integrated through the use of positive, congratulatory comments to the participant a propos to his/her decision to intend to make a positive behavior change in the future and by providing simple steps to accomplish the behavior change. The importance of helping relationships was also introduced to initiate thought about how family and friends can aid in the behavior change process. Decisional balance remains significant for the individual in contemplation and therefore, the participant was encouraged to weigh the pros and cons of behavior change through the use of posed questions, statistics, and scenarios.

Preparation. The preparation stage is a critical stage in the behavior change process because inadequate time spent in this stage usually leads to only a temporary change (27). Key strategies for moving an individual from preparation to action include development of a specific action plan and a firm commitment to change behavior (30). An individual in the preparation stage received a newsletter that continued to apply the aforementioned cognitive change processes with the addition of behavioral change processes such as self liberation, stimulus control, and counter conditioning. The participant was instructed to develop a plan of action for change which included goal setting. The plan also identified strategies for substituting desirable behaviors for undesirable behaviors, controlling the environment to reduce temptation for an undesirable behavior, using helping relationships, and making a firm commitment to

change behavior. Previous research has found that the greatest increase in self-efficacy expectation toward increasing fruit and vegetable intake occurs between the preparation and action stages (29, 32) therefore, positive and laudatory comments were provided throughout the message along with simple steps for successful behavior change to increase self-efficacy and improve the likelihood that the participant will change in the near future.

Action. For the individual in the action stage, behavioral change processes such as stimulus control, counter conditioning, and reinforcement management are extremely important as well as repetitive skills training and social support (30). The action newsletter compellingly supported the participant's commitment to change behavior by providing additional techniques for the plan of action which included more of the same strategies that were given to the participant in preparation. The topic of relapse to previous behavior was introduced at this stage with an emphasis on preparing oneself for relapse and having a plan to resume desirable behavior after relapse occurred. The newsletter stressed that relapse was a frequent and common occurrence during the behavior change process, and could be successfully managed with a plan to "get back on track." Self-efficacy continued to be an important construct in the action stage as the participant was encouraged to continue with successful change and lauded for "taking command of your health".

Maintenance. For the individual in maintenance, education should be focused on appropriate strategies to maintain the behavior change (25). Thus, the maintenance newsletter emphasized the change processes of stimulus control, reinforcement management, counter conditioning, and the self-efficacy construct. Newsletter content

prepared individuals for relapse, provided techniques for relapse prevention, reminded them of the positive consequences of the behavior change, encouraged them to assess new reasons for maintaining the desired behavior, challenged them to make new and advanced goals, and provided ways to continue to make the desired behavior a priority. The individual in maintenance was praised for maintaining the behavior change for longer than six months and was provided with positive comments that would increase one's confidence in maintaining the desired behavior.

"Fitness Corner." This intervention combined the nutrition and physical activity messages and staged according to the diet staging algorithm only. The goal of the *"Fitness Corner"* was to help those individuals in the preaction stages to move into action and to provide enough new information to those in action and maintenance to continue to exercise regularly. A combination of cognitive and behavioral change processes was incorporated into this section. This was accomplished through the use of posed questions that compelled the participant to evaluate physical activity habits and work out routines, personal risk for chronic disease, and his/her role as a positive model for family and friends. Goal setting was encouraged to help increase one's self-efficacy toward physical activity and finding time to exercise. Scenarios of senior military officers and older adults who have incorporated physical activity into their lives were provided to reinforce participants' decisions to exercise regularly.

DISCUSSION

Since participants for this intervention were both reserve and active-duty officers who could be deployed and/or activated to various regions during the intervention, an effective mode of educational delivery was necessary to reach the participants. Thus, the

Internet was chosen as the delivery mode for *Taking Command of Your Health*. Veverka and colleagues successfully used the Internet to improve eating behaviors among a group of U.S. Air Force enlisted men and all of the participants reported that they enjoyed receiving health information over the Internet (21). Additionally, Salveson and Messecar reported that a virtual health and wellness center was feasibile for an Air National Guard population since 91 percent reported using the Internet for health information, 82 percent had Internet access, and respondents scored high on self-efficacy for computer use (33).

The Internet was the ideal channel for this intervention given that the participants were stationed or deployed throughout the world in various locations and had access to the world wide web since the USAWC course is delivered via the Internet. Also, the participants were adequately knowledgeable about the use of computers, access to a secure website, and navigation through a website program. Access to the intervention was limited to those participants with the website address and a confirmed username and password. Investigators had the capability to track participants' navigations in "real time" through the subject identification number by stage and month.

Although participants occasionally could not access the website program due to administrator maintenance, participants were able to logon to the site whenever they chose and from anywhere in the world as long as they had an Internet connection. Only one participant withdrew from the intervention due to continuous problems accessing the website and downloading the information. At least one participant was activated from reserve to active duty status and deployed to Iraq, yet was able to access the intervention for the entire six month period.

Although few studies have evaluated its effectiveness in changing behavior, the Internet is a very promising channel of delivery for providing tailored health information. The Internet offers many advantages for the delivery of health information which include immediate feedback, the potential for more interactive exercises, the ability to reach more people with minimum investment in resources and personnel, the ease with which the information can be changed and updated continuously, and access from anywhere in the world with an Internet connection at any time during the day. However, there are also disadvantages which include limited accessibility to the Internet in certain populations or regions of the world, information read from a website may not be as thoroughly processed as a personal counseling session, the credibility of the information may be of question, the Internet may be difficult to attract those individuals who are not aware of or do not want to change a behavior (precontemplators), and some individuals may perceive receiving health information over the Internet as impersonal.

This intervention was based on a behavior change theory to increase the likelihood of changing behavior since many nutrition studies based only on dissemination of information and teaching of skills have not been very effective in changing behavior (22). The Transtheoretical Model was chosen as the basis for the educational intervention to provide individualized and tailored education to all participants in the treatment group and not just to those who were ready to make a change.

Previous research has reported that at any given moment, only one-quarter of the population is ready to take meaningful action to change a health behavior and half of those with problems are unaware that a problem exists (34). The TTM acknowledges that individuals are in various stages of readiness to change a particular behavior and

proposes that stage-specific messages help individuals change behavior regardless of their readiness to change. Brug and van Assema reported that stage-matched feedback was more effective in encouraging non-motivated individuals (precontemplators) to proceed to further stages of change related to dietary fat reduction than non-tailored information (35). Interventions utilizing the TTM have proven to be effective in smoking cessation programs (24, 36) and other health behaviors such as weight control, high-fat diets, condom use, sunscreen use, exercise, quitting cocaine, and mammography screening (28). Additionally, the TTM was effectively employed in an Internet-based intervention for U.S. Air Force enlisted men (21).

Some learning theories do not consider readiness to change as a basic tenet of change, but may take into account other constructs such as self-efficacy, intrinsic and extrinsic motivators and barriers to change, and beliefs, attitudes and social norms impacting one's decision to change a behavior (37). However, the Transtheoretical Model is an all-encompassing behavior change model that integrates basic concepts from a number of behavior change theories to provide an understanding of the cognitive and behavioral processes an individual uses to change behavior. In addition to recognizing an individual's stage of readiness to change, the TTM provides the medium for applying behavior change through the use of its other basic constructs such as self-efficacy, decisional balance, and processes of change. A time frame of six months was chosen as the length of the intervention since the TTM literature states that a minimum of six months is required for those in contemplation to progress (23).

Previous interventions incorporating the use of the TTM have found that the intervention is more likely to be effective when as many of its constructs (stages of

change, processes of change, decisional balance, and self-efficacy) are used as possible. The challenge in the development of the newsletter content for this investigation was the application of the TTM's core constructs at each stage of readiness for consumption of fruits and vegetables (the behavioral criterion for the staging algorithm) and the integration of the educational preferences of the USAWC students as determined by the needs assessment survey.

As stated previously, the success of the TTM relies heavily upon the development of a staging algorithm that appropriately assesses stage of change for the dietary behavior being examined, an accurate definition of the target behavior, and criterion for effective action (34). If the algorithms are valid and are correctly interpreted and completed by the participant, they should be able to predict differences in dietary behavior across the stages of change. Staging algorithms have been developed for dietary intakes such as fat, fruit and vegetables and fiber (38-41) but controversy exists on whether to use self-reported (subjective) dietary intake or an objective dietary assessment to classify an individual into the stage of change model. Individual perceptions of diet can have serious implications for the appropriate application of the stage of change model, especially since previous studies report a large discrepancy between the objective assessment of diet and the self-rated subjective assessment (42, 43).

Fruit and vegetable intake was chosen as the behavioral criterion upon which to stage participants because it is relatively easy for individuals to subjectively assess fruit and vegetable intake, whereas other dietary components such as fat or fiber intake are much more difficult to subjectively quantify. Additionally, a relatively simple criterion was needed since participants had to assess eating habits monthly and investigators were

not present to help in the assessment because it occurred over the Internet. Povey and colleagues (44) found that as behaviors became more specific such as "eating a healthy diet" to "eating five portions of fruits and vegetables per day," the proportion of people in the motivational stages (precontemplation, contemplation, and preparation) increased while the proportion of people in the action and maintenance stages decreased. These results indicated that people may be more likely to self-evaluate a specific behavior such as "eating five portions of fruits and vegetables per day" more accurately than a general behavior like "eating a healthy diet" or "eating a low-fat diet."

Although the primary goal of *Taking Command of Your Health* was to increase fruit and vegetable intake, secondary goals were to improve other eating behaviors such as reducing fat and calorie intake and increasing fiber intake, as well as increasing physical activity. A second difficult task in creating the monthly newsletters was the integration of the underlying theme of fruit and vegetable intake with the monthly topic while utilizing appropriate change processes. Five different versions of the newsletter were created each month to correspond with each of the five stages of change. From previous research, Prochaska has observed that there is a relationship between an individual's readiness to change (stage of change) and the change processes that are applied to change the behavior (23). Therefore, in the development of each newsletter, change processes pertinent to each stage were applied as well as self-efficacy and decisional balance, when appropriate.

In general, the newsletters for the early stages (precontemplation and contemplation) emphasized cognitive processes while the latter stages (preparation, action, and maintenance) emphasized behavioral strategies for changing behavior. For

example, individuals in precontemplation and contemplation received messages that were created to raise awareness, personalize the risk of an undesirable behavior, encourage the participant to assess personal barriers and motivators, and provide role models who depicted successful behavior change. On the other hand, individuals in preparation, action, and maintenance received messages that encouraged the participant to develop a plan of action for adopting the desired behavior, substituting positive behavior for undesirable behavior, changing the situation or environment that is a temptation for undesirable behavior, rewarding oneself for positive behavior, and employing helping relationships. Additionally, the action and maintenance newsletters emphasized relapse prevention strategies.

Self-efficacy and decisional balance were also important constructs to consider in the development of newsletter content. Previous research has found that self-efficacy for eating fruits and vegetables is consistently and strongly associated with increased consumption of fruits and vegetables (29, 32, 45). Therefore, self-efficacy was introduced in the contemplative message and applied throughout the later stages in an effort to encourage the participant to become more confident in his/her ability to change and maintain the desired behavior of committing to and executing the "5 A Day" goal of eating five or more servings of fruits and vegetables daily.

Investigations into the pros and cons of fruit and vegetable intake show a shift in decisional balance as one progresses through the stages (46, 47). To progress from precontemplation to preparation, one must place more importance on the perceived positive aspects of changing a particular behavior (pros) while placing less emphasis on the perceived barriers (cons). This was done through the use of national statistics, posed

questions, and scenarios depicting other senior officers who assessed the pros and cons of behavior change.

Because individuals wanted to know more about specific health topics like control of blood pressure and blood cholesterol, consciousness raising was emphasized throughout all stages by providing national statistics and credible information on the specific disease or health condition. The rationale for doing this is the fact that individuals who are in action for eating five or more servings of fruits and vegetables may not be knowledgeable about heart disease or hypertension and the benefits of fruit and vegetable consumption on heart disease prevention. Thus, the information provided additional and possibly new reasons for planning or continuing to eat five or more servings of fruits and vegetables daily.

Nutrition interventions can be effective through a variety of delivery modes which differ in length per session or newsletter, content, and by number of sessions or newsletters. Very little is known about the impact of message length for particular target groups (48). The intent of this intervention was to limit the written text since the participants were extremely busy senior military officers who juggled many responsibilities throughout the intervention period. However, newsletter length was difficult to limit due to the fact that there were seven newsletter sections each month. The precontemplation message was the first newsletter written each month followed by newsletters for the other stages. As a result, the precontemplator received a newsletter that may have been too lengthy and may have contained information that was inappropriate for an individual who is not interested in changing a behavior. In retrospect, it may have been more feasible to create a later staged newsletter first and the

precontemplation message last to avoid putting too much information in the precontemplation message. Also, fewer newsletter sections would have helped limit the length of written material each month.

An assumption of the TTM is that intervention programs are matched to each individual's stage of change for a behavior (23). This investigation did not provide staged newsletters for both diet and exercise, but instead staged only for fruit and vegetable intake and provided all participants with identical fitness messages. In *Let's Get Moving,* the Internet-based intervention developed for U.S. Air Force enlisted men, stage-matched newsletters for both exercise and diet did not significantly improve fitness levels between the control and experimental groups but did improve eating behaviors (21). Potential reasons for not detecting significant differences include the fact that the majority of participants in both groups were in action and maintenance for exercise at the beginning of the study, a six-month period may not have been long enough to detect significant differences in fitness scores, and the intervention may have been too low in intensity to produce significant fitness differences (49).

As a result of Veverka's findings, this intervention combined the fitness and diet messages and provided tailored information for the diet component only. Also, it was assumed that the majority of senior military officers would likely be in the later stages for physical activity since exercise and fitness testing is mandatory for all military personnel. In fact, upon initial staging for physical activity, none of the participants in the experimental group were in precontemplation or contemplation. Combining two separate activities (diet and exercise) may be a questionable use of the stage of change theory, but

it was agreed that this group of individuals may find the nutrition information more useful and applicable than the exercise information.

CONCLUSIONS

Taking Command of Your Health was an experimental intervention based on the Transtheoretical Model of behavior change. The program integrated the health concerns and educational nutrition and fitness preferences of senior military officers and addressed barriers and motivators for eating healthfully and exercising regularly. Major challenges in the development of the Internet-based program were the appropriate application of the model's constructs with regard to stage of change and management of newsletter content to ensure that the content was not too lengthy and time consuming for the participant. The health and fitness of our nation's armed forces can have a significant impact on military readiness and national defense. Further investigations need to determine the most effective method of delivery and an applicable behavior change theory that will promote and improve the health of military personnel.

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CHAPTER 5

APPLICATION OF THE TRANSTHEORETICAL MODEL TO IMPROVE EATING AND EXERCISE BEHAVIORS IN A GROUP OF SENIOR MILITARY OFFICERS

INTRODUCTION

Numerous studies have shown a strong association between a healthy diet and a lower risk for cardiovascular disease, obesity, and certain cancers (1-3). Specific national recommendations include restricting fat to 30 percent or less of total energy intake and consuming a minimum of five servings of fruits and vegetables daily (4, 5). Yet, only 34.4 percent of U.S. adults report consuming the recommended 30 percent or less of calories from fat and 35.1 percent report consuming five or more servings of fruits and vegetables a day (6). A review of health habits of U.S. Army personnel revealed that Healthy People 2000 goals were not met for dietary fat and sodium intake, tobacco, and seat belt use (7).

The 1996 Army Food and Nutrition Survey observed a mean daily fruit and vegetable intake of 2.5 and 2.9 servings, respectively among military personnel (8). Approximately 55 percent of officers reported consuming less than two servings a day of fruits and about 87 percent consumed less than three servings a day of vegetables. When soldiers were asked if they thought their diet was too low, too high, or just about right for fat content, 51.2 percent reported that they thought their diet was too high in fat with

those in the $\geq$ 40 years age group reporting higher percentages of 54.6 percent for males and 57.1 percent for females (8). When asked about attitudes on diet, 45.7 percent of soldiers thought that it was very important to have a diet low in saturated fat and 51.1 percent thought that it was very important to have a diet with plenty of fruits and vegetables.

Sixty-four percent of U.S. adults are overweight or obese as defined by a body mass index (BMI) of higher than 25.0 kg/m^2, an increase of more than 25 percent over the past three decades (9). Additionally, one-quarter of U.S. adults do not engage in any leisure-time physical activity (10). Results from Department of Defense (DoD) Surveys of Health Related Behaviors among Military Personnel reported a significant increase in the percent of both overweight male and female military personnel (defined as BMI $\geq$ 25.0 kg/m^2), from 54.1 percent to 58.6 percent ($p < 0.001$) and 21.6 percent to 26.1 percent ($p < 0.01$), respectively (11). Excess body weight incurs significant costs to the military in terms of both direct costs for increased health care and indirect costs for lost workdays. Total estimated costs, including direct and indirect costs, associated with overweight in the Air Force was $22.8 million in 1997 (12) while total annual cost to the U.S. Navy for obesity-related inpatient care was expected to be $5.8 million in 1998 dollars (13).

Emphasis has been placed on the evaluation and improvement of the health and physical fitness of military personnel since the inception of Department of Defense Directive 1308.1 "Physical Fitness and Weight Control Programs" in 1981 (14). The 2003 update of Health Promotion Directive 1010.10 continues to "establish the DoD requirement to implement health promotion and disease and injury prevention programs

to improve and sustain military readiness and the health, fitness and quality of life of military personnel, DoD personnel, and other beneficiaries" (15). A goal of the directive is to "enhance mission readiness, unit performance, and the health and fitness of military personnel, beneficiaries, and civilian employees through the creation of a culture within the Department of Defense that values health and fitness and empowers individuals and organizations to actualize those values and achieve optimal health" (15). Despite these directives, military personnel are not meeting national recommendations for dietary intakes and body mass index is increasing.

Clearly, more effective nutrition and fitness interventions are needed. It has been reported that the most effective nutrition programs are those that are behaviorally focused and based on appropriate theory and prior research (16). The Transtheoretical Model (TTM), a theory for behavior change, provides a theoretical framework that may increase program effectiveness. Also referred to as the Stage of Change Theory, the TTM was initially developed by Prochaska and colleagues for addictive behaviors, particularly smoking cessation (17). Since its inception, the model has been effectively applied to other health behaviors such as weight control, high-fat diets, safer sex, condom use, sunscreen use, exercise, quitting cocaine, and mammography screening (18).

The TTM consists of the following four constructs: 1) stages of change, 2) processes of change, 3) decisional balance, and 4) self-efficacy. The model describes behavior change as a spiral process in which an individual progresses (or relapses) through a series of stages, called precontemplation, contemplation, preparation, action, and maintenance. The model also suggests that people use different processes of change (cognitive and behavioral activities) throughout the behavior change process. As a result,

people benefit the most from appropriate stage-matched interventions to move them through the behavior change process (19). Decisional balance is an individual's evaluation of the pros, the perceived positive aspects and motivators to changing a behavior, against the cons, the perceived negative aspects or barriers to changing a behavior (20). As an individual progresses through the stages of change for a specific behavior, the perceived pros for changing the behavior will increase while the cons decrease (18). Self-efficacy is the confidence that an individual has about successfully changing a behavior and is the situation-specific confidence people have that they can cope with high risk situations without relapsing to an unhealthy habit (17). Purposeful application of the four constructs is essential for providing appropriately stage-matched education in a TTM-based intervention.

This paper reports on the results of a six-month Internet-based nutrition and fitness intervention based on the Transtheoretical Model. The purpose of the study was to improve diet and fitness behaviors and physiological measures in a group of senior military officers enrolled in the Distance Education course at the U.S. Army War College (USAWC) in Carlisle, Pennsylvania. It was hypothesized that stage-matched education provided via the Internet would result in improved behavioral and physiological changes in the treatment group.

METHODS

Seventy-eight USAWC Department of Distance Education (DDE) students (39 controls, 39 treatments) voluntarily participated in the six-month intervention. Using a randomized controlled intervention design, participants were randomly assigned to either

a treatment group who had access to a website program based on the Transtheoretical Model or a control group who did not have access to the program. Participants in the treatment group were required to logon to the website a minimum of one time each month using an individually assigned password and username to ensure approved access and avoid cross contamination. Participants were allowed access only to the current and previous months' newsletters, and did not have access to the current month's newsletter until the first day of that month.

Upon initial access to the website each month, participants completed two staging algorithms surveys (Appendix C). The first algorithm was for diet with a behavioral criterion of eating five or more servings of fruits and/or vegetables daily. The second algorithm was for exercise with a behavioral criterion of 30 minutes or more of moderate intensity physical activity on at least 3 or more days per week. The staging algorithms used for this study were the algorithms used in a similar web-based study with enlisted U.S. Air Force males (21). Since this intervention combined the nutrition and fitness information into one monthly newsletter, the diet algorithm was used as the classification tool for staging participants and for providing the appropriate stage-matched nutrition education to the participant each month. Staging results for exercise were collected, but all participants received identical fitness information regardless of stage for exercise.

Participants were active duty and reserve military officers with the rank of Lieutenant Colonel and Colonel who were enrolled in a two-year distance education course at the USAWC. All students completed USAWC course work via the Internet with the exception of spending two weeks at the USAWC at the end of the first year, referred to as the First Resident Course and at the end of the second year of study, the

Second Resident Course. Participants were recruited through flyers and information on the DDE website and were initiated into the study during the First Resident Course at the USAWC. The research protocol was approved by both the Human Research Committee at Colorado State University and the Institutional Review Board at the U.S. Army Medical Research and Materiel Command, Fort Detrick, Maryland (Appendix G). Participants included both males and females. Participants were not excluded for medical diagnoses or prescription medications. All pre-study measures were collected during the First Resident Course and post-study measures were collected one year later during the Second Resident Course.

Self-administered surveys (Appendix H) were used to collect information on demographics, physical activity, dietary intake, and eating habits at pre- and post-study. The validated Block Brief Food Frequency Questionnaire was used to collect usual eating habits in the past year. Completed questionnaires were scanned to determine caloric intake, fat percentage, and intake of total fat, mono- and polyunsaturated fat, saturated fat, fiber, and number of fruit and vegetable servings. The Physical Activity Readiness Questionnaire, also a validated survey, was used to calculate daily caloric expenditure. The General Demographics Questionnaire and the Eating Habits Survey were not tested for validity and reliability. Each military service has a branch-specific physical fitness test but only U.S. Army students were required to report fitness measures to the USAWC. Therefore, fitness measures were not accessible for Air Force, Navy and Marine participants. Also, a number of participants were exempt from all or parts of the physical fitness test due to injuries.

Physiological measures were collected through anthropometric assessments, blood tests, and blood pressure readings. Body mass index was determined from height and weight measures and body fat was calculated from circumference taping methods in accordance with Army Regulation 600-9 (22). Blood values for fasting glucose and lipids were taken by certified laboratory technicians at Dunham Army Health Clinic, Carlisle, Pennsylvania. Analyses were performed using Johnson and Johnson Clinical Chemistry Products on a Vitros 950 instrument.

Stage of change for diet and exercise was obtained each month during the six-month program, via online surveys, and at post-study for treatment participants. Stage of change for diet and exercise was obtained only at post-study for control participants.

Analysis of Covariance (ANCOVA) was used to compare mean post-test scores, adjusting for pre-test scores for behavioral and physiological measures. Additionally, independent sample t-tests were performed at pre-and post-study to compare unadjusted group means as well as the difference in change between the two groups. Pearson's correlations were performed to determine the association of time spent on the program with behavioral and physiological measures and stages of change.

Chi-square test (χ^2) was used to compare baseline demographic variables between treatment and control groups and changes in these variables from pre-study to post-study. McNemar tests were used to compare the difference in stage distribution of diet and exercise among the treatment participants at month 1, month 6 (end of educational intervention) and month 12 (six months after the educational intervention). Differences in stage distribution for diet and exercise were also analyzed using the nonparametric analogue of the single factor repeated measures analysis of variance (Friedman test). All

analyses were performed using Statistical Package for the Social Sciences, Version 12.0 (SPSS, INC, Chicago, IL). A p–value of 0.05 or less was used to determine significance for all statistical analyses.

RESULTS

Of the 78 participants who initially volunteered to participate in the study, 88 percent (35 controls; 34 treatments) completed the study. Five participants did not complete follow-up measurements at the end of the study, two participants in the treatment group did not complete the intervention, and two participants deferred the USAWC course. Table 5.1 describes baseline demographic variables of the groups. Although there were more females in the treatment group (21% versus 9%), this was not significant ($\chi^2 = 2.01$; $p = 0.16$).

Table 5.1. Baseline Demographics of the Control and Treatment Groups.

VARIABLE	CONTROL (N = 35)	TREATMENT (N = 34)
Age, years (± SD)	45.6 (3.3)	46.8 (4.8)
GENDER (%)		
Male	91	79
Female	9	21
ETHNICITY (%)		
Caucasian	86	91
Black	11	3
Hispanic	3	3
Other	0	3
MILITARY SERVICE (%)		
Army	100	91
Navy	0	3
Marine	0	6
MILITARY COMPONENT (%)		
Active Duty	23	24
Reserve/National Guard	77	76

Table 5.2 lists baseline variables for family history of disease, smoking habits, current diagnoses and medications, dietitian visits, and personal perceptions of eating and exercise habits between the treatment and control groups. Family history of diabetes was the only significant association ($\chi^2 = 4.68$; $p = 0.03$) between the two groups with a higher percentage of disease in the control group.

Table 5.2. Baseline Characteristics of Family History, Smoking Habits, Diagnoses and Medications, Dietitian Visits and Perceptions of Eating and Exercise Habits.

VARIABLE	CONTROL (N = 35)	TREATMENT (N = 34)	CHI-SQUARE P-VALUE
% PARTICIPANTS REPORTING A FAMILY HISTORY OF:			
Heart Disease	46	38	0.53
Stroke	23	21	0.82
Diabetes†	49	24	**0.03**
Cancer	43	53	0.40
SMOKING HABITS (%)			
Current Smoker	3	9	0.41
Former Smoker	17	24	
Never Smoked	80	68	
CURRENT DIAGNOSES (%)			
Hypertension	14	6	0.25
Diabetes	3	3	0.98
Hypoglycemia	3	3	0.98
Cancer	0	3	0.31
High Cholesterol	23	21	0.82
Heart Disease	0	0	NA
Menopause	0	0	NA
Thyroid Disorder	0	6	0.15
Other	6	6	0.98
CURRENT MEDICATIONS (%)			
Hypertension	14	6	0.25
Diabetes	3	0	0.32
Hypoglycemia	0	0	NA
Cancer	0	0	NA
High Cholesterol	9	6	0.67
Heart Disease	0	0	NA
Menopause	3	3	1.00
Thyroid Disorder	0	3	0.31
Other	11	6	0.41
PARTICIPANTS SEEING REGISTERED DIETITIAN WITHIN PAST YEAR (%)			
	11	3	0.17
PERSONAL PERCEPTION OF EATING HABITS WITHIN PAST YEAR (%)			
More healthy	26	21	0.52
No change	51	65	
Less healthy	23	15	
PERSONAL PERCEPTION OF EXERCISE HABITS WITHIN PAST YEAR (%)			
More exercise	20	18	0.84
No change	46	41	
Less exercise	34	41	

†Significant at $p \leq 0.05$.

Table 5.3 reports the changes that occurred between the groups from months 1 to 12. Calculations for the percentage of new diagnoses, new medications, and new dietitian visits included only participants who did not have a specific diagnosis, were not taking a medication, and had not seen a dietitian at baseline. For example, 5 participants (14.3%) in the control group had a hypertension diagnosis at baseline (Table 5.2). At follow-up (Table 5.3), the total number of participants included in the calculation for the control group was 27 (35 minus 5 who had an original hypertension diagnosis minus 3 who did not complete follow-up surveys). Although sample sizes are not listed in Table 5.3, the sample sizes for new diagnoses, new medications, and new dietitian visits for both groups ranged from 27 – 32 and 26 – 33 participants for the control and treatment groups, respectively. The percentage of new hypertension diagnoses between the control and treatment groups was significant ($\chi^2 = 3.74$; $p = 0.05$) as four participants in the treatment group were diagnosed with hypertension during the course of the experiment.

Sample sizes for the personal perceptions of eating and exercise habits (Table 5.3) included all participants completing follow-up surveys (control = 32; treatment = 33). Although there is not a significant association in the distribution of perceived eating habits ($\chi^2 = 4.83$; $p = 0.09$) between the groups, there is a statistically significant difference among treatment participants ($\chi^2 = 8.27$; $p = 0.001$) to perceive having healthier eating habits at post-study (58%) than at baseline (21%).

Table 5.3. New Diagnoses and Medications, Dietitian Visits and Perceived Changes in Eating and Exercise Habits Since the Study Started.

VARIABLE	CONTROL[a]	TREATMENT[a]	CHI-SQUARE P-VALUE
NEW DIAGNOSES SINCE STUDY STARTED (%)			
Hypertension[†]	0	13	**0.05**
Diabetes	0	0	NA
Hypoglycemia	0	0	NA
Cancer	3	0	0.31
High Cholesterol	2	15	0.19
Heart Disease	0	3	0.32
Menopause	3	0	0.31
Thyroid Disorder	0	0	NA
Other	3	3	0.98
NEW MEDICATIONS SINCE STUDY STARTED (%)			
Hypertension	0	3	0.35
Diabetes	0	0	NA
Hypoglycemia	0	0	NA
Cancer	0	0	NA
High Cholesterol	10	0	0.07
Heart Disease	0	3	0.32
Menopause	3	3	1.00
Thyroid Disorder	0	3	0.31
Other	4	0	0.29
PARTICIPANTS SEEING REGISTERED DIETITIAN SINCE STUDY STARTED (%)			
	4	0	0.29
PERSONAL PERCEPTION OF EATING HABITS WITHIN PAST YEAR (%)	**N = 32[b]**	**N = 33[b]**	
More healthy	31	58	0.09
No change	41	21	
Less healthy	28	21	
PERSONAL PERCEPTION OF EXERCISE HABITS WITHIN PAST YEAR (%)	**N = 32[b]**	**N = 33[b]**	
More exercise	25	33	0.74
No change	44	36	
Less exercise	31	30	

[a]Total number of participants in each group excludes those who had a diagnosis, medication, or saw a dietitian at baseline. Total N in each group ranges from 26 to 33.

[b]Total number of participants in each group for personal perceptions of eating and exercise habits includes all participants completing follow-up questionnaires.

[†]Significant at $p \leq 0.05$.

Mean pre- and post-study scores for behavioral and physiological measures are presented in Table 5.4. Independent sample t-tests comparing mean scores at pre-study, post-study, and the difference in change between the groups is reported. This table also reports results for ANCOVA analyses to test the significance of the intervention. A total of 69 participants completed the study, but not everyone completed all measurements and surveys. Some physiological measures were not performed on all participants due to staff error, some participants failed to go to the lab for blood tests, and some participants did not complete follow-up surveys. In an effort to increase responses at follow-up, reminder notes were placed in participant's mailboxes, but the 2-week data collection period was held in conjunction with the participants' intense academic and social schedules, making it difficult for them to complete all study requirements. Although the total sample sizes are not listed in Table 5.4, the sample sizes for t-tests and ANCOVA analyses ranged from 29 to 34 or 35 participants, depending on the group (34 treatments, 35 controls).

Percent body fat was the only pre- and post-study measure that was significant between the groups (pre-study $t = -2.16$, $df = 67$, $p = 0.04$; post-study $t = -2.97$, $df = 67$, $p = 0.004$) with the control group having a mean body fat lower than the treatment group at both data collection times. Since the treatment group had more females than the control group, statistical analyses were calculated without the females. At baseline, the difference in body fat measures between the two groups was not significant ($t = -1.86$, $df = 57$; $p = .07$).

For ANCOVA analyses, all pre-test scores were significant covariates ($p < 0.0005$) and are not listed in Table 5.4. Based on the analyses, there is no evidence that the educational intervention was effective in improving behavioral and physiological

measures of the treatment group as compared to the control group. The treatment effect was significant for waist size [$F(1, 64) = 5.38$; $p = .02$)] and body fat percent [$F(1, 68) = 4.66$; $p = .04$)] however both groups increased from baseline to follow-up with the control group demonstrating lower post-test adjusted means than the treatment group. Analyses without females changed the treatment effect. Waist size remained significant [$F(1, 55) = 4.79$; $p = 0.03$)] while percent body fat was not significant [$F(1, 56) = 3.18$; $p = 0.08$)]. Interestingly, other measures of body composition (weight, BMI, and waist to hip ratio) increased for both groups while blood pressure, glucose, and lipids (except triglycerides) decreased. Although not favorable, high-density lipoproteins also decreased a non-significant amount.

Since there was a significant difference in the number of new hypertension diagnoses during the study period, analyses were performed without the four participants from the treatment group who were diagnosed with hypertension during the study. ANCOVA analysis revealed no statistically significant difference between treatment and control groups in either diastolic [$F (1, 60) = 0.96$; $p = 0.33$] or systolic blood pressure [$F (1, 60) = 0.004$; $p = 0.95$] from baseline to follow-up between the two groups. Although not statistically significant but noteworthy was the fact that three participants in the control group started taking cholesterol-lowering medication during the study period (Table 5.3) as compared to zero participants in the treatment group ($\chi^2 = 3.38$; $p = 0.07$). Further ANCOVA analysis without the three participants did not result in statistical significance [$F(1, 60) = 0.82$; $p = 0.37$)] in lipids between the two groups.

Table 5.4. Summary Statistics for Physiological and Behavioral Variables at Pre-Study and Post-Study.

Variable	Control (mean ± SD)	Treatment (mean ± SD)	Independent Sample t-test p-value[1]	ANCOVA Treatment p-value[2]
Weight (lbs)				
Pre-test[3]	192.0 (26.4)	184.1 (26.4)	0.22	
Post-test[3]	192.4 (25.6)	186.0 (27.4)	0.32	
Difference[3]	+ 0.4 (6.6)	+ 1.9 (6.7)	0.26	
ANCOVA post-test adjusted means (± s.e.)	192.4 (1.1)	186.3 (1.2)		0.31
BMI (kg/m^2)				
Pre-test	27.2(2.7)	26.7 (2.3)	0.43	
Post-test	27.2 (2.6)	26.9 (2.3)	0.65	
Difference	0.0 (0.9)	+ 0.2 (0.9)	0.33	
ANCOVA post-test adjusted means (± s.e.)	27.0 (0.2)	27.2 (0.2)		0.42
Waist (inches)				
Pre-test	35.9 (3.1)	35.5 (3.7)	0.61	
Post-test	37.0 (3.1)	37.3 (3.8)	0.83	
Difference	+ 1.1 (1.3)	+ 1.8 (1.2)	**0.02**	
ANCOVA post-test adjusted means (± s.e.)	36.8 (0.2)	37.53 (0.2)		**0.02**
Body Fat (percent)				
Pre-test	21.6 (4.3)	23.9 (4.5)	**0.04**	
Post-test	23.0 (3.4)	25.7 (4.1)	**0.004**	
Difference	+ 1.4 (2.2)	+ 1.8 (2.1)	0.47	
ANCOVA post-test adjusted means (± s.e.)	23.9 (0.3)	24.9 (0.3)		**0.04**
Waist-to-Hip Ratio				
Pre-test	0.87 (0.04)	0.86 (0.08)	0.72	
Post-test	0.89 (0.04)	0.88 (0.07)	0.38	
Difference	+ 0.02 (0.03)	+ 0.02 (0.04)	0.89	
ANCOVA post-test adjusted means (± s.e.)	0.88 (0.01)	0.88 (0.01)		0.89
Systolic Blood Pressure (mm/Hg)				
Pre-test	128.7 (14.9)	129.3 (15.2)	0.79	
Post-test	123.3 (11.2)	124.8 (11.4)	0.56	
Difference	- 5.4 (16.9)	- 4.5 (12.9)	0.80	
ANCOVA post-test adjusted means (± s.e.)	123.4 (1.8)	124.7 (1.8)		0.61

[1]p-values are based on original sample sizes at pre- and post-study.
[2]All pre-test covariates were significant at $p < 0.0005$.
[3] means (± SD) are based on paired samples.

Variable	Control (mean ± SD)	Treatment (mean ± SD)	Independent Sample t-test p-value[1]	ANCOVA Treatment p-value[2]
Diastolic Blood Pressure (mm/Hg)				
Pre-test	76.3 (9.5)	78.6 (9.1)	0.28	
Post-test	73.7 (9.1)	77.3 (8.9)	0.09	
Difference	- 2.6 (7.7)	- 1.3 (6.8)	0.46	
ANCOVA post-test adjusted means (± s.e.)	74.5 (1.1)	76.5 (1.1)		0.20
Fasting Glucose (mg/dl)				
Pre-test	101.1 (14.2)	99.8 (13.3)	0.72	
Post-test	97.6 (26.5)	95.9 (14.5)	0.63	
Difference	- 3.5 (14.5)	- 3.9 (6.6)	0.89	
ANCOVA post-test adjusted means (± s.e.)	96.7 (1.7)	96.8 (1.8)		0.97
Total Cholesterol (mg/dl)				
Pre-test	209.0 (39.0)	211.4 (27.5)	0.58	
Post-test	192.8 (34.3)	196.6 (30.6)	0.74	
Difference	- 16.2 (38.0)	-14.8 (20.8)	0.86	
ANCOVA post-test adjusted means (± s.e.)	193.5 (4.6)	195.9 (4.8)		0.72
Triglycerides (mg/dl)				
Pre-test	127.7 (77.7)	133.6 (79.0)	0.53	
Post-test	136.0 (79.3)	134.2 (64.1)	0.86	
Difference	+ 8.3 (45.0)	+ 0.6 (73.9)	0.60	
ANCOVA post-test adjusted means (± s.e.)	137.8 (9.2)	132.2 (9.5)		0.67
Low Density Lipoproteins (mg/dl)				
Pre-test	132.3 (33.0)	133.6 (27.0)	0.60	
Post-test	114.0 (31.7)	119.1 (26.5)	0.52	
Difference	- 18.3 (33.7)	- 14.5 (19.0)	0.59	
ANCOVA post-test adjusted means (± s.e.)	114.4 (4.2)	118.7 (4.4)		0.48
High Density Lipoproteins (mg/dl)				
Pre-test	51.8 (10.0)	52.2 (13.8)	0.86	
Post-test	51.6 (12.2)	50.4 (12.0)	0.66	
Difference	- 0.2 (7.3)	- 1.8 (6.8)	0.36	
ANCOVA post-test adjusted means (± s.e.)	51.8 (1.2)	50.2 (1.2)		0.36

Variable	Control (mean ± SD)	Treatment (mean ± SD)	Independent Sample t-test p-value[1]	ANCOVA Treatment p-value[2]
Cholesterol:HDL Ratio				
Pre-test	4.2 (1.2)	4.3 (1.2)	0.49	
Post-test	4.0 (1.3)	4.1 (1.1)	0.71	
Difference	- 0.2 (0.9)	-0.2 (0.6)	0.89	
ANCOVA post-test adjusted means (± s.e.)	4.0 (0.13)	4.1 (0.13)		0.79
Caloric Intake/day				
Pre-test	1541.2 (576.2)	1601.9 (567.8)	0.52	
Post-test	1501.9 (705.9)	1475.3 (522.2)	0.86	
Difference	- 39.3 (458.1)	- 126.6 (448.9)	0.45	
ANCOVA post-test adjusted means (± s.e.)	1525.7 (78.7)	1452.2 (77.5)		0.51
Caloric Expenditure/day				
Pre-test	3369.9 (1060.1)	3091.4 (562.2)	0.17	
Post-test	3373.4 (1082.7)	3477.2 (1218.3)	0.75	
Difference	+ 3.5 (1436.5)	+ 385.8 (1027.4)	0.24	
ANCOVA post-test adjusted means (± s.e.)	3332.3 (196.9)	3524.0 (210.3)		0.51
Total Fat Grams/day				
Pre-test	57.9 (26.7)	60.2 (24.5)	0.50	
Post-test	56.9 (35.2)	56.5 (26.7)	0.96	
Difference	- 1.0 (22.6)	- 3.7 (21.5)	0.63	
ANCOVA post-test adjusted means (± s.e.)	57.9 (3.9)	55.5 (3.9)		0.67
Monounsaturated Fat Grams/day				
Pre-test	11.4 (5.4)	11.4 (4.9)	0.88	
Post-test	11.2 (6.0)	10.6 (4.3)	0.79	
Difference	- 0.2 (4.8)	-0.8 (5.0)	0.64	
ANCOVA post-test adjusted means (± s.e.)	11.2 (0.8)	10.6 (0.8)		0.59
Polyunsaturated Fat Grams/day				
Pre-test	21.6 (10.2)	22.8 (10.1)	0.44	
Post-test	21.6 (13.8)	21.6 (11.0)	0.92	
Difference	0.0 (8.7)	- 1.2 (8.6)	0.59	
ANCOVA post-test adjusted means (± s.e.)	22.2 (1.6)	21.1 (1.5)		0.64

Variable	Control (mean ± SD)	Treatment (mean ± SD)	Independent Sample t-test p-value[1]	ANCOVA Treatment p-value[2]
Saturated Fat Grams/day				
Pre-test	19.8 (9.8)	20.4 (8.3)	0.47	
Post-test	19.0 (13.1)	19.3 (10.3)	0.87	
Difference	- 0.8 (8.1)	- 1.1 (7.1)	0.84	
ANCOVA post-test adjusted means (± s.e.)	19.4 (1.4)	19.0 (1.4)		0.84
Dietary Fat (% of total calories)				
Pre-test	33.4 (8.2)	33.6 (6.7)	0.77	
Post-test	32.3 (8.5)	34.0 (8.6)	0.32	
Difference	- 1.1 (5.7)	+ 0.4 (6.0)	0.31	
ANCOVA post-test adjusted means (± s.e.)	32.4 (1.0)	33.9 (1.0)		0.30
Fiber Grams/day				
Pre-test	16.5 (7.1)	16.7 (9.1)	0.76	
Post-test	16.4 (7.5)	16.8 (9.5)	0.89	
Difference	- 0.1 (6.1)	+ 0.1 (7.8)	0.91	
ANCOVA post-test adjusted means (± s.e.)	16.5 (1.2)	16.8 (1.2)		0.87
Servings of Fruits and Vegetables/day (FFQ)				
Pre-test	3.0 (1.5)	3.4 (2.1)	0.23	
Post-test	3.2 (1.4)	3.5 (2.0)	0.54	
Difference	+ 0.2 (1.2)	+ 0.1 (1.3)	0.61	
ANCOVA post-test adjusted means (± s.e.)	3.4 (0.2)	3.3 (0.2)		0.91
Number of Dine-outs/week				
Pre-test	4.5 (4.0)	4.5 (4.6)	0.91	
Post-test	3.5 (2.6)	3.2 (2.4)	0.72	
Difference	- 1.0 (3.0)	- 1.3 (3.8)	0.75	
ANCOVA post-test adjusted means (± s.e.)	3.5 (0.4)	3.2 (0.3)		0.63
Number of Breakfasts Consumed/week				
Pre-test	4.9 (2.7)	4.4 (2.8)	0.53	
Post-test	5.3 (2.1)	4.5 (2.8)	0.24	
Difference	+ 0.4 (2.8)	+ 0.1 (1.4)	0.58	
ANCOVA post-test adjusted means (± s.e.)	5.1 (0.3)	4.7 (0.3)		0.32

Variable	Control (mean ± SD)	Treatment (mean ± SD)	Independent Sample t-test p-value[1]	ANCOVA Treatment p-value[2]
Number of Lunches Consumed/week				
Pre-test	5.4 (2.2)	5.6 (1.5)	0.63	
Post-test	5.7 (1.7)	5.6 (1.5)	0.90	
Difference	+ 0.3 (1.8)	0.0 (1.3)	0.57	
ANCOVA post-test adjusted means (± s.e.)	5.7 (0.2)	5.6 (0.2)		0.66
Servings of Fruits and Vegetables/day (participant's subjective intake)				
Pre-test	3.0 (2.7)	2.6 (1.8)	0.35	
Post-test	2.7 (1.6)	3.2 (1.8)	0.32	
Difference	- 0.3 (2.7)	+ 0.6 (1.3)	0.08	
ANCOVA post-test adjusted means (± s.e.)	2.6 (0.3)	3.3 (0.3)		0.09
Push-ups (number)				
Pre-test	50.8 (18.1)	48.8 (4.6)	0.72	
Post-test	48.6 (17.6)	48.5 (17.7)	0.98	
Difference	- 2.2 (9.9)	- 0.3 (7.4)	0.40	
ANCOVA post-test adjusted means (± s.e.)	47.8 (1.4)	49.4 (1.5)		0.46
Sit-ups (number)				
Pre-test	58.0 (16.3)	56.9 (16.4)	0.79	
Post-test	57.7 (16.2)	57.0 (16.3)	0.99	
Difference	- 0.3 (9.5)	+ 0.1 (7.9)	0.82	
ANCOVA post-test adjusted means (± s.e.)	57.2 (1.5)	57.5 (1.6)		0.88
2-mile Run Time (minutes)				
Pre-test	16.3 (2.1)	17.3 (2.2)	0.09	
Post-test	16.5 (2.1)	17.0 (1.8)	0.38	
Difference	+ 0.2 (0.9)	- 0.3 (0.9)	0.07	
ANCOVA post-test adjusted means (± s.e.)	16.9 (0.2)	16.6 (0.2)		0.25

Since previous studies report a large discrepancy between objective dietary assessment and self-rated, subjective intake (23-25), there was question as to whether the participants correctly interpreted and accurately completed the self-administered surveys,

especially the Physical Activity Readiness Questionnaire (PAR) and the Block Food Frequency Questionnaire (FFQ). When outliers ($\pm$ 2 standard deviations from the mean) were removed for values obtained from the PAR (caloric expenditure) and the FFQ (caloric intake, total fat grams, monounsaturated fat grams, polyunsaturated fat grams, saturated fat grams, percent dietary fat, fiber grams, and number of fruit and vegetable servings per day), subsequent analyses showed no statistical significance in t-tests or ANCOVA results.

Correlations were performed to determine if the total number of minutes participants spent on the program had any effect on physiological or behavioral measures. Since total time was skewed, ranging from 13 to 558 minutes per participant, a log transform of time was used to calculate the correlations. Pearson's correlations revealed that the more time spent on the website, the higher the increase in the daily number of fruits and vegetables ($r = .39$; $p = .04$) and fiber grams ($r = .35$; $p = .07$) as determined by the FFQ. An unfavorable correlation was an increase in systolic blood pressure when more time was spent on the website ($r = .49$; $p = .005$). Additionally, when time was included in the ANCOVA analyses as a covariate, systolic blood pressure was again significant [$F(1, 29) = 5.30$; $p = 0.03$] as well as servings of fruits and vegetables [$F(1, 28) = 5.78$; $p = 0.02$] obtained from the FFQ.

McNemar's test to determine changes in stage distribution suggests that the intervention was effective in progressing participants through the stages of change for diet but not for exercise behavior (Table 5.5). Although there were 34 participants in the treatment group, only 29 completed staging algorithms at months 1, 6, and 12 and therefore five participants were excluded from analysis.

Table 5.5. Number of Treatment Participants in Each Stage for Diet and Exercise at Month 1, Month 6, and Month 12 [a] (n=29).

	Precontemplation	Contemplation	Preparation	Action	Maintenance
DIET					
Month 1 [b]	1	7	8	4	9
Month 6 [c]	0	1	6	9	13
Month 12 [b]	2	4	9	5	9
EXERCISE					
Month 1 [d]	0	0	8	4	17
Month 6 [d]	0	0	5	9	15
Month 12 [d]	0	0	6	3	20

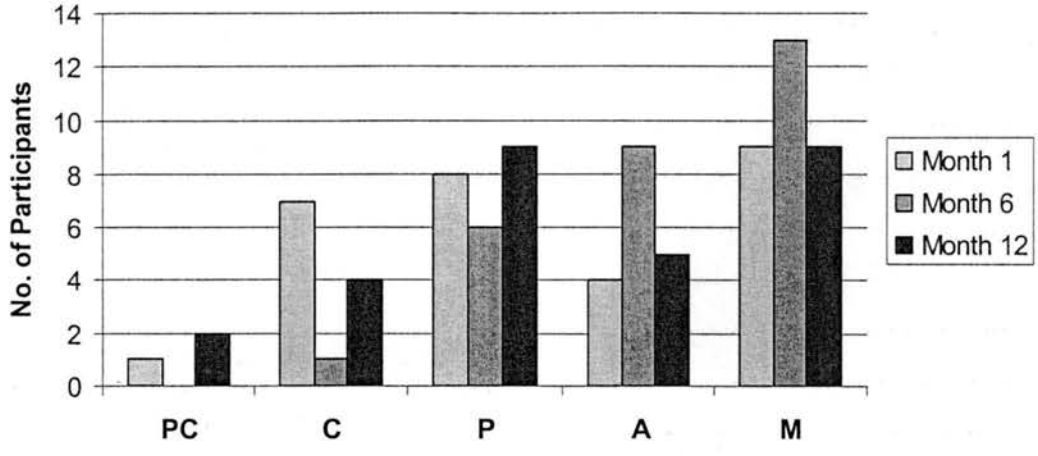
[a]Month 1 = beginning of intervention; Month 6 = end of intervention; and Month 12 = six months after intervention

[b-d]Time periods having the same superscripts are not statistically significant ($p > 0.05$) as determined by McNemar's test.

Due to investigator error, baseline stages were not measured in the control group for comparison with the treatment group however, post-study stages were collected. At post-study, χ^2 analysis of stages between the treatment and control groups were not significantly associated for diet ($\chi^2 = 0.99$; $p = 0.9$) or exercise ($\chi^2 = 3.53$; $p = 0.2$).

Figure 5.1 illustrates stage distribution from Table 5.5 for diet throughout the study period. For diet, there was a significant difference ($p < 0.0005$) in the distribution of stages during the six-month intervention (from month 1 to month 6) as the number of participants in the preaction stages decreased and the number in action and maintenance increased. From month 6 to 12, a statistically significant shift in stage distribution was observed as some participants in maintenance and action relapsed to preaction stages ($p = 0.004$). Overall, stage distribution for the entire study period (from month 1 to 12) is not statistically significant ($p = 0.629$) for diet.

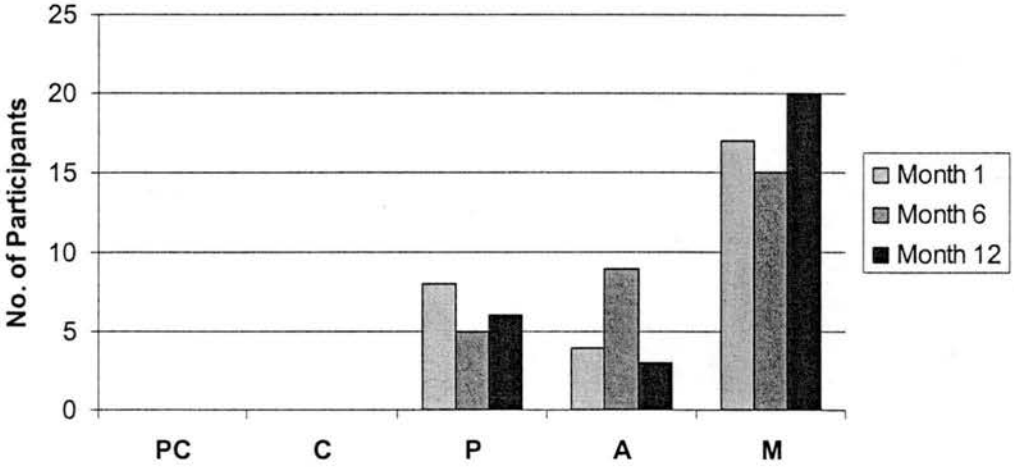
Figure 5.1. Diet Stage[1] for Treatment Participants at Months 1, 6 and 12 (n = 29)



[1]PC = precontemplation; C = contemplation; P = preparation; A = action; M= maintenance

For exercise, there was not a statistically significant difference in the distribution of stages between months 1, 6, and 12 (Table 5.5 and Figure 5.2).

Figure 5.2. Exercise Stage[1] for Treatment Participants at Months 1, 6, and 12 (n = 29)



[1]PC = precontemplation; C = contemplation; P = preparation; A = action; M= maintenance

Analysis of mean ranks (Friedman test) for diet and exercise stage categorizations was performed (Table 5.6). Month 1, month 6, and month 12 stages were ranked from one to three for each participant. Analyses revealed that diet stages were significantly different between the three time periods for diet (χ^2= 17.36; $p < 0.0005$). Diet stage was highest at month 6 compared to months 1 and 12. For exercise stage, there was no statistically significant difference between the three time periods (χ^2= 1.96; $p = 0.376$).

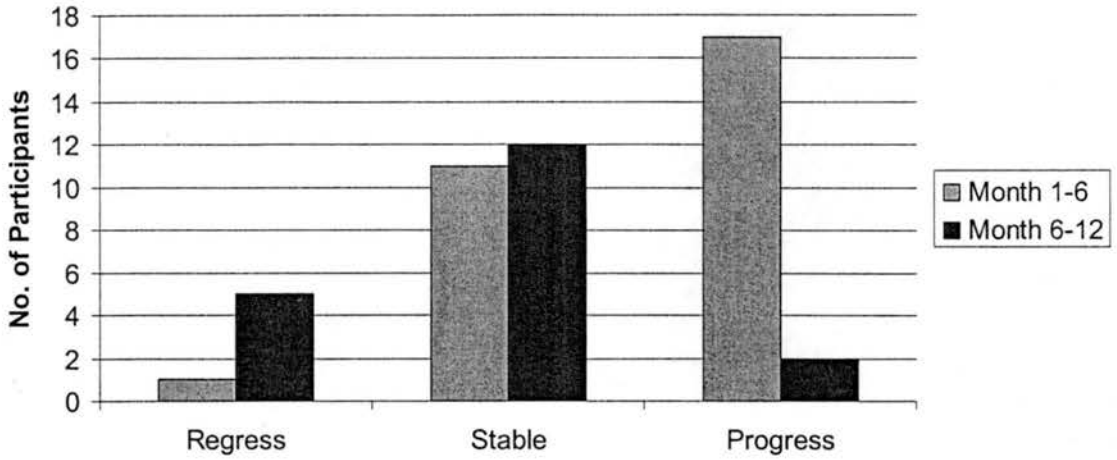
Table 5.6. Mean Rank[1] for Stage of Change Scores for Diet and Exercise of the Treatment Group Measured at Months 1, 6, and 12 (n=29).

Time Period	Mean Rank for Diet Stage[2]	Mean Rank for Exercise Stage[3]
Month 1	1.67	1.90
Month 6	2.50	1.98
Month 12	1.83	2.12

[1]Basis for mean rank categorization: 1 = month 1; 2 = month 6; 3 = month 12
[2]Friedman's Test for diet: χ^2= 17.36, $p < .0005$
[3]Friedman's Test for exercise: χ^2= 1.96, $p = 0.376$

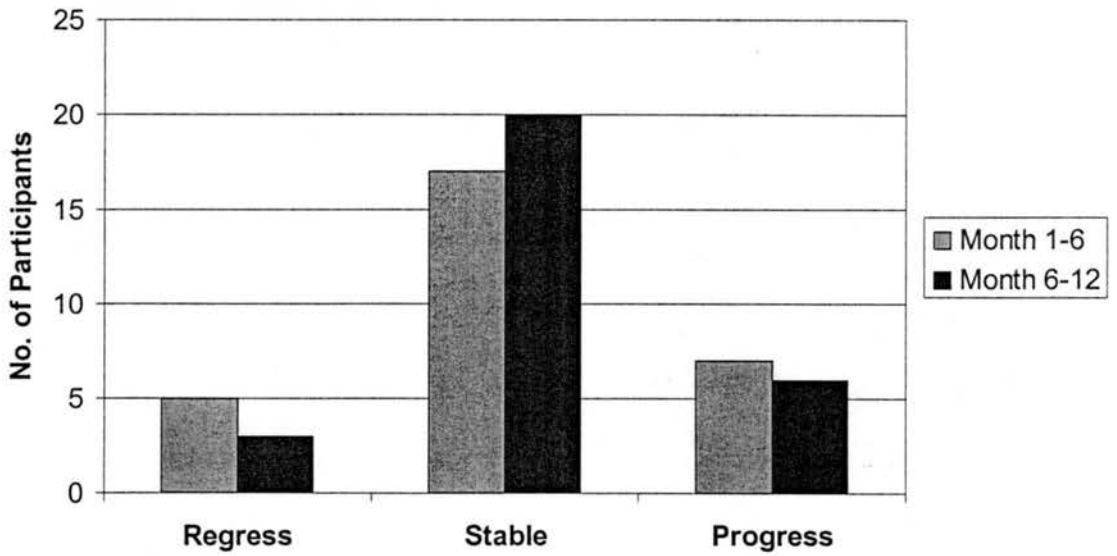
A summary chart illustrating the number of treatment participants who regressed, progressed and remained stable for diet and exercise during the intervention (months 1 to 6) and after the intervention (months 6 to 12) is found in Figures 5.3 and 5.4. Although not shown on the chart, 5 participants were in maintenance, one was in action, and one was in preparation during the entire study for diet. For exercise, 13 participants were in maintenance for the entire study, one stayed in action and two remained in preparation.

Figure 5.3. Movement of Diet Stage for Treatment Participants During and After the Intervention[1]



[1]During the intervention = month 1 – 6; after the intervention = month 6 – 12.

Figure 5.4. Movement of Exercise Stage for Treatment Participants During and After the Intervention[1] (n = 29)



[1]During the intervention = month 1 – 6; after the intervention = month 6 – 12.

Time (log transformed) was correlated for both diet and exercise stage at the end of the intervention. Pearson's correlation revealed that time was significantly correlated with diet stage ($r = .57$; $p = .001$) but was not significantly correlated with exercise stage ($r = .04$; $p = .82$).

DISCUSSION

The results of this study indicate that a six-month intervention based on the TTM was effective in significantly progressing senior military officers through self-reported stages of change for diet during the course of the intervention. However as a group, treatment participants relapsed during the six-month period from the end of the intervention to the time of post-study measurements. Stage of change for exercise behavior was not significantly different at any time during the study. Furthermore, the more time participants spent on the program, the more likely they were to progress to a higher stage for diet, but not for exercise. The intervention was not effective in significantly improving behavioral and physiological measures in the treatment group as compared to the control group.

Several factors could have influenced the results. This study collected behavioral and physiological measures at the beginning of the study and follow-up measures one year later. For an accurate assessment of the educational effect, measures should have been taken immediately after the intervention at the end of month 6. However, because the participants were located throughout the country or overseas, it was not possible to collect measurements until they reported to the USAWC for the Second Resident Course. Since some participants in the treatment group progressed in stage of change for fruit and

vegetable intake during the intervention and some participants relapsed from months 6 to 12, it is conceivable that some participants in the treatment group may have made significant improvements in behavioral and physiological measures during the intervention but regressed by month 12.

A second explanation for the non-significant statistical results is that participants in both groups were provided with the results of their individual laboratory tests (glucose and lipids) and blood pressure readings from the staff at the Army Physical Fitness Research Institute (APFRI), USAWC as part of a health and fitness assessment to all DDE students. In addition to a print-out of the results, APFRI also provided students with dietary and medical recommendations for follow-up, depending on results, and offered nutrition classes on blood pressure and cholesterol control during the First Resident Course. Awareness of blood pressure and blood test findings may have prompted both control and treatment participants to seek medical advice for abnormal results. For instance, nearly one-quarter of participants in both groups had a high cholesterol diagnosis at baseline with only nine and six percent of participants in the control and treatment groups, respectively taking medication for high cholesterol. At post-study, 13 percent in the treatment group were newly diagnosed with high cholesterol as compared to no one in the control group however, 10 percent of the controls had started taking medication to lower cholesterol levels since the beginning of the study. The fact that participants were aware of their cholesterol and blood pressure results may have encouraged them to change dietary and/or exercise habits, regardless of access to the intervention. Additionally, participants who volunteered in the study may have been

interested in changing health habits and pursued these interests even though they were not assigned to the treatment group.

The war in Iraq started in March 2003. Anecdotal reports at post-study revealed that a small proportion of participants were activated from reserve status and/or deployed during this 2002-2003 investigation. Reservists who were activated left civilian for military careers where physical fitness is part of the work day and strongly encouraged (depending on mission requirements and workload). As a result, the activated participants may have had more time for exercise. On the other hand, if the individual was deployed to a combat zone, he/she likely had less time to exercise and very little choice, if any, on food selection and intake. Additionally, the reservist who was activated had unlimited access to military health care which could have affected some of the results if he/she sought medical treatment during the study. The war in Iraq and its impact on the participants in this study could not have been anticipated or controlled.

Nearly 86 percent of the participants in this study were male with an average age of 46. Although marital status was not collected, nearly 58 percent of U.S. Army active duty officers participating in a food intake survey reported that they were married (8). Likewise, 90 percent of military officers who completed the needs assessment survey for this study reported that they were married (chapter 3). It has been reported that the more interaction concerning food within the family, the more healthful the diet of marital partners (26). It has also been reported that wives influence husbands' dietary quality more than husbands influence wives' diet (26). This finding is consistent with other research that has demonstrated that in spite of changes in gender roles, women continue

to take major responsibility for household tasks including food selection and preparation (27).

Interventions targeted at the family unit have been successful in improving health behaviors (28). Although this study excluded family members from logging on to the website, participants were encouraged to use helping and social relationships such as family and friends to help them change behaviors. Perhaps an intervention designed for the entire military family would have produced different results. It is difficult to speculate if any of the participants shared information with the rest of the family or if family members were a source of support in helping or encouraging the participant to improve health habits. Considering the active duty and reserve officer's busy schedule, an intervention including the family or at least the spouse who is responsible for the majority of food shopping and preparation may have been more appropriate for this particular group of senior officers. In fact, this suggestion is corroborated in a comment by one of the treatment participants who wrote:

> "Recommend this program be provided to spouses to encourage and reinforce the new dietary program. If the Family is eating well and in good health that's one less thing for the soldiers to worry about."

Although participants in this study reported positive improvements in diet by means of the staging survey, the challenge of a successful health intervention is maintenance of the health behavior change. Interventions have been successful in initially changing behavior but repeated findings demonstrate that many individuals fail to maintain the new pattern of behavior (29-31). Most weight loss relapse occurs six months after a treatment program (29) while most smoking relapse occurs within three months of initial cessation (30). Eighty-one percent of YMCA members reported at least

one lapse during a year, defined as not attending the YMCA for at least seven consecutive days (32). The average number of lapses per member was 4.8 per year and 36 days was the average length of the lapse. Interventions that increase the intensity or duration of treatment can delay relapse, but they do not substantially improve rates of long-term maintenance (33). Consequently, relapse tends to be the norm regardless of the behavior. Theoretical approaches offer little guidance as to how the processes and factors that determine the initiation and the maintenance of behavior change differ. Much of the emphasis in the behavior change realm is on the adoption of a desired behavior with little focus on the maintenance of the new behavior.

There could be several reasons to explain why participants in this study relapsed after the treatment program. First, the psychological factors and processes that facilitate the execution of new behaviors may not be the same characteristics that enable individuals to sustain the new behavior over time (33). Why is one person successful in maintaining a weight loss, an exercise program, or smoking cessation while others are not? Although there is little empirical evidence assessing the determinants of maintenance, one could argue that an individual's satisfaction with outcomes, the value placed on outcomes, the degree of self-efficacy, and the initial reasons for initiation of change can influence maintenance or relapse behavior. The current study did not measure participants' attitudes, beliefs, self-efficacy, or barriers and motivators associated with the desired behaviors. Repeated assessments of participants' thoughts and feelings both during and after an intervention would provide some insight into the complex relationship between one's thoughts and actions.

Secondly, failure to maintain new behaviors may be due to insufficient attention given to population-level interventions and to state and national public policy influencing the interventions. According to the Population-based Health Promotion Model proposed by John McKinlay in 1995, the success in achieving short-term behavior change and maintaining it long-term requires broad-spectrum approaches that include individual-level, population-level, and macro-level interventions (34). Many treatment approaches provide individuals with behavioral strategies to initiate and maintain behavior during the intervention with the goal of maintaining the behavior after the intervention. However after the treatment, individuals are sent into a larger social environment that encourages, rewards, and profits from at-risk behaviors (such as advertising the promotion of high-fat foods, alcohol, and cigarette smoking). With exposure to the "norms" of the social system and discontinuation of treatment support, it is not surprising that most successfully treated individuals revert to their old high-risk behaviors within six to twelve months of treatment (34). This model advocates the importance of not only changing an individual's behavior, but also changing the environment and/or organization to support individual attempts at behavior change.

Two examples of how macro-level policy impacted both organizational and individual change was the implementation of a smoke-free environment mandated by the Department of Defense for all federal buildings and military installations (35) and the adoption of mandatory physical fitness testing (14) for all members of the armed forces. Enforcement of these policies from the DoD and from high ranking officials in each military branch resulted in significant behavior changes. From 1980 to 1998, smoking prevalence in the military declined from 51 percent to 30 percent (36). In 1997-1998, 70

percent of Army personnel reported participating in aerobic activity three or more times a week (7).

In the current study, 13 of the 29 participants completing staging surveys indicated that they were in maintenance for exercising moderately three or more times a week while only five participants were in maintenance for consuming five or more servings of fruits and vegetables daily. These examples confirm that macro-level policy changes, high-level enforcement and support, and environmental re-structuring can lead to positive behavior changes for individuals within the organization. Perhaps a macro-level policy within the DoD mandating a healthy diet and providing strict provisions for available food choices on military installations would help improve eating behaviors of military personnel.

A third potential reason for the relapse in behavior and minimal dietary changes reported in this group of senior military officers could relate to challenges in goal setting and insufficient feedback to participants. Although the intervention encouraged participants to eat at least five servings of fruits and vegetables daily and exercise a minimum of three times a week for 30 minutes or more and generic feedback was provided according to stage, participants may have needed more individualized follow-up and monitoring. Lack of awareness of personal dietary habits has been identified as a major barrier in motivating people to change their diets (23, 24). It has been reported that participants who received an interactive computer-tailored intervention and extensive feedback on personal eating behaviors rated the tailored information as more effective, more personally relevant, more individualized, and provided more new information (37). Additionally, setting specific goals (eat five fruits and vegetables a day) in combination

with performance feedback, generally leads to higher performance than does no goal or a vague goal such as "eat more fruits and vegetables" (38).

Therefore, this population may have benefited from more personal, individualized feedback on diet and exercise habits, comparison of habits with peers, and an interactive food/exercise record to monitor changes. Perhaps an educational intervention that included specific goal strategies and individualized feedback followed by weekly e-mail reminders and updated feedback on goal achievement would have promoted further positive change and encouraged behavior maintenance in a group of motivated individuals.

However, even if a person is interested in changing behavior, setting a goal may not be effective if the goal conflicts with other goals (38). With this extremely busy, stressed group of participants, achievement of diet and exercise goals may have conflicted with more importantly perceived issues such as completion of homework for the USAWC course, dual military/civilian duties and responsibilities, and family obligations. Accomplishment of goals requires effort, persistence, and concentration (38). Individuals who are distracted from set goals may not be able to achieve these goals until the distraction(s) such as the USAWC course is eliminated and more time is available to focus on behaviors. Although simple, realistic goal setting was encouraged throughout the intervention, the goals may have been perceived as too difficult to achieve given the fact that participants were under intense stress to complete USAWC requirements and prepare for possible deployment. Anecdotal evidence indicated that USAWC students worked on their course work after 2200 hours because there were too many other commitments during the day. Additionally, five of the treatment participants

commented in their exit surveys that time was a barrier and they were too busy to implement changes. If this intervention had been given to participants after completion of the USAWC course, they may have had more time to commit to behavior changes which may have resulted in more positive outcomes.

Lastly, because dietary behavior is complex and often involves several different behaviors, the arbitrary time frames defined in the Transtheoretical Model for each stage may not be applicable to dietary behaviors. Changing dietary behavior requires careful planning, adequate knowledge of one's own eating behaviors, implementation of effective behavioral strategies, motivation, and many other factors. Eating is a behavior that cannot be ceased. It can only be modified and constant awareness is needed if one is to make healthy food choices over an extended period of time. The TTM was developed and applied to help individuals with smoking cessation, not eating behavior modification. There are some very evident differences between smoking and eating. Smoking is a single addictive behavior with the very clear goal of cessation; eating behavior is a necessary behavior that is not inherently addictive and the goal(s) for eating behavior change is often complex, confusing and requires multiple changes (39). While the reporting of smoking behavior is relatively simple (number of cigarettes per day), self-report of dietary intake is often difficult to assess, requiring substantial awareness and knowledge of intake.

For individuals attempting smoking cessation, one-third to one-half relapse within the first month after initiation of cessation (30). In contrast, weight regain typically begins approximately six months after initiation of weight loss and continues until weight stabilizes slightly below baseline (29). Reviews concerning behavioral maintenance of

dietary constituents such as fat, fiber, sodium, and fruit and vegetable intake indicate that maintenance can be achieved however, participants are often more highly selected (high-risk individuals such as cancer, HIV, or cardiovascular patients) and motivated than the general population (31). Thus, health behaviors yield dissimilar relapse patterns, diverse outcomes, and involve very different and often complex changes. How long does a person have to repeat the desired behavior to predict continued success? One could argue that the six-month time frame used in the TTM to determine successful maintenance may not be applicable to eating behaviors and that an individual may relapse and progress several times for a specific dietary behavior over a short period of time, such as one year.

In research evaluating qualitative stage differences for three dietary behaviors (healthy eating, eating a low-fat diet, and eating five servings of fruits and vegetables a day), it was observed that individuals who were actively making a change or attempting to maintain a change had done so for a range of different time periods and a six-month cut-off point was not significant between the two stages (40). In fact, 82 percent of respondents reported that they were currently in the process of trying to eat healthfully and had been doing so for longer than six months. According to the TTM, these individuals would be in maintenance, not action, and may erroneously receive inappropriate education. Although the six-month time frame may be appropriate for individuals attempting smoking cessation, it appears that six months may not be enough time for individuals who are actively changing eating habits to move into maintenance. It may be possible to modify dietary patterns short-term (less than six months), but a variety of factors like individual preferences and family, demographic, and lifestyle factors influence the desire and ability to sustain changes in day-to-day food selection,

preparation, and consumption patterns (31). Monthly logons to the website intervention may have motivated participants to initially change dietary patterns, but they were not able to sustain these changes when the education ended. As stated earlier, continued e-mail reminders, goal setting, and individualized feedback may have helped these participants maintain behavior changes. Additionally, an assessment of barriers, attitudes, and self-efficacy during and after the treatment period would help identify potential reasons for initiation to change and failure to maintain the desired behaviors.

There are several study limitations that need to be addressed. The small sample size is a limitation. The self-selected sample of respondents may not be representative of the senior officer military population. A major flaw of this study is the lack of stage measures at baseline for participants in the control group. Stages measures would have been useful in assessing pre- and post-study differences between the control and treatment groups. Due to location constraints of the participants, post-study measures were collected at month 12 instead of month 6 which limited the results; behavioral and physiological measures taken at month 6 would have more accurately assessed the intervention's effect. The APFRI staff conducted anthropometric and blood pressure measures. Due to staff turnover and availability, the same staff members did not perform all measurements. Although the staff was trained in correct measurement techniques, reliability between staff members cannot be assumed. Behavioral measures and staging data was collected by subjective self-report and may not have been an accurate reflection of diet and exercise behaviors. Non-compliance may also have been a limitation since approximately 35 percent of participants spent less than five minutes viewing the website every month. Of these participants, eleven of them routinely spent fewer than five

minutes on the site each month. A thorough perusal of the information should have taken at least 15 minutes a month. Finally, although the war in Iraq could not have been anticipated or controlled, it was a limitation that may have influenced the results.

CONCLUSIONS

Based on the findings from this study, it is inconclusive to suggest that an educational intervention based on the Transtheoretical Model would be effective in improving eating and exercise behaviors of the senior officer military population. Although a similar study reported improved dietary outcomes of U.S. Air Force enlisted male participants (21), it consisted of a smaller sample size (n = 39) and post-study measurements were collected immediately after the intervention.

The application of the TTM is a useful and practical theoretical approach in developing tailored information however future research should investigate the effects of the TTM in combination with other behavior change strategies such as goal setting and personalized feedback via the Internet or e-mail. These additional strategies may be helpful adjuncts to the TTM, resulting in more effective outcomes.

Future research on health behavior interventions should include in-depth assessments of participants' beliefs, attitudes, and self-efficacy about the targeted behavior(s) and the perceived motivators and barriers influencing the behavior change process. To gain a thorough understanding of an individual's cognitive and behavioral processes, these evaluations should be conducted before, during, and after an intervention. Finally, more effort should be directed at macro-level policy changes within the military. Positive health behavior changes have occurred among military personnel when policies were implemented and supported from the top levels of

command. Reports of health behaviors, outcomes of interventions, and the financial burden related to negative behaviors needs to be reiterated and emphasized to the Department of Defense. Making positive changes within the environment along with gaining the support of commanders can lead to positive health outcomes in a military population and more importantly, can lead to a more fit and ready fighting force.

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CHAPTER 6

EVALUATION OF AN INTERNET-BASED INTERVENTION FOR SENIOR MILITARY OFFICERS

INTRODUCTION

Rapid increases in access to the Internet have made it a viable and realistic mode for health promotion interventions. A 2003 study reported that 80 percent of U.S. adult Internet users have searched for online health information, making it the second most popular online activity after e-mail use (1). The third and fourth most searched health topics respectively were "diet, nutrition, vitamins, or nutritional supplements" and "exercise or fitness" with 44 percent of users searching for nutrition and one-third searching for fitness information (1). In 2002, it was estimated that 73 to 110 million American adults used the Internet to look for health information and spent an average of 10 hours per month online (2).

The world wide web has provided a virtually endless amount of information to individuals. Online health consumers can search for information on specific diseases, treatments, drugs and their interactions, can pose questions to health care providers, find tools to manage chronic conditions and share experiences and concerns in peer discussion groups. The Internet allows for dissemination of written material, video and photographic material as well as direct communication and social support via e-mail, bulletin boards and chat rooms (3). Other advantages to the Internet as a method of

education include 24-hour accessibility, elimination of geographic constraints, anonymity, convenience, links for additional information, and the potential for "real time" or immediate feedback.

However, there are challenges in utilizing the Internet for health promotion interventions. The Internet itself is a potential barrier because its virtually unlimited sources for information encourage some individuals to "surf" instead of focusing their attention on one specific website. One has to question whether people actually read and process information that is perused from various websites. Another potential challenge is the issue of an Internet site's credibility. Due to the lack of quality control, information found on the Internet may have variable validity and may not be appropriate or truthful information. Also, some individuals may not process information as effectively from online communication and may prefer a face-to-face interview over the more impersonal nature of the Internet. A final challenge to using the Internet for dissemination of health promotion information is that Internet-based interventions will likely attract motivated, action-oriented individuals who are ready to change behaviors. An Internet program will less likely attract individuals who are unaware that a problem exists or are uninterested in changing a behavior even though these individuals could benefit the most from the intervention.

Published studies on the efficacy of Internet-based health interventions are limited. In a 2003 review of seventeen studies that used the Internet to deliver health education interventions, Nguyen and colleagues summarized that more focused and thorough evaluations need to be conducted to determine the effectiveness and usefulness of Internet-based education yet, some outcomes in certain groups could be moderately

improved with the use of the Internet as a medium (2). A six-month weight loss program that utilized the Internet found that subjects who received 24 weekly behavioral lessons via e-mail, individualized therapist feedback and were required to submit weekly online self-monitoring diaries lost more weight than those who received non-tailored Internet-based nutrition education (3). However, the significant change in weight occurred in the first three months of the program with no weight loss occurring from month three to month six in either group. Interestingly, logon frequency to the website was significantly correlated with weight change between 0 and 6 months, although logons decreased significantly after the third month for each group.

An 8-week Internet-based study that focused on increasing physical activity in patients with type 2 diabetes reported modest, but not statistically significant improvements in physical activity among individuals who received a goal setting, personalized feedback Internet-based intervention and those who received an Internet intervention based on general information (4). Although participants in the intervention logged on more times and viewed more web pages than the control group, they also accessed the website less often as time passed. A significantly larger percentage of control participants did not use the program on a frequent basis as compared to intervention participants (59% vs 34%).

There are limited published studies incorporating both the Internet as the medium for education delivery and the Transtheoretical Model (TTM) as the theoretical basis for the intervention. One study that compared an 8-week stage-targeted print program with a stage-targeted website program found no significant differences in reported physical activity between the two groups (5). A six-month Internet-based fitness and nutrition

program targeted at U.S. Air Force enlisted males demonstrated that the intervention was not effective in improving fitness scores but did improve weight, body mass index, and percent body fat (6).

In both studies, the subjects reported a preference for the Internet in providing information. Fifty-three percent of the subjects receiving print material and 59 percent of subjects receiving the web-based program on physical activity indicated that they would prefer to receive health-related information via the website and e-mail (5). Interestingly, one-half of the subjects in the web-based education group did not view the website at all. All twenty treatment subjects in the Air Force investigation strongly agreed or agreed that they enjoyed getting health information over the Internet and would recommend that type of program for others in the Air Force (7).

A preference for the Internet to help promote healthy lifestyles has also been confirmed by the Oregon Air National Guard. Nearly 91 percent of respondents ranked the Internet as a popular source for health information, 82 percent had Internet access, and average computer self-efficacy was rated as very high (8). These results demonstrate that the Internet may be a viable and effective medium for providing health information to the Air National Guard and other military populations.

The efficacy of and the possibility of reaching large numbers of people with the Internet is a promising and innovative technique that requires more research. The Internet also appears to be a viable medium for health information dissemination for most individuals, including members of the armed forces (7, 8). This chapter describes the evaluation results of a six-month Internet-based nutrition and fitness intervention provided to senior military officers.

METHODS

Seventy-eight active duty and reserve senior military officers enrolled in the U.S. Army War College (USAWC) Department of Distance Education (DDE) course voluntarily participated in a six-month Internet-based education program designed to improve eating and exercise behaviors. The theoretical framework of the intervention was based on the Transtheoretical Model of behavior change. Using a randomized controlled intervention design, participants were randomly assigned to either a treatment group (n = 39), who had access to the website program containing stage-matched education, or to a control group (n = 39) who did not have access to the program. Participants in the treatment group were required to logon to the website a minimum of one time each month using an individually assigned password and username to ensure approved access and to avoid cross contamination. Participants were allowed access to the current and all previous months' newsletters, and did not have access to the current month's newsletter until the first day of the current month. Participants were automatically logged out of the program after 20 consecutive minutes of inactivity.

Effective use of the TTM stipulates that participants receive tailored information that is matched to an individual's stage of change for the behavior being investigated. For this investigation, diet (fruit and vegetable intake) and moderate intensity exercise were the behaviors used to stage individuals into the stage categories of precontemplation, contemplation, preparation, action and maintenance. For appropriate stage classification, participants had to complete two staging algorithm surveys upon initial access to the website every month (Appendix C). One survey staged individuals for fruit and vegetable consumption with a behavioral criterion of five or more servings

of fruits and/or vegetables daily. A second survey staged individuals for exercise behavior with a criterion of 30 minutes or more of moderate intensity physical activity on at least 3 or more days per week. The staging algorithms used for this study were the algorithms used in a web-based study with enlisted U.S. Air Force males (6). Since this intervention combined the nutrition and fitness information into one monthly newsletter, the diet algorithm was used as the classification method for classifying participants into an appropriate stage of readiness for fruit and vegetable intake and for providing stage-matched nutrition education to the participant each month. Staging results for exercise were collected, but all participants received identical fitness information regardless of stage for exercise.

The website intervention, called *Taking Command of Your Health*, provided participants with information on various diet, exercise and health topics. Results of the needs assessment survey administered to USAWC officers attending the Academic Year 2002 in-resident course determined the monthly topics. Chapter 3 describes the results of the needs assessment survey. The website contained seven newsletter sections. Participants could navigate the site as they chose since there was not forced navigation through the various sections.

In addition to monthly staging surveys, participants were also required to answer five questions each month in the *Command Post* section. The questions were either behavior-based to assess the participant's behavior, such as eating breakfast or eating five servings of fruits and vegetables a day, or knowledge-based to assess how well the participant could apply the information learned that month. Immediately after submission of selected answers, participants received the correct answers and feedback

comments based on the answer. Therefore, this section raised awareness of personal habits (self reevaluation) and continued to build confidence (self-efficacy) for those individuals in all stages of change.

Website administrators tracked participants' navigations throughout the intervention to include minutes spent on the newsletter sections of the website and participants' requests for external websites that were posted in the *Links* section. The investigator's e-mail address was available on the website if participants had questions or concerns. At the end of the intervention, participants completed an anonymous exit survey designed to gather subjective information on the usefulness of the intervention and the efficacy of the Internet as a method for education.

Means ($\pm$ SD) for stage scores and t-tests for pairwise comparisons of stages at specific time periods were analyzed. A p-value of 0.05 or less was used to determine significance. Means were reported for time spent on the website program. Statistical analyses were performed using Statistical Package for the Social Sciences, Version 12.0 (SPSS, INC, Chicago, IL).

RESULTS

Of the 39 participants who were assigned to the treatment group, 34 participants completed the study. Two participants were removed from the study because they did not participate in the website intervention, two deferred the USAWC course, and one participant did not complete post-study surveys and measures. Changes in behavioral and physiological measures as well as stage of change analyses are presented in Chapter 5.

Minutes Spent on Website

The amount of time that participants spent on the website was monitored throughout the program. One participant was eliminated from time analysis because the individual had access problems for two consecutive months due to a deployment to Iraq. The participant completed staging algorithms, was provided with the appropriate newsletter, and answered the monthly questions via e-mail instead of the Internet. Table 6.1 lists the average number of minutes that treatment participants spent on the website every month by stage of change for diet. Figure 6.1 graphically illustrates the results from Table 6.2. In general, participants in action spent the most time on the website every month except for months five and six when maintenance participants spent more time on the site.

Table 6.1. Average Minutes Participants Spent on the Website by Month by Diet Stage (n = 33).

Month of Intervention	Precontemplation	Contemplation	Preparation	Action	Maintenance
#1: Eating to Fuel Your Active Lifestyle	9	15	8	41	15
#2: Controlling Your Cholesterol	9	10	16	21	22
#3: Simple Strategies for Weight Control	9	2	9	37	23
#4: Controlling Your Blood Pressure	1	9	4	27	18
#5: Eating for Performance	2	15	4	17	26
#6: The ABCs of Good Nutrition	NA	3	16	7	23
Overall Average	**6**	**9**	**10**	**25**	**21**

Figure 6.1. Average Minutes Spent on Web Site by Diet Stage by Month (n = 33)

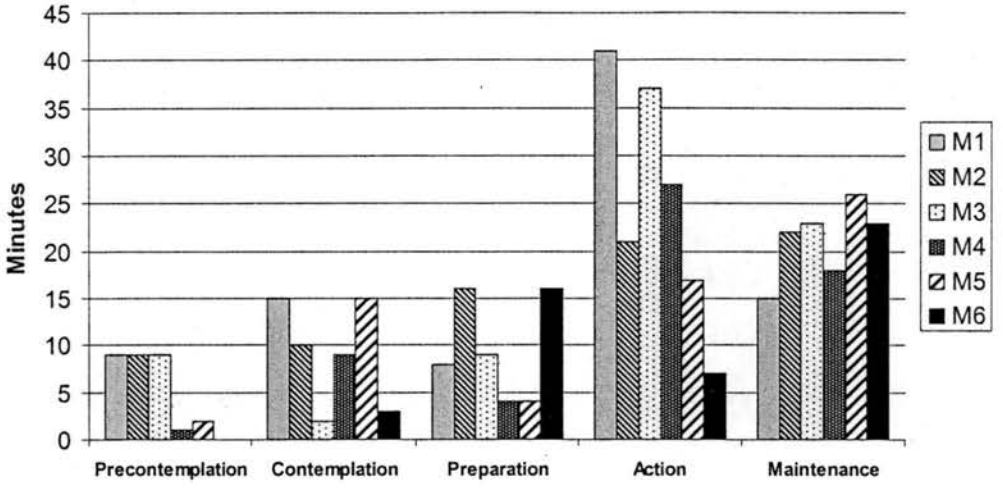
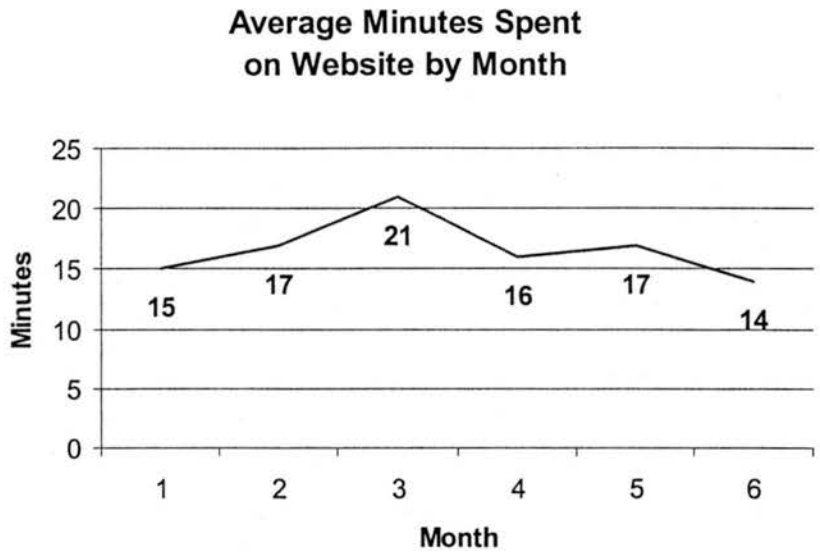


Figure 6.2 illustrates the average number of minutes spent on the website each month regardless of stage. Participants spent the most time viewing the information from month three "Simple Strategies for Weight Control" and spent the least amount of time during the final month "The ABCs of Good Nutrition," which summarized the information from the previous five months and provided tips on how to continue making progress in diet and exercise behaviors.



Although mean stage scores are infrequently reported in the literature, Table 6.2 lists the mean stage scores for diet and exercise at each month during the intervention and at post-study (month 12). Mean stage scores for diet increased throughout the six-month intervention with a significant increase from month two to three. The significant increase in mean exercise stage occurred from month four to five. Although there is a statistically significant increase in mean diet stage from month one to six, there is not a significant difference in mean stage for exercise from month one to six. Furthermore, there were no statistically significant differences in mean stages from baseline to post-study for either diet or exercise behavior.

Table 6.2. Mean (± SD) Stage Scores[a] for Diet and Exercise of the Treatment Group (n = 28)[b].

Time Period	Mean Diet Stage (± SD)	Mean Exercise Stage (± SD)
Month #1	3.5 (1.3)[c]	4.3 (0.9)[g,i]
Month #2	3.6 (1.1)[c]	4.1 (1.0)[g,i]
Month #3	3.9 (1.1)[d,e]	4.3 (0.9)[g,i]
Month #4	4.0 (1.1)[d,f]	4.1 (0.9)[g]
Month #5	4.2 (0.8)[d]	4.4 (0.8)[h,i]
Month #6	4.2 (0.9)[d]	4.3 (0.8)[h,i]
Month #12	3.6 (1.3)[c,e,f]	4.5 (0.8)[h,i]

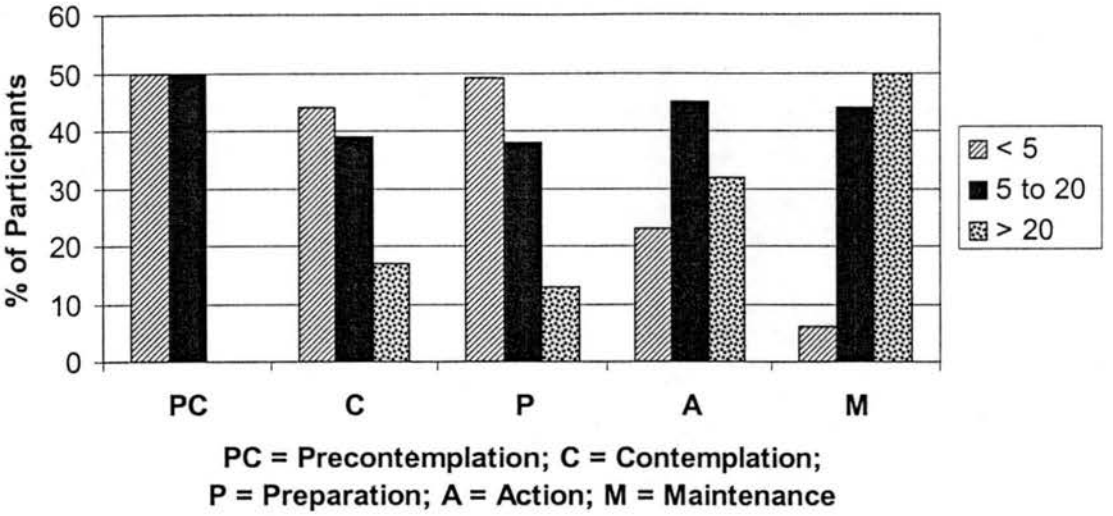
[a]Stage scores range from 1 to 5: 1=precontemplation; 2=contemplation; 3=preparation; 4=action; and 5=maintenance

[b]Although there were 34 participants in the treatment group, only 28 participants completed staging algorithms at every time period.

[c-i]Items having the same superscripts are not significantly different from each other ($p > 0.05$) as determined by t-tests for pairwise comparisons.

Every month throughout the intervention, 21 to 33 percent of participants spent less than five minutes on the site regardless of stage. One participant logged on only once during the treatment period (categorized in maintenance) and four participants failed to logon at least one month during the six month period. Figure 6.3 represents the percentage of participants in each diet stage that spent less than five minutes, five to twenty minutes, and more than twenty minutes on the website. The percents are based on the total logons that occurred during the six-month treatment period for each stage. Participants spending more than 20 minutes on the website were primarily in the action and maintenance stages for fruit and vegetable intake, while those spending fewer than five minutes were in a preaction stage (precontemplation, contemplation and preparation).

Figure 6.3. Percent of Participants[1] Spending < 5, 5 to 20, and > 20 Minutes on the Website by Diet Stage



[1]Percent based on total logons during the treatment period for each stage: precontemplation (n = 8); contemplation (n = 18); preparation (n = 45); action (n = 47); and maintenance (n = 64).

Minutes Spent on Newsletter Sections

Five of the seven newsletter sections contained educational information. The sections that did not provide educational text were the *Command Post* where participants answered monthly questions and the *Links* section which provided participants with websites for further information. Table 6.3 describes the amount of time participants spent on the educational newsletter sections, the average word count per section, and the number of participants who did not view the section. As a group, participants spent the least amount of time on the *Fitness Corner* information and the most time on *The Sensible Weigh*. According to the word count, *The Sensible Weigh* section, on average, provided the most information to the user while the *Food for Thought* section was the shortest in word count.

Table 6.3. Average Minutes (± SD) Spent on Newsletter Section each Month, Average Word Count, and Number of Participants not Viewing each Website Section (n=33).

Newsletter Section	Average Minutes (± SD)	Average Word Count	No. of Participants not Viewing Section
Food For Thought	12.3 (12.9)	647	7
Survival Eating	12.4 (12.3)	1169	9
The Sensible Weigh	16.7 (16.7)	1376	4
Combating Disease	10.4 (10.3)	1147	7
Fitness Corner	8.9 (8.6)	920	6

The *Links* section provided participants with websites in which they could seek further information. Fourteen of the 34 participants (41%) clicked on the provided websites for additional information (Table 6.4). Although Table 6.4 lists 15 participants, one participant moved from action to maintenance from month five to six. Most of the requests were solicited from participants in action and maintenance while only three participants in a preaction stage sought further information from the websites.

Table 6.4. Number of Requests to Review Additional Websites by Diet Stage During the Intervention.

DIET STAGE	No. of Requests (No. of participants)
Precontemplation	0
Contemplation	2 (2)
Preparation	2 (1)
Action	20(3)[a]
Maintenance	21 (9)[b]

[a]One participant made 16 of the 20 requests over the course of five months.
[b]The participant from action moved into maintenance the sixth month and made 5 of the 21 requests.

Exit Survey

All participants completed an anonymous exit survey during the final month of the intervention and results are listed in Table 6.5. Ninety-four percent of participants strongly agreed and agreed that receiving health information from the Internet was convenient and flexible. Only one participant disagreed that the information was relevant and understandable. Seventy-six percent strongly agreed and agreed that they were more likely to continue reading the newsletter each month when it was received via the Internet. Eighty-six percent of participants reported that they felt that the program improved dietary habits compared to 53 percent who felt that it improved physical activity habits. Lastly, 85 percent of respondents strongly agreed and agreed that they would recommend this type of program to other persons in the military.

Table 6.5. Results of the Exit Survey Completed by Treatment Participants (n=34)

QUESTION	STRONGLY AGREE % (N)	AGREE % (N)	NEUTRAL % (N)	DISAGREE % (N)	STRONGLY DISAGREE % (N)
1. I found that receiving this health information by way of the Internet was convenient and flexible.	56 (19)	38 (13)	6 (2)	0	0
2. I found the health information and graphics by way of the Internet was eye-appealing and attention-getting.	32 (11)	53 (18)	15 (5)	0	0
3. I found the health information and graphics by way of the Internet was relevant and understandable.	47 (16)	50 (17)	0	3 (1)	0
4. By getting my health information over the Internet, I was more likely to continue reading my newsletters each month.	38 (13)	38 (13)	21 (7)	3 (1)	0

QUESTION	STRONGLY AGREE % (N)	AGREE % (N)	NEUTRAL % (N)	DISAGREE % (N)	STRONGLY DISAGREE % (N)
5. Overall, I enjoyed getting my health information over the Internet.	47 (16)	38 (13)	15 (5)	0	0
6. Do you feel this program helped improve your dietary habits?	21 (7)	65 (22)	6 (2)	9 (3)	0
7. Do you feel this program helped improve your physical activity habits?	15 (5)	38 (13)	32 (11)	15 (5)	0
8. Would you recommend this type of program for others in the military?	56 (19)	29 (10)	9 (3)	6 (2)	0

Participants were also encouraged to submit anonymous personal comments regarding the experience. The comments are listed in Appendix I. Overall, eleven participants made specific positive comments about the program or the information provided in the program. Five participants specifically commented that they were too busy to make changes during the intervention. Participants offered the following suggestions for improving and changing the program:

- Add specific workout routines for muscle groups
- Add running/cardio routines that can be sustained long term
- Chat room for monthly discussions
- More emphasis on health concerns for those 40-50 years
- More discussion on a rounded program of physical, mental and spiritual health
- Recommend program to spouses to encourage and reinforce the new dietary program
- Information about maintaining regimens while on the road should be a critical part to any military related website
- Tell soldiers how they might locally shop for further information. For example: if the interest in this website stimulated interest in visiting a nutritionist on a regular basis, it would be helpful to know how to shop for a qualified R.D., what to expect, how much to pay, etc.

- Have an advanced section for those who already have the basics. More in-depth information on exercise.
- Would like to see some emphasis on cognitive psychology in the area of Habits, Attitudes, Beliefs and Expectations.
- Additional/increase in-text links would be useful to most readers -- for instance, a battery of fast-food or restaurant nutrition sites to allow users to "see for themselves" immediately just how much damage a "Bloomin' Onion" REALLY does to your health
- Design more like weight watchers e-tools. Where recipes, information on exercise and nutrition, encouragement/inspirational SHORT tips which would all pop up on your computer screen at random times. More visual graphics - have a picture of a healthy dish and the recipe. Tailor things specifically for me. If I tell you age, height, weight, eating habits, medical history, tailor a program just for me.
- Recommend some mention of the value of supplements such as vitamins, protein powder, and herbal remedies

Monthly Quiz

Participants were required to answer five questions in the *Command Post* section each month. Eighteen knowledge and twelve behavior questions were posted during the six-month program and participant's answers were posted in the database. Although participants were reminded to answer the questions, only 26-28 participants answered them monthly (not always the same participants). Participants in the action and maintenance stages had the highest percentage of participants providing the correct answer while the precontemplators scored lowest on the knowledge questions (Table 6.6). The following three questions were answered correctly by less than 50 percent of the treatment participants regardless of stage:

1) Which food does not contain cholesterol? A) skim milk, B) salmon, C) peanut butter, D) butter, or E) all of the above **(15% answered correctly)**
2) A ½-cup raisin is equivalent to how many fruit servings? A) .5 serving, B) 1 serving, or C) 2 servings **(43% answered correctly)**
3) If you take a multivitamin/mineral supplement, you should take supplements that are specially formulated for men or women. A) true or B) false **(48% answered correctly)**

Table 6.6. Percent Correct Answers to Knowledge Questions by Diet Stage[1]

Precontemplation	Contemplation	Preparation	Action	Maintenance
45%	58%	57%	76%	69%

[1]Sample size for calculations was 26 or 28 participants, depending on the month.

The behavior questions were provided to raise awareness of and encourage self-assessment of individual personal habits. Each question was related to a topic presented that month. Some questions were asked more than once during the treatment and therefore there were nine different questions throughout the intervention. Table 6.7 lists the behavior questions and the percentage of participants who selected each answer.

Table 6.7. Percent of Treatment Participants' Answers to Monthly Behavior Questions from the *Command Post*[1]

CHOICES	ANSWERS (%)	ANSWERS (%)	ANSWERS (%)
HOW MANY DAYS A WEEK DO YOU EAT BREAKFAST?[2]			
0 days	8	11	
1-2 days	23	22	
3-4 days	15	7	
5-6 days	12	48	
7 days	42	11	
HOW MANY DAYS A WEEK DO YOU EAT LUNCH?			
0 days	0		
1-2 days	0		
3-4 days	27		
5-6 days	23		
7 days	50		
DO YOU ACCUMULATE A TOTAL OF 30 MINUTES OR MORE OF MODERATE ACTIVITY ON MOST DAYS OF THE WEEK?			
Yes	73		
No	27		
HOW MANY RISK FACTORS DO YOU HAVE FOR HEART DISEASE?			
0 risk factors	15		
1 risk factors	33		
2 risk factors	22		
3 risk factors	19		
≥ 4 risk factors	11		
ON THE AVERAGE, HOW MANY SERVINGS OF FRUITS AND VEGETABLES DO YOU EAT DAILY?[3]			
0 servings	4	0	0
1-2 servings	26	15	29
3-4 servings	22	11	18
≥ 5 servings	48	74	54
IS STRENGTH TRAINING (DOES NOT INCLUDE PUSH-UPS AND SIT-UPS) A PART OF YOUR REGULAR EXERCISE ROUTINE?			
Yes	30		
No	70		
ON THE AVERAGE, HOW MANY SERVINGS OF BREAD/PASTA/GRAINS DO YOU EAT DAILY?			
≤ 3 servings	19		
4-5 servings	39		
6-11 servings	42		
≥ 12 servings	0		
IS CROSS TRAINING A CONSISTENT PART OF YOUR EXERCISE ROUTINE?			
Yes	50		
No	50		
DO YOU THINK THAT YOU ARE A GOOD ROLE MODEL TO YOUR FAMILY AND FRIENDS REGARDING HEALTH AND FITNESS?			
Yes, strongly agree	21		
Yes, but I could do better	68		
No, but I'm going to try	0		
No and I don't care	11		
Don't know	0		

[1]Total N = 26 to 28 participants, depending on the month.
[2]This question was asked on months one and three.
[3]This question was asked on months two, four, and six.

DISCUSSION

An Internet-based educational intervention for military personnel provides an opportunity to reach a large number of active-duty and reserve personnel who are stationed or deployed around the world. During this intervention, some of the participants were activated from reserve to active duty status, moved to a new duty station, traveled to locations around the world, or were deployed overseas, yet were able to maintain Internet access throughout the six-month intervention period. Even when deployed to combat zones such as Iraq and Afghanistan, most military personnel have access to computers, e-mail, and the Internet which makes it a viable and available medium for educational purposes.

Results of this six-month intervention demonstrate that the Internet was a feasible approach in delivering education to a group of senior military officers. Participants were instructed from the study's onset that they had to log-on to the website every month during the intervention however, many participants were sent reminder e-mails at the end of the month to log-on, complete surveys, read information, and answer questions in the *Command Post*. After these reminders, only four participants failed to logon at some time during the six-month period.

Interest in the program appeared to remain fairly consistent since most participants spent some amount of time on the site every month. They spent the least amount of time on the site during the final month. In contrast, two 8-week website physical activity programs and a six-month weight loss program showed a decline in the number of participants entering the website during the duration of the treatment period (3-5). Although reminder e-mails were sent to participants in one study, less than half of

the participants even logged on to the website after reminder e-mails (5). These studies tracked number of logons, but not the actual amount of time spent on the website.

On the average, precontemplators spent the least amount of time on the program (6 minutes). Since a precontemplator does not intend to change behavior, it is surprising that those individuals even logged on to the site every month. In fact, one participant in precontemplation spent 14 minutes on the website for three consecutive months before progressing to contemplation while another precontemplator spent four minutes on the program for two months before progressing to the next stage.

Participants in contemplation and preparation averaged nearly equivalent times on the website at nine and ten minutes, respectively. Since an individual in preparation is intending to change behavior in the very near future and has a plan of action (9), one would anticipate the individual to spend more time on the Internet than a contemplator. Of the nine participants who were in preparation at month one, only one-third progressed to action at month two. In fact, one participant regressed to contemplation at month four before progressing to action in month five. Another participant stayed in preparation during the entire treatment. The remaining four participants progressed in either months three, four, or six. These findings suggest that the one-month time frame defined in the Transtheoretical Model as the period in which individuals will change, may not be appropriate for dietary behaviors since only one-third of participants in preparation changed in a month. On the other hand, participants may not have accurately assessed their intention to change; perhaps they wanted to eat more fruits and vegetables but were more accurately in contemplation than preparation. One may also question the content of

the newsletter for the preparation stage; it may have contained too much or the wrong type of information for participants in preparation.

The action stage involves the most overt behavioral changes and requires considerable commitment of time and energy (10). Unsurprisingly, participants in action spent the most time on the website program with an average of 25 minutes a month. Maintainers averaged 21 minutes per month on the website, supporting the concept that maintenance is a continuation of behavior change and not a static stage. The primary goal in maintenance is to prevent relapse and, predictably, maintainers continued to spend a substantial amount of time on the website.

Participants spent the most amount of time on the website during the third month, "Simple Strategies for Weight Control," which also coincided with a statistically significant increase in mean stage score for diet. This result raises the question "Were participants more interested in the information for weight control strategies or were participants spending more time on the site because they progressed to a higher stage and wanted more information?" Although mean stage scores for diet increased through month five, they were statistically non-significant increases from month three to month five. This result brings into question the appropriate duration for an educational intervention. Would a shorter intervention of three or four months followed by a six to nine month period of monthly or weekly e-mails that provided brief information tips and personalized feedback be sufficient to improve diet and exercise behaviors in this group of senior military officers?

According to the average minutes spent viewing each newsletter section, participants averaged the most time on *The Sensible Weigh* and the least amount of time

on the *Food for Thought* section. The *Fitness Corner* was the second section in which participants spent the least amount of time. It would seem logical that participants would spend the most amount of time on *The Sensible Weigh* because of its length, but participants spent less time on the *Fitness Corner* than would be expected according to informational length (word count). Although there were no participants in precontemplation or contemplation for exercise (Chapter 5) and the information was intended to motivate participants to start and continue a regular exercise program, the information may have been too general. Because of mandatory fitness testing and promotion of physical activity among military personnel, participants may have felt that they were knowledgeable on fitness and did not need to spend as much time on that section. Also, the information presented in the *Fitness Corner* may not have interested the participants.

The *Survival Eating* section provided participants with strategies for eating healthy on the run which, according to the needs assessment survey, was the number one topic that senior officers wanted to know more about. Surprisingly, participants spent, on the average, almost equivalent minutes on *Survival Eating* as they did on *Food for Thought* even though *Survival Eating* was nearly twice as long in content. *Survival Eating* contained lists of foods and their respective sodium, fat, or saturated fat contents and also provided participants with shopping tips and recipe ideas. The other newsletter sections also provided strategies on how to eat healthy on the run through the use of senior officer scenarios, which may have had more appeal and may have elicited a more personal connection with participants.

Forty-four percent of the participants (n = 15) sought more information from the additional websites listed in the *Links* section. Of the participants who sought more information, only 20 percent (n = 3) were in a preaction stage. These results suggest that even though participants in contemplation and preparation were thinking about changing dietary behavior, in general, they were not motivated or curious enough to seek further information. It appears that participants in action and maintenance were most motivated to find more information that would potentially help them in their efforts to continue with successful behavior change.

Although pre- and post-tests for nutrition knowledge were not assessed in this group, it is presumed that some nutrition knowledge was obtained from the program since participants in the action and maintenance stages obtained the highest percentage of correct answers on knowledge questions and also averaged the most number of minutes on the program. Precontemplators, who as a group averaged just six minutes per month on the site, answered only 45 percent of the questions correctly. One would have expected that more than 76 percent of the questions would have been answered correctly by participants in action since the questions were related to the monthly information however questions were not validated prior to their use and may have been misleading or confusing.

The objective of the behavior questions was to encourage self-assessment of individual personal habits (decisional balance construct) and raise awareness of potential problem behaviors. It is impractical to conclude whether or not this goal was met since participants were not given surveys measuring these factors. A second objective of both the behavior and knowledge questions was to increase self-efficacy of learned behaviors

and knowledge. Feedback was given to participants for both correct and incorrect answers to questions (there were not incorrect answers for behavior questions). However, self-efficacy was not measured at any time during the study to know if the goal was accomplished. The questions and answers may have been more applicable to participants if they had been used to develop a tailored e-mail message that provided more personalized and relevant feedback related to self-efficacy and decisional balance issues.

Results of the exit survey indicate that the Internet-based program appealed to participants and they found some benefit from using the program. Ninety-four percent of the participants strongly agreed and agreed that receiving the information over the Internet was convenient and flexible. Overall, 85% enjoyed getting the information over the Internet while five percent where neutral. Participants reported feeling that the intervention had more of an impact on improving dietary habits than on physical activity habits. Although the goals of the program were to improve both diet and exercise behaviors, only one section of the website contained fitness and exercise information. This information may have been too basic for the participants or they may not have been interested in the type of information provided to them. Also, the information in the *Fitness Corner* was not tailored to each participant's stage for exercise behavior which may have reduced the effectiveness of the intervention.

Eighty-five percent of the participants strongly agreed and agreed that they would recommend this type of program to others in the military. This result suggests that the Internet was a feasible medium for educational delivery and that participants thought it was beneficial enough to recommend to others, which agrees with findings from a similar

U.S. Air Force study (7). Nearly all participants submitted anonymous comments regarding their experiences which should be considered in future attempts in providing an Internet-based intervention to a similar population. In general, participants wanted specific exercise routines, inclusion of family members, a chat room for monthly discussions, and more personally tailored feedback.

There were several limitations to this study. The sample size for the treatment group (n = 34) was a small, self-selected group of individuals who were primarily male and exclusively military. It is impractical to generalize the results to a civilian adult population or to other military audiences. Although participants were tracked on their use of the website through usernames and passwords, it is difficult to verify whether individuals actually read and processed the information. Additionally, family members may have used the username and password to review the information. The purpose of the knowledge and behavior questions was to assess comprehension of the material and encourage participants to assess current eating and exercise habits, but the questions did not undergo validity and reliability testing prior to their use.

CONCLUSIONS

The Internet provides the opportunity for lower-cost interventions to reach a large target audience as an alternative to face-to-face counseling. Military personnel are stationed around the world often with limited access to health care, but usually with unlimited access to the Internet and e-mail. Furthermore, a fit and ready force is necessary to meet the increased demands of recent international conflicts. An Internet-based health promotion intervention is an ideal strategy to improve or maintain the health

of the U.S. military, wherever they may be stationed or deployed. The evaluation of this Internet-based intervention demonstrates that the Internet is a viable mode of educational delivery since most participants would recommend this type of program to others in the military and they enjoyed getting health information over the Internet. Internet education may become a fundamental tool for improving the health of military personnel. Therefore, future research should concentrate on the characteristics of tailored interventions that increase its effectiveness, participation and regular usage of an educational website, the impact of individualized feedback, and the appropriate duration of programs for different military populations.

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CHAPTER 7

CONCLUSIONS AND RECOMMENDATIONS

This experimental intervention used the Transtheoretical Model to provide tailored, stage-matched education to senior military officers participating in an Internet-based nutrition and fitness program. Although the program failed to result in statistically significant physiological and behavioral changes among treatment participants, the intervention did successfully move some individuals into higher stages of change for fruit and vegetable intake. Six months following the intervention however, many individuals relapsed to earlier stages. The intervention was not successful in improving stage of change for exercise behavior. The more time an individual spent on the program, the greater the likelihood that he/she would progress in stage for fruit and vegetable intake, but not for exercise.

Assessing the Needs of the Target Population

Prior to program development, this study assessed the health concerns, educational preferences for nutrition and health topics, eating habits, and barriers and motivators for eating healthfully and exercising regularly. The needs assessment was a self-administered, e-mail survey completed by senior military officers at the U.S. Army War College (USAWC) who were stationed at the War College and enrolled in the in-

resident course. This population was chosen for the needs assessment since individuals were demographically similar to the target audience, which was senior military officers enrolled in the distance education course of the USAWC.

The following recommendations are suggested for assessing future populations prior to designing an intervention:

1. If the method of assessment is a self-administered survey, provide a survey that allows respondents to provide additional comments. The Nutrition and Fitness Needs Assessment Survey (Appendix A) used in this investigation provided a limited number of specific answers without allowing additional comments which potentially restricted the respondents' answers and biased the results.
2. When feasible, employ the use of focus groups. A focus group can obtain more in-depth, qualitative information about individuals' feelings and thoughts regarding nutrition and fitness programs that are being designed specifically for them. This information may provide more benefit in the determination of program content.
3. Assess the needs of specific target groups within the U.S. military. Military basic trainees, senior military officers, Special Forces, Rangers, and senior enlisted personnel will likely have different educational preferences, health concerns, and barriers and motivators for healthy behaviors. It is imperative to tailor an intervention to the specific needs and preferences of the targeted group.
4. Conduct an objective assessment of dietary intake and exercise patterns of the targeted group. This investigation relied on self-reports about diet and exercise behaviors and therefore, may not be objectively accurate. An accurate assessment

of diet and exercise can identify problem areas that should be addressed in the intervention.

Developing a Program based on the Transtheoretical Model

Every attempt was made to develop an appropriate newsletter tailored to each stage of change every month for fruit and vegetable intake. Fitness and nutrition information was combined into one monthly newsletter and was not tailored to stage of change for exercise behavior. Prior to writing the newsletters, a matrix (Appendix E) was developed to determine the change processes and TTM constructs to apply to each of the model's five stages of change. This matrix was followed every month when writing each newsletter.

The following recommendations are suggested in the development of future educational programs based on the TTM:

1. Develop a program content matrix to guide in the development of the intervention. The matrix was extremely beneficial in ensuring that the appropriate TTM constructs were applied to the different staged newsletters.
2. Obtain a keen understanding of the target population's lifestyles to ensure that the strategies used in the intervention are applicable to the participants. The investigator of this study worked three and a half years with the target group at the USAWC and was therefore very perceptive about the participants' lifestyles, conflicting demands, and struggles with attempts at improving diet and exercise behaviors. In fact, participants' exit comments alluded to the fact that they could relate to the scenarios and strategies that were given to them in the intervention.

3. Maintain different stage-matched messages for each targeted behavior within an intervention. This intervention combined the fitness and nutrition information into one newsletter and was stage-matched according to diet only. Although there were not any participants in precontemplation or contemplation during the study, there was no statistically significant progression in exercise behavior during the intervention. Additionally, exit survey results indicated that participants felt that the program improved their dietary habits more than their physical activity habits.
4. Consider combining constructs of other theories with the TTM. Stronger emphasis on a goal-setting strategy may have helped participants in this study to improve behaviors. Some participants in Veverka's study spent twice as much time on the goal setting newsletter as other participants; one suggestion from a treatment participant from that study was to include an interactive goal setting section on the website to encourage self-monitoring of progress.

Testing the Effectiveness of an Intervention based on the Transtheoretical Model

Based on the findings of this study, it is inconclusive to suggest that an educational intervention based on the Transtheoretical Model would be effective in improving eating and exercise behaviors in a group of senior military officers. Therefore, the following recommendations are suggested for testing the effectiveness of future educational programs based on the TTM:

1. Collect post-study measures at the end of the educational intervention to determine the program's impact on behavioral and physiological measures. Due to time constraints and physical location of participants, post-study measures

could not be collected until six months after the intervention. It is conceivable that some participants improved during the intervention and relapsed after the intervention.

2. Obtain pre-study and post-study stage classifications for both control and treatment groups to determine pre- and post-study differences between the groups. In this study, it was not possible to measure stage changes from pre- to post-study in the control group since baseline stages were not measured.
3. Measure and assess psychological factors, self-efficacy patterns, and motivators and barriers of the targeted behavior before, during, and after the intervention to identify changes in cognitive processes and personal characteristics that determine why some people change and others do not change. This may also help identify the characteristics that enable some people to sustain the new behavior and why others do not.
4. Measure nutrition knowledge and behaviors before, during and after the intervention to assess learned knowledge and behavior skills. This study did not measure baseline nutrition knowledge nor did it measure specific behaviors throughout the study. It would be interesting to know if the behavior-related questions provided in the *Command Post* had an impact on participants' assessments of personal habits and helped them weigh the pros and cons of behavior change. It would also be helpful to know whether the knowledge questions increased nutrition knowledge and what, if any, impact they had on behaviors.

5. Assess and determine an appropriate length for an educational program. Is there a time period after which continuation of the program does not result in significant changes for the participants? Can a short, intensive program followed by a series of brief follow-ups produce the same results as a longer program without follow-up contacts?

Using the Internet to Deliver Nutrition and Fitness Education

Exit survey results from this investigation indicated that 94 percent of the participants liked receiving an intervention over the Internet because it was convenient and flexible. They also reported that they enjoyed receiving health information over the Internet. Although many participants were sent e-mail reminders to logon to the website every month, logon frequency remained relatively consistent throughout the six-month treatment. Additionally, participants were able to maintain Internet access during deployments, military activation, and business trips with the exception of one participant who had access problems for two months.

The following recommendations are suggested for using the Internet to deliver educational programs:

1. Continue to provide usernames and passwords for participants. Approval of user access through usernames and passwords is a method for tracking each individual's logon frequency, answers to questions, viewing of web pages, and other activities.
2. Consider using e-mails as an adjunct to a website intervention. Individual, personalized e-mails that are tailored to one's motivational readiness to change,

self-efficacy, attitudes, and personal characteristics may appeal to certain individuals and may encourage the desired behavior change more effectively than logging on to a website.

3. Add a section to the website where participants can record and self-monitor goals and daily activities related to behavior change. Often, keeping a record of physical activity and food intake helps an individual see progress and provide motivation to continue with the desired behavior. A "virtual" log book can also help website administrators track an individual's use of the log book and could be a source for personalized feedback.
4. Incorporate more real-time interaction within the website, such as calculation of BMI, caloric requirements, caloric expenditure, and disease risk. This program was very basic in design and did not offer additional opportunities for participants to assess personal habits. Immediate feedback of personal risk factors may encourage more participants to assess the pros and cons of behavior change (decisional balance) and, in some cases, increase self-efficacy.
5. Include a discussion forum for participants to ask questions and discuss concerns with other participants. This may have more appeal to some individuals or target groups than others, depending on how much time individuals have to commit to the program and how comfortable they feel discussing diet and exercise issues with others. Assessment of this issue should be done before program development.
6. In the exit survey, ask participants about the amount of information provided each session, or month, in the study. Participants did not comment on the amount of

information provided to them monthly, and this question was not asked. It would be beneficial to know if there was adequate information to read, not enough, or too much information. Also, ask participants if they shared the information with others such as family and friends. It would be interesting to know if they sought help and support from others during their attempts to change behavior since helping relationships were encouraged throughout the intervention.

APPENDIX A

NUTRITION AND FITNESS EDUCATIONAL NEEDS ASSESSMENT SURVEY

Nutrition & Fitness Educational Needs Assessment

The purpose of this survey is to determine senior military officers' educational needs and preferences for nutrition and fitness information. The results will be used to design an internet-based nutrition education program for the Department of Distance Education students at the U.S. Army War College. Thank you for taking the time to complete this survey.
Directions: Using the mouse on your computer, please select your answer by clicking on the appropriate box. Only select one answer per question.

1. What is your current age:
   - ☐ < 40 YEARS OLD
   - ☐ 40 – 50 YEARS OLD
   - ☐ > 50 YEARS OLD

2. What is your gender:
   - ☐ MALE
   - ☐ FEMALE

3. What is your military status:
   - ☐ U.S. ARMY (ACTIVE)
   - ☐ U.S. ARMY RESERVE
   - ☐ U.S. NATIONAL GUARD
   - ☐ U.S. NAVY
   - ☐ U.S MARINE CORPS
   - ☐ U.S. AIR FORCE
   - ☐ U.S. COAST GUARD
   - ☐ OTHER

4. What is your present marital status?
   - ☐ NEVER MARRIED
   - ☐ MARRIED
   - ☐ DIVORCED
   - ☐ SEPARATED
   - ☐ WIDOWED

The following questions ask you to rate how strongly you agree or disagree with a statement. Use the scale below to describe how you feel about each issue and place an X in the corresponding box.

SA = STRONGLY AGREE
A = AGREE
N = NEITHER AGREE/DISAGREE
D = DISAGREE
SD = STRONGLY DISAGREE

5. Listed below are a number of health concerns. How strongly do you agree or disagree with the following statement: "_____ **is an important health concern to me at *this time in my life.*"**

	SA	A	N	D	SD
BLOOD CHOLESTEROL LEVEL	☐	☐	☐	☐	☐
BLOOD PRESSURE LEVEL	☐	☐	☐	☐	☐

	SA	A	N	D	SD
BODY FAT	☐	☐	☐	☐	☐
CANCER	☐	☐	☐	☐	☐
DIABETES	☐	☐	☐	☐	☐
FITNESS	☐	☐	☐	☐	☐
WEIGHT	☐	☐	☐	☐	☐

6. Listed below are a variety of educational topics in nutrition/health. How strongly do you agree or disagree with the following statement: **"I would like to know more about _____".**

SA=Strongly Agree A=Agree N=Neither Agree/Disagree D=Disagree SD=Strongly Disagree

	SA	A	N	D	SD
BENEFITS OF DIETARY FIBER	☐	☐	☐	☐	☐
DIETING/WEIGHT LOSS/FAD DIETS	☐	☐	☐	☐	☐
EATING HEALTHY ON THE RUN	☐	☐	☐	☐	☐
HOW TO LOWER/CONTROL BLOOD CHOLESTEROL LEVELS	☐	☐	☐	☐	☐
HOW TO LOWER/CONTROL BLOOD PRESSURE	☐	☐	☐	☐	☐
READING FOOD LABELS	☐	☐	☐	☐	☐
SAFETY & USE OF DIETARY SUPPLEMENTS	☐	☐	☐	☐	☐

7. Several barriers prevent people from eating healthfully. How strongly do you agree or disagree that "**_____ *prevent(s)* me from eating healthfully".**

SA=Strongly Agree A=Agree N=Neither Agree/Disagree D=Disagree SD=Strongly Disagree

	SA	A	N	D	SD
BEING TOO BUSY	☐	☐	☐	☐	☐
NOT A PERSONAL PRIORITY	☐	☐	☐	☐	☐
LACK OF KNOWLEDGE—NOT SURE WHAT FOODS TO EAT	☐	☐	☐	☐	☐
HEALTHFUL FOOD CHOICES NOT AVAILABLE	☐	☐	☐	☐	☐
CONFUSION FROM THE MEDIA/RESEARCH	☐	☐	☐	☐	☐
DO NOT LIKE TO COOK	☐	☐	☐	☐	☐

8. Listed below are several factors that motivate people to eat healthfully. How strongly do you agree or disagree that "_____ ***encourage(s)*** **me to eat healthfully".**

SA=Strongly Agree A=Agree N=Neither Agree/Disagree D=Disagree SD=Strongly Disagree

	SA	A	N	D	SD
MY HEALTH	☐	☐	☐	☐	☐
MY APPEARANCE	☐	☐	☐	☐	☐
MEETING WEIGHT AND/OR BODY FAT STANDARD	☐	☐	☐	☐	☐
MY FAMILY	☐	☐	☐	☐	☐
MY PERSONAL MEDICAL HISTORY/ ADVICE BY HEALTH CARE PROVIDER	☐	☐	☐	☐	☐
SUPPORT FROM FAMILY/FRIENDS/ CO-WORKERS	☐	☐	☐	☐	☐

9. Listed below are several barriers that prevent people from exercising regularly. How much do you agree or disagree that "_____ ***prevent(s)*** **me from participating in regular, consistent exercise.**

SA=Strongly Agree A=Agree N=Neither Agree/Disagree D=Disagree SD=Strongly Disagree

	SA	A	N	D	SD
BEING TOO BUSY	☐	☐	☐	☐	☐
LACK OF KNOWLEDGE	☐	☐	☐	☐	☐
FITNESS FACILITY IS NOT IN CLOSE PROXIMITY	☐	☐	☐	☐	☐
DO NOT LIKE TO EXERCISE	☐	☐	☐	☐	☐

10. Listed below are several factors that motivate people to exercise regularly. How much do you agree or disagree that "_____ ***encourage(s)*** **me to participate in regular, consistent exercise".**

SA=Strongly Agree A=Agree N=Neither Agree/Disagree D=Disagree SD=Strongly Disagree

	SA	A	N	D	SD
MY APPEARANCE/WEIGHT	☐	☐	☐	☐	☐
MY MILITARY CAREER—PASSING THE FITNESS TEST	☐	☐	☐	☐	☐
ACHIEVEMENT OF PERSONAL FITNESS GOALS	☐	☐	☐	☐	☐
MY PERSONAL MEDICAL HISTORY/ ADVICE BY HEALTH CARE PROVIDER	☐	☐	☐	☐	☐
SUPPORT FROM FAMILY/FRIENDS/ CO-WORKERS	☐	☐	☐	☐	☐

The next 5 questions ask you about your eating/exercise habits for the **past 6 months**.

11. Overall, how do you rate your current eating habits?
- ☐ EXCELLENT
- ☐ GOOD
- ☐ FAIR
- ☐ NEEDS IMPROVEMENT
- ☐ POOR

12. Overall, how do you rate your current fitness level?
- ☐ EXCELLENT
- ☐ GOOD
- ☐ FAIR
- ☐ NEEDS IMPROVEMENT
- ☐ POOR

13. On the average, how many times per week do you dine out (include dining facility/cafeteria, fast food, and regular restaurants)?
- ☐ ≤ 2 TIMES/WEEK
- ☐ 3 – 5 TIMES/WEEK
- ☐ 6 – 8 TIMES/WEEK
- ☐ ≥ 9 TIMES/WEEK

14. How many days a week do you usually eat breakfast?
- ☐ ≤ 2 DAYS/WEEK
- ☐ 3 – 4 DAYS/WEEK
- ☐ 5 – 6 DAYS/WEEK
- ☐ 7 DAYS/WEEK

15. How many days a week do you usually eat lunch?
- ☐ ≤ 2 DAYS/WEEK
- ☐ 3 – 4 DAYS/WEEK
- ☐ 5 – 6 DAYS/WEEK
- ☐ 7 DAYS/WEEK

Save this survey on your hard drive. Forward this e-mail and your saved survey file attachment to MAJ Lori Sigrist at lsigrist@earthlink.net. If you have any comments or suggestions regarding this survey, type them in the e-mail note since you cannot type on this form. Thank you for completing this survey.

APPENDIX B

HUMAN RESEARCH APPROVAL FOR PHASE I

Colorado State University

Office of Regulatory Compliance
Office of Vice President for Research
and Information Technology
Fort Collins, CO 80523-2046
(970) 491-1563
FAX: (970) 491-2293

APR 10 2002

MEMORANDUM

TO: Jennifer Anderson, Food Science and Human Nutrition, 1570
FROM: Celia Walker, Administrator for the Human Research Committee
SUBJECT: **PROJECT APPROVAL**
Title: Internet-based Nutrition Education for Senior Military Officers-Phase I.
Protocol No.: 02-036H
Funding Agency: N/A
Funding Agency Deadline: N/A
DATE: April 8, 2002

I am pleased to inform you that the above-referenced project was approved by the Human Research Committee on April 4, 2002 for the period April 4, 2002 to February 19, 2003. Because of the nature of this research, it will not be necessary to obtain a signed consent form. However, all subjects must receive a copy of the approved cover letter printed on department letterhead. The requirement of documentation of a consent form is waived under § _ _.117 (c) (2) with the return of the approved survey. **Approval is for a maximum of 350 USAWC students.**

A status report of this project will be required within a 12-month period from the date of approval. You will be sent a reminder approximately two months before the protocol expires. The Principal Investigator will report on the numbers of subjects who have participated this year and project-to-date, about problems encountered, and provide a verifying copy of the consent form or cover letter used. The necessary form (H-101) is available from the Regulatory Compliance web page (see below). Should the protocol not be renewed before expiration, all activities must cease until the protocol has been re-reviewed.

It is the responsibility of the investigator to immediately inform the Committee of any serious complications, unexpected risks, or injuries resulting from this research. It is also the investigator's responsibility to notify the Committee of any changes in experimental design, participant population, or consent procedures or documents. This can be done with a memo which completely describes the changes and their consequences (new consent form or cover letter, or altered survey instrument, for example). Students serving as Co-Principal Investigators may not alter projects without first obtaining PI approval. The PI is ultimately responsible for the conduct of the project.

This approval is issued under Colorado State University's OHRP Federal Wide Assurance 00000647 issued July 1, 2001. If approval did not accompany a proposal when it was submitted to a sponsor, it is the researcher's responsibility to provide the sponsor with the approval notice.

Please direct any questions about the Committee's action on this project to me for routing to the Committee. Additional information is available from the Regulatory Compliance web site at www.research.colostate.edu/regulatory/

Attachment

xc: Lori Sigrist w/attachment

DEPARTMENT OF THE ARMY
UNITED STATES ARMY WAR COLLEGE AND CARLISLE BARRACKS
CARLISLE, PENNSYLVANIA 17013-5237

REPLY TO
ATTENTION OF

AWCC-AA

13 February 2002

MEMORANDUM FOR Major Lorie Sigrist, Department of Food Science and Human Nutrition, Colorado State University, 234 Gifford Building, Fort Collins, Colorado 80523-1571

SUBJECT: Survey of U.S. Army War College (USAWC) AY 02 Resident Students

1. Permission: The Office of Institutional Assessment at the USAWC grants permission for you to survey its AY 02 Resident students (excluding International Fellows and civilians) for your Internet-based nutrition education program.

2. Limitations: This permission is granted only up until 8 June (Graduation Day), when Resident students depart to their next duty stations. This permission is not granted for the AY 03 Resident students nor for USAWC Department of Distance Education Program students.

3. Disclaimer: The Office of Institutional Assessment will not provide resources to assist in this study. This Disclaimer extends to any USAWC components who have agreed to help in the study. This also extends to subject selection, label preparation, email or hard mail distribution, survey collection, data entry, data analysis, data interpretation, and report review.

Anna T. Waggener

ANNA T. WAGGENER, Ph.D.
Director, Institutional
Assessment
U.S. Army War College
Carlisle, PA 17013
(717) 245 3365

MEMORANDUM TO ARMY WAR COLLEGE RESIDENT STUDENT

SUBJECT: "Internet-based Nutrition Education for Senior Military Officers" Research Project

1. You are being asked to complete a needs assessment survey as part of a research project entitled **"Internet-based Nutrition Education for Senior Military Officers"** for Major Lori Sigrist, an active duty Army dietitian, who is currently pursuing a doctorate at Colorado State University. The purpose of the survey is to determine senior military officers' educational needs and preferences for nutrition and fitness information. The results will be used to design the content of an internet-based nutrition education program for the Department of Distance Education students at the U.S. Army War College. An internet-based educational program can be effective in improving health and fitness outcomes of senior military leaders therefore, we need your help to identify the important concerns of your population.

2. Participation in this research study is strictly voluntary. Completion of this survey, which will take approximately 10 minutes, and returning it to MAJ Sigrist implies your consent in participation of this study. There are no known risks involved in completing this survey. To eliminate the risk of loss of confidentiality, the researchers will assign a number to each survey and no names will be linked to the survey. All e-mail addresses will be deleted after receipt of the completed survey.

3. We hope you decide to take 10 minutes to complete this survey so that we may implement an Internet program that is based on the nutritional education needs of the senior officer population. We thank you in advance for participating in this research project. Questions about participants' rights may be directed to Celia S. Walker, Human Research Committee Administrator, Colorado State University, at 970-491-1563. Questions related to the research study may be directed to the Principal Investigator, Jennifer Anderson, Ph.D., Professor in the Department of Food Science and Human Nutrition at 970-491-7622 or the Co- Principal Investigator, Major Lori Sigrist, at 970-491-2242 or lsigrist@earthlink.net.

Lori D. Sigrist
Major, SP
U.S. Army

APPENDIX C

STAGING ALGORITHM SURVEYS

Code # _____

Dietary Survey

Various nutrition and health organizations recommend eating at least 5 servings a day of both fruits and/or vegetables for good health. Think about your current diet and read each of the following statements one at a time, starting with the first one. When you come to a statement in which the answer is "True", circle the answer. You may only select one statement as true.

What counts as 1 serving?

1 piece medium fruit	10-12 grapes	½ cup tomato/spaghetti sauce
½ grapefruit	7 medium strawberries	1 medium tomato/potato
¾ cup juice	1 kiwi fruit	½ medium cucumber
½ cup berries	½ cup cooked vegetables	½ cup cole slaw
½ cup fresh/canned fruit	½ cup chopped raw vegetables	1 medium ear of corn
¼ cup dried fruit	1 cup leafy vegetables	6 asparagus spears
2 TBSP raisins	¾ cup vegetable juice (V-8)	7-8 carrot/celery sticks

- I currently consume at least 5 servings of fruits and vegetables (combined) per day and have done so for a time period of 6 months or longer.

  True False **IF TRUE, STOP HERE**

- I currently consume at least 5 servings of fruits and vegetables (combined) per day and have done so for a time period of less than 6 months.

  True False **IF TRUE, STOP HERE**

- I do not eat 5 servings of fruits and vegetables (combined) per day, but I intend to eat more fruits and vegetables in the next 30 days.

  True False **IF TRUE, STOP HERE**

- I do not eat 5 servings of fruits and vegetables (combined) per day, but I intend to eat more fruits and vegetables in the next 6 months.

  True False **IF TRUE, STOP HERE**

- I do not eat 5 servings of fruits and vegetables (combined) per day and I do not intend to eat more fruits and vegetables.

  True False

Code # _____

Physical Activity Survey

Exercise includes moderately intense, continuous activities such as brisk walking, aerobics classes, basketball, jogging, running, swimming, biking, rowing, racquetball, etc., or involves the use of spinning, stairmaster, elliptical or treadmill equipment for a period of 30 minutes or longer. Activity exertion levels should reflect a great increase in your heart rate (within the target range for your age) and cause sweating. Activities that are primarily sedentary such as bowling or golfing with a cart would not be considered exercise. **REGULAR EXERCISE = 3 TIMES OR MORE PER WEEK.**

Think about whether you engage in regular exercise **according to the above definition** and read each of the following statements one at a time, starting with the first one. When you come to a statement in which the answer is "True", circle the answer. You may only select one statement as true.

- I currently exercise regularly and have done so for a time period of 6 months or longer.

  True False **IF TRUE, STOP HERE**

- I currently exercise regularly, but have only done so within the last 6 months.

  True False **IF TRUE, STOP HERE**

- I do not currently exercise on a regular basis but intend to start in the next 30 days.

  True False **IF TRUE, STOP HERE**

- I do not currently exercise on a regular basis but I am thinking about starting to exercise regularly in the next 6 months.

  True False **IF TRUE, STOP HERE**

- I do not currently exercise on a regular basis and I do not intend to start exercising regularly.

  True False

APPENDIX D

TAKING COMMAND OF YOUR HEALTH: WEBSITE WELCOME

Taking Command of Your Health

Web Site Welcome

Taking Command of Your Health is a nutrition and fitness education program that is targeted to your specific needs. The program will provide you with real life strategies on nutrition and exercise that are easy to implement—even in your hectic, fast-paced lifestyle. As a senior military officer, you will receive information designed to help you obtain a healthier lifestyle, which may result in weight reduction or control, blood cholesterol or blood pressure reduction, or healthier eating and exercise habits. Additionally, if you have any questions or are confused about the information presented on this site, feel free to contact **MAJ Lori Sigrist**, the registered dietitian who created this program. Good luck in **Taking Command of Your Health!**

USE AND RESTRICTION OF THIS SITE

- This site is intended for the use of U.S. Army War College Department of Distance Education students participating in a doctoral research project with Colorado State University. Do not reproduce or distribute the content of this site to a wider audience without coordination of the information owner of this site.
- The views expressed are those of the author and do not reflect the official policy or position of the U.S. Army, Department of Defense or the U.S. Government.

IMPORTANT: This website is not intended to be a substitute for consultation with your personal physician and/or health care provider. Before you engage in any diet or physical activity program, please consult your physician. This site is designed to improve your current health habits and help you obtain a healthier life style.

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APPENDIX E

NEWSLETTER CONTENT MATRIX

PRECONTEMPLATION STAGE - NEWSLETTER CONTENT MATRIX

DESIRED OUTCOME FOR PRECONTEMPLATION STAGE: Contemplate the possibility of increasing daily fruit and vegetable intake in the next 6 months or less.

WEBSITE SECTION	CONSTRUCTS	CONTENT STRATEGY	GOAL
"Food for Thought" "Survival Eating" "The Sensible Weigh"	Consciousness raising Dramatic Relief	Increase awareness of a problem behavior by personalizing the information through the use of key facts, recommendations, and statistics from credible national organizations related to a particular disease, health condition, or eating habit	Realize that there are serious health consequences if he/she does not change a problem behavior
"Combating Disease"	Decisional balance	Introduce the positive and negative consequences of a problem behavior by posing key questions that encourage the reader to think about the behavior and his/her habits affecting the behavior	Start to consider the pros and cons of changing behavior
	Environmental Reevaluation	Provide information that allows reader to evaluate others' behaviors through the use of: • Relevant statistics to compare with other senior officers • Scenarios in which senior officers depict a role model describing a problem behavior with emphasis on the positive consequences of changing his/her behavior	Think about how others have changed behaviors
	Social Liberation	Create more alternatives and reduce resistance for the desired behavior by using scenarios and providing easy tips to adopt the new behavior	

PRECONTEMPLATION TABLE CONTINUED.

WEBSITE SECTION	CONSTRUCTS	CONTENT STRATEGY	GOAL
"The Command Post"	Consciousness raising	Increase awareness and knowledge of presented information	Increase knowledge and awareness of monthly topic
	Self Reevaluation	Encourage self-assessment of eating and/or exercise habits	Start to think about personal behaviors
	Self-efficacy	Improve confidence of learned information and personal habits by providing instant feedback and praise on correct answers. When the answer is incorrect (knowledge) or inappropriate (behavior), the correct/appropriate answer is given as well as ways to incorporate the behavior or knowledge in question.	Increase self-confidence in knowledge gained from the newsletter

CONTEMPLATION STAGE – NEWSLETTER CONTENT MATRIX

DESIRED OUTCOME FOR CONTEMPLATION STAGE: Contemplate the possibility of increasing fruit and vegetable intake in the next 6 months or less.

WEBSITE SECTION	CONSTRUCTS	CONTENT STRATEGY	GOAL
"Food for Thought" "Survival Eating" "The Sensible Weigh" "Combating Disease"	Consciousness Raising Dramatic Relief	Increase awareness and knowledge of problem behavior by personalizing the information through the use of key facts, recommendations, and statistics from credible national organizations related to a particular disease, health condition, or eating habit	• Increase awareness of problem behavior • Increase knowledge of monthly topic
	Decisional balance	Encourage a personal assessment of the pros and cons of behavior change by posing key questions that encourage the reader to think about the behavior, why he/she should change, and perceived barriers that may interfere with behavior change	Start to think about changing behavior based on new knowledge and facts of behavior and health
	Environmental Reevaluation	Reinforce positive consequences of changing behavior by providing: • Risk factors, statistics, and facts • Scenarios of senior officers • Personalization of information Provide information that allows reader to evaluate others' behaviors through the use of: • Relevant statistics to compare with other senior officers	Start to think about weighing the pros and cons of behavior change through personal assessment of behavior and the assessment of others' behaviors Think about how others have changed behaviors and relate to personal lifestyle, habits, and goals

CONTEMPLATION TABLE CONTINUED.

WEBSITE SECTION	CONSTRUCTS	CONTENT STRATEGY	GOAL
"Food for Thought" "Survival Eating" "The Sensible Weigh" "Combating Disease"	Social Liberation Helping Relationships Self-efficacy	Create more alternatives and reduce resistance for the desired behavior by using scenarios and providing easy tips to adopt the new behavior Introduce the reader to the importance of support relationships from family, friends, and co-workers to help them change behavior Praise the reader in contemplation for making the decision to change a behavior in the future	Realize that behavior change can be easy if taken in small steps Start to think about how others can support behavior change attempt Improve confidence in the ability to change behavior
"The Command Post"	Consciousness raising Self Reevaluation Self-efficacy	The monthly questions: Increase/strengthen knowledge of presented information Encourage reader to assess personal eating and/or exercise habits Improve confidence of learned information and personal habits by providing instant feedback and praise on correct answers. When the answer is incorrect (knowledge) or inappropriate (behavior), the correct/appropriate answer is given as well as ways to incorporate the behavior or knowledge in question.	Increase knowledge and awareness of monthly topic Encourage the reader to think more about personal behaviors Increase self-confidence in knowledge gained from the newsletter

PREPARATION STAGE – NEWSLETTER CONTENT MATRIX

DESIRED OUTCOME FOR PREPARATION STAGE: Increase daily fruit and vegetable intake to 5 servings a day within the next 30 days.
SECONDARY OUTCOMES:

- Increase daily fiber intake
- Decrease daily total fat and saturated fat intake
- Decrease daily caloric intake
- Increase breakfast and lunch consumption
- Decrease frequency of dining out

WEBSITE SECTION	CONSTRUCTS	CONTENT STRATEGY	GOAL
"Food for Thought"	Consciousness Raising	Increase further awareness and knowledge of behavior by providing key facts, recommendations, and statistics from credible national organizations related to a particular disease, health condition, or eating habit	• Become more aware of monthly topic • Increase knowledge of monthly topic
	Self Reevaluation	Pose key questions that encourages the reader to further think about the behavior; how he/she can overcome barriers that are currently preventing a change; and begin to think about a plan to adopt the desired behavior	Assess personal behaviors and how life will be different if change occurs
	Environmental Reevaluation	Provide information that allows reader to evaluate others' behaviors through the use of: • Relevant statistics to compare with other senior officers • Scenarios in which senior officers depict a role model describing how he/she changed a problem behavior and the personal weighing of the pros and cons of the behavior change	Evaluate and assess how other people have changed behavior

PREPARATION STAGE CONTINUED.

WEBSITE SECTION	CONSTRUCTS	CONTENT STRATEGY	GOAL
"Food for Thought"	Self Liberation Decisional Balance Self-efficacy Helping Relationships	Encourage the reader to think about making a firm commitment to change a behavior in the very near future by: • Reinforcing the pros (positive consequences) of why he/she should change • Providing strategies and goals for a change plan • Praising the reader for accepting responsibility for personal health; assessing personal habits; and deciding to make change a priority Emphasize the importance of support relationships from family, friends, and co-workers to help them change	• Start to think about making a commitment to change and set goals • Continue to weigh the pros of behavior change more heavily than the cons • Increase confidence in his/her ability to change behavior Think about how others can help with the action plan
"Survival Eating" "The Sensible Weigh" "Combating Disease"	Same as the above with the addition of: Counter Conditioning Stimulus Control Helping Relationships Self-efficacy	Same as the above with the addition of: Emphasize the importance of developing a plan of action to change behavior by providing: • Strategies for substituting desirable behaviors for undesirable behaviors through the use of senior officers' scenarios • Techniques to change the situation/environment that is a temptation for undesirable behavior • Ways that helping relationships can be employed to help change the problem behavior Increase the reader's self confidence in making the behavior change by providing positive comments/praise and simple steps that he/she can take for successful behavior change	• Start to develop an action plan to change behavior and think about a "start" date to change • Think about how to change the response to a situation and the environment that triggers undesirable behavior • Talk to friends or family about a plan to change and how they can help Increase self-confidence in ability to change behavior

PREPARATION STAGE CONTINUED.

WEBSITE SECTION	CONSTRUCTS	CONTENT STRATEGY	GOAL
"The Command Post"	Consciousness raising	The monthly questions: Increase/strengthen knowledge of presented information	Increase self-confidence in: • Knowledge gained from the newsletter • Personal commitment to change behavior Encourage the reader to assess personal behaviors
	Self Reevaluation	Help the reader to evaluate and relate his/her behaviors with the acquired knowledge and encourage reader to feel confident of the decision to change	
	Self Liberation	Reinforce the reader to make a personal commitment to change	
	Self-efficacy	Improve confidence of learned information and personal habits by providing instant feedback and praise on correct answers. When the answer is incorrect (knowledge) or inappropriate (behavior), the correct/appropriate answer is given as well as ways to incorporate the behavior or knowledge in question.	

ACTION STAGE – NEWSLETTER CONTENT MATRIX

DESIRED OUTCOME FOR ACTION STAGE: Actively engage in consuming a minimum of 5 servings of fruits and vegetables a day.
SECONDARY OUTCOMES:

- Increase daily fiber intake
- Decrease daily total fat and saturated fat intake
- Decrease daily caloric intake
- Increase breakfast and lunch consumption
- Decrease frequency of dining out

WEBSITE SECTION	CONSTRUCTS	CONTENT STRATEGY	GOAL
"Food for Thought"	Consciousness Raising	Increase further awareness and knowledge of behavior by providing key facts, recommendations, and statistics from credible national organizations to a related particular disease, health condition, or eating habit	Become more aware of monthly topic Increase knowledge of monthly topic
	Self Reevaluation	Pose personal key questions that encourages the reader to think about how he/she can maintain the action plan and prevent relapse	Assess personal behaviors and how one will deal with success and failure
	Self Liberation Decisional Balance Self-efficacy	Support the reader's commitment to maintain desired behavior by: • Reinforcing the pros of the behavior change and his/her commitment to make the behavior change • Praising he/she for taking responsibility of his/her health; taking action; and continuing to make change a priority • Emphasizing the common occurrence of relapse and providing strategies and goals to prevent relapse	• Commit to change and execute the action plan; track changes and accomplishment of goals • Increase self-confidence in one's ability to change behavior • Prepare for the possibility of relapse to undesirable behavior • Talk to others about the action plan
	Helping Relationships	• Emphasizing the importance of support relationships from family, friends, and co-workers to help him/her maintain the desired behavior	

ACTION TABLE CONTINUED.

WEBSITE SECTION	CONSTRUCTS	CONTENT STRATEGY	GOAL
"Survival Eating" "The Sensible Weigh" "Combating Disease"	Same as the above with the addition of: Self-efficacy	Same as the above with the addition of: Commend the reader in action for a job well done and continue to increase the reader's self confidence in maintaining the desired behavior by providing positive comments and simple, relevant strategies to ensure continued success	Increased confidence in the ability to maintain the desired behavior and stick to the action plan
		Provide the reader with additional tips on how to maintain his/her behavior change and prevent relapse by providing:	Execute the action plan by:
	Counter Conditioning	• Strategies for substituting desirable behaviors for undesirable behaviors	• Using healthy behaviors for unhealthy behaviors
	Stimulus Control	• Techniques to change the situation/environment that is a temptation for undesirable behavior	• Restructuring the environment to reduce temptation for undesirable behavior
	Decisional balance	• Scenarios in which senior officers depict a role model to describe how he/she changed a problem behavior and maintained the change long-term	
	Helping Relationships	• Ways that helping relationships can be employed to help maintain the desired behavior	• Enlisting the support of others
	Reinforcement Management	• Suggestions on how to reward oneself for a successful behavior change with positive self-talk and personal incentives	• Reward positive behavior

ACTION TABLE CONTINUED.

WEBSITE SECTION	CONSTRUCTS	CONTENT STRATEGY	GOAL
"The Command Post"	Consciousness raising Self Reevaluation Self Liberation Self-efficacy	The monthly questions: Increase/strengthen knowledge of presented information Help the reader to continue to evaluate and relate his/her behaviors with the acquired knowledge and reinforce to the reader that he/she made the right decision to change Help strengthen the reader's personal commitment to continue the desired behavior Improve confidence of learned information and personal habits by providing instant feedback and praise on correct answers. When the answer is incorrect (knowledge) or inappropriate (behavior), the correct/appropriate answer is given as well as ways to incorporate the behavior or knowledge in question.	Increase self-confidence in: • Knowledge gained from the newsletter • Personal commitment to continue desired behavior(s) Encourage the reader to assess personal behaviors and that making a change was the right decision

MAINTENANCE STAGE – NEWSLETTER CONTENT MATRIX

DESIRED OUTCOME FOR MAINTENANCE STAGE: Consume a minimum of 5 servings of fruits and vegetables a day for longer than six months.
SECONDARY OUTCOMES:

- Increase daily fiber intake
- Decrease daily total fat and saturated fat intake
- Decrease daily caloric intake
- Increase breakfast and lunch consumption
- Decrease frequency of dining out

WEBSITE SECTION	CONSTRUCTS	CONTENT STRATEGY	GOAL
"Food for Thought"	Consciousness Raising	Increase further awareness and knowledge of behavior by providing key facts, recommendations, and statistics from credible national organizations to a related particular disease, health condition, or eating habit	Become more aware of monthly topic Increase knowledge of monthly topic
	Self Reevaluation	Pose personal key questions that encourages the reader to think about how he/she can prevent relapse	Assess personal behaviors and temptations that may lead to relapse
	Self Liberation Helping Relationships Decisional Balance	Support and praise reader's continued commitment to maintain the desired behavior by: • Reinforcing the pros of the behavior change and encouraging reader to consider more advantages to sustaining desired behavior • Praising he/she for taking responsibility of his/her health; taking action; and making change a continued priority • Encouraging reader to have a plan to resume desired behavior if/when relapse occurs • Providing strategies and goals to prevent relapse • Emphasizing the importance of support relationships from family, friends, and co-workers to help him/her maintain the desired behavior and prevent relapse	• Maintain commitment to continue the desired behavior, set new goals and reasons to continue behavior • Increase self-confidence in one's ability to maintain the desired change and possibly start new changes • Develop a plan for relapse • Talk to others about the success of behavior change; help others change

MAINTENANCE TABLE CONTINUED.

WEBSITE SECTION	CONSTRUCTS	CONTENT STRATEGY	GOAL
"Survival Eating" "The Sensible Weigh" "Combating Disease"	Same as above with the addition of: Self-efficacy	Commend the reader in maintenance for maintaining the desired behavior; encourage he/she to continue to maintain the desired behavior; and increase the reader's self confidence in maintaining the desired behavior by providing positive comments and simple, relevant strategies to prevent relapse	Increased confidence in the ability to maintain the desired behavior and the ability to overcome relapse when and if it occurs
	Counter Conditioning Stimulus Control Decisional balance Helping Relationships Reinforcement Management	Provide the reader with additional tips on how to maintain his/her commitment to the desired behavior and prevent relapse by providing: • Strategies for substituting desirable behaviors for undesirable behaviors • Techniques to change the situation/environment that is a temptation for undesirable behavior • Scenarios in which senior officers depict a role model to describe how he/she changed a problem behavior and maintained the change long-term • Ways that helping relationships can be employed to help maintain the desired behavior • Suggestions on how to reward oneself for maintenance of a successful behavior change with positive self-talk and personal incentives	Continue to engage in desired behavior and prepare for relapse by: • Using healthy behaviors for unhealthy behaviors • Restructuring the environment to reduce temptation for relapse • Enlisting the support of others and helping others change • Reward maintenance of positive behavior

MAINTENANCE TABLE CONTINUED.

WEBSITE SECTION	CONSTRUCTS	CONTENT STRATEGY	GOAL
"The Command Post"	Consciousness raising Self Reevaluation Self Liberation Self-efficacy	The monthly questions: Increase/strengthen knowledge of presented information Continue to help the reader evaluate and relate his/her behaviors with the acquired knowledge and reinforce to the reader that he/she made the right decision to change Help reaffirm the reader's personal commitment to maintain the desired behavior Improve confidence of learned information and personal habits by providing instant feedback and praise on correct answers. When the answer is incorrect (knowledge) or inappropriate (behavior), the correct/appropriate answer is given as well as ways to incorporate the behavior or knowledge in question.	Increase self-confidence in: • Knowledge gained from the newsletter • Personal commitment to continue desired behavior(s) and prevent relapse Encourage the reader to assess personal behaviors and determine that change was necessary

"FITNESS CORNER" SECTION – NEWSLETTER CONTENT MATRIX

DESIRED OUTCOME DEPENDING UPON STAGE FOR EXERCISE:

- Increase moderate physical activity to 3 or more days per week for 30 minutes or longer per session, or
- Maintain moderate physical activity 3 or more days per week for 30 minutes or longer per session
- Increase in physical fitness test scores (push ups, sit ups, 2-mile run)
- Increase in caloric expenditure

CONSTRUCTS	CONTENT STRATEGY	GOAL
Consciousness Raising	Increase awareness and knowledge of personal exercise habits, exercise benefits, and exercise routines throughout the 6-month intervention	Increase awareness of exercise habits and knowledge of monthly topic
Environmental Reevaluation Self Reevaluation	Pose questions that compel the reader to evaluate: his/her physical activity habits, work out routines and daily schedules; risk for future chronic disease; and his/her role as a positive model for family and friends	Evaluate others' behaviors Evaluate personal exercise behaviors
Self Liberation Dramatic Relief Environmental Reevaluation Decisional Balance	Provide a motive to start and/or maintain regular exercise by: • Describing anecdotes from older adults on what they would have done differently in their lives in regard to health and fitness • Providing scenarios of senior military officers in similar situations (i.e. solutions for finding time to exercise during a busy day) • Listing the negative consequences of not engaging in regular exercise • Encouraging a personal assessment of the pros and cons of not exercising and exercising regularly	Make a commitment to exercise regularly based on: • Observation of others' exercise habits • An assessment of the pros and cons of regular exercise

"*FITNESS CORNER*" TABLE CONTINUED.

CONSTRUCTS	CONTENT STRATEGY	GOAL
Self-efficacy	Increase self-confidence in one's ability to exercise regularly through the use of: • Goal setting • Simple strategies to incorporate physical activity into a busy schedule and have more control over personal environment • Providing new ideas/alternatives for usual exercise routines	Increase self-confidence in the ability to exercise regularly by: • Developing an action plan and setting goals Enlisting the support of others to start and continue exercise
Helping Relationships Counter Conditioning Stimulus Control	• Helping relationships • Providing techniques for substituting exercise for undesirable behaviors • Techniques to change the situation/environment that is a temptation for undesirable behavior	• Using healthy behaviors for unhealthy behaviors (i.e. exercise instead of watching television) • Restructuring the environment to reduce temptation for not exercising

APPENDIX F

TAKING COMMAND OF YOUR HEALTH: EXAMPLES OF NEWSLETTER CONTENT

PRECONTEMPLATION NEWSLETTER

Think about this—one or two simple changes to your current diet may help you lose a few pounds and feel better! So this month, think about trying one of the strategies listed below or make up your own strategy that fits your lifestyle!

- Eat when you are hungry; do not wait until you are starved.
- Time your meals. If you eat a meal in less than 10 minutes (or 4 or 5 minutes!), try to slow down your eating and enjoy the food.
- Pay attention to your hunger and satiety signals. Stop eating when you feel satisfied, not stuffed.
- Take one or two pieces of fresh fruit to work and eat them for snacks to curb your appetite before meals.
- Drink water or other non-calorie beverages to help keep you fully hydrated and your stomach full.

CONTEMPLATION NEWSLETTER

A few simple changes to your current diet may help you lose a few pounds and feel better! Although you are thinking about changing your eating habits in the future, try just one of the strategies listed below or make up your own strategy that fits your lifestyle!

- Eat when you are hungry; do not wait until you are starved.
- Time your meals. If you eat a meal in less than 10 minutes (or 4 or 5 minutes!), try to slow down your eating and enjoy the food.
- Pay attention to your hunger and satiety signals. Ask yourself, "How full will I feel if I eat everything on my plate?"
- Take a few pieces of fresh fruit, a box of raisins, or fresh vegetables to work and eat them for snacks to curb your appetite before meals.
- Drink water or other non-calorie beverages to help keep you fully hydrated and your stomach full.

PREPARATION NEWSLETTER

Think about your past attempts to change your diet or lose a few pounds. Which strategies worked? Which strategies did not work? Now is the time to develop your plan of action to change your eating habits. Incorporate a few of the simple strategies listed below or make up your own strategy that fits your lifestyle! You are on the right track and you can do anything you want—you are in command of your health!

- **Do you forget to eat fruits and vegetables during the day?** Staple a piece of paper to your daily schedule to remind you. Using tick marks, record your fruit and vegetable servings daily so that you can monitor your progress.
- **Do you eat your meals too quickly?** If you eat a meal in less than 10 minutes (or 4 or 5 minutes!), make a conscious effort to slow down and enjoy your food. If you can't seem to break the habit of inhaling your meal quickly, wait for at least 10 minutes before you decide to go for seconds or dessert.
- **When traveling, do you rely on over-priced and often over-sized airport and restaurant food?** Pack a peanut butter and jelly sandwich, cheese and crackers, or a single serving of tuna in your briefcase. Pack a few servings of fresh and canned fruits, vegetable/tomato juice, and dry cereal in your luggage. Ask for a refrigerator for your hotel room—for yogurt, milk, or leftovers, not for the 6-pack!
- **Are the office snacks always visible? Is it too tempting to walk by without nibbling on candy, crackers, pretzels, and chips?** If so, ask the office staff to keep the snacks in the cupboard out of sight. Not only are you doing yourself a favor, but you are also reducing the temptation for your staff to eat.

ACTION NEWSLETTER

You have changed your eating habits so let's make sure that you stick to your commitment and are successful in achieving a permanent change!
Listed below are some simple strategies that may encourage you to maintain your healthy eating habits. If you already use these strategies, make up your own strategy that fits your lifestyle! You can do anything you want—you are in command of your health!

- **Do you forget to eat fruits and vegetables during the day?** Staple a piece of paper to your daily schedule to remind you. Using tick marks, record your fruit and vegetable servings daily so that you can monitor your progress.
- **Do you arrive home from work hungry, only to find nothing for dinner and the quickest thing to eat is a bag of chips and a beer (or 2 or 3)?** First of all, do not go home ready to inhale everything in sight. Eat a healthy snack before leaving the office (from your stash you keep in your desk) so that when you get home, you have enough energy and will power to make dinner or wait until dinner is ready. If you are the cook of the house, make a weekly dinner menu and take a few minutes the night before or in the morning to prepare, chop, or marinate food for your next dinner.
- **When traveling, do you rely on over-priced and often over-sized airport and restaurant food?** Pack a peanut butter and jelly sandwich, cheese and crackers, or a single serving of tuna in your briefcase. Pack a few servings of fresh and canned fruits, vegetable/tomato juice, and dry cereal in your luggage. Ask for a refrigerator for your hotel room—for yogurt, milk, or leftovers, not for the 6-pack!
- **Are the office snacks always visible?** Is it too tempting to walk by without nibbling on candy, crackers, pretzels, and chips? If so, ask the office staff to keep the snacks in the cupboard out of sight. Not only are you doing yourself a favor, but you are also reducing the temptation for your staff to eat.
- **Do you have a habit of eating while watching television after dinner or while doing your DDE homework?** You may want to think about taking a walk or doing something active instead of watching TV and munching on food. While doing your homework, sip on a beverage (preferably low-calorie and non-alcoholic!), suck on hard candies, chew gum, or munch on fruits and vegetables.

MAINTENANCE NEWSLETTER

As you know, change involves practice and maintaining that change long-term takes patience and persistence. You should be quite proud of yourself for eating at least five fruits and vegetables daily considering that the average American consumes about 2.5 servings daily!

Some thoughts to ponder....

1) Sometimes it is difficult to eat healthfully all the time, right?
2) Do you occasionally revert back to old habits?
3) Are there times when you allow yourself to indulge on fast food, junk food, or desserts?
4) And realize weeks later that you are still overeating and you are back where you started at the same old habits and the same weight?
5) Do you have strategies to get you back on track?

Many people who successfully change a behavior often relapse, or revert to old behaviors from time to time. This is a natural part of change and in order to have long-term, successful change, you need to have strategies that will get you back on track. Think about your past attempts to change your diet or lose a few pounds. Which strategies worked for you? Which strategies did not work for you?

People who have mastered the art of weight control prevent relapse by "nipping it in the bud". Although they have lost weight and have changed their eating and exercise habits, they continue to set goals for themselves to keep them on track. Reversing small weight gains immediately, as they occur, is the single most important skill you can learn to control your weight. After all, losing 5 to 10 pounds is much easier than losing 20 to 30 pounds!

You have changed your eating habits so let's make sure that you stick to your commitment and are successful in achieving a permanent change!
The following strategies can help you prevent relapse:

1. **Identify potential high-risk situations.** High-risk situations are times when you are likely to "slip" to old eating/exercise habits or lapse from your eating plan. A high-risk situation may be any of the following: being alone, feeling very hungry, feeling bored/lonely/depressed/stressed, being in a bad mood, having a hectic day, procrastinating a task, cooking, walking in the front door after a long day at work, party, or a restaurant.
2. **Prevent high-risk situations as best you can.** Write down several specific things you can do prevent a high-risk situation. It's important to do this ahead of time, because if you wait until the moment, it is much easier to eat than to consider your options.
    - If you overeat when you allow yourself to become starved, make it a point to eat every three to four hours.

- If you find yourself eating another full meal while clearing the dinner table, have someone else clear the table or at least have someone clear it with you!
- If you eat out of loneliness, call a friend or plan an outing with someone.
- If you eat chips or cookies when they are in the house, do not buy them. Or ask whoever does the shopping to support you by not buying them because they tempt you too much.

3. **Effectively deal with high-risk situations when they occur.** You cannot eliminate all high-risk situations, but you can learn to deal with them effectively instead of throwing in the towel and saying "what the heck, I can't do this". You cannot control every situation or behave perfectly all the time, but you can limit how much the situation influences you. You will always have slips so anticipate them and use strategies to cope with them.
   - If you automatically think of food when you walk in the door, bypass the kitchen, grab the mail, play with the dog (or kids), talk to your spouse, and relax. Plan ahead to have a low-calorie, healthy snack waiting for you.
   - If you attend socials and can't seem to control your food intake, set realistic goals. It is not realistic that you can attend a party and sip on club soda without eating! Scope out the food situation, select a few items that you would really enjoy, load up from the fruit and vegetable trays, and station yourself away from the food table. Wait a few minutes before going back for seconds.
4. **React constructively after high-risk situations.** So you stuffed yourself at the family get-together or you only ate 5 servings of fruits and vegetables the entire week. The worst thing you can do is criticize yourself and feel guilty. The situation is over so forget about it and get back on track. Congratulate yourself on the fact that you are aware of the situation and know what to do the next time it happens. Guilt and self-blame only increase the likelihood that you will continue to revert to old habits.

"FITNESS CORNER" Section

LTC Athlete was an ex-football player from West Point and although he lifted weights regularly, his aerobic exercise was sporadic. As a result, over the last 10 years he had gained about 25 pounds, exceeded the Army weight table, and was close to exceeding the allowable body fat. In an effort to lose weight, LTC Athlete started to run two miles at lunch five days a week. He also drank one Slim Fast for breakfast and one for lunch along with a "sensible" meal. After a few weeks on this routine, LTC A. was frustrated because he had gained weight!

LTC Athlete talked to a dietitian who discovered that his "sensible" dinners consisted of two to three pieces of meat and double servings of carbohydrates and vegetables. He also liked to have a bowl of ice cream at night. The dietitian also learned that his 2-mile run took him about 18 minutes and this was the extent of his aerobic exercise. The remainder of his workouts focused on sit-ups, push-ups and neck exercises in an effort to reduce his body fat percentage as measured by the Army Tape Test.

What flaws existed in LTC Athlete's weight loss strategy?

- His aerobic exercise was less than 20 minutes a day, which is not enough for weight loss.
- His exercise intensity was constant throughout his exercise routine. He did not challenge his muscles or his metabolism with interval training.
- He starved himself during the day, which also lowered his metabolic rate throughout the day.
- He overate at night because he deprived himself during the day.

Smart Strategy! Although LTC Athlete was a little skeptical of these recommendations, here are the strategies that LTC Athlete implemented:

- He started running a minimum of 30 minutes a day and integrated interval training into his program by varying his exercise intensity. When he ran longer distances, he ran slower and if he could not run the entire time, he walked.
- He cross trained with different activities, such as the bike, stair master, and elliptical trainer, again incorporating interval training into his workouts.
- Because LTC Athlete worked out at lunch, he ate more during the day when his body needed the energy. He ate breakfast before leaving the house and ate a snack about two hours before his lunchtime workout. About 2 hours after his workout, he ate a light lunch or snack, which helped to control his intake at dinner. He kept Slim Fast shakes at work, more as a supplement when he needed nourishment and not as a weight loss aid.

Within one month, LTC Athlete lost 6 pounds and couldn't believe that eating more could help him lose weight.

As you know, exercise is a key component to weight control and better health. If you feel you are at a weight plateau or you are bored with your current work out routine, jazz it up with a few of the strategies listed below.

- Go on a long, slower run/walk once a week and go on a short, faster run/walk once a week. Challenge your outdoor routine with a hill workout.
- Cross train with other activities, such as hiking, biking, rollerblading, swimming, dancing, tennis, racquetball, or basketball.
- Remember that you still burn calories doing any activity, such as house cleaning, playing with your children, walking the dog, washing the car, and gardening. So get up off the couch or get up from the desk every now and then and burn some calories.
- Lift weights once or twice a week to preserve muscle mass. Don't worry if you do not have time to perform 3 sets of each exercise—performing just one set of 8 to 12 repetitions provides 75 to 80 percent of the benefits of 3 sets.
- Incorporate activity into your day by taking the stairs instead of the elevator, walking to meetings, or riding a bike.
- Buy a pedometer to monitor how many miles you walk every day. Set a goal to walk 3 miles in addition to your exercise routine.

APPENDIX G

HUMAN RESEARCH APPROVAL FOR PHASE II

Colorado State University

Office of Regulatory Compliance
Office of Vice President for Research
and Information Technology
Fort Collins, CO 80523-2046
(970) 491-1563
FAX: (970) 491-2293

MEMORANDUM

TO: Jennifer Anderson, Food Science and Human Nutrition, 1571

FROM: Celia S. Walker, Regulatory Administrator for the Human Research Committee

MAY 22 2002

SUBJECT: **PROJECT APPROVAL**
Title: Internet-based Nutrition and Fitness Education for Senior Military Officers-Phase II.
Protocol No.: 02-036 H
Funding Agency: U S Center for Health Promotion and Preventive Medicine
Funding Agency Deadline: N/A

DATE: May 20, 2002

I am pleased to inform you that the above-referenced project was approved by the Human Research Committee on May 13, 2002 for the period May 13, 2002 to April 18, 2003 with the condition that the attached consent form is signed by the subjects and each subject is given a copy of the form. It is the investigator's responsibility to obtain this consent form from all subjects. *NO changes may be made to this document without first obtaining the approval of the Committee.* **Approval is for 140 subjects.**

A status report of this project will be required within a 12-month period from the date of approval. You will be sent a reminder approximately two months before the protocol expires. The Principal Investigator will report on the numbers of subjects who have participated this year and project-to-date, about problems encountered, and provide a verifying copy of the consent form or cover letter used. The necessary form (H-101) is available from the Regulatory Compliance web page (see below). Should the protocol not be renewed before expiration, all activities must cease until the protocol has been re-reviewed.

It is the responsibility of the investigator to immediately inform the Committee of any serious complications, unexpected risks, or injuries resulting from this research. It is also the investigator's responsibility to notify the Committee of any changes in experimental design, participant population, or consent procedures or documents. This can be done with a memo which completely describes the changes and their consequences (new consent form or cover letter, or altered survey instrument, for example). Students serving as Co-Principal Investigators may not alter projects without first obtaining PI approval. The PI is ultimately responsible for the conduct of the project.

This approval is issued under Colorado State University's OHRP Federal Wide Assurance 00000647 issued July 1, 2001. If approval did not accompany a proposal when it was submitted to a sponsor, it is the researcher's responsibility to provide the sponsor with the approval notice.

Please direct any questions about the Committee's action on this project to me for routing to the Committee.

Additional information is available from the Regulatory Compliance web site at www.research.colostate.edu/regulatory/

Attachment

xc: Lori Sigrist

Colorado State University

Office of Regulatory Compliance
Office of Vice President for Research
and Information Technology
Fort Collins, CO 80523-2046
(970) 491-1563
FAX: (970) 491-2293

MEMORANDUM

TO: Jennifer Anderson, Food Science and Human Nutrition, 1571
FROM: Janell A. Meldrem, Regulatory Administrator for the Human Research Committee
SUBJECT: **PROJECT APPROVAL**
Title: Internet-based Nutrition and Fitness Education for Senior Military Officers-Phase II
Protocol No.: 02-036H
Funding Agency: U S Center for Health Promotion and Preventive Medicine
Funding Agency Deadline: N/A
DATE: April 9, 2003

I am pleased to inform you that the above-referenced project was approved by the Human Research Committee on April 4, 2003 for the period April 18, 2003 to April 18, 2004 with the condition that the attached consent form is signed by the subjects and each subject is given a copy of the form. It is the investigator's responsibility to obtain this consent form from all subjects. *NO changes may be made to this document without first obtaining the approval of the Committee.*

A status report of this project will be required within a 12-month period from the date of approval. You will be sent a reminder approximately two months before the protocol expires. The Principal Investigator will report on the numbers of subjects who have participated this year and project-to-date, about problems encountered, and provide a verifying copy of the consent form or cover letter used. The necessary form (H-101) is available from the Regulatory Compliance web page (see below). Should the protocol not be renewed before expiration, all activities must cease until the protocol has been re-reviewed.

It is the responsibility of the investigator to immediately inform the Committee of any serious complications, unexpected risks, or injuries resulting from this research. It is also the investigator's responsibility to notify the Committee of any changes in experimental design, participant population, or consent procedures or documents. This can be done with a memo which completely describes the changes and their consequences (new consent form or cover letter, or altered survey instrument, for example). Students serving as Co-Principal Investigators may not alter projects without first obtaining PI approval. The PI is ultimately responsible for the conduct of the project.

This approval is issued under Colorado State University's OHRP Federal Wide Assurance 00000647 issued July 1, 2001. If approval did not accompany a proposal when it was submitted to a sponsor, it is the researcher's responsibility to provide the sponsor with the approval notice.

Please direct any questions about the Committee's action on this project to me for routing to the Committee.

Additional information is available from the Regulatory Compliance web site at www.research.colostate.edu/rcoweb/

Attachment

xc: Lori Sigrist w/attachment

Lori Sigrist

From: Anderson,Jennifer [anderson@CAHS.Colostate.edu]
Sent: Thursday, May 09, 2002 5:20 PM
To: Walker,Celia
Cc: lori sigrist
Subject: FW: A-11592 Approval Memo

SUBJECT: Protocol Entitled, "Internet-based Nutrition and Fitness Education for Senior Military Officers," Submitted by Jennifer Anderson, Ph.D., R.D., and MAJ Lori Sigrist, M.H.A., R.D., Colorado State University, Fort Collins, Colorado, HSRRB Log No. A-115925

1. Both the HSRRB and the Colorado State University IRB have oversight responsibilities for this study. Study activities should be coordinated and reported to the IRB at the Colorado State University and the HSRRB.

2. The protocol, consent form and supportive documents received 15 April 2002 and 6 May 2002 have been reviewed and found to comply with applicable human subjects protection regulations.

3. There are no outstanding human subjects protection issues to be resolved. This no greater than minimal risk study is approved for implementation.

4. Any modifications or changes made to the study must be submitted to the HSRRB in writing for review. The HSRRB must approve all changes before the changes can be implemented.

5. All adverse events must be reported to the HSRRB immediately with a written report to follow within 3 working days of the initial notification.

6. In accordance with 32 Code of Federal Regulations 219, a continuing review report must be submitted to this office no later than 9 May 2003.

7. Submission of the Volunteer Registry Data sheet is not required.

8. Point of contact for this action is Ms. Louise Pascal at louise.pascal@det.amedd.army.mil or 301-619-2607.

JULIE K. ZADINSKY
COL, AN
Acting Chair, Human Subjects
Research Review Board

COLORADO STATE UNIVERSITY
INFORMED CONSENT TO PARTICIPATE IN A RESEARCH PROJECT

TITLE OF PROJECT: Internet-based Nutrition and Fitness Education for Senior Military Officers

NAME OF PRINCIPAL INVESTIGATOR: Jennifer Anderson, PhD, RD

NAME OF CO-INVESTIGATOR: Major Lori Sigrist, MHA, RD

CONTACT NAME AND PHONE NUMBER FOR QUESTIONS/PROBLEMS: Major Lori Sigrist; 970-491-2242; lsigrist@earthlink.net

SPONSORS OF PROJECT: Funding provided by the U.S. Army War College and the U.S. Army Center for Health Promotion & Preventive Medicine. Collaborative support provided by the Army Physical Fitness Research Institute (APFRI) and Dunham Army Health Clinic.

COLLABORATION WITH COLORADO STATE UNIVERSITY: This research project is for MAJ Lori Sigrist, an active duty Army dietitian, who is pursuing her PhD in nutrition at Colorado State University.

PURPOSE OF THE RESEARCH: To evaluate an internet-based nutrition and fitness education program that will promote positive health outcomes among Army War College Department of Distance Education (DDE) students.

PROCEDURES/METHODS TO BE USED: Information regarding the effectiveness of the program will be gathered via 140 volunteers in a study that will last one year (June 2002 to July 2003). You will be randomly assigned to either a control group (70 subjects who do not have access to the internet-based program) or intervention group (70 subjects who have access to the internet-based education program) using the last number of your social security number, on an odd/even number basis. If you volunteer to participate in this study, we would ask you to do the following: complete written surveys and undergo physical measurements (listed below). Measurements/surveys will be collected at pre-intervention (June 2002) and post-intervention (July 2003).

Measurements:

a. Blood will be drawn twice during the study to measure fasting glucose and lipid panel (cholesterol, HDL, LDL, and triglycerides). A certified medical technician at Dunham Army Health Clinic will draw approximately 0.6 ounces (two tubes) of blood by routine venipuncture procedures. The blood draw is part of APFRI's Wellness Program offered to DDE students and your results will only be provided to the research team upon your consent.
b. Height and weight
c. Body composition: Army tape test to determine percent body fat, waist to hip ratio, body mass index, and waist circumference
d. Blood pressure
e. Demographic survey
f. Food frequency questionnaire
g. Physical activity recall questionnaire
h. Eating habits questionnaire
i. Stage of change questionnaire for physical activity and diet
j. APFT scores (you will need to provide researchers with a copy of your latest physical fitness test scores)

Intervention plan: If you are assigned to the intervention group, you will have access to monthly educational information on nutrition and fitness. The U.S. Army War College's DDE website will be used to disseminate the information to you. Only students assigned to the intervention group will have access to the material. Monthly nutrition and fitness information will be posted every month for six months (July through December 2002) followed by a 6-month maintenance period (January through June 2003), in which no new information will be provided. If you are assigned to the intervention group, you will have access to information that is tailored to your specific "stage of change" for dietary behavior. Stage of change is a behavior change model in which people are classified into "stages" (precontemplation, contemplation, preparation, action, and maintenance) based on intent or action to change specific behaviors (i.e. eating/exercise habits). The Co-PI (MAJ Sigrist) will be accessible through the DDE website if questions/concerns arise.

Expected Participant Activities:

Control Group:	Intervention Group:
Blood draw (June '02, July '03)	- Blood draw (June '02, July '03)
Physical measurements (June '02, July '03)	- Physical measurements (June '02, July '03)

 Participant's initials _____ Date _____

Control Group:
Completion of Surveys (June '02, July '03)
Provide latest APFT scores (June '02, July '03)

Intervention Group:
- Completion of Surveys (June '02, July '03)
- Provide latest APFT scores (June '02, July '03)
- Log-on to the website a minimum of once a month
- Read the educational information on the website
- Complete a "stage of change" survey monthly to assess progress/regression through behavior stages
- Complete a short nutrition quiz monthly to assess knowledge/behaviors

RISKS INHERENT IN THE PROCEDURES: There are no substantial risks to you as the participant. There is a minimal risk for developing slight bruising and soreness on the arm from the blood draw, but certified technicians will use appropriate procedure to reduce this risk. Breach of confidentiality is a potential risk, however all measures will be taken to minimize this risk by assigning coded numbers to all collected data. Names and social security numbers will not be used to identify subjects. Additionally, the researchers will not have access to your lab results until you sign an informed consent and APFRI releases the results. It is not possible to identify all potential risks in an experimental procedure, but researchers have taken reasonable safeguards to minimize both the known and the potential, but unknown, risks.

BENEFITS: There is no direct benefit to you for participating in this study, except for the fact that you will be receiving results and interpretation of your blood work from APFRI, and blood pressure and body composition results. If assigned to the intervention group, you will have the opportunity to use a program which may change your nutrition and exercise habits, and possibly improve your personal health, such as lowering cholesterol, blood pressure, or weight, improving your fitness or even reducing your risk for future chronic illness.

CONFIDENTIALITY: All information collected by the research team will be identified with code numbers and not names or social security numbers. The Principal Investigator and the Co-Principal Investigator will have access to information linked to individuals. Also, representatives from the U.S. Army Medical Research and Materiel Command and Colorado State University are eligible to review research records as a part of their responsibility to protect human subjects in research.

LIABILITY: The Colorado Governmental Immunity Act determines and may limit Colorado State University's legal responsibility if an injury happens because of this study. Claims against the University must be filed within 180 days of the injury. Questions about participants' rights may be directed to Celia S. Walker at (970) 491-1563.

PARTICIPATION: Your participation in this research is voluntary. If you participate in the study, you may withdraw your consent and stop participating at any time without penalty or loss of benefits to which you are otherwise entitled. Your participation in this study may be terminated if you do not comply with the previously mentioned activities (i.e. completion of required questionnaires, participation in the blood draw and physical measurements at the beginning and end of the study). Also, if you are assigned to the intervention group, you may be terminated from the study if you do not log-on to the website at least once a month and/or if you do not complete required quizzes and surveys monthly.

Your signature acknowledges that you have read the information stated and willingly sign this consent form. Your signature also acknowledges that you have received, on the date signed, a copy of this document containing 2 pages.

_____
Participant name (printed)

_____ _____
Participant signature Date

_____ _____
Witness to signature (project staff) Date

Participant's Permanent Home of Record:

_____

_____

_____

 Participant's initials _____ Date _____

DEPARTMENT OF THE ARMY
UNITED STATES ARMY WAR COLLEGE AND CARLISLE BARRACKS
CARLISLE, PENNSYLVANIA 17013-5243

REPLY TO
ATTENTION OF

AWCC-ADE

1 April 2002

MEMORANDUM FOR RECORD

SUBJECT: Memorandum of Agreement Between Major Lori Sigrist, Department of Food Science and Human Nutrition, Colorado State University, Fort Collins, Colorado and USAWC Department of Distance Education

1. As the Chairman, Department of Distance Education (DDE) at the U.S. Army War College (USAWC) in Carlisle, Pennsylvania, this memorandum acknowledges awareness of and support of Major Lori Sigrist's research study "Internet-based Nutrition Education for Military Senior Officers." The research study is supported under the auspices of the USAWC Distance Education Program's Well-Being sub-program as an educational trial in distance learning.

2. The study is completely voluntary and is available to the military USAWC Distance Education Program students enrolled in the Class of 2003.

3. Initial data collection will occur in June 2002 during the First Resident Course for the Class at the Army War College and will end in July 2003 during the Second Resident Course for the Class. The research study will be conducted in the intervening period.

4. The primary research period will be an 6-month educational intervention conducted through the USAWC Education On-Line website from July 2002 through December 2002. MAJ Sigrist will provide monthly educational materials and research instruments, as appropriate, to post on the website no later than 30 days prior to the first of each month. USAWC support is guided by the educational goals and resource guidance associated with the Well-Being sub-program.

HARRY R. YARGER, Ph.D.
Chairman, Department
of Distance Education

DEPARTMENT OF THE ARMY
UNITED STATES ARMY WAR COLLEGE AND CARLISLE BARRACKS
CARLISLE, PENNSYLVANIA 17013-5245

REPLY TO
ATTENTION OF

MEMORANDUM OF AGREEMENT
BETWEEN
MAJOR LORI SIGRIST
AND
THE ARMY PHYSICAL FITNESS RESEARCH INSTITUTE
AND
THE LABORATORY, DUNHAM UNITED STATES ARMY HEALTH CLINIC

SUBJECT: Research Project Entitled "Internet-based Nutrition and Fitness Education for Military Senior Officers"

1. Purpose: To establish an agreement between Major Lori Sigrist, the Army Physical Fitness Research Institute (APFRI) and the Laboratory at the Dunham United States Army Health Clinic (DAHC) regarding MAJ Sigrist's doctoral research project at Colorado State University, "Internet-based Nutrition and Fitness Education for Military Senior Officers".

2. Scope: This agreement delineates the relationship between Major Sigrist, APFRI and the DAHC lab in support of the research project, which will begin in June 2002 during the Department of Distance Education (DDE) First Resident Course and will end in July 2003 during the DDE Second Resident Course.

3. Responsibilities:

a. Major Sigrist will:

(1) obtain resources for the study when necessary.

(2) explain procedures and purpose of the study to the DDE students, conduct an information briefing and answer concerns and questions that potential participants may express.

(3) coordinate with APFRI and the DAHC lab on dates for the blood draw, which will occur during both the First Resident Course and the Second Resident Course.

(4) collect physiological measurements and surveys from participants.

(5) conduct data entry and analysis.

(6) adhere to regulatory requirements established by the U.S. Medical Research and Materiel Command's Human Subjects Research Review Board and Colorado State University's Human Research Committee.

SUBJECT: Research Project Entitled "Internet-based Nutrition and Fitness Education for Military Senior Officers"

b. APFRI will:

(1) coordinate with DAHC lab on dates for the blood draw, which will occur during both the First Resident Course and the Second Resident Course, and will inform MAJ Sigrist of the dates. Labs that will be drawn on DDE students are lipid profile and fasting glucose.

(2) provide MAJ Sigrist with lab results of those DDE students who participate in her study.

(3) assist MAJ Sigrist with data collection (body composition and blood pressure measurements) if there are adequate APFRI staff available.

c. The laboratory at DAHC will:

(1) coordinate with APFRI on dates for the blood draw, which will occur during both the First Resident Course and the Second Resident Course. Labs that will be drawn on DDE students are lipid profile and fasting glucose.

(2) Trained laboratory staff will draw blood on DDE students and perform the analysis on fasting glucose and lipid profile.

4. Administration: this agreement is effective upon signature and will remain in effect until completion of the study, which is 30 July 2003.

LORI D. SIGRIST Major, SP Colorado State University	SANDRA L. GREENFIELD Laboratory Manager Dunham U.S. Army Health Clinic	MARK A. VAITKUS Lieutenant Colonel, MS Acting Director, Army Physical Fitness Research Institute

APPENDIX H

SURVEYS

Today's Date _____ Code # _____

GENERAL DEMOGRAPHICS QUESTIONNAIRE

"Internet-based Nutrition and Fitness Education for Senior Military Officers"

Gender ____ *Age* _____

Component: Active Duty ☐ Reserve/National Guard ☐

Service: (Check one) Army ☐ Navy ☐ Air Force ☐ Marine ☐ Coast Guard ☐

Race/Ethnicity: (Check one)

Caucasian ☐ Black ☐ Hispanic ☐ American Indian/Eskimo ☐ Asian/Oriental ☐ Other ☐

Smoking Habits (place X in proper space and enter appropriate number)

☐ Current smoker. Number of cigarettes smoked per day ____
☐ Former Smoker. Number of months since quitting ____
☐ Never a smoker of cigarettes (Less than 100 in lifetime)

Do you have any of the following medical conditions?

High Blood Pressure ☐ High Blood Sugar/Diabetes ☐ Low Blood Sugar/Hypoglycemia ☐

Cancer ☐ High Cholesterol ☐ Heart Disease ☐ Menopause ☐ Thyroid disorder ☐

Other (list) _____

Do you take prescription medications for the following conditions?

High Blood Pressure ☐ High Blood Sugar/Diabetes ☐ Low Blood Sugar/Hypoglycemia ☐

Cancer ☐ High Cholesterol ☐ Heart Disease ☐ Menopause ☐ Thyroid disorder ☐

Other (list) _____

Have you seen a registered dietitian within the past year? YES ☐ NO ☐
If yes, please explain the purpose of the counseling (i.e., weight loss, to lower cholesterol or blood pressure, etc):

_____

Have your eating habits changed within the past year due to life events? (i.e., deployment, geographical separation from family, etc.) YES—more healthy ☐ YES—less healthy ☐ NO CHANGE ☐
If yes, please explain: _____

Have your exercise habits changed within the past year due to life events? (i.e., deployment, injury, illness, etc.)
YES—exercise more ☐ YES—exercise less ☐ NO CHANGE ☐
If yes, please explain: _____

Family History: Does any parent, 1st generation aunt or uncle, or sibling have a history of the following? (check all that apply):

Heart Disease ☐ Stroke ☐ Diabetes ☐ Cancer ☐

If any checked, provide details including which family member, which health problem, and the age at which it first occurred:

_____

_____

Today's Date _____ Code # _____

GENERAL DEMOGRAPHICS QUESTIONNAIRE (Follow-Up)
"Internet-based Nutrition and Fitness Education for Senior Military Officers"

Please answer the following questions accurately. The purpose of this survey is to evaluate any possible changes in your health status since entering the study. All questions pertain to the past 12 months (or since June 2002).

Since June 2002, have you been diagnosed with any of the following medical conditions?

High Blood Pressure ☐ High Blood Sugar/Diabetes ☐ Low Blood Sugar/Hypoglycemia ☐

Cancer ☐ High Cholesterol ☐ Heart Disease ☐ Menopause ☐ Thyroid disorder ☐

Other (list) _____

Since June 2002, have you started taking prescription medications for the following conditions?

High Blood Pressure ☐ High Blood Sugar/Diabetes ☐ Low Blood Sugar/Hypoglycemia ☐

Cancer ☐ High Cholesterol ☐ Heart Disease ☐ Menopause ☐ Thyroid disorder ☐

Other (list) _____

Since June 2002, have you seen a registered dietitian? YES ☐ NO ☐
If yes, please explain the purpose of the counseling (i.e., weight loss, to lower cholesterol or blood pressure, etc):
_____

Since June 2002, have your eating habits changed due to life events? (i.e., deployment, geographical separation from family, etc.) YES—more healthy ☐ YES—less healthy ☐ NO CHANGE ☐

If yes, please explain. **Note: If you were in the intervention group, please indicate if the website affected (positively or negatively) your eating habits.** _____

Since June 2002, have your exercise habits changed due to life events? (i.e., deployment, injury, illness, etc.)
YES—exercise more ☐ YES—exercise less ☐ NO CHANGE ☐

If yes, please explain. **Note: If you were in the intervention group, please indicate if the website affected (positively or negatively) your exercise habits.** _____

Today's Date _____ Code # _____

EATING HABITS SURVEY

"Internet-based Nutrition and Fitness Education for Senior Military Officers"

Looking back on your eating habits for the last 6 months, answer each question as accurately as possible.

1. On the average, how many times per week do you dine out (include dining facility/cafeteria, fast food, and regular restaurants)?

   _____ TIMES PER WEEK

2. How many days a week do you usually eat breakfast?

   _____ DAYS PER WEEK

3. How many days a week do you usually eat lunch?

   _____ DAYS PER WEEK

4. On the average, how many servings of fruits and/or vegetables do you eat every day?

   _____ SERVINGS PER DAY

Examples of serving sizes:
1 medium-size fresh fruit
6 oz fruit/vegetable juice
½ cup frozen, canned or cooked fruit/vegetable
1 cup of raw vegetables/salad

ACT Physical Activity Recall

ID ☐☐☐☐☐☐ Acrostic ☐☐☐☐☐☐

Date Completed ☐☐/☐☐/☐☐ (Mon Day Year) Visit Code ☐☐☐

Day of the week form completed : _____

1. Were you employed in the last seven days? ☐ Yes ☐ No

2. How many days of the last seven did you work? ☐ (round to nearest day)

3. How many total hours did you work in the last seven days? ☐☐ hours

4. What days of the week do you consider to be your weekend or non-work days? For most people this would be Saturday and Sunday but it may be different for you.

   ☐ Sunday ☐ Monday ☐ Tuesday ☐ Wednesday ☐ Thursday ☐ Friday ☐ Saturday

5. If you did not work your usual week, why did you work less than usual?

   _____

   _____

6. For the past seven days, and thinking only about activities that are *at least* of moderate intensity, how many days did you do activity or exercise that added up to at least 30 minutes each day?

   ☐ number of days (0 to 7)

Acrostic ☐☐☐☐☐☐

7. Was this a typical week in terms of your usual pattern of activity or exercise?

1☐ Yes

2☐ No — Were you more or less active in the past week than you usually are? 1☐ More 2☐ Less

Until now, we've just been talking about the last seven days. Now I would like you to think about your usual activities over the last three months.

8. During your work week, on average how many hours per day do you spend sitting quietly (e.g., watching TV, working at a desk or computer, eating, or reading)? ☐☐ average hours per day

During your weekend, on average how many hours per day do you spend sitting quietly (e.g., watching TV, working at a desk or computer, eating, or reading)? ☐☐ average hours per day

9 How many flights of stairs do you climb up each day? (1 flight = 10 steps) ☐☐ number of flights

10. If you had to add together the total minutes you spend walking during the day, how many minutes would that be? Remember, add up your actual walking time and don't add in the time spent just standing. Include your to and from walking and any fitness walking. Don't try to remember every step, just give a general idea of the time spent walking. ☐☐☐ total minutes per day.

11. What is your usual pace of walking? Mark ONE only.

1☐ Casual or strolling (less than 2 miles per hour)

2☐ Average or normal (2 to 3 miles per hour)

3☐ Fairly brisk (3 to 4 miles per hour)

4☐ Brisk or striding (4 miles per hour or faster)

12. Do you regularly do strength and flexibility exercises like sit-ups, push-ups, yoga, or stretching?

1☐ Yes — How many days per week do you do these exercises? ☐ number of days (0-7)

2☐ No

13. On the days that you do strength and flexibility exercises, how many minutes do you spend doing them? ☐☐☐ total minutes

Form completed by ☐☐ (staff code)

Instructions: Beginning with last night, estimate the number of hours you slept to the nearest ¼ hour. If you slept 7 hours and 15 minutes, write 7:15. Include any naps you may have taken during the day. Think back 6 more nights and record your sleep hours. Beginning with yesterday, estimate the number of hours you spent in moderate, hard, and very hard activity during the morning (before noon), afternoon (1200 to 1800 hours), and evening (after 1800 hours). Estimate your activities to the nearest minute and categorize the activities according to the following definitions:

Moderate activity: at least the intensity of brisk walking (15-20 minute/mile pace)

Hard Activity: intensity between walking and running

Very Hard Activity: intensity of running

Thinking back, record your activity for the past 7 days. Include all activities, such as mowing the yard, gardening, weight lifting, gym workouts, athletic events, housekeeping, etc.

Note: if the past week has not been typical, record the physical activity that you *usually* perform.

Acrostic ☐☐☐☐☐☐

		Yesterday						One Week Ago
	Days of the Week	HRS MIN	HRS MIN	HRS MIN	HRS MIN	HRS MIN	HRS MIN	HRS MIN
	Sleep	:	:	:	:	:	:	:
MORNING	Moderate	:	:	:	:	:	:	:
	Hard	:	:	:	:	:	:	:
	Very Hard	:	:	:	:	:	:	:
AFTERNOON	Moderate	:	:	:	:	:	:	:
	Hard	:	:	:	:	:	:	:
	Very Hard	:	:	:	:	:	:	:
EVENING	Moderate	:	:	:	:	:	:	:
	Hard	:	:	:	:	:	:	:
	Very Hard	:	:	:	:	:	:	:

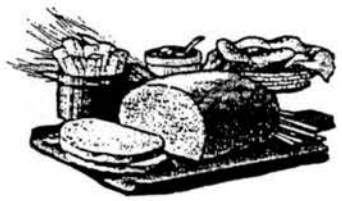
Calculated Energy Expenditure ☐☐.☐ Kcal/kg/day

RESPONDENT ID NUMBER

TODAY'S DATE

	DAY	YEAR
○ Jan		
○ Feb		
○ Mar		2000 ○
○ Apr		2001 ○
○ May		2002 ○
○ Jun		2003 ○
○ Jul		2004 ○
○ Aug		2005 ○
○ Sep		2006 ○
○ Oct		2007 ○
○ Nov		2008 ○
○ Dec		2009 ○

BRIEF FOOD QUESTIONNAIRE



This form is about the foods you usually eat.
It will take about 15 - 25 minutes to complete.

- Please answer each question as best you can. Estimate if you aren't sure.
- Use only a No. 2 pencil.
- Fill in the circles completely, and erase completely if you make any changes.

SEX
○ Male
○ Female

If female, are you pregnant or breast feeding?
○ No
○ Yes
○ Not female

AGE

WEIGHT pounds

HEIGHT ft. in.

Please print your name in this box.

This form is about your usual eating habits in the past year or so. This includes all meals or snacks, at home or in a restaurant or carry-out. There are two kinds of questions for each food.

HOW OFTEN, on average, did you eat the food during the past year?
*Please DO NOT SKIP any foods. Mark "Never" if you didn't eat it.

HOW MUCH did you usually eat of the food?
*Sometimes we ask how many you eat, such as 1 egg, 2 eggs, etc., ON THE DAYS YOU EAT IT.
*Sometimes we ask "how much" as A, B, C or D. LOOK AT THE ENCLOSED PICTURES. For each food, pick the picture (bowls or plates) that looks the most like the serving size you usually eat. (If you don't have pictures: A=1/4 cup, B=1/2 cup, C=1 cup, D= 2 cups.)

EXAMPLE: This person drank apple juice twice a week, and had one glass each time. Once a week he ate a "C"-sized serving of rice (about 1 cup).

TYPE OF FOOD	HOW OFTEN IN THE PAST YEAR: NEVER	A FEW TIMES per YEAR	ONCE per MONTH	2-3 TIMES per MONTH	ONCE per WEEK	TWICE per WEEK	3-4 TIMES per WEEK	5-6 TIMES per WEEK	EVERY DAY	HOW MUCH EACH TIME (SEE PORTION SIZE PICTURES FOR A-B-C-D)				
Apple juice	○	○	○	○	○	●	○	○	○	How many glasses each time	● 1	○ 2	○ 3	○ 4
Rice	○	○	○	○	●	○	○	○	○	How much each time	○ A	○ B	● C	○ D

PLEASE DO NOT WRITE IN THIS AREA

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TYPE OF FOOD	HOW OFTEN IN THE PAST YEAR									HOW MUCH EACH TIME SEE PORTION SIZE PICTURES FOR A-B-C-D				
	NEVER	A FEW TIMES per YEAR	ONCE per MONTH	2-3 TIMES per MONTH	ONCE per WEEK	TWICE per WEEK	3-4 TIMES per WEEK	5-6 TIMES per WEEK	EVERY DAY					
How often do you eat each of the following foods all year round?														
Eggs, including egg biscuits or Egg McMuffins (Not egg substitutes)	○	○	○	○	○	○	○	○	○	How many eggs each time	○ 1	○ 2	○ 3	○ 4
Bacon or breakfast sausage, including sausage biscuit	○	○	○	○	○	○	○	○	○	How many pieces	○ 1	○ 2	○ 3	○ 4
Cooked cereals like oatmeal, cream of wheat or grits	○	○	○	○	○	○	○	○	○	Which bowl		○ B	○ C	○ D
Cold cereals like Corn Flakes, Cheerios, Special K, fiber cereals	○	○	○	○	○	○	○	○	○	Which bowl		○ B	○ C	○ D
Which cereal do you eat most often? **MARK ONLY ONE:** ○ Product 19, Just Right, Total ○ Bran Buds, Raisin Bran, Fruit-n-Fiber, other fiber cereals ○ Other cold cereal, like Corn Flakes, Cheerios, Special K														
Cheese, sliced cheese or cheese spread, including on sandwiches.	○	○	○	○	○	○	○	○	○	How many slices	○ 1	○ 2	○ 3	○ 4
Yogurt (not frozen yogurt)	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D
How often do you eat each of the following fruits?														
Bananas	○	○	○	○	○	○	○	○	○	How many each time	○ 1/2	○ 1	○ 2	○ 3
Apples or pears	○	○	○	○	○	○	○	○	○	How many	○ 1/2	○ 1	○ 2	○ 3
Oranges, tangerines, not including juice	○	○	○	○	○	○	○	○	○	How many	○ 1/2	○ 1	○ 2	○ 3
Applesauce, fruit cocktail, or any canned fruit	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D
Any other fruit, like grapes, melon, strawberries, peaches, applesauce	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D

TYPE OF FOOD	HOW OFTEN IN THE PAST YEAR									HOW MUCH EACH TIME SEE PORTION SIZE PICTURES FOR A-B-C-D				
	NEVER	A FEW TIMES per YEAR	ONCE per MONTH	2-3 TIMES per MONTH	ONCE per WEEK	TWICE per WEEK	3-4 TIMES per WEEK	5-6 TIMES per WEEK	EVERY DAY					
How often do you eat each of the following vegetables, including fresh, frozen, canned or in stir fry, at home or in a restaurant?														
French fries, fried potatoes or hash browns	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D
White potatoes not fried, incl. boiled, baked, mashed & potato salad	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D
Sweet potatoes, yams, or sweet potato pie	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D
Rice, or dishes made with rice	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D
Baked beans, chili with beans, pintos, any other dried beans	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D
Refried beans	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D
Green beans or green peas	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D
Broccoli	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D
Carrots, or stews or mixed vegetables containing carrots	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D
Spinach, or greens like collards	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D
Cole slaw, cabbage	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D
Green salad	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D
Raw tomatoes, including in salad	○	○	○	○	○	○	○	○	○	How much	○ 1/4	○ 1/2	○ 1	○ 2
Catsup, salsa or chile peppers	○	○	○	○	○	○	○	○	○	How many TBSP.	○ 1	○ 2	○ 3	○ 4
Salad dressing or mayonnaise (Not lowfat)	○	○	○	○	○	○	○	○	○	How many TBSP.	○ 1	○ 2	○ 3	○ 4
Any other vegetable, like corn, squash, okra, cooked green peppers, cooked onions	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D
Vegetable soup, vegetable beef, chicken vegetable, or tomato soup	○	○	○	○	○	○	○	○	○	Which bowl		○ B	○ C	○ D

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TYPE OF FOOD	HOW OFTEN IN THE PAST YEAR: NEVER	A FEW TIMES per YEAR	ONCE per MONTH	2-3 TIMES per MONTH	ONCE per WEEK	TWICE per WEEK	3-4 TIMES per WEEK	5-6 TIMES per WEEK	EVERY DAY	HOW MUCH EACH TIME — SEE PORTION SIZE PICTURES FOR A-B-C-D
MEATS										
Do you ever eat chicken, meat or fish? ○ Yes ○ No IF NO, SKIP TO NEXT PAGE										
Hamburgers, cheeseburgers, meat loaf, at home or in a restaurant	○	○	○	○	○	○	○	○	○	How much meat: ○ 1/8 lb. ○ 1/4 lb. ○ 1/2 lb. ○ 3/4 lb.
Tacos, burritos, enchiladas, tamales	○	○	○	○	○	○	○	○	○	How much: ○ A ○ B ○ C ○ D
Beef steaks, roasts, pot roast, or in frozen dinners or sandwiches	○	○	○	○	○	○	○	○	○	How much: ○ A ○ B ○ C ○ D
Pork, including chops, roasts, or dinner ham	○	○	○	○	○	○	○	○	○	How much: ○ A ○ B ○ C ○ D
When you eat beef or pork, do you ○ Avoid eating the fat ○ Sometimes eat the fat ○ Often eat the fat ○ I don't eat meat										
Mixed dishes with meat or chicken, like stew, corned beef hash, chicken & dumplings, or in frozen meals	○	○	○	○	○	○	○	○	○	How much: ○ A ○ B ○ C ○ D
Fried chicken, at home or in a restaurant	○	○	○	○	○	○	○	○	○	# medium pieces: ○ 1 ○ 2 ○ 3 ○ 4
Chicken or turkey not fried, such as baked, grilled, or on sandwiches	○	○	○	○	○	○	○	○	○	How much: ○ A ○ B ○ C ○ D
When you eat chicken, do you ○ Avoid eating the skin ○ Sometimes eat the skin ○ Often eat the skin ○ N/A										
Fried fish or fish sandwich, at home or in a restaurant	○	○	○	○	○	○	○	○	○	How much: ○ A ○ B ○ C ○ D
Any other fish or shellfish not fried, including tuna	○	○	○	○	○	○	○	○	○	How much: ○ A ○ B ○ C ○ D
Hot dogs, or sausage like Polish, Italian or Chorizo	○	○	○	○	○	○	○	○	○	How many: ○ 1 ○ 2 ○ 3 ○ 4
Boloney, sliced ham, turkey lunch meat, other lunch meat	○	○	○	○	○	○	○	○	○	How many slices: ○ 1 ○ 2 ○ 3 ○ 4
When you eat lunch meats, are they ○ Usually low-fat ○ Sometimes ○ Rarely low-fat ○ N/A										

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TYPE OF FOOD	HOW OFTEN IN THE PAST YEAR: NEVER	A FEW TIMES per YEAR	ONCE per MONTH	2-3 TIMES per MONTH	ONCE per WEEK	TWICE per WEEK	3-4 TIMES per WEEK	5-6 TIMES per WEEK	EVERY DAY	HOW MUCH EACH TIME (SEE PORTION SIZE PICTURES FOR A-B-C-D)				
Pasta, breads, spreads, snacks														
Spaghetti, lasagna, or other pasta with tomato sauce	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D
Cheese dishes without tomato sauce, like macaroni and cheese	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D
Pizza, including carry-out	○	○	○	○	○	○	○	○	○	How many slices	○ 1	○ 2	○ 3	○ 4
Biscuits, muffins	○	○	○	○	○	○	○	○	○	How many each time	○ 1	○ 2	○ 3	○ 4
Rolls, hamburger buns, English muffins, bagels	○	○	○	○	○	○	○	○	○	How many each time	○ 1/2	○ 1	○ 2	○ 3
White bread or toast, including French, Italian, or in sandwiches	○	○	○	○	○	○	○	○	○	How many slices	○ 1	○ 2	○ 3	○ 4
Dark bread like rye or whole wheat, including in sandwiches	○	○	○	○	○	○	○	○	○	How many slices	○ 1	○ 2	○ 3	○ 4
Tortillas	○	○	○	○	○	○	○	○	○	How many each time	○ 1	○ 2	○ 3	○ 4
Margarine on bread, potatoes or vegetables	○	○	○	○	○	○	○	○	○	How many pats (Tsp.)	○ 1	○ 2	○ 3	○ 4
Butter on bread, potatoes or vegetables	○	○	○	○	○	○	○	○	○	How many pats (Tsp.)	○ 1	○ 2	○ 3	○ 4
Peanuts or peanut butter	○	○	○	○	○	○	○	○	○	How many TBSP.	○ 1	○ 2	○ 3	○ 4
Snacks like potato chips, corn chips, popcorn (Not pretzels)	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D
Doughnuts, cake, pastry, pie	○	○	○	○	○	○	○	○	○	How many pieces	○ 1	○ 2	○ 3	○ 4
Cookies (Not lowfat)	○	○	○	○	○	○	○	○	○	How many	○ 1-2	○ 3-5	○ 6-7	○ 8+
Ice cream, frozen yogurt, ice cream bars	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D
When you eat ice cream or frozen yogurt, is it	○ Usually low-fat	○ Sometimes	○ Rarely low-fat	○ N/A										
Chocolate candy, candy bars	○	○	○	○	○	○	○	○	○	How many bars	① small	① medium	① large	② large

TYPE OF BEVERAGE	HOW OFTEN IN THE PAST YEAR									HOW MUCH EACH TIME SEE PORTION SIZE PICTURES FOR A-B-C-D				
	NEVER	A FEW TIMES per YEAR	ONCE per MONTH	2-3 TIMES per MONTH	ONCE per WEEK	TWICE per WEEK	3-4 TIMES per WEEK	5-6 TIMES per WEEK	EVERY DAY					
How often do you drink the following beverages?														
Real orange or grapefruit juice, Welch's grape juice, Minutemaid juices, Juicy Juice	○	○	○	○	○	○	○	○	○	How many glasses each time	○ 1	○ 2	○ 3	○ 4
Hawaiian Punch, Sunny Delight, Hi-C, Tang, or Ocean Spray juices	○	○	○	○	○	○	○	○	○	How many glasses each time	○ 1	○ 2	○ 3	○ 4
Kool Aid, Capri Sun or Knudsen juices	○	○	○	○	○	○	○	○	○	How many glasses each time	○ 1	○ 2	○ 3	○ 4
Instant breakfast milkshakes like Carnation, diet shakes like Slimfast, or liquid supplements like Ensure	○	○	○	○	○	○	○	○	○	How many glasses or cans	○ 1	○ 2	○ 3	○ 4
Glasses of milk (any kind)	○	○	○	○	○	○	○	○	○	How many glasses	○ 1	○ 2	○ 3	○ 4
When you drink glasses of milk what kind do you usually drink? **MARK ONLY ONE:**	○ Whole milk ○ Reduced fat 2% milk ○ Low-fat 1% milk				○ Non-fat milk ○ Rice milk ○ Soy milk				○ I don't drink milk or soy milk					
Cream, Half-and-Half or non-dairy creamer in coffee or tea	○	○	○	○	○	○	○	○	○	Total TBSP. on those days	○ 1	○ 2	○ 3-4	○ 5+
Regular soft drinks, or bottled drinks like Snapple (Not diet drinks)	○	○	○	○	○	○	○	○	○	How many bottles or cans	○ 1	○ 2	○ 3-4	○ 5+
Beer	○	○	○	○	○	○	○	○	○	How many bottles or cans	○ 1	○ 2	○ 3-4	○ 5+
Wine or wine coolers	○	○	○	○	○	○	○	○	○	How many glasses	○ 1	○ 2	○ 3-4	○ 5+
Liquor or mixed drinks	○	○	○	○	○	○	○	○	○	How many drinks	○ 1	○ 2	○ 3-4	○ 5+

During the past year, have you taken any vitamins or minerals regularly, at least once a month?

○ No, not regularly ○ Yes, fairly regularly →

(IF YES) WHAT DID YOU TAKE FAIRLY REGULARLY?

VITAMIN TYPE	HOW OFTEN					FOR HOW MANY YEARS?					
	DIDN'T TAKE	A FEW DAYS per MONTH	1-3 DAYS per WEEK	4-6 DAYS per WEEK	EVERY DAY	LESS THAN 1 YR.	1 YEAR	2 YEARS	3-4 YEARS	5-9 YEARS	10+ YEARS
Multiple Vitamins. Did you take...											
Regular Once-A-Day, Centrum, or Thera type	○	○	○	○	○	○	○	○	○	○	○
Stress-tabs or B-Complex type	○	○	○	○	○	○	○	○	○	○	○
Antioxidant combination type	○	○	○	○	○	○	○	○	○	○	○
Single Vitamins (not part of multiple vitamins)											
Vitamin A (not beta-carotene)	○	○	○	○	○	○	○	○	○	○	○
Beta-carotene	○	○	○	○	○	○	○	○	○	○	○
Vitamin C	○	○	○	○	○	○	○	○	○	○	○
Vitamin E	○	○	○	○	○	○	○	○	○	○	○
Folic acid, folate	○	○	○	○	○	○	○	○	○	○	○
Calcium or Tums, alone or combined with vit. D or magnesium	○	○	○	○	○	○	○	○	○	○	○
Zinc	○	○	○	○	○	○	○	○	○	○	○
Iron	○	○	○	○	○	○	○	○	○	○	○
Selenium	○	○	○	○	○	○	○	○	○	○	○
Vitamin D, alone or combined with calcium	○	○	○	○	○	○	○	○	○	○	○

If you took vitamin C or vitamin E:

How many milligrams of **vitamin C** did you usually take, on the days you took it?

○ 100 ○ 250 ○ 500 ○ 750 ○ 1000 ○ 1500 ○ 2000 ○ 3000+ ○ don't know

How many IUs of **vitamin E** did you usually take, on the days you took it?

○ 100 ○ 200 ○ 300 ○ 400 ○ 600 ○ 800 ○ 1000 ○ 2000+ ○ don't know

How often do you use fat or oil in cooking?

○ Less than once per week ○ A few times per week ○ Once a day ○ Twice a day ○ 3+ per day

What kinds of fat or oil do you usually use in cooking? MARK ONLY ONE OR TWO

○ Don't know, or Pam ○ Butter/margarine blend ○ Lard, fatback, bacon fat
○ Stick margarine ○ Low-fat margarine ○ Crisco
○ Soft tub margarine ○ Corn oil, vegetable oil
○ Butter ○ Olive oil or canola oil

Did you ever drink more beer, wine or liquor than you do now? ○ Yes ○ No

Do you smoke cigarettes now? ○ Yes ○ No

IF YES, On the average about how many cigarettes a day do you smoke now?

○ 1-5 ○ 6-14 ○ 15-24 ○ 25-34 ○ 35 or more

What is your ethnic group? (MARK ONE OR MORE)

○ Hispanic or Latino ○ Black or African American ○ American Indian or Alaska Native
○ White, not Hispanic ○ Asian ○ Native Hawaiian or Other Pacific Islander

Thank you very much for filling out this questionnaire. Please take a minute to go back and fill in anything you may have skipped.

PLEASE DO NOT WRITE IN THIS AREA

APPENDIX I

EXIT SURVEY COMMENTS

PARTICIPANTS' COMMENTS FROM EXIT SURVEY

The program was great. I wish I had had access to this information years ago. My challenge is to digest the amount of information and make specific, permanent changes in my life stle.

Good variety of information.
Taking a test each month forced me to track what I was eating daily more closely.
Add: specific work out routines (recommended abdominals, back, chest, etc. Also running/cardio routines that can be sustained long term.

The program is very well done and the information is helpful. I'm afraid that despite the author's best efforts I managed to backslide into less than optimal eating habits, and let things interfere with regular exercise. I found the program helped me stay on track during the normal, routine times, but when the optempo went up or the number of TDY trips increased, old eating habits and lack of exercise prevailed though I at least felt guilty about it.
This has helped me identify areas where I need to improve and has provided helpful strategies, particularly regarding diet. I am certainly better off for having participated, and am working to get back to the level of good eating and good exercise habits it had helped me to reach.
It's a classic example the spirit being willing, but the flesh being weak.

If you hadn't prompted me every month, I would not have gone to the site. So, thanks for that. Unfortunately, I don't think the site helped change my work habits to make more time for health improvement...I wish it could. Thanks for the your time.

Nothing particular. I was grateful for the information because high cholesteral is a big problem for me.

Perhaps a chat room for monthly discussions on the survey, health related issues and information in the newsletter.
A little more emphasis on health concerns for those 40 to 50.
A little more discussion on a rounded program of physical, mental and spirtial health.

Overall, an excellent website loaded with information. I particularly liked the examples of how to change eating and exercise habits in real situations.

Great program. You could relate to the secenarios. Not only did you see yourself in these examples but you were given a solution to improve your dietary/physical activities.
Recommend this program be provided to spouses to encourage and reinforce the new dietary program.
'If the Family is eating well and in good health that's one less thing for the soldier to worry about.'

Overall I believe the program improved my understanding of nutritional needs and improved my diet. I'm not sure why, but my physical activity did not change during the program. I always felt motivated after working through the material each month. But, I nver actually did anything. Perhaps wanting to did not change the fact that my schedule was demanding. On the other hand,

since I eat anyway, it was much easier to incorporate the recommendations into my daily lifestyle. Overall, I enjoyed the program, and I hope you or someone makes this available on a non-experimental basis.

Some mention was made regarding fitness and diet while traveling. However, since most military travel extensively and relentlessly, information about maintaining regimens while on the road should be a critical part to any military related website.

The dietary information was helpful. None of the information helped me get to the gym frequently enough. The home portion of the Total Trainer CD was helpful for at home workouts.

There was a lot of information on health, diet and exercise that was very informative and interesting. It was a much more "modern" approach that the usual fare, i.e., it seemed to fit the active lifestyles of most individuals who work full-time either in the military or in high-stress, fast-paced civilian jobs.

I felt that my participation in the program heightened my own consciousness about my exercise and dietary requirements. I think I am healthier because I took part in this program. Thanks for asking me to take part in this.

Need to tell soldiers how they might locally shop for further information. For example: if the interest in this web site stimulated interest in visiting a nutritionist,on a regular basis, it would be helpful to know how to shop for a qualified R.D., what to expect, how much to pay, etc. I would add the same comments for other health professionals. For example, a physiologist who could perform a proper stress test; a qualified strength trainer, a qualified massage therapist, etc., etc. Overall it was fun to participate, hope to see more tailored programs like this-thanks, MAJ Sigrist!

You might have an advanced section for those who already have the basics. More in depth information on exercise. Thanks for your efforts on our behalf. Good luck.

I enjoyed being a participant and found your web site very informative. Sorry I was late sometimes. Been too busy.

The point of the program is to encourgage improved health through better diet and exercise. I found the program successful in that regard. Best wishes on being hooded at Colorado.

There appeared to be redundancy every month with respect to diatary needs i.e fruits and vegetables, exercise etc. Eating habits are related to an individuals emotional state, self-esteem and other physicological factors. Would like to see some emphasis on cognative pyschology in the area of Habits, Attitudes, Beliefs and Expectations. How you feel about yourself is directly related to how well you manage your health. Lou Tice a renound consultant on interpersonal development has based his program on the fact that "permenant and lasting change starts on the inside and works its way out". Most people understand this concept but can't put all the psychlogical tools together to find true interpersonal peace and happiness. Start on the inside

and everything else will come together.

This program has -- so far -- been of great benefit to me. It has reinforced the commitment I made back at the first resident course and provided reminders to take care of myself. It has kept me focused on health and channeled me into my workplace (The Pentagon) "Fit to Win" program. My cholesterol is down, hypertension & arrythmia under treatment or control.
I think that additional/increase in-text links would be useful to most readers -- for instance, a battery of fast-food or restaurant nutrition sites to allow users to "see for themselves" immediately just how much damage a "Bloomin' Onion" REALLY does to your health...

Program was not always user friendly - at least, from perspective of doing from overseas computer.

Design more like weight watchers e-tools. Where receipes, information on exercise and nutrition, encouragement/inspirational SHORT tips which would all pop up on your computer screen at random times. More visual graphics - have a picture of a healthy dish and the receipe. Tailor things specifically for me. If I tell you age, height, weight, eating habits, medical history tailor a program just for me. I would love to see something pop up on my computer that says, hey Alicia how are you doing on your specialized diet and exercise program am I making progress? am I discouraged?

Although I was one of the habitually latecomers, I really enjoyed this forum,and would be interested in some links to continue to pursue this kind of info, or better yet, will you continue to do this monthly?

The time I spent doing War College stuff was the time I normally spent taking care of myself. (xercice better diet vacation etc.)Once that is done,I will go back to a healthier lifestyle. I hope. Your web program kept good diet and exercise in my thoughts, but not my actions.

There were times when the program seemed very slow to me. I don't necessarily ALWAYS live in the fast lane, but my time is my most precious commodity, and other information formats are quicker for me.
I have done nutrition research and have spent many research hours on web sites devoted to nutrition and weight loss/management. This information was good, but not any better than other sites already provide. I can't really say I learned anything new and/or different at this site.
I knew what I should do when I started. I still know what I should do. My problem lies in finding a consistent time (between work, War college, family, and animals) to exercise regularly. I ride the horses 2-3 times/week, but other than that, exercise is the first thing to go when time gets really tight.
For people that don't have a background in nutrition or healthcare, I think the information was good and written at a level then can understand. For people with a higher baseline knowledge level, this was simplistic. I don't think it's unreasonable to assume that high level leaders have done some significant digging into nutrition & exercise issues over their 20 year army career to this point.

Many of the the health tips were so helpful that I printed them. It would be even better if they were in a printer friendly form without the graphics - they tended to use up lots of ink and take a longer time to print at home. I hope you got some useful data from us. Good luck.

A very fine program. I have been health conscious for my entire adult life, but the program assisted me in providing "focus" to what has frequently been a sincere, but haphazard approach. Lori is to be congratulated on her efforts. I would postulate that my career in the Marine Corps has made me more aware than many of my contemporaries in other services (he said, at the risk of being accused of institutional prejudice...). But the tips she has laid out for the modern military leader can close the gaps-- perceived or otherwise.
Thanks for allowing me to participate in the program.

Focused my attention of some important information

I recommend some mention of the value of supplements such as vitamins, protein powder, and herbal remedies.

This information reinforced my in-house Pentagon "Fit-to-Win" active program.

This program reinforced the effort begun at the first residence course & encouraged me to participate more fully in physical fitness programs at work and at home.