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Applying the transtheoretical model to promote greater fruit and vegetable consumption: a successful approach to maintaining behavioral change

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APPLYING THE TRANSTHEORETICAL MODEL TO PROMOTE GREATER FRUIT AND VEGETABLE CONSUMPTION: A SUCCESSFUL APPROACH TO MAINTAINING BEHAVIORAL CHANGE

A Dissertation

Submitted to the Graduate Faculty of the Louisiana State University and Agricultural and Mechanical College in partial fulfillment of the requirements for the degree of Doctor of Philosophy

in

The School of Human Ecology

by

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B.S., Jordan University of Science and Technology, 1997
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August 2004
DEDICATION

With great pride I dedicate this dissertation to my parents, Mr. and Mrs. Bawadi, who provided me with unending love and support throughout my life, you bestowed upon me so many gifts, including a love for learning.
ACKNOWLEDGMENTS

First of all, I would like to thank God “Allah”, the most gracious and the most merciful, for the strength, courage, and help He has given me in finding my own path over the past years. Many people supported me during the completion of this dissertation with criticism, helpful assistance and references. This dissertation would have never been possible without them. I would like to first thank Dr. Michael Keenan for his guidance and encouragement. He was a wonderful supervisor whose assistance and motivation were greatly appreciated. I owe appreciation and sincerest thanks to my co-advisor, Dr. Georgianna Tuuri, whose critical eye and watchful guidance contributed greatly to my research. Deep thanks and appreciation are not enough to express my gratitude toward my advisory committee members including Dr. Hugh-Jones, Dr. Sarah Pierce, Dr. Lynn LaMotte, Dr. Maren Hegsted, Dr. Heli Roy, and Dr. Joan King. I would like to thank all of them for the support and professional insight they provided at each step of the process. Working with the entire committee has been a quality professional and educational experience. My appreciation is also extended to Dr. William Richardson, the chancellor of the LSU Agricultural Center, and Dr. Rosalie Bivin, the assistant vice chancellor, for the great help they offered in distributing the survey and sending reminders through their personal emails. The cover letter they wrote and signed had a great impact on increasing the response rate for the survey. Special thanks to all of the AgCenter employees for volunteering in this research and who were very committed and responsible. I enjoyed working with them; they made my research FUN. I owe thanks to Mr. Dewey Coulon, the department’s computer analyst for the great help he offered in developing the on-line survey. I would like to thank all the staff of the Jordan University of Science and
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ABSTRACT

The purpose of this study was to investigate the response of participants in the first three Stages of Change (SOC) to a preparation stage-tailored intervention to increase fruit and vegetable (F&V) consumption. An on-line survey was delivered to 400 university employees, and included questionnaires about their demographic information, SOC, self efficacy (SE), and decisional balance (DB). One hundred fifty six (39%) responded to the survey. A total of 40 were selected from the first three stages, precontemplation (PC), contemplation (C), and preparation (P), and were assigned into two groups (PC/C and P) with consideration to the best possible matching in age, gender, income, education, and smoking status. Employees in both groups received the same intervention which was composed of four 1-hour sessions given over four consecutive weeks. Outcomes (F&V, SOC, SE, and DB) were measured at every session, and were also measured at weeks 5, 6, and 20 following the intervention.

At baseline (the response to the survey), the majority of the 400 employees were in the contemplation and the maintenance stages (34.9 and 34.3% respectively). Most of them reported positive perception and self confidence of consuming 5 servings of F&V everyday. Employees who were greater than 50 years old and held a PhD degree were more likely to consume five servings of F&V every day. During the intervention and until week 5, all employees increased their F&V, SE and DB and moved an advanced along SOC. However, employees in the PC/C group failed to maintain the change after week 5, and relapsed back to the baseline measures. The repeated measure MANOVA revealed a statistically significant interaction between the intervention and time which suggests that the intervention had a different effect on the employees in the two groups.
(i.e., relapse for the PC/C group and maintenance of the P group). These results suggest that individuals who receive intervention not matching their SOC are at higher risk to relapse. Stage-tailored interventions may be more cost-effective when delivered to the appropriate individuals.
CHAPTER 1

INTRODUCTION

The trans-theoretical model (TTM) of behavior change, offers a relatively new approach for examining how and why people change their behaviors. It was developed by Dr. James Prochaska and his colleagues in 1982 (Prochaska et al., 1994a), and proposes that the behavioral change process consists of five discrete and sequential stages. The TTM has been used to develop many programs designed to improve health including smoking cessation, overcoming alcohol and drug abuse, eating disorders, and panic disorders (Prochaska et al., 1994b). A primary reason for the success of the model is that it does not treat subjects all the same way; rather, it takes into consideration the readiness of the subjects to adopt the new behavior. It has been shown that successful behavioral change goes through a series of stages. The stages that have been categorized in the behavioral change process include pre-contemplation, contemplation, preparation, action, and maintenance (Prochaska et al., 1994a). The model assumes that individuals in the stage closest to the action stage change their behaviors faster than those farther away. The model has been tested with smoking and other addictive behaviors, information linking success of the TTM with changing dietary habits is limited. According to cross-sectional studies, the TTM appeared useful in placing individuals into different stages of change toward higher fruit and vegetable (F&V) consumption. However, there is not enough knowledge available about how people change their dietary behaviors or the response of individuals in different stages who receive nutrition intervention.

Objectives

The study included two projects with the following objectives:
Project 1: Participants’ On-line Survey

1. To evaluate the F&V intake of a group of individuals employed by a major university.

2. To assess the employees’ current stage of change (SOC), self efficacy (SE), and decisional balance (DB) toward consuming 5 or more servings of F&V daily.

3. To determine the employees’ demographic and social factors that might be associated with their F&V intake.

Project 2: Preparation Stage- Based Intervention Program for Employees in the Pre-contemplation and Contemplation Stages Combined, as Compared to the Preparation Stage

The objective of this project was to test the assumption that if a preparation-stage-oriented intervention is used, individuals in the preparation stage will have a faster rate of change, and that they will maintain that change of consuming five or more servings of F&V every day when compared to individuals in the pre-contemplation and contemplation stages combined.

Limitations

1. The data gathered from the survey questionnaire were based upon subjective assessments. Participants’ reported their F&V consumption, and answered questions pertaining to their SE to adopt a change, and their SOC. It was not possible to assess the truthfulness of the participants’ self-report.

2. There is an inherent risk in attempting to generalize the results to the U.S. population because the demographic factors of the sample in the two projects may not be representative of the total population. The employees who responded to the survey
were predominantly over 40 years old, were Caucasian, had incomes above $50,000, and possessed either a PhD or Masters Degree. Therefore, there could have been some level of age, ethnicity, income, and education bias in the responses. These limitations mean that the findings from this university employee population cannot be conclusively generalized to the attitudes and behavioral change patterns of the total U.S population.

3. The study was limited by the fact that the questionnaire was distributed as an on-line survey. All of the employees had email addresses; however, not all of them had internet access or had enough computer knowledge to check their emails or complete an on-line survey. Moreover, it was hard to identify if the same person submitted two surveys especially if submitted under different names.

4. The sample size in the second study, which was a longitudinal study, may be small due to possible attrition. As with any follow up study, missing data may have an impact on the data analysis and statistical inferences.

Assumptions

This study must be reviewed in the context of the following assumptions.

1. The data collected and analyzed in the study are assumed to be an accurate representation of the participant’s F&V intake.

2. Instruments used in the study, including the scales and questionnaires used to determine SOC, decisional balance DB, and SE, were valid and reliable.

3. The participants were truthful in their responses.

4. The research sample was a representative, and homogenous sample of employees of a major university.
Definitions

1. The trans-theoretical model (TTM) provides a framework for understanding how people decide to change their behavior and is conceptualized in terms of several major dimensions (Fisher, 1996). The core concept of the model is the SOC, and includes other components such as the processes of change, DB, and SE.

2. The SOC concept proposes that not all individuals are ready, or at least are not at the same level of readiness, to adopt the change; consequently individuals should be treated differently from each other, that is, according to the SOC in which they exist (Marcus et al., 1992).

Five stages of change have been identified based on the stages that “self-changers” pass through. The five stages of change include the following:

- Pre-contemplation stage: state in which individuals are unaware of a problem and have no desire to change.

- Contemplation stage: state in which individuals are aware of a problem and have an intention to change the behavior in the future.

- Preparation stage: state in which individuals make plans to change their behaviors, and are ready to adopt the change.

- Action stage: state in which individuals put into practice the plans they have made during the preparation stage.

- Maintenance: state in which individuals are consistent in practicing a new behavior for at least six months.

The utilization of the SOC concept is the primary difference between TTM and
other approaches including the group counseling approach that targets a behavioral change problem.

3. Self efficacy: The self-assurance to make and maintain a behavioral change and to avoid a relapse. One’s SE has a linear and positive relationship with one’s SOC; as one moves to higher stages, one’s SE increases (Laforge et al., 1994).

4. Decisional balance: The balance between the perceived advantages of adopting a new behavior (the pros), and the perceived disadvantages or barriers to adopting of a new behavior (the cons). Once the pros outweigh the cons, movement from the pre-action stages to the action stage is expected. As an individual moves from one stage to another, the pros for the new behavior are expected to increase and the cons are expected to decrease (Prochaska et al., 1994b).

5. The processes of change: The techniques used to help individuals move from one stage to the other until they completely adopt the new behavior. The processes of change include consciousness raising, dramatic relief, self-reevaluation, environmental reevaluation, self-liberation, helping relationships, stimulus control, social liberation, and rewarding (Marcus et al., 1992). Because all individuals are not at the same SOC, different processes will be more useful for individuals in different stages.

**Justifications**

The high prevalence of diet-associated chronic diseases in the United States, is a concern for health professionals. Epidemiological studies have shown strong negative relationships between F&V consumption and obesity (p < 0.05) (Rolls, 2000), diabetes (Meyer et al., 2000) (p < 0.05), cardiovascular diseases (Joshipura et al., 2001) (p <
0.05), and many types of cancers (Terry et al., 2001a) ($p < 0.05$). The Third National Health and Nutrition Examination Survey (NHANES III) found that heart disease, cancer, and diabetes accounted for 53.2% of all U.S. deaths in 1999 (CDC, 2002a).

Because the treatment for such diseases is sometimes not available, prohibitively expensive or not effective, prevention is the preferred option to control the increase of chronic diseases. The prevalence of many chronic diseases is associated with poor nutrition including high saturated fat intake, high cholesterol intake, high sodium intake, and low fiber intake. In essence, poor nutrition is considered by most health professionals as a diet that is low in fruits and vegetables, and whole grains.

Louisiana, in particular, has a special interest in improving the diets of its citizens because of the higher prevalence of chronic diseases when compared to the National average. Louisiana has the highest rate of death due to diabetes (CDC, 2002e), the second-highest rate of death due to cancer, and the fifth-highest rate of death due to heart disease (CDC, 2002e). A contributing factor to these dramatic numbers is the poor eating habits of the people in Louisiana, including diets that are low in fruits and vegetables. Despite the demonstrated benefits of F&V consumption, only 23.1% of Americans eat the recommended intake of F&V of 5 servings a day (CDC, 2002d). Among the 50 states, Louisiana has the highest percentage of adults who consume less than 5 servings of F&V (CDC, 2002d) daily. Despite efforts to promote healthy nutrition, the situation in Louisiana is not improving. In 1996, only 18% of Louisiana adults reported eating 5 or more F&V each day, only 17.3% in 1998, and only 15.8% in 2000 (CDC, 2002d).

An understanding of Prochaska’s theory might help to explain the lack of success in increasing F&V consumption among Louisiana adults. Prochaska proposed in his
model that people have different stages to adopt any change, and the appropriate process or technique should be used to target behavioral change for people in a certain stage. Moreover, Porchaska states that the stages are linear; meaning that individuals in the preparation stage are in a more advanced stage than those in the pre-contemplation or contemplation stages. Consequently, they are more ready and need less time and effort to move to the next stage and adopt the new behavior.

If Prochaska was correct with this argument, this might help to explain why past intervention efforts have not been successful despite the fact that much effort, money, and other resources have been invested. Perhaps interventions have not been based on the SOC for the targeted individual, but have been designed to be effective only for those participants in the preparation stage. Our hypothesis was individuals in the preparation stage will change faster and maintain this change better than those in the precontemplation/contemplation stages. To test this hypothesis we developed a uniform intervention based on the preparation stage, but given to individuals in the precontemplation, contemplation, and preparation stages. Rate of change was measured for all participants during the intervention and as a short-term and long-term follow up. If our hypothesis is not rejected, more cost effective interventions can be designed by targeting the individuals who are ready to change. Further, if the goal is to get the highest possible response rate from an intervention, intervention strategy guidelines can be provided based on each SOC to promote the movement of individuals between stages.

Most of the studies that have used the TTM for dietary behavior modification have examined the efficiency of the model in fat intake reduction and obesity (Suris et al., 1998; Logue et al., 2000; Sutton et al., 2003). Very few have applied the model to
promote greater F&V consumption (Lafarge et al., 1994; Brug et al., 1997; Campbell et al., 1998; Campbell et al., 1999; Brinley et al., 2001). The majority of these studies were descriptive rather than interventional.

The rationale for this study is based on the following points:

1. It used a unique approach to investigate the process of change as well as the net change before and after an intervention to increase F&V consumption

2. Although descriptive research demonstrates that there is an association between SOC and SE and the consumption of fruits and vegetables, to the best of our knowledge, no study has compared the rate of change of the individuals in different stages. Further none has identified those individuals who are most ready to adopt the dietary behavioral change.

3. Long-term health behavior maintenance remains a challenge for individuals and health behavior interventionists. In addition, Prochaska stressed that there is a high risk of relapse if the wrong process is used, therefore, this project examined the maintenance of 5-a-day F&V for a four-month period follow up after the intervention. This was done in order to measure the maintenance of the behavior. Beyond the very few interventional studies, researchers still lack much information on the risk of relapse for individuals who were subjected to non stage-based intervention.
CHAPTER 2
LITERATURE REVIEW

Fruits and Vegetables in Health and Disease

There is strong evidence supporting an inverse relationship between fruit and vegetable (F&V) consumption and the prevalence of chronic diseases, particularly, cancer (Jansen, 2001), diabetes (Sargeant et al. 2001), obesity (McCrory, 2000), and cardiovascular disease (Joshipura et al. 2001). Among the many benefits of fruits and vegetables, is the uniqueness of their high “potential antioxidant capacity.” Moreover, the high fiber and water content, and the zero to low fat content- except for avocados, olives (these two are high in unsaturated fat), and coconut (high in saturated fat)- add to the importance of F&V in terms of their contribution to disease prevention and treatment.

The potential benefit of F&V consumption is attributed to their high content of vitamins, minerals, phytochemicals, and fiber. When functioning as antioxidants, antibacterials, and antivirals, phytochemicals are biologically active compounds present in fruits, vegetables, and grains, and may have a synergistic mechanism of action. Phytochemicals have been suggested to have a consequential role in enhancing health through their effect on the alteration of detoxification enzymes, stimulation of the immune system, reduction of platelet aggregation, modulation of cholesterol synthesis and hormone metabolism, and reduction of blood pressure (Lampe, 1999). Although studies examining the effect of some fruits or vegetables rich in a specific phytochemical (ex. β- carotene ) have shown promising results, very few have succeeded in demonstrating this relation when a sole β-carotene supplement was used. This contradiction might confirm the fact of the synergistic effect of more than 40 classes of
phytochemicals found in F&V. Because it is so difficult, if not impossible, for any multinutrient supplement pill to contain all phytochemicals present in fruits and vegetables, health professionals no longer recommend the use of supplements, for the general population, as an alternative to F&V (Fletcher, 2002).

**F&V and Cancer**

According to the statistics released by the Centers for Disease Control (CDC) in 1999, cancer accounted for 23% of all deaths in the United States (CDCe, 2002). Louisiana had the second-highest cancer death rate among all the states (CDCe, 2002). The relationship between low F&V consumption and the increased risk for all types of cancers is under investigation (Terry et al. 2001a).

A strong association has been found between low F&V consumption and the high risk of lung cancer (Jansen, 2001). Neuhouser and colleagues (2003) examined the effect of F&V compounds on the risk of lung cancer. Food frequency questionnaires of 14,120 participants were used to examine associations between diet and lung cancer risk. Participants were followed for 12 years (1989-2001). After the follow up period, 742 participants developed lung cancer. Participants in the highest quintile of total fruit consumption had less relative risk of lung cancer than participants in the lowest quintile of total fruit consumption (RR= 0.56, p= .003), when controlled for smoking. A study conducted by Holick et al. (2002) showed similar results with decreased relative risk (RR) of lung cancer for participants in the highest quintile of total fruit consumption versus participants in the lowest quintile of total fruit consumption (RR= 0.73, p =0.05). High F&V consumption has also been associated with a lower risk of breast cancer (Smith-Warner, 2001). A latent effect of cruciferous vegetables in the reduction of risk of
breast cancer in post-menopausal women has been demonstrated. In a case-control study, post-menopausal women who had 1-2 servings of cruciferous vegetables per day reduced their risk by 40-50% (Terry et al. 2001b). Similar findings were reported by Willett (2000). Moreover, it was found that intake of F&V is associated with an increased survival in women diagnosed with breast cancer. In a review study, Rock and Demark-Wahnefried (2002) documented five cohort studies which found this same relationship ($p \leq 0.05$). Another common type of cancer associated with low F&V consumption is colorectal cancer. Many case control studies have shown lower risk of colorectal cancer with higher consumption of F&V (Steinmetz and Potter 1996). Smith-Warner and colleagues (2002) found that increased F&V intake is associated with decreased recurrence of adenomatous polyps, the precursor lesions for colorectal cancer, in the large bowel. The odds ratio for developing adenoma in women in the highest quintile of fruit consumption versus women in the lowest quintile was 0.50. Similar results were documented by Lanza et al. (2001). Despite the lack of clinical control studies, most of the epidemiological studies have shown a relationship between F&V consumption and a lower risk of different types of cancer. Nevertheless, there is a need for clinical control studies to show a cause-effect relationship.

**F&V and Diabetes**

Diabetes, a group of diseases characterized by chronic abnormally high blood glucose levels, is the sixth greatest cause of death in the United States, with an estimated total direct and indirect cost of $100 billion a year (CDC, 2002c). Louisiana has the highest rate of death due to diabetes compared to the other 49 states. The association between higher F&V consumption and lower risk of diabetes has been documented. In a
cohort study conducted on 9,665 participants to examine the association between F&V consumption with the incidence of diabetes, participants were followed for about 20 years. The mean daily intake of F&V, as well as the percentage of participants consuming five or more F&V per day, was lower among persons who developed diabetes than among persons who remained free of this disease ($p < 0.001$) after controlling for age, race, cigarette smoking, systolic blood pressure, use of antihypertensive medication, serum cholesterol concentration, body mass index, exercise, and alcohol consumption (Ford and Mokdad, 2001).

In a cohort study conducted on 35,988 participants, researchers examined the effect of dietary fiber on the development of type 2 diabetes. After 6 years, a follow up study showed that 1141 participants had developed diabetes. Total fiber intake was strongly and inversely associated with the incidence of diabetes ($p = 0.0089$); however, F&V consumption was not related to the development of the disease (Meyer et al., 2000).

Williams and coworkers conducted a cross-sectional study to examine the relationship between vegetable consumption and the risk of diabetes. An oral glucose tolerance test, as a measure for diabetes risk, was conducted for 1,122 participants aged 40-64. After controlling for age, frequent consumption of vegetables was inversely associated with the risk of having impaired glucose tolerance with an odds ratio of 0.16 ($p = 0.05$) (Williams et al., 1999).

In a cross-sectional study conducted with 2,678 men and 3,318 women not known to have diabetes, a difference ($p = 0.046$) was found between the means of glycosylated hemoglobin (HbA1C) for individuals who reported frequent consumption of F&V (5.34% ± 0.67) and for those who reported that they “seldom or never eat fruits and vegetables”
Reynolds and co-workers found similar results in a 6-month intervention study conducted to test the effect of lifestyle change including higher consumption of F&V had on the blood glucose control for patients with type 2-diabetes. Glycosylated hemoglobin was reduced significantly for patients in the intervention group as compared to the placebo group (Reynolds et al., 2002).

In a study conducted to investigate the relationship between glycosylated hemoglobin levels and the source or amount of dietary carbohydrate, Buyken and his colleagues (2000) studied carbohydrate intake. This included total carbohydrate, and carbohydrate from cereals, fruits, vegetables, milk, and potato carbohydrate, for 2,084 adults with type-1 diabetes. Participants with an increased intake of total and potato carbohydrate had higher levels of HbA1c; however, participants with an increased intake of vegetable carbohydrate had lower HbA1c. Consumption of cereal and fruit carbohydrates was not related to HbA1c (Buyken et al., 2000).

**F&V and Heart Disease**

Heart disease is another common, life-threatening disease in the United States. In 1999, heart disease accounted for 30% of all deaths in the United States (CDC, 2002f). In the same year, among the 50 states, Louisiana had the fifth highest rate of death due to heart disease. Strong evidence is now available to support a relationship between higher F&V intake and a lower rate of heart disease. In a cohort study conducted on 84,251 women aged 34-59 years, and 42,148 men aged 40-75 years, Joshipura and colleagues (2001) followed the participants for 8-14 years. After controlling for confounding factors associated with increased risk of heart disease, lower relative risk (RR=0.80) was found for participants in the highest quintile of F&V intake as compared to those in the lowest
quintile \( (p = 0.05) \). Moreover, it was shown that an increase in one serving of either fruits or vegetables per day was associated with lowering the risk of heart disease by 4\% \( (p=0.01) \) (Joshipura et al. 2001).

A similar prospective study was undertaken on 39,876 women who were followed for five years for incidence of nonfatal myocardial infarction (MI). Data about F&V consumption were collected using a detailed food-frequency questionnaire. After controlling for age, treatment status, and smoking, researchers observed lower relative risk \( (RR=0.51) \) of cardiovascular disease for participants in the highest quintile of F&V consumption as compared with those in the lowest quintile \( (RR=0.92), p = 0.001 \) (Liu et al., 2000). A lower relative risk with higher consumption of F&V was also documented by Rissanen et al. (2003), Bazzano et al. (2002), and by Law and Morris (1999).

The potential antioxidant effect of F&V is suggested to be the main reason behind the relationship between higher F&V consumption and the lower risk of heart disease. A dose-dependent relationship was observed between the frequency of F&V consumption and the antioxidant concentrations in the blood (Strain, 2000). Chopra and coworkers conducted a study to determine the effect of increased intake of 300-400 g of vegetables on LDL oxidation. Thirty-four healthy females, smokers and nonsmokers, followed a depletion period of eight days and then were supplemented with green and red vegetables (carotene-, lutein-, and lycopene-rich) for 7 days. It was shown that the addition of the lycopene-rich vegetables \( (> 40 \text{ mg/day}) \) to the diet was associated with less LDL oxidation in the group of non-smoking women (Chopra et al. 2000).
F&V and Obesity

Obesity can lead to life threatening health problems and is also associated with low F&V intake. In the year 2000, the total estimated cost ascribed for overweight and obesity in the United States was $117 billion (CDC, 2002b). Obesity is responsible for 300,000 premature deaths every year as it is associated with an increased prevalence of cancer, diabetes, and heart disease. In 1999, Louisiana, among the 50 states, had the sixth highest percentage of overweight adults (CDC, 2002e).

Many studies have examined the association between low F&V consumption and obesity. Sahota and colleagues conducted a study with 634 children aged 7-11 years to assess the effect of greater F&V consumption on risk for obesity. Fruit consumption, measured by 24-hour recall, was significantly lower in obese children (Sahota et al., 2001). In a clinical control study, researchers compared two regimens to target weight loss in obese participants. The two regimens used were 1) to either reduce the intake of high fat/ high sugar food or 2) to increase F&V consumption. Participants in the increased F&V group showed significantly greater weight loss than participants in the decreased high-fat/high-sugar group ($p \leq 0.05$) (Epstein et al., 2001).

The relationship between higher F&V consumption and lower risk of obesity could be explained by the low energy density of fruits and vegetables, which also have a high fiber and water content. McCrory and coworkers found that habitual consumption of high-energy, dense loads significantly contributed to a high consumption of energy (McCrory, 2000), whereas vegetables were negatively associated with energy consumption. Energy dense foods, unlike fruits and vegetables, have been shown to be “foods that facilitate the over-consumption of fat”; and so, increase the risk of obesity
(Rolls, 2000). The unique properties of dietary fiber underscore the relationship between F&V consumption and obesity. Dietary fibers may also regulate energy intake because of their bulking effect. This enhances satiety, because of a viscosity-producing effect and reduces fat absorption (Burton-Freeman, 2000); however, results from research conducted to examine this effect of fibers are still equivocal and further research is recommended (USDA, 2004)

Despite all the demonstrated benefits of F&V on improving health and reducing the economic burden of chronic disease, Americans have not, as yet, adopted the minimum recommendations to consume five servings of F&V per day. In the year 2000, 75.6% of American adults reported a consumption of less than 5 servings of F&V per day (CDC, 2002a). Among the 50 states, Louisiana had the highest number of adults, 84%, who reported less than 5 servings of F&V per day (CDC, 2002e).

In response to the growing burden of chronic diseases associated with a low intake of fruits and vegetables, and given that prevention is the best method to control premature chronic diseases, the need for nutrition intervention programs has been recognized. The “5 A Day for Better Health” program is a national nutrition program, sponsored by the National Cancer Institute (NCI) and a group of nonfederal organizations, which encourages Americans to increase their F&V consumption to five or more servings a day. Although the “5 A day for better health” program was initiated over 16 years ago (Heimendinger, 1996), the national average for individuals who are consuming the recommended amounts of F&V is not improving; conversely, in some states such as Louisiana, F&V consumption is decreasing. In 1996 the percentage of adults in Louisiana who were consuming 5 servings of fruits and vegetable a day was
18% and dropped to 17.3% in 1998 and 15.8% in 2000 (CDC, 2002d). The lack of success in getting Americans to increase their F&V intake has forced health professionals to seek new approaches such as the TTM model to target nutrition behavioral change.

**Transtheoretical Model (TTM) of Behavioral Change**

**Definition and History of TTM**

The transtheoretical model (TTM) of behavior change is a new approach, originated by Dr. James Prochaska and his colleagues in 1982, for targeting behavioral problems (Prochaska et al., 1994b). The model was derived from an extensive examination of a large number of successful self-changers (Fisher, 1996). The core component of the model is the stage of change (SOC), with other components such as the process of change, decisional balance (DB), and self efficacy (SE) being the outer frame of the model. Dr. Prochaska and his colleagues intensively studied stages and process of change among individuals who had successfully quit smoking (Prochaska et al., 1994a). Many studies have shown the validity of TTM in smoking cessation and other addiction problems (Prochaska et al., 1994a).

**Applications of TTM in Dietary Behavioral Problems**

The TTM model was suggested as an alternative for group, untailored, counseling programs because its efficacy had been shown with other health behavioral problems (Prochaska et al., 1994a). The difference between TTM and the group counseling approach originates from the concept that the group counseling approach assumes that all individuals are ready to adopt the behavioral change. TTM does not
make that assumption; instead TTM classifies people into different stages of change based on their readiness to adopt the change and suggests different interventional techniques based on the individuals’ stages. Other constructs for TTM are DB (the balance between the perceived pros and cons to adopting the new behavior) and SE (the self-assurance to initiate and to maintain the behavioral change and to avoid the relapse).

The most common application for TTM in dietary behavioral change has been to intervene in the problem of high fat intake and overeating. Most of the intervention studies conducted on fat intake reduction have shown promising results. It has been shown that dietary fat reduction nutrition education programs based on SOC were more effective than general nutrition education (Brug and van Assema 2000). Finckenor and Byrd-Bredbenner (2000) conducted an intervention study to test the ability of TTM to enhance fat reduction in a group of participants. They found that all participants in the pre-action stages (pre-contemplation, contemplation, and preparation) reduced their fat intake as a result of the intervention. However, the follow-up test, conducted one year later, showed that differences were maintained only in the group who received tailored intervention, but not the other group who received general nutrition education. (Finckenor and Byrd-Bredbenner 2000). The model has also been applied to dietary behavioral change to promote more F&V consumption (Suris et al., 1998; Logue et al., 2000; Sutton et al., 2003). However, most of the studies are descriptive and cross-sectional and are not interventional trials (Laforge et al., 1994; Brug et al., 1997; Campbell et al., 1998; Campbell et al., 1999; Brinley et al., 2001).
Descriptive Studies

Most of the studies that have been conducted were aimed at classifying participants into the appropriate stage of dietary behavioral change of increasing F&V intake. The psychosocial factors, including SOC and their association with F&V consumption, have been intensively studied. Laforge et al. (1994) conducted a telephone survey with 407 participants to study psychosocial factors, as related to the SOC, which could influence F&V consumption. They found that more than two-thirds of participants were in the first two stages (pre-contemplation and contemplation).

Research has suggested that gender and education may be associated with F&V consumption and one’s SOC. Van Duyn and co-workers (1998) found that the percentage of males in the pre-contemplation stage (46.3%) is significantly higher when compared to females (33.3%). They also found that being in the maintenance stage was associated with being female and having a formal education. In a second study, however, Ling and Horwath (2000) did not find any significant association between gender and education and one’s SOC.

Van Duyn and colleagues found that SOC for F&V consumption was associated with other demographic factors, in addition to gender and education, including age, race, and income. They found that the percentage of older participants, (over 50 years of age) who were in the maintenance stage was higher than that for younger individuals (p<0.001). The percentage of white Americans in the maintenance stage was higher than that for African Americans and Hispanics (p<0.001). Income was positively associated with the SOC. It has been shown that individuals in the pre-action stages have less
income, as measured by the Poverty Income ratio (PIR) and adjusted for household size, than those in the action and the maintenance stages, \( p < 0.001 \) (Van-Duyn et al., 1998).

Lifestyle and psychosocial factors that seem to have an association with one’s SOC for F&V consumption include non smoking status, preferring the taste of fruits and vegetables, and having a habit of eating fruits and vegetables. In a study by Sorensen et al., (1998), the percentage of non-smokers in the maintenance stage was greater than the percentage of current smokers (93.6 vs 6.2%), \( p = 0.001 \). Similar association between smoking status and one’s SOC for increased F&V intake was found by Van Duyn and co-workers (1998). They also found that having a childhood habit of F&V consumption, and liking the taste of F&V were also positively associated with the SOC (\( p < 0.001 \)) (Van Duyn et al. 1998).

As expected, SOC also has been reported to have a positive association with participants’ self-reported F&V intake (Laforge et al. 1994). Ling and Horwath (2000) also observed an association between F&V self-reporting and SOC. They found that mean reported intake of F&V was higher for participants in the maintenance and action stages when compared to the participants who were in the pre-action stages. Fruit and vegetable consumption was measured using both a food frequency questionnaire and a 24-hour recall (Ling and Horwath 2000). A regression analysis in the Van Duyn et al. study (1998) showed that one’s SOC was a good predictor for F&V consumption such that it was able to explain 17% of the total variation in F&V consumption by participants (Van Duyn et al. 1998).
Constructs of TTM, in addition to the SOC, have also been studied. These include DB and SE. Ma et al. (2002) conducted a cross-sectional study to examine the relation between DB, SE, and F&V intake. The researchers studied 1,545 participants that were recruited from 10 states using telephone interviews and U.S. postal mail questionnaires. The expected pattern of a shift in the participants’ DB was associated with movement across the stages of change. The pros’ scores in the maintenance stage were significantly higher when compared to those in the pre-contemplation stage, and the cons’ scores in the maintenance stage were lower when compared to those in the pre-contemplation and contemplation stages ($p \leq 0.05$).

A positive, linear trend was found between increases in both one’s SE and SOC for increased F&V consumption; participants reported being more confident of their ability to initiate and to maintain the behavioral change of increased F&V consumption as they moved upward through the stages ($p \leq 0.05$) (MA et al. 2002). The positive association between SE and one’s SOC found by Ma et al (2000) was also seen in prior research. Glanz et al (1994) classified their participants into three levels of SE: high, medium, and low. The majority of the participants in the contemplation stage showed a level of low SE, and the majority of participants in the maintenance stage showed a level of high SE ($p < 0.001$) (Glanz et al. 1994).

**Clinical Control Trials**

There are very few studies that did more than simply correlate the SOC of subjects with their F&V consumption. Havas et al. (2000) carried out an intervention study aimed at increasing F&V consumption at 16 Women, Infants, and Children (WIC).
sites. Eight sites received the intervention and eight served as controls. Women in the treatment group received nutrition education based on the TTM framework. The education was composed of mailed letters that were tailored to each participant’s SOC. Three sessions of nutrition education, and printed materials (e.g., recipes, F&V guidebook) were sent by mail. Women in the control group received the normal WIC program nutrition education. A two month post-intervention follow-up showed that the women in the intervention group had a higher mean increment in their F&V consumption (0.56± .11 servings) as compared to the women in the control group (0.13± .17 servings, p=0.002) (Havas et al. 2000).

Siero et al. (2000) applied the TTM to target dietary behavioral change in a group of participants with high risk of cardiovascular disease (CVD). The objective of the study was to compare two approaches of nutrition intervention: a group nutrition education program versus a tailored nutrition education program based on the participants’ SOC. The aim of both intervention programs was to promote an increase in F&V consumption. The participants were randomly assigned to 3 groups. The participants in group 1 (n= 49) received leaflets sent to them through the U.S mail. The participants in group 2 (n= 49) received health education in a group-oriented context. The participants in group 3 (n=36) received the same education that was delivered to the participants in group 2 plus tailored education based on the participants’ measured SOC. The outcomes that were measured included any shift in the participants’ (a) SOC, (b) beliefs and attitudes toward high F&V consumption, (c) SE, and (d) actual F&V consumption. A shift in SOC from the preparation to the action stage was higher in both intervention groups (group 2 and 3) when compared to the control group (group 1) (p<
The results also showed that participants in the treatment groups had a more positive attitude toward F&V consumption. In terms of actual F&V consumption, both interventions resulted in a higher mean F&V intake (10% and 16% increase in consumption for group 2 and group 3, respectively) when compared to that of the control group (p < 0.01). The researchers attributed the unexpected result of having no statistical difference in any of the three outcomes between group 2 and group 3 to 1) the other interventional program delivered to group 2, and 2) the overlap between programs delivered to group 2 and group 3 (researchers used the same systematic sequence of information in the program delivered to group 2 that is used in TTM) (Siero et al. 2000).

Steptoe et al (2003) conducted a randomized controlled trial to measure the efficiency of behavioral counseling using the TTM for F&V consumption by low income adults. A sample of 271 men and women, aged 18-70 years, participated. Self-reported measures (F&V consumed) and biomarkers of F&V consumption (plasma beta-carotene, alpha- tocopherol, and ascorbic acid concentrations, and 24 hour urinary potassium excretion) were used to compare the intervention with the control group. Measurements were taken at the baseline, after eight weeks, and after 12 months. Participants in the control group received three 15-minute sessions given once a week that began immediately after the baseline measurements. The sessions emphasized the importance of increasing consumption of F&V and the beneficial bioactive compounds in fruits and vegetables. Participants in the intervention group received tailored intervention based on the participants’ SOC. After 12 months, consumption of F&V increased in the two groups (1.5 and 0.9 servings in the intervention and the control group respectively) as compared to the baseline measurement. However, the intervention group had a higher
increment ($p < 0.05$) with a mean difference of 0.6 portions. Similar results were observed in β-carotene concentration in that it increased in both groups, but the increment was greater in the intervention group with a mean difference of 0.16 µmol/l.

A similar study was conducted by Resnicow et al. in 2003 to examine if precontemplators are less likely to change when compared to those in the preparation stage. The authors studied the effect of three types of intervention on 861 participants who were randomly assigned to three groups; control, treatment 1, and treatment 2. Participants in the control group received "usual nutrition education.” Treatment 1 consisted of self-help intervention (video, brochures, and a cookbook), and one "telephone cue call” to help the participants using the tools of the self-help intervention. In addition, treatment 2 had an additional three counseling calls. Participants were asked to complete a pre- and a post-test questionnaire (one year apart). Variables measured included: SOC, F&V consumption, and SE. The results of the study showed that, for each treatment group, the mean change in all variables reported by the precontemplators was not significantly different than that reported by participants in the preparation group. The authors conducted only a single post-test assessment which was one year from the baseline. Collecting intermediate follow-up data might have helped in a better understanding of the process of change. Collecting more data points might have yielded different results. Another shortcoming of this study was the nature of the intervention. None of the intervention plans that were used were stage-tailored. The intervention was directed toward the pre-contemplation/contemplation stage, which might explain why pre-contemplators showed the greater change.


**Conclusion**

A high F&V intake is highly associated with a reduction in incidence of many chronic diseases. Clinical trials performed with single food components usually have not demonstrated the same benefits as consuming F&V, which highlights the need to eat F&V and not to rely on supplements of single nutrients or phytochemicals.

Despite all the benefits of F&V, including the positive health related outcomes, Americans are not, as yet, adopting the recommendations for fruit and vegetable intake. The TTM is a suggested alternative to a group nutrition counseling approach to initiate changes in diet choices. Most of the studies that have applied TTM to dietary behavioral change focused on fat intake reduction and obesity, whereas relatively few studies have been conducted on promoting F&V intake. Most of the available data about F&V consumption are from cross-sectional and descriptive studies. However, a limited number of clinical controlled studies have examined the effectiveness of TTM in promoting greater F&V consumption. None of these studies were conducted in Louisiana where 84.2% of the adults are consuming less than the daily-recommended intake of fruits and vegetables. Controlled trials are needed to provide stronger evidence about the potential benefits of TTM as a method to increase F&V intake.
CHAPTER 3

PARTICIPANTS’ ON-LINE SURVEY

The first project was a survey to assess fruit and vegetable (F&V) consumption and to measure the participants’ stage of change (SOC) toward greater consumption of fruits and vegetables. Appendix A shows the protocol used to conduct the study. The survey examined the Baton Rouge campus of LSU Agricultural Center employees’ reported consumption of F&V (Appendix B), their SOC (Appendix C), self efficacy (SE) (Appendix D), and decisional balance (DB) (Appendix E) toward daily consumption of 5 servings or more of fruits and vegetables. Participants were also asked to provide demographic information (Appendix F) that was suggested by the literature to be associated with greater F&V consumption. To help participants give a better estimation of their daily consumption of fruits and vegetables, a F&V estimation sheet was provided through a hyperlink attached to the F&V consumption questions. The link was titled as “Click here for more specific examples on a serving” (Appendix G).

Methods

Participants

All LSU-campus Agricultural Center employees were eligible to participate in the study. A link to the survey was electronically mailed to all LSU-campus AgCenter employees. In order to increase the participation response rate, the survey was accompanied by a cover letter from the Chancellor where he encouraged employees to participate (Appendix H). One week after sending the survey and the Chancellor’s letter,
a reminder signed by the Vice Chancellor (Appendix I) was sent with a hyperlink to the survey to encourage the employees who did not complete the survey to complete it.

The on-line survey was composed of three web pages (Appendix J). The first page was a cover letter signed by the researcher to explain the importance of the study (Appendix K). At the end of the cover letter page, the participants were directed to the consent form for completing the survey (Appendix L). Because the survey was on-line, participant’s physical signature was not obtained; rather, it was stated at the end of the consent form that “Filling the attached questionnaires will be considered your consent to participate.” The survey was attached to the consent form through a hyperlink. For confidentiality purposes, participants were given codes and the original contact information was available only to the researcher for use in project 2.

Design

The design for the first project was a cross-sectional, one shot case study design.

Demographic Information and Health Status

Data about the participants’ demographics and health conditions were collected using a multiple-choice questionnaire. The questionnaire included questions about age, gender, ethnicity, living situation, education, income, marital status, smoking status, and history of chronic diseases.

Fruit and vegetable Daily Consumption

The participants were provided with a detailed F&V serving size determination sheet. The sheet included different items of F&V that are available in most of Louisiana’s
markets. Participants were asked to estimate their average daily servings of F&V that were consumed at breakfast, lunch, dinner, and in between meals as snacks or deserts.

**Stage of Change (SOC)**

The participants’ SOC were assessed using five multiple choice questions adopted from the literature on F&V SOC assessment (Ma et al., 2002). Participants were asked to click on the statement that best described their status. Choices for the SOC questions were 1) I am not currently consuming 5 servings of F&V a day and I am not thinking of doing so in the coming 6 months, 2) I am not currently consuming 5 servings of F&V a day but I have thought about that, 3) I am not currently consuming 5 servings of F&V a day but I plan to do so within the next 6 months, 4) I am currently consuming 5 servings of F&V a day but I have only been doing so for less than six months, and 5) I am currently consuming 5 servings of F&V a day and I have been doing that for more than six months. Stages corresponding to the previously mentioned statements were pre-contemplation, contemplation, preparation, action, and maintenance, respectively.

**Self Efficacy (SE)**

The participants’ SE, the self-assurance to make and maintain a behavioral change and to avoid a relapse, was assessed using a five-item scale developed by Ma et al. (2002). The scale has been tested for validity and consistency. For each of the five items, the participants were asked to give a response from 1-5 indicating the confidence to maintain the behaviors of greater F&V consumption. The response of “1” was equal to “not at all confident” whereas “5” was equal to “very confident”. The summation of the responses for the five items was considered as the SE score.
**Decisional Balance (DB)**

A checklist of 10 pros and 10 cons for F&V consumption was used to assess the DB. Decisional Balance is the balance between the perceived advantages of adopting a new behavior (the pros), and the perceived disadvantages or barriers to adopting a new behavior (the cons). The checklist was adopted from the Ma et al. study (2002). Participants were asked to determine whether they agreed or disagreed with each particular pro and con when they made their decision about F&V consumption. For each pro, an “agree” answer was given a value of 1 and a “disagree” answer was given a value of zero, whereas for each con, an “agree” answer was given a value of -1 and a “disagree” answer was given a value of zero. The summation of all pros and cons was calculated as the DB score. Based on this coding, a zero score meant that the participant had equal pros and cons, whereas a negative score meant that the participant has more cons than pros, and a positive score meant that the pros outweighed the cons.

**Analysis**

The responses to the multiple-choice questions were coded for the purpose of data entry and analysis. Because targeted F&V intake was 5 or more servings every day, participants’ F&V intake was analyzed as a dichotomous variable of “less than 5 a day” or “5 or more a day.” To study the baseline characteristics of participants in the two intervention groups (preparation or pre-preparation), unadjusted frequencies and cross-tabulations of stages of change or F&V consumption with categorical demographic and psychosocial variables were computed. The chi-square test was used to test for independence. Self efficacy and DB scores were used as categorical variables rather than continuous variables. The full SE score was 25 (5 questions of 5 points each). The 5
question-summed scores were categorized in the following manner: “very low” if the score was 1-5, “low” if it was 6-10, “medium” if it was 11-15, “high” if it was 16-20, and “very high” if it was 21-25. Decisional balance was categorized as follows: “highly negative” if the total DB score was -10 to -6, “negative” if it was -5 to -1, “balanced” if the score was zero, “positive” if the score was 1 to 5, and “highly positive” if the score was 6 to 10. The lowest score was -10 reflecting participants who disagreed with all the pros and agreed with all the cons. The highest was 10 reflecting participants who agreed with all the pros and disagreed with all the cons.

The odds ratios obtained from logistic regression were used to identify the magnitude of association between the 5 a day or more criteria and other psychosocial variables including age, gender, race, income, education, and TTM constructs. To avoid “zero-cell counts”, which would lead to infinite odds ratios and standard errors, some classes were merged. For example, the first two classes of the variable “age” were 18-24, and 25-30. When contingency tables between age and 5 a day consumption were created, there were only 4 from the first age class and only 2 from the second age class who were consuming 5 a day. To avoid the less than five participants in a cell count (chi-square test is not valid with less than five participants in a cell), these two classes were merged and represented as one class (18-30).

**Results**

After two electronic reminders were sent, 152 of 400 employees (38%) successfully completed and submitted the on-line surveys. The survey response rate approached the typical response rate (39.2%) of online-surveys yielded by a meta-analysis conducted by Cook et al (2000). As shown in table 1, the respondents were
equally distributed between both genders. The majority of the participants were 40 years or older, Caucasians, Doctorate degree holders, and non-smokers. The generalizability of the results, therefore, may be limited to predominantly white, middle-age Americans with a high level of education.

**TABLE 1**

Selected Characteristics of the Employees (n = 152)

<table>
<thead>
<tr>
<th>Variable</th>
<th>N¹</th>
<th>%</th>
<th>Variable</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
<td><strong>Income</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18-30</td>
<td>25</td>
<td>17.3</td>
<td>30-40</td>
<td>17</td>
<td>11.8</td>
</tr>
<tr>
<td>40-50</td>
<td>44</td>
<td>30.6</td>
<td>&gt; 50</td>
<td>58</td>
<td>40.3</td>
</tr>
<tr>
<td><strong>Ethnicity</strong></td>
<td></td>
<td></td>
<td><strong>Education</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hispanic</td>
<td>3</td>
<td>2.0</td>
<td>White Caucasians</td>
<td>116</td>
<td>79.4</td>
</tr>
<tr>
<td>African-American</td>
<td>13</td>
<td>8.9</td>
<td>Others (African, Ar)</td>
<td>4</td>
<td>2.7</td>
</tr>
<tr>
<td>Asian</td>
<td>10</td>
<td>6.8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
<td><strong>Smoking</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>72</td>
<td>49.3</td>
<td>Non-smokers</td>
<td>129</td>
<td>88.3</td>
</tr>
<tr>
<td>Female</td>
<td>74</td>
<td>50.6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Income</strong></td>
<td></td>
<td></td>
<td><strong>SOC²</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤ $ 29,999</td>
<td>39</td>
<td>26.7</td>
<td>$ 30,000- $ 49,999</td>
<td>31</td>
<td>21.2</td>
</tr>
<tr>
<td>$ 50,000- $ 69,999</td>
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<td>21.2</td>
<td>≥ 70,000</td>
<td>45</td>
<td>30.8</td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td></td>
<td></td>
<td><strong>DB³</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤ High school diploma</td>
<td>25</td>
<td>17.1</td>
<td>Bachelor’s degree</td>
<td>22</td>
<td>15.7</td>
</tr>
<tr>
<td>Master’s degree</td>
<td>34</td>
<td>23.3</td>
<td>Doctorate degree</td>
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<td>44.5</td>
</tr>
<tr>
<td><strong>Smoking</strong></td>
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<td></td>
<td><strong>SE²</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current smokers</td>
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<td>11.6</td>
<td>Not too confident</td>
<td>17</td>
<td>11.6</td>
</tr>
<tr>
<td>Non-smokers</td>
<td>129</td>
<td>88.3</td>
<td>Confident</td>
<td>28</td>
<td>19.2</td>
</tr>
<tr>
<td><strong>SOC²</strong></td>
<td></td>
<td></td>
<td>Very confident</td>
<td>40</td>
<td>27.4</td>
</tr>
<tr>
<td>Pre-contemplation</td>
<td>22</td>
<td>14.2</td>
<td></td>
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<td>Preparation</td>
<td>18</td>
<td>12.3</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Maintenance</td>
<td>49</td>
<td>33.5</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td><strong>DB³</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cons&gt;&gt; Pros</td>
<td>4</td>
<td>2.7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cons = Pros</td>
<td>2</td>
<td>7.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cons&lt;&lt; Pros</td>
<td>94</td>
<td>64.4</td>
<td></td>
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<td></td>
</tr>
<tr>
<td><strong>SE²</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not at all confident</td>
<td>4</td>
<td>2.7</td>
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<td></td>
<td></td>
</tr>
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<tr>
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<td>40</td>
<td>27.4</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

¹N= the total number of respondents. Different totals are due to missing values
²SOC= Stage of Change; DB= Decisional Balance; SE= Self Efficacy; N=total number of the survey respondents.
# TABLE 2

Distribution of Selected Characteristics of University Employees Who Did Not Meet the Requirements of Five Servings of F&V a Day \( (n = 152) \)

<table>
<thead>
<tr>
<th>Variable</th>
<th>N Total respondents</th>
<th>n Less than “5 a day”</th>
<th>% of total</th>
<th>p-value$^1$</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>18-30</td>
<td>25</td>
<td>20</td>
<td>80.0</td>
<td>0.005</td>
</tr>
<tr>
<td>30-40</td>
<td>17</td>
<td>16</td>
<td>94.1</td>
<td></td>
</tr>
<tr>
<td>40-50</td>
<td>44</td>
<td>29</td>
<td>65.9</td>
<td></td>
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<td>&gt; 50</td>
<td>58</td>
<td>29</td>
<td>50.0</td>
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</tr>
<tr>
<td><strong>Ethnicity</strong></td>
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<td>African-American</td>
<td>13</td>
<td>10</td>
<td>76.9</td>
<td></td>
</tr>
<tr>
<td>White Caucasians</td>
<td>116</td>
<td>73</td>
<td>62.9</td>
<td></td>
</tr>
<tr>
<td>Arab Americans</td>
<td>4</td>
<td>4</td>
<td>100.0</td>
<td></td>
</tr>
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<td>Asian</td>
<td>10</td>
<td>6</td>
<td>60.0</td>
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<td><strong>Gender</strong></td>
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<td>66.6</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>74</td>
<td>48</td>
<td>64.8</td>
<td></td>
</tr>
<tr>
<td><strong>Income</strong></td>
<td></td>
<td></td>
<td></td>
<td>0.0022</td>
</tr>
<tr>
<td>≤ $29,999</td>
<td>39</td>
<td>28</td>
<td>71.8</td>
<td></td>
</tr>
<tr>
<td>$30,000- $49,999</td>
<td>31</td>
<td>22</td>
<td>71.0</td>
<td></td>
</tr>
<tr>
<td>$50,000- $69,999</td>
<td>31</td>
<td>26</td>
<td>83.8</td>
<td></td>
</tr>
<tr>
<td>≥ $70,000</td>
<td>45</td>
<td>20</td>
<td>44.4</td>
<td></td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td></td>
<td></td>
<td></td>
<td>0.81</td>
</tr>
<tr>
<td>≤ High school diploma</td>
<td>25</td>
<td>15</td>
<td>64.6</td>
<td></td>
</tr>
<tr>
<td>Bachelor’s degree</td>
<td>25</td>
<td>16</td>
<td>67.6</td>
<td></td>
</tr>
<tr>
<td>Master’s degree</td>
<td>34</td>
<td>23</td>
<td>72.7</td>
<td></td>
</tr>
<tr>
<td>Doctorate degree</td>
<td>65</td>
<td>42</td>
<td>60.0</td>
<td></td>
</tr>
<tr>
<td><strong>Smoking</strong></td>
<td></td>
<td></td>
<td></td>
<td>0.12</td>
</tr>
<tr>
<td>Current smokers</td>
<td>17</td>
<td>14</td>
<td>82.3</td>
<td></td>
</tr>
<tr>
<td>Non-smokers</td>
<td>129</td>
<td>82</td>
<td>63.5</td>
<td></td>
</tr>
</tbody>
</table>

$^1$P-values are based on chi square test of independence. Having p-values less than 0.05 suggests relationship between F&V consumption and the variable that has that p-value.

## Demographic Factors and Fruit and Vegetable (F&V) Consumption

The characteristics of the employees who reported less than “5 a day” are presented in table 2. Regardless of age, around 65% of all respondents were not
consuming the recommended servings of F&V. Among all the age groups, those who were between 30 and 40 years of age were least likely to consume “5 a day.” This scenario was observed with respect to all categories in variables namely, age, race, gender, income, education, and smoking (Table 2). These results should not be surprising because the overall number of “5 a day” consumers was half the number of non-5 a day consumers. Due to these unequal proportions, the decision was made to compare the odds ratio instead of the absolute percentages. Table 3 shows the logistic regression coefficients and the associated odds ratios for all the variables for the participants with “5 a day” consumption versus those with less than “5 a day” consumption.

The odds ratios resulting from logistic regression between “5 a day” consumption, as a response variable and age revealed a positive trend, although it was not significant. As shown in table 3, higher odds to consume “5 a day” were observed as age increased; in other words, individuals of older ages were more likely to consume 5 servings of F&V. Likewise, a positive relationship was found between income and F&V consumption. The odds of consuming “5 a day” for individuals with an income of ≥ 70 thousand dollars were 220% higher (P = 0.05) when compared to those participants with income less than 30 thousand dollars. Nevertheless, this association was not significant for participants who reported income of 30-69 thousand dollars.

No differences in the odds of consuming “5 a day” were found between males and females, or between smokers and non-smokers. Similarly, the odds of consuming “5 a day” for those with a college degree were not significantly different when compared to those participants with only a high school diploma education.
### Table 3
Odds Ratios and Confidence Intervals for Logistic Regression Analysis of Consumption of 5 servings of F&V per Day in Relation to Other Employee Psychosocial Characteristics

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>SE</th>
<th>Odds Ratio</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30-39</td>
<td>-1.4</td>
<td>1.1</td>
<td>0.25</td>
<td>0.02-2.3</td>
</tr>
<tr>
<td>40-50</td>
<td>0.7</td>
<td>0.6</td>
<td>2.0</td>
<td>0.64-6.6</td>
</tr>
<tr>
<td>&gt; 50</td>
<td>1.4</td>
<td>0.56</td>
<td>4.0*</td>
<td>1.3-12.1</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>0.04</td>
<td>0.17</td>
<td>1.1</td>
<td>0.5-2.1</td>
</tr>
<tr>
<td>Income</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$30,000-$49,999</td>
<td>0.04</td>
<td>0.53</td>
<td>1.04</td>
<td>0.4-2.9</td>
</tr>
<tr>
<td>$50,000-$69,999</td>
<td>-0.7</td>
<td>0.6</td>
<td>0.5*</td>
<td>0.15-1.6</td>
</tr>
<tr>
<td>≥ $70,000</td>
<td>1.15</td>
<td>0.46</td>
<td>3.2*</td>
<td>1.8-7.9</td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bachelor’s degree</td>
<td>-0.6</td>
<td>0.6</td>
<td>0.5</td>
<td>0.2-1.9</td>
</tr>
<tr>
<td>Master’s degree</td>
<td>-0.3</td>
<td>0.5</td>
<td>0.7</td>
<td>0.2-2.1</td>
</tr>
<tr>
<td>Doctorate degree</td>
<td>-0.19</td>
<td>0.5</td>
<td>0.8</td>
<td>0.3-2.1</td>
</tr>
<tr>
<td>Smoking</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Smokers</td>
<td>-0.98</td>
<td>0.6</td>
<td>0.4</td>
<td>0.1-1.4</td>
</tr>
<tr>
<td>SOC</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contemplation</td>
<td>0.8</td>
<td>1.1</td>
<td>2.3</td>
<td>0.25-12.2</td>
</tr>
<tr>
<td>Preparation</td>
<td>0.3</td>
<td>1.45</td>
<td>1.3</td>
<td>0.07-22.6</td>
</tr>
<tr>
<td>Action</td>
<td>2.6</td>
<td>1.4</td>
<td>14.0</td>
<td>0.9-205.8</td>
</tr>
<tr>
<td>Maintenance</td>
<td>4.4</td>
<td>1.0</td>
<td>81.9*</td>
<td>9.8-684.0</td>
</tr>
<tr>
<td>SE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Somewhat confident</td>
<td>1.9</td>
<td>1.0</td>
<td>7.1</td>
<td>0.8-57.8</td>
</tr>
<tr>
<td>Confident</td>
<td>2.0</td>
<td>1.1</td>
<td>7.9*</td>
<td>0.9-69.9</td>
</tr>
<tr>
<td>Very confident</td>
<td>3.6</td>
<td>1.0</td>
<td>37.1*</td>
<td>4.5-306.0</td>
</tr>
<tr>
<td>DB</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Balance</td>
<td>1.0</td>
<td>0.7</td>
<td>2.8</td>
<td>3.3-51.2</td>
</tr>
<tr>
<td>Positive perception</td>
<td>2.0</td>
<td>0.7</td>
<td>7.76</td>
<td>1.7-35.3</td>
</tr>
</tbody>
</table>

1Reference group for age is 18-29; 2reference group for gender is males; 3reference group for income is ≤ $29,999; 4reference group for education is ≤ high school diploma; reference group for smoking is non-smokers; 6reference stage is PC; 7reference group for SE is “not confident”; 8reference group for DB is “negative perception.”

Note: SOC= Stage of Change; DB= Decisional Balance; SE= Self Efficacy; B=logistic regression coefficient

**Transtheoretical Model Constructs and F&V Consumption**

As shown in Table 1, there were two dominant stages, contemplation (n=50) and maintenance (n=49) (34.9 and 34.3% respectively). However; in the SE scale, 40% of the participants were in the middle (somewhat confident), and about 90% of all the
participants had a positive perception about their F&V consumption (had pros> cons).

Among all pre-contemplators (n=22), 95% reported consumption of less than 5 a day, whereas 20% of those in the maintenance stage reported less than “5 a day” (see Table 4).

### TABLE 4
Distribution SOC, SE, and DB of Employees Who Did Not Meet the Requirements of Five Servings of F&V per Day

<table>
<thead>
<tr>
<th>SOC</th>
<th>N</th>
<th>% of total</th>
<th>p-value&lt;sup&gt;1&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-contemplation</td>
<td>22</td>
<td>95</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Contemplation</td>
<td>52</td>
<td>86.5</td>
<td></td>
</tr>
<tr>
<td>Preparation</td>
<td>18</td>
<td>88</td>
<td></td>
</tr>
<tr>
<td>Action</td>
<td>5</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>Maintenance</td>
<td>49</td>
<td>20</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DB&lt;sup&gt;2&lt;/sup&gt;</th>
<th>N</th>
<th>% of total</th>
<th>p-value&lt;sup&gt;1&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very negative perception</td>
<td>4</td>
<td>100</td>
<td>0.002</td>
</tr>
<tr>
<td>Negative perception</td>
<td>7</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Balance</td>
<td>2</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Positive perception</td>
<td>39</td>
<td>82.9</td>
<td></td>
</tr>
<tr>
<td>Very positive perception</td>
<td>94</td>
<td>53.6</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SE&lt;sup&gt;3&lt;/sup&gt;</th>
<th>N</th>
<th>% of total</th>
<th>p-value&lt;sup&gt;1&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at all confident</td>
<td>4</td>
<td>100</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Not too confident</td>
<td>17</td>
<td>94</td>
<td></td>
</tr>
<tr>
<td>Somewhat confident</td>
<td>57</td>
<td>73.7</td>
<td></td>
</tr>
<tr>
<td>Confident</td>
<td>28</td>
<td>71.4</td>
<td></td>
</tr>
<tr>
<td>Very confident</td>
<td>40</td>
<td>35.5</td>
<td></td>
</tr>
</tbody>
</table>

<sup>1</sup>P-values are based on chi square test of independence. Having P-values less than 0.05 suggests relationship between F&V consumption and the variable; <sup>2</sup>Very negative perception (Pros<<Cons), Negative perception (Pros<Cons), Balance (Pros=Cons), Positive perception (Pros>Cons), and Very positive perception (Pros>>Cons); <sup>3</sup>Confidence of one’s ability to consume 5 servings of F&V every day Note: SOC= Stage of Change; DB= Decisional Balance; SE= Self Efficacy

The distribution of participants who reported no “5 a day” consumption on the SE and DB scales was not surprising. As we move on the scales toward more confidence (in
the SE scale) or more positive perception (in the DB scale), the percentage of those who
do not consume “5 a day” decreases (Table 4). The odds of consuming “5 a day” were
significantly higher in all of the TTM model’s constructs (SOC, SE, and DB) when
obtained for those located in the extreme categories, i.e. maintenance versus
precontemplation, or “very confident” versus “not at all confident.”

The odds of consuming “5 a day” for participants in the maintenance stage were
82 times higher than that for participants in the precontemplation stage (P <0.0001).
There were no differences in the odds ratio of “5 a day” consumption between the
participants in the preparation, contemplation, and precontemplation stages. The same
trends in the odds ratios were found for SE and DB. There was a 37 times increase in the
odds of “5 a day” consumption when moving along the SE scale from “not at all
confident” to “very confident” (P = 0.0003). Likewise, there was a 13 times increase in
the odds of consuming “5 a day” when participants with a positive perception about F&V
consumption were compared to those with a negative perception (P=0.008).
CHAPTER 4

PREPARATION STAGE- BASED INTERVENTION PROGRAM FOR EMPLOYEES IN THE PRE-CONTEMPLATION AND CONTEMPLATION STAGES COMBINED, AS COMPARED TO THE PREPARATION STAGE

The second project was an experiment to measure the rate of change in adopting the behavior of consuming 5 or more servings of F&V per day for the participants in the preparation (P) SOC as compared to those in the pre-preparation stages, that is, pre-contemplation (PC) and the contemplation (C) stages. The pre-contemplation and contemplation subjects were grouped into a pre-preparation group which was compared to a preparation stages group using a repeated measure design. Appendix A shows the protocol used to conduct the study. Both groups participated together in a preparation stage tailored education based on the trans-theoretical model.

Methods

Participants

Thirty nine participants were recruited based on the data collected in project 1. All the participants recruited were from the pre-action stages in which participants did not, as yet, practice the targeted behavior of consuming five or more servings of F&V every day. As shown in table 1, the total number of participants in the pre-preparation stages was 74, and the total number of participants in the preparation stage was 18. Factors known to affect the response to the intervention, including sex, age, ethnicity, income, education, smoking, and living status, were controlled for by the best possible matching of the participants in the two groups (Table 4). Twenty one participants from the pre-preparation stages were selected from a total of 72. The selection was done in a
way to match the mentioned factors of the 18 participants in the preparation group. More participants were recruited from the pre-preparation stages because we expected to have more drop outs in this group as compared to those in the preparation (less interested). The selected participants (18 in the preparation stage and 21 in the per-preparation stages) were contacted through email and asked if they were willing to participate in the second study (Appendix M). Participants were also informed about the intervention and the number of required meetings with the researcher during and after the intervention.

**Design**

The design used in this study was a pretest-posttest repeated measure control group design. The following notation explains the study design:

<table>
<thead>
<tr>
<th>Group</th>
<th>Project1</th>
<th>Intervention</th>
<th>Follow up</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>session1</td>
<td>session2</td>
<td>session3</td>
</tr>
<tr>
<td>PC/C</td>
<td>O1</td>
<td>O2</td>
<td>O3</td>
</tr>
<tr>
<td>P</td>
<td>O9</td>
<td>O10</td>
<td>O11</td>
</tr>
</tbody>
</table>

Participants were assigned to one of two groups based on their SOC. There were twenty one subjects in the pre-contemplation, contemplation stages (PC/C), and eighteen in the preparation stage (P). More participants were recruited for the PC/C group because more drop out was expected in this group as compared to the P group. Fruit and vegetable intake, SE, and DB measures reported in Project 1 were used as the baseline data (O1, O9). Both groups participated together in a preparation stage intervention (X1-X4). The measures that were taken at times O1 and O9 were retaken at O2 through O8 and O10 through O16. Participants who missed one session or more were excluded from the
analysis. One participant from the P group and three from the PC/C group were dropped from the analysis. Consequently, the final group size was 18 for the PC/C and 17 for the P group.

**Pretest: O1 and O9**

The data collected in Project 1 (F&V Daily Consumption Estimation Sheet, the SOC Assessment, SE, and DB) were treated as the base-line (pretest) measure.

**Intervention**

The educational program (Appendix N) was developed based on the TTM and the techniques (processes) associated with the preparation SOC; that is social liberation, emotional arousal, self-evaluation, and commitment. The intervention was composed of four consecutive sessions of one meeting per week. Each session was an hour in length and included a 20-minute PowerPoint Presentation, 5 minutes for discussion, 30 minutes for lunch, and 5 minutes for completion of the questionnaires. During each session, at least one of the mentioned techniques was used. To assure that participants in both groups received the same contact time, attention, and education, groups were merged, and each session was held only once for all participants in both groups. The study was single blinded because participants thought that they were one group of 39 participants and they did not know which stage they were in.

**Session One (X1)**

Participants were asked to sign a consent form (Appendix O) that was discussed by the researcher in the first session. The consent form included an explanation about the purpose of the study, time, commitment, procedures, participants’ rights, benefits, risks,
privacy, and the researcher’s contact information. Any questions were clarified by the researcher. The objectives of the first session were (1) to explain the purpose of the study and the urgency for dietary behavior modification, and (2) to introduce basic concepts related to F&V consumption.

Topics introduced in the session included the purpose of the study, the consent form, the typical American diet, the F&V consumption by Louisiana adults, the prevalence of chronic diseases in Louisiana that are associated with low fruit and vegetable-consumption, the recommended intake of fruits and vegetables, the serving size, and the benefits of F&V(Appendix N). The presentation was ended with a song downloaded from the “Dole 5 a day” web site accessed at: www.dole5aday.com. The song’s lyrics presented how to get 5 easy servings of F&V per day (Appendix P).

The process used in session one was the “helping relationships” which is defined as having a caring, trusted, and accepted person who can give the support and the counseling for the healthy behavior change. Participants were encouraged to contact the researcher or the research advisors at any time. All e-mails and contacts sent to the researcher were carefully received and all inquiries were answered promptly to encourage the building and the strengthening of the “helping relationship” with the participants.

Recipe booklets from 5 a day were distributed to the participants. Food served at the end of session one included ouzy (rice, green peas, carrots, and mushrooms), salad, fruits (apples, oranges, pears, and bananas), water, 100% juice, and soft drinks

Session Two (X2)

The objective of the second session was to help the participants understand the relationship between lower consumption of F&V and increased risk for chronic diseases,
especially diabetes, cancer, heart disease, and obesity. The topics that were introduced in session two included the statistics about the prevalence of the previously mentioned diseases in Louisiana, the scientific studies relating the protective effect of F&V against each of these diseases, and information about the energy-diluting effect of the dietary fiber and water in F&V. Pictures that visualized menus of equal calories and different sizes or menus with equal sizes and different calories were also included (Appendix N). The session was ended with a song named “fiber” which presented the health benefits of dietary fibers for the body (Appendix P). The song was downloaded from the “Dole 5 a day” web site accessed at: www.dole5aday.com.

“Emotional arousal”, the use of certain techniques that produce increased emotional experiences that can be followed by action, was the process of behavioral change used in this session. The participant’s emotions were aroused when the numbers and statistics of chronic disease occurrence were related to actual fruit and vegetable consumption. A healthy lunch was served after the session. Menu for the lunch included spinach and beef pies, cucumber-yogurt salad, Dole fruit salad, water, 100% juice, and soft drinks.

Session Three (X3)

The objectives of the third session were to 1) help the participants be able to make the right decision of choosing either fruits and vegetables or supplemental vitamins and minerals, and 2) introduce the concept of “phytochemicals” and their health benefits against chronic diseases. Topics introduced in session three included: data that compared the consumption of F&V with taking of daily multivitamin supplements, the definition of phytochemicals, and the health benefits and dietary sources of carotenoids, flavonoids,
and phenolic compounds (Appendix N). The presentation ended with an entertaining song called “phytochemicals” which presented the health protective effect of phytochemicals (Appendix P). The song was downloaded from the “Dole 5 a day” website accessed at: www.dole5aday.com. The process of change that was used in the session was the “self re-evaluation,” which is an assessment of one's self-image with and without a particular unhealthy habit. The researcher asked the participants who were now consuming 5 servings of F&V per day to compare their lifestyle and diet before and after increasing their intake of F&V to five or more servings per day. Food served at the end of the session included bell peppers (stuffed with rice, tomatoes, onion, mint, and olive oil), eggplant dip (baked eggplant, yogurt, cucumber, mint, parsley, lemon juice, and olive oil), Dole fruit salad, water, 100% juice, and soft drinks.

**Session Four (X4)**

The objective of the fourth session was to help the participants overcome the barriers (cons) of consuming five or more servings of F&V everyday. Topics discussed in the session included the most commonly perceived barriers to consuming 5 or more servings of F&V per day, including cost, taste, preparation time, and F&V content of chemicals and pesticides. Ways to overcome these barriers were also discussed. The cons discussed were ones most frequently mentioned by the in Project 1 (Appendix N). The session ended with a “yes I can” song that discussed how easy it is to consume 5 servings of F&V if a plan and a goal are set (Appendix P). The process of behavioral change used in the fourth session was “self-liberation,” which is the belief that one can change and have the commitment to act on that belief. The technique used to increase participants’ commitment was the “multiple choice technique.” Participants were given many choices.
of how to consume five servings of F&V per day. Participants were asked to make a plan and set a goal and be committed to that goal. The lunch that was served after the session was musaqa’a (eggplant, minced beef, tomato sauce, onions, and cheese), chickpea dip, Dole fruit salad, water, 100% juice, and soft drinks.

**Short Term Follow Up**

After the intervention period was completed, all participants were contacted one week (O6, O14) and two weeks (O7, O15) after the intervention period was completed and asked to complete the same questionnaire they had completed during the interventions (X1-X4).

**Long Term Follow Up**

It was hypothesized that individuals who were in the pre-preparation stages would be at higher risk for a relapse if they were treated the same way as the participants in the preparation stage. In other words, participants in the pre-preparation stages may have been forced to take premature action by merging them with participants who were more ready to change. Based on that, we hypothesized that the participants in the pre-preparation stages were would not maintain the behavior and thus, a long-term follow-up was necessary to test this hypothesis. Participants were contacted 20 weeks after the intervention was completed (O8, O16) and were asked to complete the same questionnaire.

**Analysis**

To study the baseline characteristics of the participants in the two intervention groups, unadjusted frequencies and cross-tabulations of groups with categorical
demographic and psychosocial variables were computed. The chi-square test was used to test for independence. The distribution of some characteristics resulted in a few dominant classes including self efficacy and decisional balance. These classes were combined to make fewer categories for data analyses. For example, there was a very low count (less than five) in the “very negative” and the “negative” classes of the decisional balance variable, so these two classes were merged as “negative.” The same process was repeated with the “very positive” and the “positive” classes; that is they were merged as “positive.”

Four multivariate repeated measure analyses (MANOVAs) were conducted to test the changes in the outcome variables, namely F&V consumption, SOC, SE, and DB. Because the primary aim of the project was to study and to compare the rate of change over time between the two groups, the analyses were not performed on the baseline data collected in the project. For each outcome, new sets of variables were created. The new variables were calculated as the accumulative change. For example, the original variables for intake were what participants reported as the number of servings at the baseline, session 1-session 4, short term follow up 1, and 2; and long term follow up. The new variable was the change from the baseline; that is intake at session 1- intake at the baseline, intake at session 2- intake at baseline, intake at session3- intake at baseline and so forth. The same thing was done for all outcome measures including SOC, SE, and DB. Because the study was limited due to the fact that we started with non-equivalent groups, we believed that participants had different baseline intake, SOC, DB, and SE scores. These differences were statistically controlled by including all the baseline measurements in the model as covariates.
Results

Thirty five participants, including 18 in the PC/C and 17 in the P group, completed the study. As shown in Table 5, all chi squared tests suggest that participants were matched for age, ethnicity, gender, income, education, and smoking status.

### TABLE 5

Distribution of Selected Participants’ Characteristics by Test Groups at the Baseline

<table>
<thead>
<tr>
<th>Variable</th>
<th>PC/C (n=18)</th>
<th>P (n=17)</th>
<th>P-value&lt;sup&gt;1&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>18-30</td>
<td>7</td>
<td>7</td>
<td>0.96</td>
</tr>
<tr>
<td>30-40</td>
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<td>1</td>
<td>5.88</td>
</tr>
<tr>
<td>40-50</td>
<td>4</td>
<td>4</td>
<td>23.53</td>
</tr>
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<td>&gt; 50</td>
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<tr>
<td>Ethnicity</td>
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<td>0</td>
<td>0.0</td>
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<tr>
<td>African-American</td>
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<td>4</td>
<td>23.53</td>
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<tr>
<td>White Caucasian</td>
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<td>11</td>
<td>64.71</td>
</tr>
<tr>
<td>Others (African/Arabs)</td>
<td>2</td>
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<td>0.0</td>
</tr>
<tr>
<td>Asian</td>
<td>0</td>
<td>2</td>
<td>11.76</td>
</tr>
<tr>
<td>Gender</td>
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</tr>
<tr>
<td>Male</td>
<td>8</td>
<td>8</td>
<td>47.06</td>
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<tr>
<td>Female</td>
<td>10</td>
<td>9</td>
<td>52.94</td>
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<tr>
<td>≤ $29,999</td>
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<td>9</td>
<td>52.94</td>
</tr>
<tr>
<td>$30,000-$49,999</td>
<td>4</td>
<td>2</td>
<td>11.76</td>
</tr>
<tr>
<td>$50,000-$69,999</td>
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<td>3</td>
<td>17.65</td>
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<td>≥ 70,000</td>
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<td>8.57</td>
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<td>≤ High school diploma</td>
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<tr>
<td>Bachelor’s degree</td>
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<tr>
<td>Master’s degree</td>
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</tr>
<tr>
<td>Smoking</td>
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<td></td>
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</tr>
<tr>
<td>Smokers</td>
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<td>1</td>
<td>5.88</td>
</tr>
<tr>
<td>Non-smokers</td>
<td>17</td>
<td>16</td>
<td>94.12</td>
</tr>
</tbody>
</table>

<sup>1</sup>P-Values were based on chi-square test of independence.

Change in Fruit and Vegetable Consumption

The least squared differences of the means of the change in F&V consumption over time for the two groups is presented in Table 6. The change in F&V consumption
was greater for the P group than that for the PC/C group at session 3, 4, and 5; and at the short term follow up 1, 2; and long term follow up. In addition, participants in the P group were able to maintain the change the long term follow up, whereas participants in the PC/C, increased their daily intake of F &V only until the first short term follow up, and they relapsed to the baseline level again by the second short term follow up and the long term follow up with net effect=zero (figure 1). Individual data for the change in F&V intake are presented in appendix Q.

The MANOVA repeated measure analysis revealed that when the change (from Project 1 baseline) in the F&V consumption was considered as a response variable, a significant interaction between time and group was found ($P=0.004$). The interpretation of this interaction suggests that the effect of the intervention was different for the two groups, depending on the time point in which the comparison was made. Figure 1 presents this effect. For the P group, the servings of F&V increased until session 3, and were maintained until the long term follow up; on contrast to the PC/C group, where there was a decrease in the F&V consumption after the first short term follow up (the effect is not consistent in both groups).

Knowing that the groups were controlled for age, education, and income (variables were distributed equally between the groups), one can conclude that the change in fruit and vegetable intake was independent from these variables.

**Change in Stage of Change**

The difference in the mean change of the participants’ stages was not clearly seen until the first short term follow up (Table 7). From the first week of follow up through the long term follow up, participants in the P group maintained a greater change in their SOC
when compared to those in the PC/C group. Mean change in the SOC for participants in the P group was greater than the baseline at the last intervention session, short term follow up1, and 2, and the long term follow up; whereas, for those in the PC/C group, it was greater only at session 3 and session 4 (figure 2). Individual data for the change in SOC are presented in appendix R.

### TABLE 6

Mean ± SEM\(^1\) of Change in F&V Consumption from the Baseline Assessed in Project 1

<table>
<thead>
<tr>
<th>Test period</th>
<th>PC/C (N=18)</th>
<th>P (N=17)</th>
<th>P-value(^2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Session 1</td>
<td>0.2 ± 0.29</td>
<td>1.02 ± 0.30</td>
<td>0.06</td>
</tr>
<tr>
<td>Session 2</td>
<td>0.8(^*) ± 0.29</td>
<td>1.6(^*) ± 0.30</td>
<td>0.05</td>
</tr>
<tr>
<td>Session 3</td>
<td>1.17(^*) ± 0.38</td>
<td>2.5(^*) ± 0.39</td>
<td>0.01</td>
</tr>
<tr>
<td>Session 4</td>
<td>1.7(^*) ± 0.34</td>
<td>2.7(^*) ± 0.35</td>
<td>0.04</td>
</tr>
<tr>
<td>Short-Term Follow Up 1</td>
<td>1.5(^*) ± 0.29</td>
<td>2.7(^*) ± 0.29</td>
<td>0.007</td>
</tr>
<tr>
<td>Short-Term Follow Up 2</td>
<td>0.60 ± 0.34</td>
<td>2.6(^*) ± 0.35</td>
<td>0.0004</td>
</tr>
<tr>
<td>Long-Term Follow Up</td>
<td>0.04 ± 0.23</td>
<td>2.3(^*) ± 0.23</td>
<td>0.0001</td>
</tr>
</tbody>
</table>

\(^1\)SEM= standard error of the mean; \(^2\)p-values associated with the least significant difference (LSD) analysis to test the H\(_0\) that mean change in F&V consumption for PC/C = that for P; Note: The presence of the star as a superscript on the means indicating a significant difference from zero using 0.05 cut-off point (testing H\(_0\) mean change in F&V consumption =zero)

These results demonstrate that individuals in the PC/C group failed to maintain a change in the SOC with time; instead they relapsed after the intervention ended. These findings were confirmed in the MANOVA repeated measure analysis. There was a significant interaction effect between time (intervention) and the groups (P = 0.01). This means that the effect of the intervention was not the same in the two groups. The interaction suggests that the participants in the PC/C group relapsed and were not able to maintain the new SOC, and while those in the P group maintained the change.
FIGURE 1 Average Change in F&V Daily Consumption by Group. Data Points are Means ±SEM

SEM= standard error of the mean; 2 The presence of the star as a superscript on the means indicates a significant difference from zero using 0.05 cut-off point (testing H0 mean change in F&V consumption for PC/C = that for P at the same time point); 3S= intervention session; 4STFU= Short Term Follow Up; 5LTFU= Long Term Follow Up

TABLE 7

Mean ± SEM of Change in Stage of Change from the Baseline assessed from the Baseline Assessed in Project 1

<table>
<thead>
<tr>
<th>Test period</th>
<th>PC/C (N=18)</th>
<th>P (N=17)</th>
<th>P-value²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Session 1</td>
<td>-0.11 ± 0.32</td>
<td>0.4 ± 0.34</td>
<td>0.3</td>
</tr>
<tr>
<td>Session 2</td>
<td>0.57 ± 0.31</td>
<td>0.57 ± 0.33</td>
<td>1.0</td>
</tr>
<tr>
<td>Session 3</td>
<td>1.0 * ± 0.4</td>
<td>0.76 ± 0.43</td>
<td>0.7</td>
</tr>
<tr>
<td>Session 4</td>
<td>0.8 * ± 0.42</td>
<td>1.2 * ± 0.45</td>
<td>0.6</td>
</tr>
<tr>
<td>Short-Term Follow Up 1</td>
<td>-0.4 ± 0.37</td>
<td>1.8 * ± 0.39</td>
<td>0.003</td>
</tr>
<tr>
<td>Short-Term Follow Up 2</td>
<td>0.11 ± 0.43</td>
<td>1.6 * ± 0.45</td>
<td>0.04</td>
</tr>
<tr>
<td>Long-Term Follow Up</td>
<td>0.04 ± 0.38</td>
<td>1.7 * ± 0.4</td>
<td>0.007</td>
</tr>
</tbody>
</table>

SEM= standard error of the mean; ²p-values associated with the least significant difference (LSD) analysis to test the H0 that mean change in F&V consumption for PC/C = that for P; Note: The presence of the star as a superscript on the means indicating a significant difference from zero using 0.05 cut-off point (testing H0 mean change in F&V consumption =zero)
FIGURE 2 Average Change in Stage of Change by Group. Data Points are Means ±SEM\(^1\).
\(^1\)SEM= standard error of the mean; \(^2\) The presence of the star as a superscript on the means indicates a significant difference from zero using 0.05 cut-off point (testing H\(_0\) mean change in F&V consumption for PC/C = that for P at the same time point); \(^3\)S= intervention session; \(^4\)STFU= Short Term Follow Up; \(^5\)LTFU= Long Term Follow Up

**Change in Self Efficacy**

Results of SE showed the same trend as that observed in F&V intake, and SOC. For participants in the P group, there was a significant increase in the SE scores from the baseline at session 2, 3, and 4, short term follow ups, and long term follow up. For participants in the PC/C group, the increase was only observed at sessions 2, 3, and 4, which means that they had relapsed after week 4 (the end of the intervention). These results are in agreement with the SOC and the F&V intake results; i.e. PC/C participants relapsed in all of these outcomes after the intervention was completed (Table 8).

Individual data for the change in SE scores are presented in appendix S. Same trend observed in the change of fruit and vegetable consumption and stage of change was also
observed in self-efficacy. There was a significant time-group interaction ($P = 0.0003$) which suggests that the effect of time (intervention) on the SE scores was not the same for the two groups. Participants in the PC/C group increased their self efficacy of consuming five servings of fruits and vegetables every day, but failed to maintain this increment after the intervention was over; whereas participants in the P group maintained it (figure 3).

**TABLE 8**

Mean ± SEM$^1$ of Change in Self Efficacy Scores from the Baseline Assessed in Project 1

<table>
<thead>
<tr>
<th>Test period</th>
<th>PC/C (N=18)</th>
<th>P (N=17)</th>
<th>P-value$^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Session 1</td>
<td>1.1 ± 0.88</td>
<td>1.5 ± 0.9</td>
<td>0.7</td>
</tr>
<tr>
<td>Session 2</td>
<td>3.0* ± 0.82</td>
<td>3.2* ± 0.78</td>
<td>0.8</td>
</tr>
<tr>
<td>Session 3</td>
<td>3.6* ± 0.7</td>
<td>4.9* ± 0.75</td>
<td>0.23</td>
</tr>
<tr>
<td>Session 4</td>
<td>3.1* ± 0.87</td>
<td>5.5* ± 0.9</td>
<td>0.06</td>
</tr>
<tr>
<td>Short-Term Follow Up 1</td>
<td>1.1± 0.65</td>
<td>6.4*± 0.67</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Short-Term Follow Up 2</td>
<td>0.38 ± 0.73</td>
<td>6.0* ± 0.75</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Long-Term Follow Up</td>
<td>-0.70 ± 0.66</td>
<td>6.3* ± 0.68</td>
<td>&lt;0.0001</td>
</tr>
</tbody>
</table>

$^1$SEM= standard error of the mean; $^2$p-values associated with the least significant difference (LSD) analysis to test the $H_0$ that mean change in F&V consumption for PC/C = that for P; Note: The presence of the star as a superscript on the means indicating a significant difference from zero using 0.05 cut-off point (testing $H_0$ mean change in F&V consumption = zero)

**Change in the Decisional Balance scores**

The DB mean scores for participants were similar to those observed for SE.

Decisional balance scores in the P group were greater at all intervention sessions and the short term and the long term follow ups as compared to the baseline (Table 9). However, for those in the PC/C group, significant increments from the baseline were only observed at sessions 3, 4 and the first follow up; which meant that, after the first follow up, the positive perception of the participants in the PC/C group toward F&V consumption
decreased (the cons were increasing and the pros were decreasing). Individual data for the change in the DB scores are presented in appendix T.

In the MANOVA repeated measures analysis, the time-group interaction was not significant ($P = 0.08$) (figure 4). However, there was a time effect ($P = 0.0114$), which meant that the DB did increase with time during the intervention for both groups.

**FIGURE 3** Average Change in Self Efficacy Scores by Group. Data Points are Means ±SEM\(^1\).

\(^1\)SEM= standard error of the mean; \(^2\) The presence of the star as a superscript on the means indicates a significant difference from zero using 0.05 cut-off point (testing $H_0$ mean change in F&V consumption for PC/C = that for P at the same time point); \(^3\)S= intervention session; \(^4\)STFU= Short Term Follow Up; \(^5\)LTFU= Long Term Follow Up

There was also a group effect ($P = 0.0034$), indicating that the mean positive DB score was higher for participants in the P group as compared to those in the PC/C group. The least square differences analysis of the means showed that the differences were not significant during the intervention (session 1 - session 4), however there the change in the decisional balance score was higher for the preparation group during the short term and long term follow ups.
TABLE 9

Mean± SEM\(^1\) of Change in the Decisional Balance Scores from the Baseline Assessed in Project 1

<table>
<thead>
<tr>
<th>Test period</th>
<th>PC/C (N=18)</th>
<th>P (N=17)</th>
<th>P-value(^2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Session 1</td>
<td>0.77 ± 0.56</td>
<td>1.2 * ± 0.56</td>
<td>0.57</td>
</tr>
<tr>
<td>Session 2</td>
<td>0.4 ± 0.55</td>
<td>1.5 * ± 0.55</td>
<td>0.16</td>
</tr>
<tr>
<td>Session 3</td>
<td>1.4 * ± 0.51</td>
<td>2.4 * ± 0.51</td>
<td>0.21</td>
</tr>
<tr>
<td>Session 4</td>
<td>1.6 * ± 0.54</td>
<td>2.7 * ± 0.54</td>
<td>0.15</td>
</tr>
<tr>
<td>Short-Term Follow Up 1</td>
<td>1.5 * ± 0.55</td>
<td>3.1 * ± 0.55</td>
<td>0.05</td>
</tr>
<tr>
<td>Short-Term Follow Up 2</td>
<td>0.11 ± 0.52</td>
<td>3.1 * ± 0.52</td>
<td>0.0002</td>
</tr>
<tr>
<td>Long-Term Follow Up</td>
<td>-0.2 ± 0.56</td>
<td>3.0 * ± 0.56</td>
<td>0.0004</td>
</tr>
</tbody>
</table>

\(^1\)SEM= standard error of the mean; \(^2\)p-values associated with the least significant difference (LSD) analysis to test the H\(_0\) that mean change in F\&V consumption for PC/C = that for P; Note: The presence of the star as a superscript on the means indicating a significant difference from zero using 0.05 cut-off point (testing H\(_0\) mean change in F\&V consumption =zero)

Figure 4: Average Change in Decisional Balance Scores by Group. Data Points are Means ± SEM\(^1\). \(^1\)SEM= standard error of the mean; \(^2\) The presence of the star as a superscript on the means indicates a significant difference from zero using 0.05 cut-off point (testing H\(_0\) mean change in F\&V consumption for PC/C = that for P at the same time point); \(^3\)S= intervention session; \(^4\)STFU= Short Term Follow Up; \(^5\)LTFU= Long Term Follow Up
In summery, the net response of the two groups to the intervention was not only different in the magnitude, but also in the direction. The change in the four response measures for participants in the PC/C group was significantly greater than zero during the intervention; however, it went back to zero after the intervention was ended. Whereas for those on the P group, the change was significantly greater than zero during the intervention and was maintained after the intervention was ended. This finding supports Prochaska’s argument about the increased effectiveness of an intervention when it is tailored to one’s SOC.
CHAPTER 5
DISCUSSION

Participants’ On-Line Survey

This study was able to successfully identify the employees’ stage of change toward consuming 5 or more servings of F&V, which demonstrates the validity of the SOC assessment tool used in this study. This agrees with the literature on SOC assessment which consistently demonstrates that the SOC is a valid assessment tool (Suris et al., 1998; Logue et al., 2000; Sutton et al., 2003; Ma et al., 2002).

Most of the participants reported high self efficacy (SE) and positive perception about fruit and vegetable (F&V) consumption (had pros> cons). The reason why all participants reported a positive perception about F&V consumption might relate, in part, to the nature of the scale used to assess decisional balance (DB). The scale used had 10 pros and 10 cons and participants had to respond to each of them as “agree” or “disagree.” Because all the pros and cons were listed, participants might be tempted to circle the more sensible answers (agree with the pros, and disagree with the cons). This may be the reason why all participants, including the precontemplators, and the contemplators, had high DB scores. It might have been a better idea to ask the participants to complete a list of reasons to eat five or more servings of F&V daily in order to reveal the substantial advantages and obstacles of consuming five or more servings of F&V daily.

One fifth of the participants in the maintenance stage reported less than “5 a day” (see Table 4). According to the stage of change (SOC) assessment questionnaire, one should be in the maintenance stage if he/she consumes five servings of F&V per day and
has been doing that for at least six months. Participants who circled this choice (maintenance stage), yet reported consumption of less than five servings of F&V might have misinterpreted the question about F&V daily consumption. The question was phrased as: “How many servings of F&V servings do you usually consume per day?” Four blanks were provided for the answer and included breakfast, lunch, dinner, and snacks. Participants might have answered this question according to the day preceding the day of the survey which might not have been an average, representative day. Also, participants in the maintenance stage might have reported 4 servings per day, but because it was necessary to have a clear cut-off point (5 servings/ day), 4 servings was treated as zero servings because both are less than five.

The odds ratio obtained from the simple logistic regressions indicates that participants were all almost equally likely to consume five servings of F&V, with an exception that higher odds of consuming “5 a day” were observed when comparing participants with the highest versus the lowest education, income, and age. One way to explain this is through the possible intercorrelation between these three variables; i.e. participants who were 50 years or older were, in most cases, PhD holders, and employees earning more than seventy thousand dollars. In a cross-sectional study carried out to reveal the association between social factors and low consumption of F&V, Laforge et al. (1994) documented that education was positively related to F&V consumption ($P <0.05$).

In a descriptive study, conducted to examine the association between SOC related to eating more F&V and some psychosocial factors, the author found that age (older ages), gender (women), and education (college or graduate degree) were associated with higher F&V consumption and SOC, $P <0.001$ (Campbell, 1999). Minor differences in the
results of the current study and Campbell’s may be due to the different survey methods used which affect, at least in part, the comparability of the findings. For example, in our survey, we treated “age” as a categorical variable and the participants were located in age-classes, and P-values were based on chi-squares, whereas in Campbell’s study participants reported their age which was treated as a continuous variable, and P-values were based on ANOVA.

Not surprisingly, employees in the highest stages of change, SE, and DB, were more likely to consume 5 or more servings of F&V per day. The observed association of stage with F&V consumption was not surprising, yet was not redundant so that the self-report assessment of F&V consumption was not used as part of the SOC assessment. At the same time, not surprisingly, people who reported eating five servings of F&V a day on the F&V consumption questionnaire also tended to choose either the fourth (action stage) or the fifth (maintenance stage) answer in the SOC assessment item. These results are consistent with Campbell’s findings (1999) where he found that the mean daily F&V consumption was higher for participants in the later stages (action and maintenance), \( P < 0.001 \).

It was not surprising that we could not detect any differences in the odds ratio of “5 a day” consumption between the participants in preparation, contemplation, and precontemplation stages. As the theory indicates there is generally no increase in consumption that can be noticed until participants reach the action and maintenance stages of change. The current study also found no significant odds ratio when comparing participants in the action stage to those in the precontemplation stage, however the odds ratio approached significance (\( P = 0.054 \)). This can be explained by the very small
numbers of the participants in the action stage. Only five participants reported that they were in the action stage, i.e. consume “5 a day” for less than 6 months. Yet, three of them (3/5) reported consumption of less than five servings of F&V a day. Because of the small count, these three had a heavy weight on the odds ratio. The contradiction in their responses, action stage and less than “5 a day,” may be because these three participants did not understand the question about F&V consumption. They might have reported the consumption in the previous day of the survey instead of an average day consumption.

A study done by Povey et al. (1999) provides a critical examination of the application of the Transtheoretical Model's stages of change to dietary behaviors. In their work, they argued that, unlike addictive behaviors, there is "a potential mismatch between a person's perceived and actual dietary behavior," meaning that, what a person says he/she is eating may not match what he/she is actually eating. This finding justifies, at least in part, the results of the current study regarding the observed conflict between participants’ stages of change and their reported F&V intake. However, this conflict could not totally mask the differences between stages with regard to F&V consumption. Brug et al. (1997) after surveying 739 adults came to the same conclusion. People in the later stages (action, and maintenance) have a higher mean intake of F&V as compared to those in the pre-action stages (P <0.05).

Brug et al. (1997) documented that people who reported consumption of five servings of F&V per day (action/maintenance) had the most positive perception of “5 a day” behavior, whereas those in the pre-contemplation stage had the least positive perception. It was reasonable to find a similar association between F&V consumption and SOC, SE scores, and DB scores. Many studies reported a linear trend between SOC,
SE, and DB and F&V consumption (Ma et al., 2002; and Horacek et al., 2002). Moreover, Ma and coworkers demonstrated the applicability of the transtheoretical model constructs (SOC, SE, and DB) for assessing F&V consumption by adults. Van Duyn et al. (2001) conducted a survey of 2605 individuals and examined the associations between TTM constructs and consumption of F&V. They found that SE for eating F&V was strongly associated with consuming 5 servings of F&V every day (being in action or maintenance stage), P < 0.05.

All these results support the findings of Campbell (1999, 1998), who confirmed the applicability of the transtheoretical model to dietary change in his two studies where he found that higher SE scores were associated with more F&V consumption and being in a later stage (action or maintenance), P<0.001.

**Preparation Stage- Based Intervention Program for Employees in the Pre-contemplation and Contemplation Stages Combined, as Compared to the Preparation Stage**

In project 1, participants with the highest income, education, and age had higher odds of consuming F&V as compared to those with lowest income, education and age. However, after controlling for income and education (both groups included participants with low education and low income) in project 2, the consumption of more fruits and vegetables was independent from these variables. This finding supports the argument that individuals with low income and low education can respond to nutritional interventions as well as those with high income and high educational levels.

The findings of this study support Prochaska’s argument that pushing individuals toward premature action increases the risk of relapse. Participants in the PC/C group, when treated similarly to participants in the P group, relapsed after the intervention to the
starting point in terms of reported F&V intake, SOC, and SE. These findings demonstrated how TTM can be a useful approach in designing cost-effective interventions. For example, by drawing the assumptions that 1) the cost of the intervention used in this study was $400, and 2) most of the relapsed participants, if not all, were from the PC/C group then we had 17 successful changers from the P group (reached maintenance). Applying simple arithmetic, the cost of each successful changer was $23.5 ($400/17). However, if all of our sample were from the preparation stage, the cost of each successful changer would be $10.2 ($400/39). This finding supports the use of TTM as a tool for either 1) maximizing the benefits of intervention by targeting individuals who are ready to change (Preparation stage), especially if the intervention is given by an organization with limited funding, or 2) if there is enough funding, then the TTM can help in targeting all individuals in the community and moving them to the maintenance stage by designing multi-stage interventions.

The response of the two groups to the intervention in the current study supports Prochaska’s argument about the increased effectiveness of an intervention when it is tailored to one’s SOC. Because the intervention used in this study was tailored to those in the preparation stage, it was not surprising to get a greater response from the P group. This finding is consistent with that reported by Steptoe et al. (2003); individuals who received stage-tailored intervention had greater F&V consumption when compared to those who received general intervention (regardless of SOC).

Siero et al. (2000) applied the TTM to target dietary behavioral change in a group of participants with high risk of cardiovascular disease (CVD). But the objective of their study was different than the objective of the current study. They aimed to compare two
approaches of nutrition intervention: a group nutrition education program versus a tailored nutrition education program based on the participant’s SOC. These researchers found that all participants in both groups were able to increase their F&V intake. However; when they measured the shift in the SOC, they found that participants moved from the preparation stage to the action stage, which again supports our results and hypothesis (individuals in the preparation stage are the ones who would make the actual change).

Another interventional study that applied the TTM to promote more F&V consumption was conducted by Havas et al. (2000). The study was carried out at 16 Women, Infants, and Children (WIC) sites. The intervention was conducted at eight sites and eight sites served as controls. Women in the treatment group received nutrition education based on the TTM framework, whereas women in the control group received the normal WIC program nutrition education regardless of their SOC. Researchers reported that, at a two month post-intervention follow up, women in the intervention group had a higher mean increment in their F&V consumption (0.56 ± .11 servings) as compared to the women in the control group (0.13 ± .17 serving), p=0.002 (Havas et al. 2000). The finding of this study substantiates our results, and supports the idea that ignorance of one’s SOC leads to less effectiveness of the intervention.

Brinley and coworkers (2001) developed three stage-specific lessons (precontemplation-based, contemplation-based, and preparation-based) to increase F&V consumption. They started the education with 148 individuals, but only 68 completed the program with the pre and post tests. Movement between stages of change was the outcome used to evaluate the intervention. In their study, the precontemplators moved to
contemplation stage, the contemplators did not change stages, and those who were in the preparation stage moved to the action stage. These results are not inconsistent with our findings because by combining the precontemplators and contemplators we may not have been able to detect the movement from the precontemplation to the contemplation stages.

A similar study was conducted by Resnicow et al. in 2003 to examine if precontemplators are less likely to change when compared to those in the preparation stage. The authors studied the effect of three types of intervention on 861 participants who were randomly assigned to three groups; control, treatment 1, and treatment 2. Participants in the control group received the "usual nutrition education." Treatment 1 consisted of self-help intervention (video, brochures, and a cookbook) and one "telephone cue call" to help the participants use the tools of the self-help intervention. In addition to all that, treatment 2 had an additional three counseling calls. Participants were asked to fill out a pre- and a post-test (one year apart). Variables measured included: SOC, F&V consumption, and SE. The results of this study showed that, for each treatment group, the mean change, in all variables, reported by the precontemplators was not significantly different than that reported by participants in the preparation group. These results are different than the results of the current study. There may be several explanations for that. First of all, the authors only conducted a single post-test assessment which was one year from the baseline. Collecting intermediate follow-up data might have helped in better understanding the process of change. Collecting more data points might have yielded different results. While the curriculum used was not designed following the TTM, the intervention used, was more of a precontemplation/contemplation-tailored intervention, which explains the reason why precontemplators might have changed.
This study by Resnicow, despite all of its limitation, has demonstrated the applicability of the TTM for use with dietary behaviors. Although many studies have documented that the TTM can be successfully applied to changing dietary behaviors, specifically F&V consumption, additional research on a larger scale, is needed to examine the usefulness of the model when used to encourage people to change their dietary behaviors.

**Conclusion**

The findings of the current study may explain the low response rate (ineffectiveness) of many nutrition interventions. It provides potentially important information for designing intervention programs. Stage-tailored interventions appear to be more cost-effective when delivered to the right individuals. Individuals who receive non-tailored stage intervention appear to be at higher risk for relapse. However, less is published about the utility of the TTM for understanding the process of change. More research is needed to explain the process of change in other dietary and health behaviors using TTM constructs.

Because the assessment of dietary intake is more complicated than an assessment of addictive behaviors (i.e. smoking), validated SOC questionnaires specific to food consumption should be developed. This study suggests that TTM is a useful model that can be applied to dietary-behavior change, more specifically, F&V consumption. The study provided evidence that nutrition intervention aimed at encouraging higher intake of F&V might be the most effective if it is stage-tailored (movement from preparation to action occurred and was maintained). More research is needed to identify strategies to encourage individuals to move forward from the pre-preparation stages.
Future Prospective

TTM is a particularly useful heuristic approach for understanding how and when to apply interventions to promote behavioral change. The findings in this study may have implications for targeting individuals who do not, as yet, consume the recommended amount of F&V based on their readiness to change. This study, provides an important key to designing more cost-effective interventions as it suggests the following steps: a) prescreen the targeted population for stage of change b) identify those in the preparation stage and ready to change c) design interventions that target those individuals so as to maximize the benefits and minimize the cost. This study also suggests that, in order to prevent relapses, individuals identified as precontemplators and contemplators should first be moved to the preparation stage before participating in intervention programs.
REFERENCES


from the World Wide Web:


APPENDIX A

STUDY PROTOCOL

On line survey: study the characteristics of the Ag Center employees population (gather data regarding employee demographics, fruit and vegetable intake, stage of change, and self efficacy).

Group 1: Preparation stage (n= 20)

Group 2: pre-contemplation, contemplation (n=20)

merge

Week1-week 4
Meet four times (once a week)
Power Point Presentation
- Free lunch
- 30 minutes extra
- free recipes and 5 a day menus booklet
- Fill questionnaire
  - Decisional balance
  - Self -efficacy
  - Stage of change
  - Fruits and vegetables estimation

Week6-week7
- Fill questionnaire
  - Decisional balance
  - Self -efficacy
  - Stage of change
  - Fruits and vegetables estimation

Four months later
- Fill questionnaire
  - Decisional balance
  - Self -efficacy
  - Stage of change
  - Fruits and vegetables estimation
APPENDIX B

FRUITS AND VEGETABLES DAILY CONSUMPTION ESTIMATION SHEET

Instructions: Fill in the boxes below with the best estimation of your fruit and vegetable intake.

Please note: A fruit and vegetable serving includes all forms of fruits and vegetables - fresh, frozen, canned, dried and 100 percent juice.

One serving equals: One medium-sized fruit or vegetable (ex. apple, orange, banana, pear, tomato). Click here for more specific examples of a serving.

How many servings of fruits and vegetables servings do you usually consumed per day?

At breakfast __________ servings

At lunch __________ servings

At dinner __________ servings

At snacks or dessert __________ servings
APPENDIX C
STAGE OF CHANGE ESTIMATION SHEET

Please circle the number corresponding to the best description of your current stage of fruit and vegetable consumption:

1. I am not currently consuming 5 servings of fruits and vegetables a day and I am not thinking of doing so.

2. I am not currently consuming 5 servings of fruits and vegetables a day but I have thought about that.

3. I am not currently consuming 5 servings of fruits and vegetables a day but I plan to do so within the next couple of months.

4. I am currently consuming 5 servings of fruits and vegetables a day but I have only been doing so for the less than six months.

5. I am currently consuming 5 servings of fruits and vegetables a day and I have been doing so for the six months or more.
APPENDIX D

SELF EFFICACY ESTIMATION SHEET

Please circle the number on the scales from 1-5 that most precisely reflects how confident you feel about being able to perform the action stated:

1. not at all confident 2. not too confident 3. somewhat confident 4. confident 5. very confident

<table>
<thead>
<tr>
<th>Action</th>
<th>Not at all confident</th>
<th>Not too confident</th>
<th>Somewhat confident</th>
<th>Confident</th>
<th>Very confident</th>
</tr>
</thead>
<tbody>
<tr>
<td>I can keep fruits and vegetables at hand/readily available</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>When I have the chance to choose, I can eat the recommended number of servings of fruits and vegetables</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I can shop for a variety of fruits and vegetables</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I can make time to eat fruits and vegetables</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>When I eat at home, I can eat more fruits and vegetables</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
APPENDIX E

DECISIONAL BALANCE ESTIMATION SHEET

Please indicate whether you agree or disagree with the following items when you are deciding whether or not to consume Fruits and Vegetables. Circle the best response

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>Agree</th>
<th>Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>It is not convenient to include fruits and vegetables when I am in a hurry.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>I feel I am doing something good for my body if I eat more fruits and vegetables.</td>
<td>Agree</td>
<td>Disagree</td>
</tr>
<tr>
<td>3.</td>
<td>It is difficult to find fruits and vegetables that I like.</td>
<td>Agree</td>
<td>Disagree</td>
</tr>
<tr>
<td>4.</td>
<td>Consuming more fruits and vegetables adds variety to my diet</td>
<td>Agree</td>
<td>Disagree</td>
</tr>
<tr>
<td>5.</td>
<td>I don’t have time to shop at a store that sells fruits and vegetables.</td>
<td>Agree</td>
<td>Disagree</td>
</tr>
<tr>
<td>6.</td>
<td>It is easy for me to eat one serving of a fruit when I am busy.</td>
<td>Agree</td>
<td>Disagree</td>
</tr>
<tr>
<td>7.</td>
<td>I worry about the safety of chemicals used in fruits and vegetables.</td>
<td>Agree</td>
<td>Disagree</td>
</tr>
<tr>
<td>8.</td>
<td>Eating foods like fruits and vegetables would help me maintain my weight.</td>
<td>Agree</td>
<td>Disagree</td>
</tr>
<tr>
<td>9.</td>
<td>I have limited ways to incorporate fruits and vegetables in my meals.</td>
<td>Agree</td>
<td>Disagree</td>
</tr>
<tr>
<td>10.</td>
<td>I will always be able to find new ways to fix fruits and vegetables.</td>
<td>Agree</td>
<td>Disagree</td>
</tr>
<tr>
<td>11.</td>
<td>I feel better when I eat more fruits and vegetables.</td>
<td>Agree</td>
<td>Disagree</td>
</tr>
<tr>
<td>12.</td>
<td>I purchase fruits and vegetables only if on sale.</td>
<td>Agree</td>
<td>Disagree</td>
</tr>
<tr>
<td>13.</td>
<td>I eat more fruits and vegetables if my family and friends do.</td>
<td>Agree</td>
<td>Disagree</td>
</tr>
<tr>
<td>14.</td>
<td>Foods like fruits and vegetables would help me lose weight when I need to.</td>
<td>Agree</td>
<td>Disagree</td>
</tr>
<tr>
<td>15.</td>
<td>I would have to give up other foods to buy more fruits and vegetables.</td>
<td>Agree</td>
<td>Disagree</td>
</tr>
<tr>
<td>16.</td>
<td>I have limited storage space for fresh and/or frozen fruits and vegetables.</td>
<td>Agree</td>
<td>Disagree</td>
</tr>
<tr>
<td>17.</td>
<td>It would be too confusing for me to try to follow all the recommendations about eating fruits and vegetables.</td>
<td>Agree</td>
<td>Disagree</td>
</tr>
<tr>
<td>18.</td>
<td>Eating more fruits and vegetables would keep me from getting sick</td>
<td>Agree</td>
<td>Disagree</td>
</tr>
<tr>
<td>19.</td>
<td>I can find reasonably priced fruits and vegetables in my local stores and produce markets</td>
<td>Agree</td>
<td>Disagree</td>
</tr>
<tr>
<td>20.</td>
<td>It is better to get all nutrients from fruits and vegetables rather than taking supplements</td>
<td>Agree</td>
<td>Disagree</td>
</tr>
</tbody>
</table>
# APPENDIX F

## DEMOGRAPHIC INFORMATION QUESTIONNAIRE

<table>
<thead>
<tr>
<th>Name:</th>
<th>Gender</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>![Male] ![Female]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Age</th>
<th>Ethnicity</th>
</tr>
</thead>
<tbody>
<tr>
<td>25-30 years</td>
<td></td>
</tr>
<tr>
<td>31-40 years</td>
<td></td>
</tr>
<tr>
<td>41-50 years</td>
<td></td>
</tr>
<tr>
<td>&gt; 50 years</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Annual Income</th>
<th>Level of Education</th>
</tr>
</thead>
<tbody>
<tr>
<td>$ 29,999 or less</td>
<td>![High school] ![Bachelor] ![Masters] ![Doctorate]</td>
</tr>
<tr>
<td>$ 30,000-$49,000</td>
<td></td>
</tr>
<tr>
<td>$ 50,000-69,000</td>
<td></td>
</tr>
<tr>
<td>$ 70,000 or more</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>do you live.........?</th>
<th>How often do you do your grocery shopping?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alone</td>
<td>![Once a month] ![Once every 2 weeks] ![Once a week] ![More than once a Week]</td>
</tr>
<tr>
<td>with spouse</td>
<td></td>
</tr>
<tr>
<td>with spouse and children</td>
<td></td>
</tr>
<tr>
<td>with spouse, children, and other adults</td>
<td></td>
</tr>
<tr>
<td>with other adults</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Are you a current smoker?</th>
<th>Do you have any of the following diseases?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>![Cancer] ![Diabetes] ![Heart disease] ![Obesity]</td>
</tr>
<tr>
<td>No</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Do you have a family with any of the following diseases?</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Cancer] ![Diabetes] ![Heart disease] ![Obesity]</td>
</tr>
</tbody>
</table>
APPENDIX G
FRUITS AND VEGETABLES SERVING SIZE ESTIMATION SHEET

One serving of fruits and vegetables equals:

- 1/2 cup of raw, cooked, canned or frozen fruits or vegetables
- 3/4 cup (6 oz.) of 100 percent fruit or vegetable juice
- 1/2 cup cooked or canned legumes (beans, lentils and peas)
- 1 cup of raw, leafy vegetables (ex. lettuce, spinach)
- 1/4 cup dried fruit (ex. raisins, apricots, mango)
APPENDIX H

AGCENTER CHANCELLOR COVER LETTER

From: Kramer, Simone
Sent: Friday, September 19, 2003 8:56 AM
To: LCES State Faculty; LAES Departments (faculty/staff)
Subject: Nutrition and Dietary Behavior

TO: AgCenter Faculty and Staff in Baton Rouge

RE: Nutrition and Dietary Behavior

In a recent report, Louisiana was ranked among the highest 10 states in poor nutritional habits and the incidence of chronic diseases (cancer, diabetes, obesity, and heart disease) associated with inadequate nutrition.

A major goal of the LSU AgCenter is "to implement nutrition, diet, food safety and health programs for better living." The LSU AgCenter is supporting the efforts of the research scientists and extension educators in the School of Human Ecology in developing a model nutrition education program that will improve the nutritional status and health of Louisiana residents.

I encourage you to complete the attached survey, which will require approximately 10 minutes and provide valuable information for a research project addressing the nutrition and dietary behavior of LSU AgCenter employees. Please click on www.huec.lsu.edu/misc/cover.htm and respond to the survey.

A limited number of faculty and staff in Baton Rouge will be selected to participate in a tailored nutrition education program. If you are selected, I urge you to take advantage of the opportunity to improve your nutritional status and health. Your participation in the project will be appreciated.

William B. Richardson

Chancellor and Chalkley Family

Endowed Chair
From: Bivin, Rosalie J.
To: LCES State Faculty; LAES Departments (faculty /staff)
Sent: 9/30/2003 2:45 PM
Subject: FW: Reminder: Nutrition and Dietary Behavior Survey Due October 3, 2003


The message below was sent to you on September 19, 2003. If you have not completed the survey, please click on the hyperlink in the text of the letter and take a few minutes to complete the form and survey. Your prompt response by October 3, 2003, will be deeply appreciated.
Dear LSU AgCenter Employee:

Your help is needed to obtain important information about fruit and vegetable consumption by Louisiana residents. This survey is preliminary to an intervention study that will target dietary behavior modifications for increased consumption of fruits and vegetables.

Your completion of this survey will help us in achieving our mission of enhancing the health of Louisiana residents by promoting healthy dietary behaviors, including increased fruit and vegetable consumption. I would like to draw your attention to the urgency of conducting this study because Louisiana was ranked among the highest 10 states in poor nutritional habits and incidence of chronic diseases, such as cancer, diabetes, obesity, and heart disease, all of which are associated with poor nutrition.

Please take a few minutes to fill out and return the attached survey. Please do not hesitate to contact me if you have any questions at hibawadi@lsu.edu.

Thank you for your time and help. 

Click here to continue to the consent form

Sincerely,

Hiba Bawadi, B.Sc., M.Sc., Nutrition
PhD Candidate at Louisiana State University
School of Human Ecology
Human Nutrition and Food Division
126 Human Ecology Building
Baton Rouge, LA 70803
Ph: (225) 673-1732
Fax: (225) 673-2897
hibawadi@lsu.edu

Applying the Trans-theoretical Model (Stage of Change) to Identify LSU AgCenter Employees Most Ready to Adopt Greater Fruit and Vegetable Consumption

Louisiana State University
PAM-H03-08

1. Purposes: to identify the individual’s readiness to adopt a new dietary behavior, to provide a tailored nutrition education program for the population based on stages of the trans-theoretical model for selected participants, and to measure the rate of change toward greater fruit and vegetable consumption.

2. Number of Participants: five hundred of LSU AgCenter Employees in the Baton Rouge area

3. Time: the estimated time to fill out the survey is 10-15 minutes

4. Procedures: LSU AgCenter employees will be asked to fill out a survey composed of a demographic data questionnaire, fruit and vegetable daily consumption estimation sheet, and stage of change algorithm.

5. Participant’s right: your participation to the project is voluntary.

6. Benefits: Participants will learn more about healthy eating habits associated with lowering the risk of chronic diseases by increasing fruit and vegetable consumption. Moreover, based on the results of this survey, you may be selected to participate in another study where you may have 30 minutes extra for your lunch break with the approval of your supervisor and/or free lunch or other incentives.

7. Risks: there is a very minimal risk as your survey results will only be given to you. Publication of project results will only include average test scores, and collective survey results, with no reporting of individual data.

8. Privacy: your survey results will be given to you only. All results will be reported anonymously without using the names of individual participants. We will not keep the data in any way that would make it possible to identify a participant. Research records will be kept in a secure place. Access to these records will be limited to the researchers.
6. **Benefits:** Participants will learn more about healthy eating habits associated with lowering the risk of chronic diseases by increasing fruit and vegetable consumption. Moreover, based on the results of this survey, you may be selected to participate in another study where you may have 30 minutes extra for your lunch break with the approval of your supervisor and/or free lunch or other incentives.

7. **Risks:** There is a very minimal risk as your survey results will only be given to you. Publication of project results will only include average test scores and collective survey results, with no reporting of individual data.

8. **Privacy:** Your survey results will be given to you only. All results will be reported anonymously without using the names of individual participants. We will not keep the data in any way that would make it possible to identify a participant. Research records will be kept in a secure place. Access to these records will be limited to the researchers.

9. **Right to refuse or withdraw:** Because your participation is voluntary, you have the right to refuse to participate or discontinue your participation in the research *AT ANYTIME*.

10. **Right to ask questions:** If there is any point that needs to be clarified, you can call Hiba Elawadi at 225-578-1733 or Dr. Micheal Keenan at 225-578-1708.

11. **Offer to Answer Questions:** This study has been explained to my satisfaction by Hiba Elawadi and my questions were answered. If I have any other questions about this study, I may call David G. Morrison, the Assistant Director of the Louisiana Agricultural Experiment Station and Administrator for the Institutional Review Board for the Louisiana Agricultural Center, at 225-578-8236.

12. **Acknowledgment and consent for participation:** I agree that I have read and understand this consent to participate in this RESEARCH study (or if this has been read to me), that I understand the information contained in it, about which I have asked if unsure that all my questions about the study that have been answered in satisfactory manner, and that I understand the nature and purpose of the study, its benefits and risks.

13. **Your approval:** Filing the attached questionnaires will be considered your consent to participate.

---

**Click here to take the survey**

---

**A. DEMOGRAPHIC DATA QUESTIONNAIRE**

Name ___________________________ Age ______ 18-24 years ________________

Ethnicity White Caucasian ________________

Gender Male ________________ Income $29,999 or less ________________

Education High School ________________ Title Administrative ________________

Weight ________ Height ________

Do you live Alone ________

You do your grocery shopping Once a month ________

Are you a current smoker? Yes ________

Although you are an AgCenter employee, do you work on the LSU campus? Yes ________

Do you have any of the following diseases? Cancer ________

Do you have a family with any of the following diseases? Cancer ________

---

**B. FRUIT AND VEGETABLE DAILY CONSUMPTION**

Instructions: Fill in the boxes below with the best estimate of your fruit and vegetable intake.

Please note: A fruit and vegetable serving includes all forms of fruits and vegetables - fresh, frozen, canned, dried and 100 percent juice.

One serving equals __ One medium-sized fruit or vegetable (e.g., apple, orange, banana, pear, tomato) _Click here for more specific examples of a serving._
C. STAGE OF CHANGE

Please read carefully and check the number corresponding to the best description of your current stage of fruit and vegetable consumption.

☐ I am currently consuming 5 servings of fruits and vegetables a day and I am not thinking of doing so in the coming 6 months.

☐ I am currently consuming 5 servings of fruits and vegetables a day but I have thought about that.

☐ I am currently consuming 5 servings of fruits and vegetables a day but I plan to do so within the next 6 months.

☐ I am currently consuming 5 servings of fruits and vegetables a day but I have only been doing so for the less than six months.

☐ I am currently consuming 5 servings of fruits and vegetables a day and I have been doing so for the six months or more.

D. SELF-EFFICACY

Please select from the menu the best description of your confidence level about being able to perform the action stated below.

I can keep fruits and vegetables at hand/readily available [Not at all confident] ☐

When I have the chance to choose, I can eat the recommended number of servings of fruits and vegetables [Not at all confident] ☐

I can shop for a variety of fruits and vegetables [Not at all confident] ☐

I can make time to eat fruits and vegetables [Not at all confident] ☐

When I eat at home, I can eat more fruits and vegetables [Not at all confident] ☐

E. DECISIONAL BALANCE

I worry about the safety of chemicals used in fruits and vegetables. [Agree] ☐

Eating foods like fruits and vegetables would help me maintain my weight. [Agree] ☐

I have limited ways to incorporate fruits and vegetables in my meals. [Agree] ☐

I will always be able to find new ways to fix fruits and vegetables. [Agree] ☐

If I feel better when I eat more fruits and vegetables, [Agree] ☐

I purchase fruits and vegetables only if on sale. [Agree] ☐

I eat more fruits and vegetables if my family and friends do. [Agree] ☐

Foods like fruits and vegetables would help me lose weight when I need to. [Agree] ☐

I would have to give up other foods to buy more fruits and vegetables. [Agree] ☐

I have limited storage space for fresh and/or frozen fruits and vegetables. [Agree] ☐

It would be too confusing for me to try to follow all the recommendations about eating fruits and vegetables. [Agree] ☐

Eating more fruits and vegetables would keep me from getting sick. [Agree] ☐

I can find reasonably priced fruits and vegetables in my local stores and produce markets [Agree] ☐

It is better to get all nutrients from fruits and vegetables rather than taking supplements [Agree] ☐
Dear LSU AgCenter Employee:

Your help is needed to obtain important information about fruit and vegetable consumption by Louisiana residents. This survey is preliminary to an intervention study that will target dietary behavior modifications for increased consumption of fruits and vegetables.

Your completion of this survey will help us in achieving our mission of enhancing the health of Louisiana residents by promoting healthy dietary behaviors, including increased fruit and vegetable consumption. I would like to draw your attention to the urgency of conducting this study because Louisiana was ranked among the highest 10 states in poor nutritional habits and incidence of chronic diseases, such as cancer, diabetes, obesity, and heart disease, all of which are associated with poor nutrition.

Please take a few minutes to fill out and return the attached survey. Please do not hesitate to contact me if you have any questions at hbawad1@lsu.edu.

Thank you for your time and help.

Click here to continue to the consent form

Sincerely,

Hiba Bawadi, B.Sc., M.Sc. Nutrition
PhD candidate at Louisiana State University
School of Human Ecology

Human Nutrition and Food Division
125 Human Ecology Building
Baton Rouge, LA 70803
Ph: (225) 578-1733
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APPENDIX L

SURVEY CONSENT FORM

Consent form
Applying the Trans-theoretical Model (Stage of Change) to Identify LSU AgCenter Employees Most Ready to Adopt Greater Fruit and Vegetable Consumption.
Louisiana State University
IRB# H03-06

1. **Purposes:** to identify the individual’s readiness to adopt a new dietary behavior; to provide a tailored nutrition education program for the preparation stage of trans-theoretical model for selected participants, and to measure the rate of change toward greater fruit and vegetable consumption.

2. **Number of Participants:** five hundred of LSU AgCenter Employees in the Baton Rouge area

3. **Time:** the estimated time to fill out the survey is 10-15 minutes

4. **Procedures:** LSU AgCenter employees will be asked to fill out a survey composed of a demographic data questionnaire, fruit and vegetable daily consumption estimation sheet, and stage of change algorithm.

5. **Participant’s right:** your participation to the project is voluntary

6. **Benefits:** Participants will learn more about healthy eating habits associated with lowering the risk of chronic diseases by increasing fruit and vegetable consumption. Moreover, based in the results of this survey, you may be selected to participate in another study where you may have 30 minutes extra for your lunch break with the approval of your supervisor and/or free lunch or other incentives.

7. **Risks:** there is a very minimal risk as your survey results will only be given to you. Publication of project results will only include average test scores, and collective survey results, with no reporting of individual data.

8. **Privacy:** your survey results will be given to you only. All results will be reported anonymously without using the names of individual participants. We will not keep the data in any way that would make it possible to identify a participant. Research records will be kept in a secure place. Access to these records will be limited to the researchers.
9. **Right to refuse or withdraw:** because your participation is voluntary, you have the right to refuse to participate or discontinue your participation in the research AT ANYTIME.

10. **Right to ask questions:** if there is any point that needs to be clarified, you can call Hiba Bawadi at 225-578-1733 or Dr. Micheal Keenan at 225-578-1708.

11. **Offer to Answer Questions:** this study has been explained to my satisfaction by Hiba Bawadi and my questions were answered. If I have any other questions about this study, I may call David G. Morrison, the Assistant Director of the Louisiana Agriculture Experiment Station and Administrator for the Institutional Review Board for the Louisiana Agricultural Center, at 225-578-8236.

12. **Acknowledgment and consent for participation:** I agree that I have read and understand this consent to participate in this RESEARCH study (or it has been read to me); that I understand the information contained in it, about which I have asked if unsure; that all my questions about the study that have been answered in satisfactory manner; and that I understand the nature and purpose of the study, its benefits and risks.

13. **Your approval:** Filling the attached questionnaires will be considered your consent to participate.

[Click here to take the survey]
APPENDIX M

POST-SURVEY RECRUITING EMAIL FOR THE INTERVENTION STUDY

Dear All,

Your completion to the “Nutrition and Dietary Survey” was highly appreciated. Like Dr. Bill Richardson said in his letter, Louisiana has one of the highest 10 states incidence of chronic diseases, such as cancer, diabetes, obesity, and heart disease, all of which are associated with poor nutrition. Based on the survey you have submitted, you have been selected to participate in an intervention study. We appreciate your time, and that is why we promise not to waste it. Your part will be just in providing some data about your attitude toward certain food items and this will be done during the lunch break of 4 Fridays. You will be invited to have a very good, tasty, and healthy Mediterranean food that prepared with the help of professionals. You can promise that you will not regret it. Please reply me immediately as you get this email if you want to participate in the study.

Your reply is very important to order enough amount of food
When: Oct 17, 24, 31, and Nov 7 sharply at 12:00-1:00, but if you are busy, you can come at 12:00 to attend the talk and fill the requested information (about 15-20 minutes total) and take your lunch and go
Where: Lobby, school of human ecology
Reminders will be sent to you if you want to participate
Thank you for taking time reading this email and waiting for your reply

Hiba
APPENDIX N

INTERVENTION PROGRAM LESSONS

WELCOME!!!

I AM

• Hiba Bawadi
• PhD candidate at School of Human Ecology/Nutrition and Food Division
• Working under the supervision of Dr. Michael Keenan

Why you have asked to participate?

❖ Purpose
To identify the individual’s rate of dietary behavioral change toward greater fruit and vegetable consumption following a tailored nutrition education program

What is involved?

Schedule
• Weeks 1-4
  ➢ Meet once a week for 15 minutes
  ➢ complete a questionnaire (5-7 minutes)
• Weeks 5-6
  ➢ complete same questionnaire and email them to me
• Six months later
  ➢ You will be contacted to complete same questionnaire and email them back to me.

Consent Form

❖ Participant’s right
Your participation in the project is voluntary

❖ Benefits
you will learn more about healthy eating habits that are associated with lowering the risk of chronic diseases including more fruit and vegetable consumption.
you will have 30 minutes extra for your lunch break and/or free lunch or other incentives.
you will receive free recipes booklet

Consent Form
Consent Form

**Risks**
There is minimal risk to you and your results will only be given to you. Publication of projects result will only include average test scores, and collective survey results, with no reporting of individual data.

**Privacy**
Your survey result will be given to you only. All results will be reported anonymously without using the actual names of individual participations. We will not keep the data in any way that would make it possible to identify a participant. Research records will be kept on a secure place. Access to these records will be limited to the researchers.

**Right to refuse or withdraw**
Because your participation is voluntary, you have the right to refuse to participate or discontinue your participation in the research AT ANYTIME.

**Contact**
Right to ask questions: *if there is any point that needs to be clarified*

hbawad1@lsu.edu

**Please**
- Don’t talk to anyone about the research.

- It is not necessary that your behavior changes. Just report whatever you feel is correct about your attitude and behavior toward increasing your fruit and vegetable consumption.

**Please!!!**
PLEASE!!!

- Keep reporting …. It is very hard to deal with missing data.

American Diet

- High in calories
- High in saturated fat and cholesterol (butter, milk, egg, and meat)

American Diet

- High in sodium ~ 6,000 mg (fast and Processed food)
- High in simple sugar (sweets, snacks)

American Diet

- Low in fiber (whole grains, and fruits and vegetables)

Situation in Louisiana?

- Fruits and vegetables consumption

Among all States, Louisiana has the highest percentage of adults who reported eating fewer than five servings of fruits and vegetables per day.
Percentage of adults who reported less than 5 servings of fruits and vegetables in LA as compared to the national average of the US

**BASICS**

What is the recommended intake of fruits and vegetables?

According to USDA Food Guide Pyramid, the recommended intake of fruits and vegetables is 5 - 9 servings per day.

**What is a serving size?**

**Serving size of fruits =**

- 1 medium-sized piece of fruit (e.g. banana, apple, orange, pear)
- 1/2 cup cut-up fresh fruit or canned fruit, canned in its own juices
- 3/4 cup (6 fluid ounces) 100% fruit juice
- 1/4 cup dried fruit (e.g. raisins, dried apricots, prunes)

**Serving size of vegetables =**

- 1 cup raw, leafy vegetables or salad (e.g. lettuce, spinach)
- 1/2 cup cooked or canned vegetables
- 3/4 cup (6 fluid ounces) 100% vegetable juice
- 1/2 cup cooked or canned beans, peas, or lentils
Fruits and vegetables are good for you

- MOST ARE:
  - low in fat and calories except avocados, coconut and olives.
  - Rich in vitamins such as vitamin A, C, and folate, and minerals like potassium, calcium, and iron.
  - Excellent source of fiber.

Fruits and vegetables are good for you.

- Rich in phytochemicals: fruits and vegetables contain over 100,000 phytochemicals that work together. This makes it difficult to have a single supplement as powerful as fruits and vegetables.
- Associated with low prevalence of chronic diseases including heart disease, cancer, obesity, and diabetes.

5 a day

Cancer

- Cancer accounted for 23% of all deaths in the United States.
- Louisiana has the second-highest rate of death due to all cancers, and the seventh-highest due to colorectal cancer.

Chronic diseases associated with low fruits and vegetables consumption

- Cancer
- Diabetes
- Heart Disease
- Obesity

Rate of death (per 100,000 of population) due to all cancers in LA as compared to the national average of the US
Scientific proof- Lung cancer
14,120 participants
- Food frequency questionnaires
- 12 years (1989-2001) follow up
- Controlled for smoking
742 participants developed lung cancer
- lowest quintile of total fruit consumption

Conclusion: Participants in the highest quintile of total fruit consumption had less relative risk of lung cancer than participants in the lowest quintile of total fruit consumption.

Neuhouser et al. (2003)

Scientific proof- Breast cancer
Post-menopausal women
- Food frequency questionnaires
- follow up

Cancer free participants reported 1-2 servings of cruciferous vegetables per day

Conclusion:
- Intake of fruits and vegetables is associated with an increased survival in women diagnosed with breast cancer. (Smith-Warner, 2001)
- Women who reported 1-2 servings of cruciferous vegetables per day reduced their risk by 40-50% (Willett, 2000)

Scientific proof- Colorectal cancer
- Fruit and vegetable intake
- recurrence of adenomatous polyps, the precursor lesions for colorectal cancer, in the large bowel
- Odds ratio for adena in women in highest quintile of fruits consumption versus women in the lowest quintile was 0.50

Warner et al. (2002), Lanza et al. (2001)

Scientific proof- Diabetes
- Among all States, the highest rate of death due to diabetes was in Louisiana.

Diabetes

Rate of death (per 100,000 of population) due to diabetes in LA as compared to the national average of the US

Scientific proof- Diabetes
9,665 participants
- Food frequency questionnaires
- 20 years follow up
- Controlled for age, race, cigarette smoking, systolic blood pressure, use of antihypertensive medication, serum cholesterol concentration, body mass index, exercise, and alcohol consumption

Participants who developed diabetes had a lower mean daily intake of fruits and vegetables (P < 0.001).

Ford and Mokdad, 2001
Heart Disease

In 1999, heart disease accounted for 30% of all deaths in the United States.

Among all States, Louisiana had the fifth-highest rate of death due to heart disease.

Scientific proof- Heart Disease

- 84251 women, and 42148 men
- Followed the participants for 8-14 years
- Control for confounding factors associated with increased risk of heart disease
- Highest quintile of fruit and vegetable intake as compared to those in the lowest quintile, lower relative risk (p = 0.05).
- An increase in one serving of either fruits or vegetables per day was associated with lowering the risk of heart disease by 4% (p=0.01). (Joshipura et al. 2001)

Obesity

In the year 2000, the total estimated cost ascribed for overweight and obesity in the United States was $117 billion.

Obesity is responsible for 300,000 premature deaths every year as it is associated with an increased prevalence of cancer, diabetes, and heart disease.

Among all States, Louisiana has the sixth highest percentage of overweight adults.

Scientific proof- Obesity

To test whether greater fruit and vegetable consumption reduce the risk of obesity?

- Measure fruit and vegetable consumption using 24-hour recall
- Fruits and vegetables consumption was significantly lower in obese children.
- Low energy density of fruits and vegetables, which often have a high fiber and water content

Joshipura et al. 2001
An Apple A Day May Keep the Heart and Lung Specialists Away

- Researchers at the University of California Davis Medical School studied how eating apples and drinking apple juice every day affected heart disease risk.
- The 12-week study showed that by simply including apples in the diet (and without making any other dietary changes), study participants were able to reduce their risk of heart disease.

An Apple A Day May Keep the Heart and Lung Specialists Away

- Apples contain a variety of antioxidant phytochemicals that decrease LDL oxidation. Oxidized LDL cholesterol is more likely to build up in arteries, a process that can cause heart attacks and stroke.

An Apple A Day May Keep the Heart and Lung Specialists Away

- Researchers from the University of Nottingham, located in the United Kingdom, recently reported that people who eat five or more apples a week have better lung function and lower risk of asthma and other respiratory disease compared to people who rarely eat apples.

Their findings were based on a 10-year study involving 2,633 people examining relationships between diet and respiratory health.
- The researchers suspected that antioxidants in apples lead to these health benefits.

An Apple A Day May Keep the Heart and Lung Specialists Away

- In 1997 Finnish researchers reported that the antioxidant flavonoids may reduce the risk of lung cancer.
- This finding is based on a 25-year study examining relationships between diet and health in nearly 10,000 Finnish men.
Carotenoids and Cancer

• Carrots and other orange vegetables like squash and sweet potato and dark green vegetables like broccoli and spinach contain phytochemicals called carotenoids.

• The Nurses’ Health Study showed that women who eat the most carotenoid-rich vegetables have the lowest risk of breast cancer.

Carotenoids and Cancer

• Researchers report that raw vegetables contain the highest amounts of carotenoids, which are damaged by the heat of cooking.

The Cruciferous Crusaders

• Cruciferous vegetables include, broccoli, Brussels sprouts, cabbage, cauliflower, collard greens, rutabaga and turnips.

• Researchers from the Fred Hutchinson Cancer Research Center in Seattle reported in 2000 that men who eat at least 1.5 cups of cruciferous vegetables a week reduced their prostate cancer risk by more than 40 percent.

The Cruciferous Crusaders

• Researchers speculate that phytochemicals in cruciferous vegetables called isothiocyanates help the body produce enzymes that destroy cancer-causing compounds.

"Berry" Promising News

• In a study of 40 fruits and vegetables done at Tufts University in Boston, blueberries ranked number one in antioxidant content.

• A later study conducted at Tufts University in Boston reported that older rats fed blueberry extracts outperformed their study counterparts on balance, coordination, and memory tests.

"Berry" Promising News

• Researchers believe that the antioxidants in blueberries are responsible for the benefits.

• While rats are not little humans, this study has prompted researchers to explore the effects of blueberries on the effects of aging in older humans.
In 2001 researchers from Indiana University and Ohio State University reported that phytochemicals in red and black raspberries and strawberries inhibit the growth of colon and esophageal cancer cells in rats resulting from exposure to benzopyrene, a carcinogen found in tobacco smoke.

While a similar study has not been tested in humans, there are numerous studies that show that diets rich in fruits and vegetables help reduce the risk of stomach, lung, mouth, colon, and esophageal cancer by as much as 30 to 40 percent.

**FIBER**

- 4 oz vegetable bologna (120 cal)
- 2 slices pumpernickel (160 cal)
- 1 ½ cups tomato vegetable soup (90 cal)
- 3 cups mixed fruit (150 cal)

Total = 520 cal

- 4 oz bologna (360 cal)
- 2 slices pumpernickel

Total 520 cal

- 10 cups cauliflower seasoned with herbs and grated parmesan cheese (220 cal)
- 1 cup white rice (220 cal)
96 baked apples (made with cinnamon, ginger, and low-calorie sweetener) (480 cal)

1 large apple pie (480 cal)

8 cups raspberries with whipped topping (440 cal)

1 raspberry tart (440 cal)

1 ½ cups minestrone (110 cal)

1 slice cheese pizza (450 cal)

Salad with artichoke hearts and tomatoes (40 cal)

Total (600 cal)

2 slice cheese pizza (900 cal)
9 cups pasta and tomato sauce (600 cal)
Zucchini (30 cal)
Total 630 cal

1 cup pasta and tomato sauce (200 cal)
1 ½ cups zucchini and eggplant (60 cal)
Acorn squash and mixed bell peppers (60 cal)
Portobello and mushroom (20 cal)
Additional tomato sauce for vegetables (30 cal)
Total 370 cal

1 cup consomme (20 cal)
5 oz scallops (150 cal)
Asparagus (20 cal)
Red cabbage (50 cal)
Tossed salad (20 cal)
Semolina roll (80 cal)
Berries (60 cal)
3 fl oz wine (90 cal)
Total 490 cal

2 ½ fl oz vodka (300 cal)
½ cup mixed nuts (440 cal)
Total 740 cal

1 Boca burger, vegetarian, (85 cal)
Bun (110 cal)
Fixing (10 cal)
2 portobello mushrooms (30 cal)
2 slices eggplant (20 cal)
Total 255 cal

1 hamburger, 6 oz (480 cal)
Bun (110 cal)
Fixing (10 cal)
Total 600 cal

2 oz shrimp, red bell peppers, and onions (150 cal)
2 portobello mushrooms (30 cal)
6 asparagus spears (20 cal)
Potato (120 cal)
Zucchini (20 cal)
Corn on the cob (90 cal)
2 lb watermelon (100 cal)
Total 530 cal

2 oz hot dog (180 cal)
2 oz sausage (200 cal)
1/3 cup macaroni salad (150 cal)
Total 530 cal
1 medium serving frozen broccoli = 360 calories
4 cups of chips on the cob = 360 calories

1 medium serving cheese = 240 calories

6 oz apple chips = 460 calories
3 medium apples = 320 calories
4 pretzel rods = 140 calories
Total = 460 calories

7 oz low-fat, no-salt, no-cholesterol peanuts = 800 calories
4 pretzel rods = 140 calories
4 banana slices = 210 calories
5 dates = 150 calories
6 prunes = 150 calories
6 saltine crackers = 50 calories
3 dried apple slices = 40 calories
Total = 800 calories

HA...HA...HA
Colorful fruits and vegetables contain hundreds of phytochemicals that work together to promote health and prevent disease.

Supplements or pills contain large doses of only one or two phytochemicals.

When you eat fruits and vegetables, the phytochemicals are easily absorbed to provide the maximum health benefits.

Isolated supplements have not yet proven to be effective or even safe.

Again!!! Fruits and vegetables or pills?

Studies conducted to examine the effect of fruits or vegetables rich in a specific phytochemical, (ex. β-carotene) showed promising results. However, very few research succeeded in proving this relation when a sole β-carotene supplement were used.

A phytochemical is a natural bioactive compound found in plant foods that works with nutrients and dietary fiber to protect against disease.

Phytochemicals may help in slowing the aging process, reducing the risk of many diseases, cancer, heart disease, stroke, osteoporosis, cataracts, and UTI.
PHYTOCHEMICALS

"Phyto" is a Greek word that means plant and *phytochemicals* are usually related to plant pigments. So, fruits and vegetables that are bright in color - yellow, orange, red, green, blue, and purple - generally contain the most phytochemicals.

**Carotenoids**

Carotenoids are the pigments responsible for the colors of green, red, yellow and orange.

Carotenoids are a large family of phytochemicals which include:
- alpha-carotene
- beta-carotene
- lutein
- lycopene
- zeaxanthin

**Beta-Carotene**

- Beta-Carotene may help to slow the aging process, reduce the risk of certain types of cancer, improve lung function, and reduce complications associated with diabetes.

Beta-carotene is found in yellow-orange fruits and vegetables such as mangoes, cantaloupe, apricots, papaya, kiwifruit, carrots, pumpkins, sweet potatoes, winter squash, and green vegetables such as broccoli, spinach, and kale.

**Lutein**

Lutein is essential for maintaining proper vision as we age. It has been shown to reduce the risk of cataracts and macular degeneration, the leading causes of blindness in older people and may help reduce the risk of certain types of cancer.

Kale, spinach and collard greens, kiwifruit, broccoli, and Romaine lettuce.

**Lycopene**

Diets rich in lycopene have been shown to reduce the risk of prostate cancer and heart disease.

Lycopene is found in red fruits and vegetables such as tomatoes and cooked tomato products, red peppers, pink grapefruit, watermelon.
**Zeaxanthin**
- Zeaxanthin may help to prevent macular degeneration, which is the leading cause of visual impairment in people over 50. It may also help to prevent certain types of cancer.

**Flavonoids**
Flavonoids are another large family of protective phytochemicals found in fruits and vegetables and includes:
- Resveratrol
- Anthocyanins

**Corn, spinach, and winter squash**

**Resveratrol**
Resveratrol may reduce the risk of heart disease, cancer, blood clots, and stroke.

**Anthocyanins**
- Anthocyanins, have been shown to protect against the signs of aging. In one study, elderly rats that ate the equivalent of a half-cup of blueberries daily for eight weeks improved balance, coordination, and short-term memory.

**Red grapes, red grape juice, and red wine contain resveratrol.**

**Phenolic Compounds**
- Phenolic compounds may reduce the risk of heart disease and certain types of cancer.

**Ellagic Acid**
- Ellagic acid is a phenolic compound that may reduce the risk of certain types of cancer and decrease cholesterol levels.

**Phenolic compounds may be found in berries, prunes, red grapes and red grape juice, kiwifruit, apples and apple juice, and tomatoes.**

**Ellagic acid is found in red grapes, kiwifruit, blueberries, raspberries, strawberries, and blackberries.**
LUNCH

MUSAQA’A
RICE
HOMMOS
FRUIT SALAD
DRINKS

WHY NOT YET?

• Difficult?
• Long time to prepare?
Expensive
• Contain chemicals and pesticides?
EASY

Eating 5 to 9 servings of fruits and vegetables is easy, especially if you have a plan.

EASY

Start your morning off with a glass of 100% fruit juice. Just ¾ cup or 6 fluid ounces counts as one serving.

EASY

For a morning snack, eat a piece of fresh fruit, such as a banana, apple, orange, or pear. A medium piece of fruit counts as one serving.

EASY

Eat a large salad with your lunch. A large salad with 3 cups of mixed greens counts as three servings.

EASY

For an afternoon snack, munch on raw vegetables like celery sticks or baby carrots. A handful of celery sticks or baby carrots counts as one serving.

EASY

For dinner eat a dark green leafy vegetable, such as broccoli or spinach. Just ½ cup of any cooked vegetable counts as one serving.
For an evening snack, choose dried fruit like raisins or dried plums. Just ¼ cup of dried fruit counts as one serving.

Wherever you are throughout your day, there are always ways to make sure that you can get your 5 A Day.

When eating out:
- Don’t stick to the menu. As for a light salad instead of onion rings.

At Home:
- Keep a bowl of fresh fruit — washed and dried — in the kitchen.
- Stock up on frozen vegetables and throw them in the microwave for a meal or snack.
- At the grocery store, take advantage of pre-packaged salads and other vegetables.

In the Car:
- Store some dried fruit in your glove compartment.
- Wash whole pieces of fruit — like grapes and apples — and pack for the car.
- If grabbing takeout for home, order a salad or other vegetable side dish.

At Work:
- Instead of doughnuts and cookies, eat a fruit or canned fruit salad as a snack.
- Keep a package of individually boxed raisins in your desk drawer or briefcase.
Doesn’t Need A Lot Of Time

Every serving proposed here takes less than five minutes to prepare.

**LET US C ▶▶▶**

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**Breakfast**

Slice a medium or half of a large banana on top of your cereal. Above all else, don’t forget your morning juice. Just 6 ounces of 100% fruit juice or low-sodium vegetable juice counts as a serving toward your 5 A Day.

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**Midmorning Snack**

Eat just five or six baby carrots and you have another serving.

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**Lunch**

Try ordering a sandwich loaded with vegetables or a cup of vegetable soup. Add a small side salad with low-fat dressing.

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**Dinner**

Consider cooking canned or frozen peas or cauliflower in the microwave for a quick dinner side dish.

---

**Dessert**

Stock your freezer with 100% fruit juice Popsicles or place a 1/2-cup of berries, peaches, or other favorite fruit on low-fat frozen yogurt.
Over the weekend

Take advantage the weekend to prepare fruits and vegetables for the week.

Not Expensive

• Compare prices to make sure that you are getting the best deal on your fruits and vegetables.
• Buy the fruits and vegetables on sale.

Not Expensive?

• Avoid out-of-season produce and stick to fruits and vegetables that are in season to cut costs.
• Shop intelligently for frozen or canned alternatives to keep the lid firmly on your budget.

Chemicals and pesticides

The levels found by the FDA are almost all well within the safety limits set by the agency. As a result, many researchers say, there's no evidence that these very low levels of pesticide residues pose any health hazard.

Chemicals and pesticides

• Proper handling of fruits and vegetables greatly decrease the risk.
• Thoroughly washing apples, grapes, spinach, and other produce in water can remove up to 90 percent of pesticide residues.
FOLLOW UP 1
FOLLOW UP 2
FOLLOW UP 3

ACKNOWLEDGMENT
- All Participants
- Dr. Keenan and Dr. Tuuri
- Nana, Aysha, and Maryam

YES !!!
APPENDIX O

INTERVENTION STUDY CONSENT FORM

Consent form
Applying the Transtheoretical Model (Stage of Change) to Identify LSU Ag Center Employees Most Ready to Adopt Greater Fruit and Vegetable Consumption.
Louisiana State University

1. **Purpose:** to identify the individuals’ rate of dietary behavioral change toward greater fruit and vegetable consumption after following a tailored nutrition education for preparation stage of transtheoretical model

2. **Number of Participants:** Forty of LSU campus Ag Center Employees

3. **Time:** four hours distributed as an hour every week for four weeks. After that participates will be requested to fill out questionnaires that takes in total estimated time of 5-7 minutes every time.

4. **Procedures:** Volunteers will attend four educational sessions, an hour each, composed of 15 minutes of PowerPoint Presentation. Participants may have free lunch prepared from fruits and vegetables. At each session, volunteers will be asked to fill fruit and vegetable daily consumption estimation sheet, and stage of change algorithm, decisional balance questionnaire and self-efficacy questionnaire. Immediately after the end of the sessions, participants will be asked to fill the questionnaire for two consecutive weeks and one time four months later.

5. **Participant’s right:** your participation to the project is voluntary

6. **Benefits:** learning more about the healthy eating habits that associated with lowering the risk of chronic diseases including more fruit and vegetable consumption. Moreover, you will have free lunch or other incentives.

7. **Risks:** there is a very minimal risk, as your results will only be given to you. Publication of projects result will only include average test score, and collective survey results, with no reporting of individual data.

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____________________________                         ____________
Name and signature                         Date
Phytochemicals
They fight to protect your health
Phytochemicals
Doing battle for your body
They keep you feeling swell

They number in the thousands
And work together well
They aim to please and fight disease
Protecting healthy cells

They're the new thing in nutrition
And they fight, fight, fight
They're Phytochemicals!

You'll find 'em in your vegetables
Find 'em in your fruit
They give 'em fancy colors
And give them flavor too

Phytochemicals
In the colorful foods we've seen
Fruits and vegetables
Think yellow, orange, red and green

There certainly are lots of them
And some of them are new
Carotenes and flavinoids
And Indoles are a few

They're the plant food champions
They fight, fight, fight, fight
Phytochemicals!

Find 'em in your vegetables!
Find 'em in your fruit!

Phytochemicals
They fight to protect your health
Phytochemicals
Be sure to eat your 5 A Day and get some for yourself

Healthy for your body
Yes they're healthy for your heart
They're always at your service
But you have to do your part

Flavinoids, indoles and carotenes!
Think about yellow, orange, red and green!
You wanna eat right-o
Be sure to get your phytos
Phytochemicals!

5 A Day

Now here's a little song where I can take the lead
I wanna eat the right kind of foods that I need
I'm countin' all my servings in a real cool way
I'm talkin' fruits and vegetables, 5 A Day!

1 -2 -3 -4 - 5 A Day
That's the fruit and vegetable way
Eat 5 servings every day
Sing 5 A Day!

One! I grabbed a banana for my breakfast
Two! I ate a bunch of carrots for my lunch (Hey!)
Three! Felt a little hungry after school
An apple from the fridge and I'm on my way
Four! I had broccoli for dinner
Full of fiber with Vitamins C and A
Five! I needed just one more
Strawberries for dessert that's 5 A Day! (c'mon)

1 -2 -3 -4 - 5 A Day
That's the fruit and vegetable way
Eat 5 servings every day
Sing 5 A Day! (repeat)
One! A glass of fruit juice for my breakfast

Two! And a tangy tangerine
Three! Had a salad at noontime
Tomatoes and carrots and lots of good greens

Four! I had spinach for my supper
I like it fresh or I like it steamed
Five! Please gimme some cauliflower
That's 5 A Day and that's what I mean!

1 -2 -3 -4 - 5 A Day
That's the fruit and vegetable way
Eat 5 servings every day
Sing 5 A Day! (repeat)

Apple, banana, kiwis, grapes and beans
That's 5, you know that's 5

Grapefruit, orange, papaya, melon, tangerine
That's 5, you know that's 5

Broccoli, potato, celery, peppers, collard greens
That's 5, you know that's 5

Pineapple, mango, peaches, pears and nectarines
That's 5, you know that's 5

So that's the way it goes when you wanna eat right
Spread 'em all out from the morning 'till the night
Fresh or frozen, dried or canned
Just count 'em out loud, that's 5 A Day, man!

1 -2 -3 -4 - 5 A Day
That's the fruit and vegetable way
Eat 5 servings every day
Sing 5 A Day! (repeat)
1 -2 -3 -4 - 5 A Day!
5 A Day!

Fiber

Fiber, so very good for you
Fiber, it helps the food get through
Fiber, it keeps you runnin' smooth
Everybody needs a lot of Fiber

Every meal, every day
You gotta think about the Fiber way
Fruits, veggies and whole grains too
Full of Fiber and good for you
Apples, pears and prunes
Have Fiber by the mile
Eat 'em as a snack
They're gonna make you smile
Fiber, so very good for you

Fiber, it helps the food get through
Fiber, it keeps you runnin' smooth
Everybody needs a lot of Fiber

Every meal, every day
You gotta think about the Fiber way
Fruits, veggies and whole grains too
Full of Fiber and good for you

Veggies with Fiber
Like broccoli are great
Put some sweet potatoes
And spinach on your plate

Fiber, so very good for you
Fiber, it helps the food get through
Fiber, it keeps you runnin' smooth
Everybody needs a lot of Fiber

It's a whole lot of things that work together
To keep your body runnin' like a clean machine!

Keeps you healthy - Fiber
Keeps you movin' - Fiber
Every meal - Fiber
Eat a lot of foods with F-I-B-E-R!
Fiber, so very good for you

Fiber, it helps the food get through
Fiber, it keeps you runnin' smooth
Everybody needs a lot of Fiber

Yes I Can

Yes! I! Can!

Now that you know about 5 A Day
Here's a few things that we'd like to say
Once you get started you're gonna feel fine
But you gotta have the will, gotta make up your mind
Everybody here knows the right way to eat
Count 'em up, 5 A Day, seven days a week
Set it as a goal, and then take a stand
Say it out loud, say, "Yes I Can!"

Yes I can! Yes I Can!
I can eat my 5 A Day
Yes I can! Yes I Can!
And make good choices along the way
I can sing and shout about it
Tell my family and friends about it
Yes I Can
I can eat 5 A Day

I have confidence - I know I can do it
With fruits and vegetables I just gotta do it
Meal by meal, step by step
I choose what I like and that works best

'Cause every new day is a new day to be
Healthy as you can be healthy like me
Gotta have the facts, gotta have a plan
Gotta believe it, say, "Yes I Can!"

Yes I can! Yes I Can!
I can eat my 5 A Day
Yes I can! Yes I Can!
And make good choices along the way
I can sing and shout about it
Tell my family and friends about it
Yes I Can
I can eat 5 A Day

Think about it
Ask about it
Learn about it
Talk about it

When I'm at the store I can ask for more
Fruits and vegetables
When it's time for lunch I can eat a bunch
Fruits and vegetables
I want to eat right, now hear me say
Yes I Can eat 5 A Day!
Yes I can! Yes I Can!
I can eat my 5 A Day
Yes I can! Yes I Can!
And make good choices along the way
I can sing and shout about it
Tell my family and friends about it
Yes I Can
I can eat 5 A Day
APPENDIX Q

INDIVIDUAL DATA FOR CHANGE IN F&V INTAKE

Intake Profiles for Participants in the PC/C Group

Intake Profiles for Participants in the P Group
APPENDIX R

INDIVIDUAL DATA FOR CHANGE IN SOC

SOC Profiles for Participants in the PC/C Group

SOC Profiles for Participants in the P Group
APPENDIX S

INDIVIDUAL DATA FOR CHANGE IN SE INTAKE

SE Profiles for Participants in the PC/C Group

SE Profiles for Participants in the P Group
APPENDIX T

INDIVIDUAL DATA FOR CHANGE IN DB INTAKE

DB Profiles for Participants in the PC/C Group

DB Profiles for Participants in the P Group
VITA

Hiba Ahmad Bawadi was born October 9, 1975, in Amman, Jordan. She is the daughter of Mrs. Fawzieh Al-demisi and Mr. Ahmad Bawadi. Hiba received her bachelor’s degree in Nutrition and Food Technology in June 1997 from Jordan University of Science and Technology (JUST) in Irbed, Jordan. In the May of 2000, Hiba received her Masters Degree in Nutrition Science from University of Jordan (UJ) in Amman, Jordan. Hiba joined Louisiana State University (LSU) in Baton rouge, LA in May 2001 to pursue the doctor of philosophy degree in Human ecology- Human Nutrition and Food and minors in Experimental Statistics and Epidemiology. Hiba intends to graduate in Aug 2004.